CORONAVIRUS DISEASE (COVID-19): PSYCHOLOGICAL, BEHAVIORAL, INTERPERSONAL EFFECTS, AND CLINICAL IMPLICATIONS FOR HEALTH SYSTEMS

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OPINION
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The Need for a Mental Health Technology Revolution in the COVID-19 Pandemic

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INTRODUCTION

The current coronavirus 2019 (COVID-19) pandemic not only poses a large threat to the physical health of our population, if we fail to act now, it will also have detrimental long-term consequences for mental health.

Though social distancing is a crucial intervention to slow down the destructive effects of the pandemic, it can lead to isolation, decreased physical activity, and increased rumination, which might particularly hurt those with pre-existing mental illness. Further, the stream of disheartening COVID-19 news provides fodder for increased worry and distress, which can be detrimental for people with anxiety disorders. Early cross-sectional surveys in the United States, Canada, and Europe show an increase in symptoms of depression and anxiety for the general population, associated with COVID-19 concerns (1). Thus, this crisis is exacerbating existing mental health conditions and creating conditions for the development of new ones. Further, if lessons from other outbreaks such as Ebola (2) and SARS (Severe Acute Respiratory Syndrome) (3) are any indication, even after an outbreak is controlled, there will likely be a substantial increase in need for psychological support.

Crucially, this public health crisis will magnify and deepen existing shortcomings of mental health care systems. The US was already facing a mental health crisis before the pandemic: less than half of those with mental illness receive the care that they need (4). Underserved populations, such as low-income or ethnic minority populations, are disproportionately affected; they show the lowest utilization of mental health services (5). Early data suggest that underserved populations pay a larger health toll from COVID-19: they show higher mortality rates (6, 7). They are more likely to work in essential jobs putting them at greater risk of contracting COVID-19, and suffer greater economic consequences. All these factors lead to increased stress and anxiety. We will therefore be faced with an even greater relative shortage of trained professionals and means to mental health care during and after this pandemic.

We argue that what we need during a public health crisis like this is a digital mental health revolution: scaling up the delivery of confidential mental health services to patients across a wide range of platforms, from telemental health to mobile interventions such as apps and text messaging. Here, we provide an overview of technological tools which could help to decrease the mental health burden of COVID-19, provide recommendations on how they could be used and scaled-up, and discuss considerations and limitations of mental health technology applications.

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Telehealth

There is a crucial role for the use of teleconferencing software for therapy sessions during the COVID-19 pandemic. Most studies of teleconferencing services showed that effectiveness is comparable to in-person services across disorders including depression, posttraumatic stress disorder, and anxiety disorders (8). China has had some success with this approach. Researchers recently wrote in a Lancet Commentary that during the worst of the outbreak in January, China successfully provided online psychological counseling and self-help was widely rolled out by mental health professionals in medical institutions, universities, and academic societies (9).

In the US, the pandemic has also catalyzed a rapid adoption of telehealth (10). Medicare now allows for billing for telehealth. Further, the Health Insurance Portability and Accountability Act (HIPAA) has been revisited to permit more medical providers to use HIPAA compliant platforms to communicate with patients. This removes a major barrier to wider adoption of telemedicine and could also provide an outstanding opportunity for patients who previously did not feel comfortable seeking mental health care to now approach these services.

However, it is important to attend to disparities in technology access and digital literacy. Before the pandemic, only one in ten patients in the US used telehealth, and 75% said that they were unaware of telehealth options or how to access it (11). Recent data from primary care clinics showed that, though video care consults went up by 80% in late March and early April, minority groups represented a smaller portions of these visits (12). This is partly explained because of a lack of Internet availability, which varies due to limited data plans and lack of Wi-Fi, and inability to use smartphone features such as downloading apps (13). At the moment, some US telecom providers are offering free Internet services (14). However, longer-term strategies need to be developed to prevent further widening of the digital divide (15), including providing affordable, high speed Internet access, improving usability of telehealth programs, and providing appropriate guidance/training for patients using these services.

Mental Health Smartphone Applications

Importantly, the use of personal mobile phones presents an opportunity for broad scaling of interventions. Over 90% of Americans have some type of mobile phone and over 80% have smartphones (16). Even among low-income Americans (71%) and older adults (53%) smartphone ownership is high. Mental health apps have shown effectiveness in decreasing symptoms of depression (17) and anxiety (18). Because of COVID-19, multiple meditation and wellness apps designed by the private sector have now temporarily opened up free memberships to aid in easing anxiety, the majority of these being mindfulness apps (19).

However, there are over 10,000 consumer-available mental health apps in app stores and many of these are not evidence-based (20). Further, though many people download mental health apps, research shows low rates of continued use over longer periods of time (21). It is crucial that mental health providers recommend apps that are backed up by evidence. One helpful resource is Psyberguide (www.psyberguide.org), a non-profit that rates apps based on the strength of the scientific research that supports it, ease of use, and its privacy policies (22). Lastly, in order to improve engagement, providers should follow up with patients on their usage of these apps and integrate the app content into their treatment.

Texting Applications

In addition to apps, text-messaging platforms could be leveraged to help people cope with mental health challenges evoked by COVID-19. Because texts are also delivered *via* individuals' devices, they are easy to provide to many at once using automated text-messaging platforms. Text-messaging interventions have demonstrated effectiveness in behavioral health promotion and disease management (23). Importantly, text-messaging is an appropriate tool for low digital literacy populations and underserved groups (24). For instance, our own HIPAA approved texting platform, HealthySMS, was developed with and for low-income populations (mostly Spanish speakers) and shows high acceptability in underserved populations (25). We recently rolled-out a text-messaging study to provide wide-scale support to interested individuals in the US *via* daily automated text-messages, containing tips on coping with social distancing and COVID-19 anxiety.

For crisis situations, Crisis Text Line provides free confidential help *via* text-message. This platform has seen the mention of "coronavirus" in 24% of conversations from March 30th to April 6th (26). Furthermore, Caremessage, a non-profit organization, has temporarily provided free access to their messaging platform and COVID-19 template text-messaging library with health information (27). In addition, reliable information can also be delivered by health and government organizations automated *via* text messages. Scaling of information delivery to patients and the public could also relieve health professionals and public health departments, who are already understaffed, underfunded, and overburdened (14).

Social Media

Social media plays a complicated role in the management of mental health. On the one hand, it can provide positive and supportive connections during a time of physical isolation. Earlier work shows that many people with mental illness are increasingly turning to social media to share their experiences and seek mental health information and advice (28). On the other hand, it can also serve to increase depression and anxiety symptoms based on negative social comparisons and the spread of distressing information (29). For instance, in a recent cross-sectional survey of almost 5,000 participants in China, increased social media exposure on COVID-19 was associated with increases in anxiety and depression symptoms (30).

Social media has played a large role in the spread of information since the start of the COVID-19 outbreaks, including misinformation and "fake news". Large social media platforms are now reportedly taking steps to remove false content or conspiracy theories about the pandemic, using

artificial intelligence (AI); and distribute reliable information, such as developed by the World Health Organization (31).

In China, the government provided online mental health education through popular social media platforms, such as WeChat, Weibo, and TikTok during the height of the outbreak in January (9). In the UK, the National Health Service (NHS) is working with Google, Twitter, Instagram, and Facebook to provide the public with accurate information about COVID-19 (32).

Social media also provides a unique opportunity for health professionals to distribute accurate information to their patients and the public, or to highlight available mental health resources. In Wuhan China, mental health professionals uploaded videos of mental health education for the general public through WeChat and other Internet platforms at the early stage of the outbreak (9). In the US and Europe, many physicians have turned to Twitter to share medical information. The social media site has now implemented a mechanism to verify physicians and other scientific experts in an effort to counteract coronavirus misinformation (33).

However, because of the overload of information on social media, misinformation might still spread too fast to be intercepted by AI algorithms (34, 35). A recent report of responses from more than 8,000 people from six countries showed that one third reported seeing a significant amount of false or misleading COVID-19 information on social media or messaging platforms (36).

Further, posting information on social media raises the question of how health professionals should respond to the information posted by patients, and how that can impact the therapeutic relationship. Currently, there are no clear guidelines for health professionals, to determine how to act on social media. This calls for a push in quickly establishing such a consensus (37).

DISCUSSION

The COVID-19 crisis has fast-forwarded the use of technology in mental health care. Technology is crucial in scaling up access to mental health services during and after COVID-19. Given that people interact differently with technology, people of various ages, technical abilities, languages, and levels of literacy will need distinct types of interventions (38).

Older people are particularly vulnerable during this pandemic and already suffer from high rates of loneliness (39). This is strongly associated with greater symptoms of depression and anxiety (40), and physical morbidities and mortality (41). Previous work shows that older adults are interested in using technology to support their mental health, and that mobile health technology is feasible and reliable for assessing cognitive and mental illness (42).

However, older adults and those with low digital literacy might lack prior knowledge of digital technology to fully benefit from these tools (43). Digital health tools suffer from usability issues: they do not always consider digital literacy, health literacy, age, or English proficiency in their design (44). For instance, previous work showed that even the most basic functions of apps are difficult to use for diverse populations (45). Top-funded digital health companies test only 30% of their apps in people with clinical conditions (46). These factors are important because individuals with lower health literacy have worse health outcomes over time due to difficulty making informed health choices (47).

Therefore, interventions should be specifically targeted toward vulnerable groups, and adapted to their specific needs. This includes design choices such as easy to navigate user interfaces and tailoring vocabulary to older adults or those with low English proficiency (48). Training for individuals with low-tech skills, through outreach programs by healthcare staff may help patients to understand and use digital tools (49). Health systems should prioritize implementation of this crucial service (12).

Further, the right infrastructure needs to be set up to provide digital interventions securely, without personal privacy violations and minimizing the risk of data breaches. Apps and text-messaging must not only be effective, but also safe, secure, and responsible, similar to how therapists are held to standards of responsible practice and confidentiality (42). Therefore, it is imperative that cybersecurity specialists also become involved in ensuring safe technological services (50). Finally, just as they have now shown flexibility with telehealth, insurance companies and health systems should begin covering digital and mobile health interventions.

CONCLUSION

We are now in the midst of an acute health crisis which calls for a grand upscaling of mental health resources. Technology provides a medium for delivering mental health services remotely and on a wide scale, which is particularly important during social distancing measures. Even when the worst of the COVID-19 pandemic has subsided, it is likely that a large need for mental health support and services delivered through technology will remain. Digital mental health tools should be affordable, accessible, and appropriate for a wide group of individuals with varying ages, languages, and digital literacy. The time to massively invest in high quality and accessible online and mobile mental health in the face of the COVID-19 pandemic, and possible future pandemics, is now.

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CF wrote the first draft of the article. AA contributed to the writing and editing of the manuscript. Both authors contributed to the editing of the final manuscript.

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COVID-19 Confinement and Health Risk Behaviors in Spain

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The World Health Organization (WHO) has declared a world pandemic due to COVID-19. In response, most affected countries have enacted measures involving compulsory confinement and restrictions on free movement, which likely influence citizens' lifestyles. This study investigates changes in health risk behaviors (HRBs) with duration of confinement. An online cross-sectional survey served to collect data about the Spanish adult population regarding health behaviors during the first 3 weeks of confinement. A large sample of participants ($N = 2{,}741$) (51.8% women; mean age 34.2 years [SD 13.0]) from all Spanish regions completed the survey. Binomial logistic regressions adjusted for socioeconomic characteristics (i.e., gender, age, civil status, education, and occupation), body mass index (BMI), previous HRBs, and confinement context (i.e., solitude and exposure to COVID-19) were conducted to investigate associations between the number of weeks confined and a set of six HRBs (physical activity, alcohol consumption, fresh fruit and vegetable consumption, smoking, screen exposure, and sleep hours). When adjusted, we observed significantly lower odds of experiencing a higher number of HRBs than before confinement overall in a time-dependent fashion: OR 0.63; 95% CI: 0.49–0.81 for the second and OR 0.47; 95% CI: 0.36–0.61 for the third week of confinement. These results were equally consistent in all age and gender subgroup analyses. The present study indicates that changes toward a higher number of HRBs than before confinement, as well as the prevalence of each HRB except screen exposure, decreased during the first 3 weeks of COVID-19 confinement, and thus the Spanish adult population may have adapted to the new situational context by gradually improving their health behaviors.

Keywords: modifiable risk factors, social isolation, Spain, adults, COVID-19

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INTRODUCTION

The coronavirus disease 2019 (COVID-19) global pandemic has forced many countries to introduce confinement measures to minimize the propagation of the virus (SARS-CoV-2). This is true for Spain, where the confinement period started on March 15, 2020 (Agencia Estatal Boletín Oficial del Estado, 2020; Gobierno de España, 2020). A period of confinement or quarantine implies a radical change in the lifestyle of the population, disrupting usual daily activities (Jiménez-Pavón et al., 2020). Although quarantine will likely slow the spread of SARS-CoV-2, it may also lead to a

higher prevalence of health risk behaviors (HRBs), i.e., behaviors with potentially negative effects on health, such as insufficient physical activity or alcohol consumption above the recommended levels, which may lead to higher levels of anxiety, stress, and depression (Chen et al., 2020; Wang et al., 2020). According to a review conducted by Leppin and Aro (2009), there is no solid theoretical framework for the underlying risk perceptions that may have influenced HRBs in similar pandemics (i.e., SARS and Avian influenza); the majority of studies examining risk perceptions and protective behaviors are not model-based and only preliminary insights are usually provided.

The period of confinement disrupts the usual daily activities of the people that are confined and, in consequence, it is likely that prolonged homestay and solitude will increase sedentary behaviors (sitting, reclining, TV viewing, using mobile devices, or playing videogames) and reduce regular physical activity (Leppin and Aro, 2009; Lin et al., 2018), with a consequently higher risk for cardiovascular disease, cancer, mortality, and poor mental health (Lee et al., 2012; Chekroud et al., 2018; Takagi et al., 2019), and deprivation of acute mitigating effects over stress and mood (Szabo, 2003; Fleming et al., 2020; Wang et al., 2020). Currently, international guidelines recommend at least 150 min per week of physical activity, but it has been suggested that, during the confinement period, physical activity should be increased to at least 200 min per week to compensate for the decrease in the normal daily levels (Jiménez-Pavón et al., 2020). Furthermore, social isolation *per se* is associated with low levels of physical activity and poor diet in a population of young European adults (Hämmig, 2019), although the influence might extend to a wide range of ages since it has also been associated with smoking among older adults (Shankar et al., 2011; Kobayashi and Steptoe, 2018). Also, several studies have linked quarantine to negative psychological effects such as stress, anger, and post-traumatic stress-symptoms (Brooks et al., 2020).

As the COVID-19 epidemic has been found to increase population levels of perceived stress in China, it would be expected that citizens from other COVID-19-afflicted countries would experience a similar increase (Wang et al., 2020). In particular, infection fears, longer quarantine duration, boredom, frustration, inadequate supplies, inadequate information, financial loss, and stigma have been identified as stressors in other quarantine situations; thus, the increase in perceived stress levels could vary in each country depending on the policy adopted regarding the COVID-19 pandemic (Brooks et al., 2020). Moreover, there may be an interplay between COVID-19-related stress and social isolation. Indeed, particular aspects of social isolation, such as social disconnectedness, have been shown to increase the risk of perceived social isolation, which consequently predicted both higher anxiety symptoms and depression symptoms among elderly people (Santini et al., 2020). This could result in exacerbated stress, anxiety, and depression during confinement. Consequently, HRBs closely related to anxiety and stress, such as sleep quality, alcohol consumption, and smoking might be affected during the confinement period (Slopen et al., 2013; Weera and Gilpin, 2019; Xiao et al., 2020a,b). Furthermore, gender, age, and socioeconomic status differences usually lead to different responses as regards stress and HRBs; for instance, current evidence suggests that women are more susceptible to anxiety disorders and tend to smoke more than men to cope with stress (Torres and O'Dell, 2016). Also, the co-occurrence of two or more HRBs has been observed in both adults and older people (Francisco et al., 2019), and higher educational and economic levels seem to inversely correlate with this phenomenon across life (Noble et al., 2015; Mawditt et al., 2016, 2018; John et al., 2018). Similarly, age and gender differences have been pointed to as possible reasons for observed differences among the general population (Mawditt et al., 2016).

In this new situation of COVID-19 confinement, in which general lifestyle is likely to change, there have not yet been any studies analyzing the association between weeks confined due to COVID-19 and HRBs. Therefore, since there is no certainty about when the confinement will finish and how it will influence HRBs, this study aims to analyze the association between time course and HRBs in Spanish adults. This could contribute to informing strategies on how to maintain healthy behaviors among a general population of adults during confinement. Based on previous literature, we hypothesized that a greater length of time in COVID-19 confinement would be associated with unfavorable HRBs.

METHODS

A cross-sectional online survey was conducted to assess associations between time confined and HRBs during the COVID-19 pandemic.

The Survey

A web-form was used to collect data regarding health behaviors during the period March 22–April 5, 2020 (i.e., from the seventh day of national confinement in Spain being enacted). The survey was launched on social media on March 22, 2020, together with initial information about the objectives of the study. Adults aged 18 years and over currently residing in Spain and self-isolating due to COVID-19 were eligible to participate. Convenience sampling was used to select the participants of the study; according to server analytics, 3,150 media users covering all of the Spanish regions were offered the opportunity to participate. Once they accepted, participants were provided with an information sheet about the study aims and instructions for the survey, gave informed consent to participate, and confirmed whether they were confined. The data provided were anonymous and were treated according to Spanish law regarding general data protection. Once the survey was completed, participants were provided with information regarding health behaviors. The present study retrieved data from 2,741 participants with a mean age 34.2 (SD 13.0) years who completed the survey concerning the following variables: age, gender, civil status, occupation, education, time confined, height, weight, solitude during COVID-19 confinement, exposure to COVID-19, physical activity, screen exposure, sleep time, alcohol consumption, smoking habit, and fresh fruit and vegetable consumption.

Ethics

The study was conducted following the principles of the World Medical Declaration of Helsinki and was approved by the Ethics Committee of Research in Humans of the University of Valencia (register code 1278789). We reported the study according to the Strengthening the Reporting of Observational Studies in Epidemiology statement (STROBE) (von Elm et al., 2007).

Time Confined (Exposure)

Participants were asked about the time for which they had been isolated due to mandatory COVID-19 confinement through the following question: "How long have you been isolated due to the COVID-19 confinement enacted?" Possible answers ranged from 1 to 21 days. Participants were later categorized as follows: first week (1–7 days), second week (8–14 days), and third week (15–21 days).

Health Risk Behaviors (Outcome)

The outcome variable was estimated through a set of questions concerning six health-related behaviors (i.e., exposure to screens, sleep time, physical activity, fruit and vegetable consumption, alcohol consumption, and smoking habit). Participants were asked the following questions: "What is your average daily number of hours exposed to screens such as TV, cell phone, and tablet during COVID-19 confinement?", with possible answers ranging from "0 h" to "9 or more hours," "How many hours do you usually sleep a day?", with answers ranging from "<5 h" to "more than 9 h," "How many fresh fruit and vegetables do you usually eat daily?", with possible answers ranging from "0" to "more than 5," "Do you usually smoke?", with possible answers of "current smoker" or "not a current smoker," and "How often do you drink alcohol?", with answers comprising "usually," "moderate," or "never." Physical activity was estimated using the Physical Activity Vital Sign (PAVS) short version, in which participants answered two questions regarding the number of days and minutes a week they performed PA, with possible answers comprising 0, 1, 2, 3, 4, 5, 6, or 7 days per week and 10, 20, 30, 40, 50, 60, 90, and 150 or more daily minutes; following the original PAVS procedure, weekly minutes of physical activity were calculated by multiplying days by minutes (Greenwood et al., 2010; Coleman et al., 2012). All of the questions were asked twice to the participants; first, referring to before the confinement status and, second, referring to the confinement status.

We considered HRBs as not achieving the recommendations for each health-related habit. Based on current guidelines and relevant research, each HRB was defined as follows (**Table 1**): more than 2 h of daily screen time (screen exposure), <6 daily sleep hours (sleep time), less than three fresh fruit or vegetables a day (fresh and vegetable consumption), <150 weekly minutes of moderate to vigorous physical activity (physical activity), any alcohol consumption (alcohol consumption), and a current smoking habit (smoking habit) (World Health Organization, 2010; Grøntved and Hu, 2011; Ma and Li, 2017; Madrid-Valero et al., 2017; Miller et al., 2017; Theodoratou et al., 2017). Participants were categorized into those having a higher number of HRBs than before COVID-19 confinement, and participants having equal or fewer HRBs than before COVID-19 confinement.

TABLE 1 | Description of each of the health-risk behaviors included in the study.

Health-related behavior	Description	Health risk behavior score
Screen exposure		
	More than 2 h of daily screen time	Yes
	Up to 2 h of daily screen time	No
Physical activity		
	<150 weekly minutes of moderate to vigorous physical activity	Yes
	150 weekly minutes of moderate to vigorous physical activity or more	No
Fresh fruit and vegetable consumption		
	Less than three fresh fruit or vegetables a day	Yes
	Three or more fresh fruit or vegetables a day	No
Sleep time		
	<6 sleep hours daily	Yes
	6 sleep hours or over	No
Alcohol consumption		
	Any alcohol consumption	Yes
	No alcohol consumption	No
Smoking habit		
	Current smoking habit	Yes
	No current smoking habit	No

Covariates

According to previous research (Fernandez-Navarro et al., 2018; López-Sánchez et al., 2019), the present study also estimated age, gender, and socioeconomic features (marital status, education, and occupation), as well as self-reported body mass index using World Health Organization (WHO) categories. Moreover, other variables regarding the confinement situation were also controlled: solitude during COVID-19 confinement, and exposure to COVID-19. Self-reported responses were categorized as follows: marital status ("married or having a partner" or "neither married nor having a partner"), education ("having a university degree" or "not having a university degree"), occupation ("employed" or "not employed"), solitude during the COVID-19 confinement ("alone while confined" or "not alone while confined"), and COVID-19 exposure ("infected with COVID-19 or close to an infected person" or "not exposed"). Finally, we also controlled for previous HRBs.

Statistical Analyses

Statistical analyses were conducted using Stata version 16.1 (StataCorp, Texas, USA). We computed binomial logistic regression tests to check associations between time confined due to COVID-19 and HRBs during the COVID-19 confinement period in Spain, providing odds ratios (ORs) and 95% confidence intervals (CIs) for the whole sample. We also conducted stratified analyses to assess associations concerning gender, and age (i.e., cut-off point of 45 years old, which is a turning point regarding mental health for Spanish men and women)

TABLE 2 | Characteristics of the study population and health risk behaviors during COVID-19 confinement.

N = 2,741	*n* (%)	Mean (SD)
Age (y)		34.2 (13.0)
Gender		
Men	1,320 (48.2)	
Women	1,421 (51.8)	
Marital status		
Married or having a partner	1,216 (44.4)	
Not married or having a partner	1,525 (55.6)	
Occupation		
Employed	1,693 (61.8)	
Not employed	1,048 (38.2)	
Education		
Holding a university degree	1,680 (61.3)	
Not holding a university degree	1 061 (38.7)	
Body mass index		
Underweight	81 (3.0)	
Normal	2,032 (74.1)	
Overweight	437 (15.9)	
Obese	191 (7.0)	
Alcohol consumption		
Yes	1,368 (49.9)	
No	1,373 (50.1)	
Smoking		
Yes	241 (8.8)	
No	2,500 (91.2)	
Fruit and vegetable consumption (piece/day)		
<3	1,383 (50.5)	
≥3	1,358 (49.5)	
Sleep time (h/day)		
≤6	115 (4.2)	
>6	2,626 (95.8)	
Screen time (h/day)		
>2	2,678 (97.7)	
≤2	63 (2.3)	
WHO PA recommendations		
<150 weekly minutes	1,219 (44.5)	
≥150 weekly minutes	1,522 (55.5)	
Exposure to COVID-19		
Yes	288 (10.5)	
No	2,453 (89.5)	
Alone during COVID-19 confinement		
Yes	209 (7.6)	
No	2,532 (92.4)	
Number of previous health risk behaviors		
0–2	1,314 (47.9)	
3	876 (32.0)	
4–6	551 (20.1)	
Health risk behaviors during COVID-19 confinement		
More than before confinement	729 (26.6)	
Equal	1,247 (45.5)	
before confinement	765 (27.9)	
Week of COVID-19 confinement		
First	1,591 (58.1)	
Second	615 (22.4)	
Third	535 (19.5)	

(Ministerio de Salud, 2017), for each and the sum of all HRBs. Participants with missing data in any study variable were discarded for the study ($n = 143$). Levels of significance were set at $p < 0.05$.

RESULTS

The descriptive statistics of the sample are presented in **Table 2**. A total of 1,421 participants (51.8%) are women, and 288 (10.5%) declared as being COVID-19-infected or being exposed to someone who was. At the time of questionnaire reply, participants had been confined for an average of 8.8 days (SD 4.4), and 209 (7.6%) were alone while confined. Overall, the number of participants with a higher number of HRBs in comparison with pre-confinement levels while confined was 729 (26.6%).

As regards specific HRBs, **Table 3** and **Figure 1** show the evolution of percentages for each HRB (i.e., participants not meeting the recommended guidelines) before and during the COVID-19 confinement period. The percentage of participants meeting the guidelines regarding screen exposure became lower in the course of the confinement period, whereas the percentage of participants meeting the guidelines for the rest of HRBs increased with duration of confinement. Particularly, alcohol consumption and insufficient physical activity prevalence are the two that reduce the most substantially with time-course of confinement. Adjusted logistic regression analyses for each HRB (i.e., not complying with recommended guidelines for each health-related behavior) displayed in **Table 4** present significant reduced odds for insufficient physical activity for all participants as well as for all subgroup analyses in a dose-response fashion; overall, fruit and vegetable consumption also show significantly reduced odds for HRB, with the subgroup of participants aged <45 years showing a similar trend.

Overall, participants experiencing their second and third week of confinement, respectively, show significant lower odds for a higher number of HRBs (i.e., healthier lifestyles) in model 1 (**Table 5**) (OR 0.63; 95% CI: 0.51–0.79) (OR 0.65; 95% CI: 0.51–0.83) than those experiencing 1 week of confinement; even when fully adjusted, participants experiencing 2 and 3 weeks of confinement have progressively and significantly decreased odds for a higher number of HRBs in comparison with pre-confinement levels, with, respectively, OR 0.63; 95% CI: 0.49–0.81 and OR 0.47; 95% CI: 0.36–0.61. **Table 5** also shows age and gender subgroup analyses, which display similar significant trends as for the adjusted overall group. Crude analyses for older participants and women in their third week of confinement show no significant association with a higher number of HRBs; when

TABLE 3 | Percentage of participants with each health risk behavior previous to and during the COVID-19 confinement.

	Previous to COVID-19 confinement		Week 1		Week 2		Week 3		
	n (%)	Diff. (1–previous)	*n* (%)	Diff. (2–1)	*n* (%)	Diff. (3–2)	*n* (%)	Diff. (3–1)	*P**
Screen	2,274 (83.0)	14.7	1,554 (97.7)	−0.8	596 (96.9)	1.8	528 (98.7)	1.0	0.132
Sleep	172 (6.3)	−1.3	80 (5.0)	−2.6	15 (2.4)	1.3	20 (3.7)	−1.3	0.021
Alcohol	1,932 (70.5)	−17.1	850 (53.4)	−6.9	286 (46.5)	−3.2	232 (43.3)	−10.1	<0.001
PA	963 (35.1)	17.1	831 (52.2)	−11.9	248 (40.3)	−14.1	140 (26.2)	−26.0	<0.001
Fruits	1,352 (49.3)	3.5	839 (52.8)	−4.0	300 (48.8)	−3.2	244 (45.6)	−7.2	0.011
Smoke	382 (13.9)	−4.0	157 (9.9)	−2.3	47 (7.6)	−0.7	37 (6.9)	−3.0	0.059

*Chi-square test among confinement weeks.
PA, Physical activity.

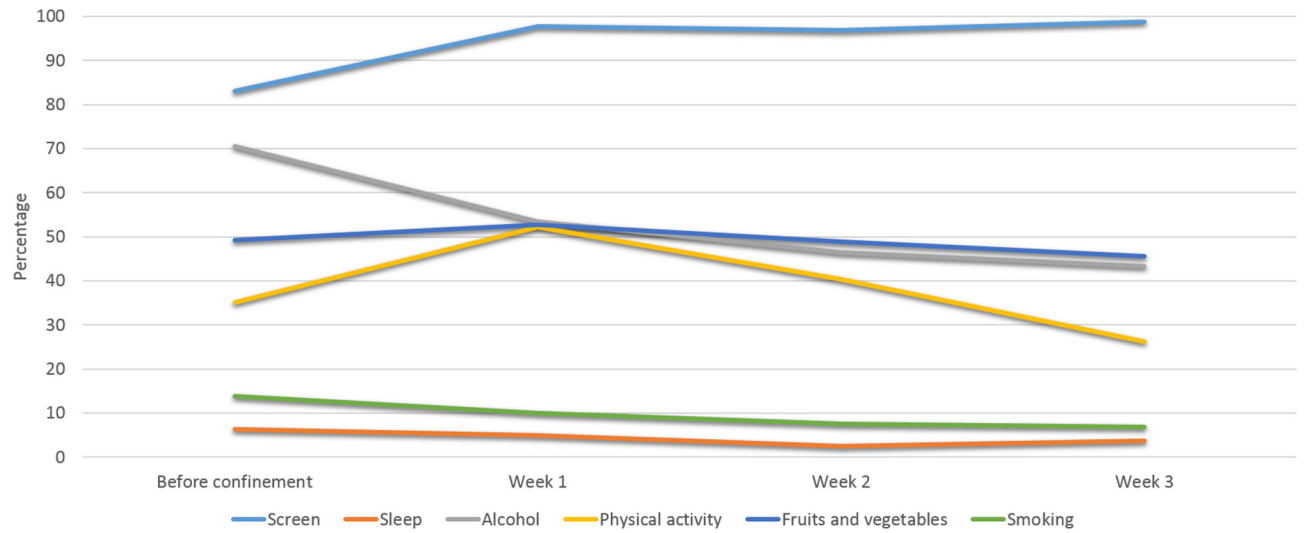

FIGURE 1 | Evolution of percentages of each health risk behavior during the COVID-19 confinement.

adjusted, both subgroups present significant associations, with, respectively, OR 0.44; 95% CI: 0.20–0.99 and OR 0.55; 95% CI: 0.36–0.83.

DISCUSSION

Our study provides novel data from an unusual setting of free movement restrictions resulting from the COVID-19 pandemic. The most critical finding of this study in a large sample of the Spanish adult population was that the odds of having a higher level of HRB (i.e., a change toward a higher number of HRBs than before the confinement) decreased during the confinement due to COVID-19. Contrary to our hypothesis, the prevalence of HRBs improved with longer confinement (i.e., physical activity and consumption of fruit and vegetable increased, tobacco and alcohol consumption decreased, and sleep quality improved), except for screen exposure time. Thus, the population gradually adapted their health behavior with time but also spent more time exposed to screens.

In the case of physical activity, the percentage of people doing <150 weekly minutes increased the first week of confinement but decreased the second and third week. This phenomenon might have occurred because the first week of confinement was used to adjust usual routines to the new context and, thereafter, home-based physical activity started to increase. This result agrees with previous research that found home-based physical activity to have a considerably better adherence (long-term maintenance) rate than center-based physical activity (Ashworth et al., 2005); interestingly, these values for HRB as regards physical activity gradually decreased whereas prevalence for screen exposure HRB remained very high. This point deserves a closer look and further investigation, since higher amounts of sedentary behavior, measured largely as screen time, have been usually associated with lower physical activity levels (O'Donoghue et al., 2016),

Regarding screen exposure, the percentage of participants dedicating more than 2 h to screen exposure daily slightly increased. This is an expected result due to the promotion of both remote work and online education during the COVID-19

TABLE 4 | Adjusted odds ratios (95% confidence interval) for each health risk behavior during COVID-19 confinement in the entire study population and age and gender subgroups (reference group: first week of confinement).

		Screen exposure			Physical activity			Fruit and vegetable consumption		
***N* = 2,741**	**Week**	***n* (%)**	**Model 1[a]**	**Model 2[b]**	***n* (%)**	**Model 1[a]**	**Model 2[b]**	***n* (%)**	**Model 1[a]**	**Model 2[b]**
All	First	1,554 (97.7)	1	1	831 (52.2)	1	1	839 (52.7)	1	1
	Second	596 (96.9)	0.74 (0.42–1.30)	0.75 (0.40–1.39)	248 (40.3)	0.63 (0.52–0.76)	0.61 (0.49–0.76)	300 (48.8)	0.84 (0.70–1.02)	0.77 (0.58–1.01)
	Third	528 (98.7)	1.26 (0.55–2.90)	1.38 (0.58–3.30)	140 (26.2)	0.39 (0.31–0.49)	0.43 (0.33–0.54)	244 (45.6)	0.74 (0.61–0.91)	0.71 (0.53–0.95)
<45 (y)	First	1,132 (98.0)	1	1	541 (46.8)	1	1	613 (53.1)	1	1
	Second	482 (98.2)	1.13 (0.52–2.47)	1.23 (0.53–2.87)	174 (35.4)	0.61 (0.49–0.76)	0.61 (0.47–0.78)	242 (49.3)	0.85 (0.69–1.05)	0.80 (0.59–1.09)
	Third	494 (99.2)	2.33 (0.80–6.80)	2.39 (0.78–7.25)	123 (24.7)	0.38 (0.30–0.49)	0.43 (0.33–0.56)	230 (46.2)	0.77 (0.62–0.95)	0.73 (0.54–0.99)
≥45 (y)	First	422 (96.8)	1	1	290 (66.5)	1	1	226 (51.8)	1	1
	Second	114 (91.4)	0.43 (0.19–1.01)	0.34 (0.13–0.92)	74 (59.7)	0.72 (0.48–1.09)	0.66 (0.42–1.04)	58 (46.8)	0.83 (0.26–1.24)	0.66 (0.34–1.28)
	Third	34 (91.9)	0.34 (0.91–1.27)	0.47 (0.10–2.18)	17 (46.0)	0.43 (0.22–0.85)	0.38 (0.18–0.81)	14 (37.8)	0.56 (0.28–1.12)	0.57 (0.19–1.71)
Men	First	741 (98.9)	1	1	358 (47.8)	1	1	392 (52.3)	1	1
	Second	251 (99.6)	2.73 (0.34–22.04)	3.06 (0.36–26.40)	95 (37.7)	0.71 (0.53–0.96)	0.65 (0.46–0.92)	120 (47.6)	0.83 (0.62–1.11)	0.80 (0.53–1.20)
	Third	314 (98.4)	0.69 (0.22–2.18)	0.93 (0.27–3.21)	56 (17.6)	0.27 (0.19–0.37)	0.29 (0.20–0.42)	140 (43.9)	0.72 (0.55–0.94)	0.71 (0.49–1.04)
Women	First	813 (96.6)	1	1	473 (56.2)	1	1	447 (53.1)	1	1
	Second	345 (95.0)	0.63 (0.34–1.15)	0.59 (0.30–1.17)	153 (42.2)	0.59 (0.46–0.76)	0.59 (0.44–0.78)	180 (49.6)	0.86 (0.67–1.10)	0.74 (0.51–1.08)
	Third	214 (99.1)	2.88 (0.67–12.33)	3.23 (0.72–14.50)	84 (38.9)	0.59 (0.43–0.80)	0.59 (0.42–0.84)	104 (48.2)	0.79 (0.58–1.07)	0.67 (0.42–1.07)
		Sleep time			**Alcohol consumption**			**Smoking habit**		
All	First	80 (5.0)	1	1	850 (53.4)	1	1	157 (9.9)	1	1
	Second	15 (2.4)	0.49 (0.28–0.86)	0.40 (0.22–0.74)	286 (43.5)	0.77 (0.64–0.93)	0.89 (0.69–1.16)	47 (7.6)	0.78 (0.55–1.09)	0.99 (0.57–1.72)
	Third	20 (3.7)	0.98 (0.58–1.65)	0.95 (0.54–1.65)	232 (43.3)	0.66 (0.54–0.81)	0.82 (0.63–1.08)	37 (6.9)	0.83 (0.56–1.21)	0.87 (0.47–1.59)
<45 (y)	First	44 (3.8)	1	1	610 (52.8)	1	1	94 (8.1)	1	1
	Second	7 (1.4)	0.35 (0.16–0.79)	0.38 (0.16–0.90)	232 (47.3)	0.93 (0.70–1.25)	0.94 (0.70–1.25)	31 (6.3)	0.75 (0.49–1.14)	0.77 (0.39–1.53)
	Third	17 (3.4)	0.94 (0.53–1.67)	0.98 (0.53–1.82)	211 (42.4)	0.84 (0.63–1.12)	0.81 (0.60–1.08)	32 (6.4)	0.80 (0.52–1.20)	0.74 (0.37–1.46)
≥45 (y)	First	36 (8.3)	1	1	240 (55.1)	1	1	63 (14.5)	1	1
	Second	8 (6.5)	0.73 (0.33–1.62)	0.55 (0.23–1.33)	54 (43.6)	0.87 (0.48–1.56)	0.85 (0.48–1.53)	16 (12.9)	0.82 (0.45–1.84)	1.81 (0.58–5.65)
	Third	3 (8.11)	1.00 (0.29–3.43)	1.00 (0.25–3.96)	21 (56.8)	1.46 (0.48–4.45)	1.49 (0.49–4.55)	5 (13.5)	0.95 (0.36–2.55)	1.20 (0.21–6.98)
Men	First	30 (4.0)	1	1	428 (57.1)	1	1	52 (6.9)	1	1
	Second	5 (1.9)	0.53 (0.20–1.39)	0.49 (0.18–1.40)	120 (47.6)	0.93 (0.64–1.37)	0.93 (0.64–1.37)	19 (7.5)	1.20 (0.66–1.93)	2.10 (0.78–5.66)
	Third	5 (1.6)	0.45 (0.17–1.20)	0.42 (0.15–1.20)	140 (43.9)	1.02 (0.70–1.48)	1.02 (0.70–1.48)	22 (6.9)	1.09 (0.64–1.85)	1.38 (0.56–3.41)
Women	First	50 (5.9)	1	1	422 (50.1)	1	1	105 (12.5)	1	1
	Second	10 (2.8)	0.48 (0.24–0.96)	0.37 (0.18–0.78)	166 (45.7)	0.88 (0.62–1.26)	0.88 (0.62–1.26)	28 (7.7)	0.62 (0.40–0.96)	0.69 (0.34–1.39)
	Third	15 (6.9)	1.53 (0.82–2.85)	1.46 (0.74–2.88)	92 (42.6)	0.62 (0.40–0.94)	0.62 (0.40–0.94)	15 (6.9)	0.63 (0.35–1.18)	0.59 (0.25–1.43)

[a] *Adjusted for age and gender (all participants), for gender (<45 y, ≥45 y), and for age (men, women).*

[b] *Model 1+ socioeconomic features (marital status, occupation, and education), exposure to COVID−19, solitude, body mass index, and previous health risk behavior.*

TABLE 5 | Adjusted odds ratios (95% confidence interval) for a higher number of health risk behaviors than before COVID−19 confinement in the entire study population and age and gender subgroups (reference group: first week of confinement).

***N* = 2,741**	**Week**	***n* (%)**	**Model 1[a]**	**Model 2[b]**
All	First	1,591 (58.1)	1	1
	Second	615 (22.4)	0.63 (0.51–0.79)	0.63 (0.49–0.81)
	Third	535 (19.5)	0.65 (0.51–0.83)	0.47 (0.36–0.61)
<45 (y)	First	1,155 (53.9)	1	1
	Second	491 (22.9)	0.64 (0.50–0.83)	0.69 (0.51–0.92)
	Third	498 (23.2)	0.64 (0.50–0.83)	0.48 (0.36–0.64)
≥45 (y)	First	436 (73.0)	1	1
	Second	124 (20.8)	0.60 (0.38–0.94)	0.52 (0.32–0.86)
	Third	37 (6.2)	0.73 (0.35–1.52)	0.44 (0.20–0.99)
Men	First	749 (56.7)	1	1
	Second	252 (19.1)	0.72 (0.52–1.00)	0.67 (0.46–0.97)
	Third	319 (24.2)	0.60 (0.44–0.83)	0.41 (0.28–0.54)
Women	First	842 (59.3)	1	1
	Second	363 (25.6)	0.57 (0.42–0.77)	0.60 (0.42–0.84)
	Third	216 (15.2)	0.73 (0.51–1.05)	0.55 (0.36–0.83)

[a] *Adjusted for age and gender (all participants), for gender (<45 y, ≥45 y), and for age (men, women).*

[b] *Model 1+ socioeconomic features (marital status, occupation, and education), exposure to COVID-19, solitude, body mass index, and previous health risk behaviors.*

confinement (Agencia Estatal Boletín Oficial del Estado, 2020). The high values found in this study for daily screen time far exceed the recommended levels for adults, which could contribute to the experience of mental health disorders such as depression (Wang et al., 2019).

Concerning alcohol and tobacco, the consumption of both decreased during the course of confinement. It seems that during this period, in which health is even more important than usual, people may be trying to adopt healthier lifestyles. Nevertheless, the values found in the present study were, respectively, higher and lower for alcohol and cigarette consumption when compared with prior research involving Spanish participants; such different percentages could be due to differences regarding sample characteristics (e.g., an overall different age may lead to different healthy habits) as well as assessment tools (e.g., alcohol consumption threshold was considered differently in the studies) (Peacock et al., 2018). The increasing use of new technologies in leisure time as substitutes for alcohol and tobacco consumption might be a possible explanation for this reduction trend (Gil-Madrona et al., 2019). Furthermore, longer confinement periods might show different results due to increased stress, especially in very specific populations (e.g., those with impulsive behaviors and/or ex-addicted) (Clay and Parker, 2020), as well as in women (Torres and O'Dell, 2016); this may result from either limited access to supplies or attempts to preserve supplies during the confinement; also, the deprivation of physical social interactions might mitigate both alcohol consumption and smoking (Knudsen et al., 2007; Seid, 2016). Further research would be required to better understand these points.

The percentage of people sleeping for fewer than 6 daily hours per day decreased during the confinement. This is likely to have happened because, during confinement, people do not need to awaken as early to commute to work or may have less job stress. Both job stress and work overload have been associated with poor sleep quality (Shiffman et al., 2009). However, this might especially occur among those with increased social capital, as has recently been shown during the COVID-19 virus epidemic in central China (Xiao et al., 2020a). Also, it is likely that achieving the weekly recommended amount of physical activity or maintaining the usual meal times helped in improving sleep quality (Potter et al., 2016; Altena et al., 2020). Besides, the fact that the HRB regarding sleep time is very low in this study may indicate a moderating influence over the higher anxiety levels associated with the COVID-19 pandemic (i.e., lower sleep deprivation during the confinement might lead to lower anxiety levels) (Pires et al., 2016; Nollet et al., 2020).

Concerning fruit and vegetable consumption, the percentage of people eating fewer than three fresh fruit or vegetables a day decreased during the confinement. This positive result agrees with the food and nutrition recommendations for the Spanish population during the COVID-19 health crisis and could be related to the fact that forced confinement and closure of both bars and restaurants might lead to consuming more home-made cooking (Academia Española de Nutrición y Dietética, 2020). Furthermore, the general tendency toward healthier behaviors as a whole observed in this study might be partially explained by the positively interrelated behavioral domains observed in prior research (i.e., individuals would have decided to lead a healthy lifestyle overall instead of placing emphasis on a single health behavior); in particular, a higher amount of physical activity has been observed to correlate with higher fruit and vegetable consumption (Fleig et al., 2015).

Regarding the influence of the control variables over the association between weeks of confinement and health risk behaviors, this study found a consistent influence of occupation and exposure to COVID-19 (i.e., those participants employed or exposed to COVID-19 had significantly higher odds for HRBs) (results not published). Thus, those working more hours might have less time to take care of their health (leisure-time physical activity, preparing healthier food, sleeping more) and be more exposed to screens due to remote work. This health-related behavior pattern is consistent with findings from previous research, which observed a higher risk of suffering from coronary heart disease and stroke with long working hours (Kivimäki et al., 2015). Furthermore, socioeconomic features may probably explain a substantial part of the differences found among gender subgroups; for instance, women and the higher educated have shown healthier behaviors regarding diet, whereas higher income has been identified as a predictor of higher levels of physical activity (Garza et al., 2013). Also, cultural differences and the perception styles of individuals have been underscored to be behind the perception of the impact of SARS, which, in turn, might have influenced the ability to deal with HRBs in this new COVID-19 pandemic (Cheng and Tang,

2004). Besides, those individuals living in the most affected countries and most financially affected due to a virus outbreak (i.e., equine influenza) have been suggested to be among the most highly stressed and, thereby, more prone to modifying their HRBs (Taylor et al., 2008). Consequently, future research focused on at-risk populations, such as those with deprived backgrounds or those socially and financially affected by the COVID-19 pandemic, is of special interest; research from a theoretical framework perspective based on either the PEN-3 cultural model or the Triandis model of social behavior could contribute to understanding the social circumstances underlying HRBs in this specific context (Facione, 1993; Iwelunmor et al., 2014).

The strengths of the current study consist of examining a wide and large sample of Spanish adults (i.e., participants representing all the Spanish regions) with a good distribution of males and females, and the analysis of a wide set of variables, including novel variables such as weeks isolated or exposure to COVID-19. Besides, the dose-dependent response remains consistent overall and in subgroup analyses. A key limitation of this study was that data were self-reported, potentially introducing self-reporting and recall bias into the findings. Moreover, since a convenience sampling method was used to recruit participants, there is a possibility of selection bias. Second, due to the observational nature of the study, the results do not allow us to infer any causality. Third, the definition for each HRB was based on both current institutional guidelines and relevant research. However, it should be noted that utilizing different definitions or cut points might lead to different results. Last, because the young population is overrepresented in this study, different results might be obtained with an older sample of participants. The authors recommend that future studies analyze the association between weeks confined due to COVID-19 and changes in health risk behaviors in other countries where the population is confined, in order to check whether the trend found in this study is specific to Spain or is an international trend.

CONCLUSION

The results of this study consistently showed that changes toward a number of HRBs in Spanish adults (PA, alcohol, tobacco, sleep time, and consumption of fruit and vegetables) progressively decreased during COVID-19 confinement. The only habit that increased was that of screen exposure time. These results point to a necessity to rethink the current system of work and education and suggest that a progressive adaptation to a system with more remote work and more online education may be beneficial for the improvement of people's health.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics Committee of Research in Humans of the University of Valencia. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

RL-B, GL-S, JAC, LS, and JCal contributed the conception and design of the study. RL-B organized the database. RL-B and GL-S performed the statistical analysis. RL-B and GL-S wrote the first draft of the manuscript. JCal, LA, JCas, LS, LA, MT, and JAC wrote sections of the manuscript. All authors contributed to manuscript revision and read and approved the submitted version.

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Caring for Health Professionals in the COVID-19 Pandemic Emergency: Toward an "Epidemic of Empathy" in Healthcare

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Psychological research into healthcare opened the door to understanding people's emotional reactions when experiencing events perceived as life-threatening. This is the case of the current outbreak of the novel Coronavirus disease (COVID-19) that has recently been declared "a public health emergency of international concern (PHEIC)" by the World Health Organization (WHO). The response to an influenza pandemic might generate remarkable stress and emotional turmoil to healthcare providers who work during the outbreak. Prior experience with disasters, pandemics, and major traumatic events indicates that enhanced support to healthcare professionals enabling them to become aware of their own emotions and effectively share their perspective and lived experience with patients can help them in remaining efficient and focused during these stressful events. This outbreak marks a vital moment where healthcare systems can endorse an "epidemic of empathy" aimed at bringing science and humanism together to benefit patients and consolidate citizens' trust in healthcare providers during this and future healthcare crisis. Perhaps, the greatest opportunity for managing people fears during health emergencies—like the COVID-19 one—lies, in the short term, in restoring our connections with each other. Today, we are all called to rebuild a sense of community and the ties that bind us together as human beings.

Keywords: COVID-19, medical humanities, empathy, healthcare professionals, patient-doctor communication, medical psychology

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Psychological research into healthcare opened the door to understanding people's emotional reactions when experiencing events perceived as life-threatening. This is the case of the current outbreak of the novel Coronavirus disease (COVID-19) that has been recently declared "a public health emergency of international concern (PHEIC)" by the World Health Organization (Wang et al., 2020).

When coping with a large-scale emergency like this, people often report a wide range of psychological needs, including out-of-control emotional reactions, as demonstrated by recent studies on the psychological impact of COVID-19 on populations across countries (Leon, 2004; Graffigna et al., 2020; Li et al., 2020; Lima et al., 2020). This "emotional surge" has the potential to overwhelm the medical system for as long as the public health crisis lasts. People's emotions, however, are only half of the story in a healthcare crisis.

The response to an influenza pandemic—like the one we are currently experiencing—might generate remarkable stress and emotional turmoil in healthcare providers who work during the

outbreak (Maunder et al., 2008; Barello et al., 2020; Lancet, 2020). This issue has been shown by many studies on healthcare professionals' experience when facing the COVID-19 pandemic to be one that needs to be urgently addressed (Adams and Walls, 2020; Selman et al., 2020; Williamson et al., 2020). In these circumstances, health professionals become increasingly crucial points of reference for citizens regarding information on how to cope with the health crisis. This might make them feel fully responsible for managing the situation and often impede their ability to recognize their own human feelings, worries, and concerns (Khalid et al., 2016).

The expression of emotions by healthcare providers has been traditionally considered unprofessional and inconvenient, basically a sort of "taboo" (Meier et al., 2001). Research in this field has increasingly addressed this issue. This as a result of the fact that healthcare providers often have to deal with unexpected emotions arising from both the patient and themselves, and should find strategies to manage the stresses and anxieties of confronting illness and suffering (Meier et al., 2001; Delfrate et al., 2018). Indeed—although medical education does not explicitly promote healthcare workers "alexithymia" and emotional neglect – what frequently occurs in the practice with patients, especially through the action of the so called "hidden curriculum" (Cherry et al., 2014), seems to encourage clinicians to detach themselves from emotions (Shapiro, 2011b). Accordingly, clinician's socialization and professional implicit norms often foster health providers' emotional detachment (Halpern, 2001) as a strategy to cope with emotional challenges in interactions with patients (Rosenfield and Jones, 2004). At the same time, research has established that emotional regulation and disclosure among healthcare professionals may vary by cultural context (Rakovski and Price-Glynn, 2010; Mastracci and Hsieh, 2016). Moreover, studies on professionals' emotions highlight the importance of clinicians' awareness of their emotional states during the clinical relationship with their patients (Kushnir et al., 2011), although with some differences across clinical settings which have been supported by various practices in this regard (Halpern, 2014).

We know that emotions play a significant role in human interactions, even those occurring in healthcare encounters; as a matter of fact, they are a "vehicle" that is able not only to communicate intentions and shape behaviors, but that is also functional to build (or not) mutual trust, affect information processing, and even to determine people's health choices (Chapman and Coups, 2006). Studies showed that unrecognized emotions in the healthcare providers' experience may prevent the adoption of a patient-centered style of care and may be associated with harmful behaviors, such as neglecting patients' psychological issues or avoiding bonding with patients to elude the burden of highly emotional contents (Ely et al., 1995; Smith et al., 2005). Lack of recognition of emotions (of both patients and providers) can affect the quality of medical care and the healthcare provider's own sense of well-being, and may also lead to physician distress, disengagement, and burnout (Ekman and Halpern, 2015; Silva and Carvalho, 2016).

Prior experience with disasters, pandemics, and major traumatic events indicates that enhanced support to healthcare professionals enabling them to elaborate upon and become aware of their own emotions and effectively share their perspective and lived experience with patients can help them in remaining efficient and focused during these stressful events (Silva and Carvalho, 2016). That's because healthcare is not simply a purely scientific discipline, it is a matter of empathy, and communication skills are necessary to convey that empathy (Reynolds and Quinn Crouse, 2008).

During a healthcare crisis, an empathetic style of communication is the most effective when attempting to push the population to take preventive actions or to avoid harmful behaviors. An empathetic response, and the relative efforts in responding sensitively to others, has been associated with a more frequent adoption of recommended health precautions during a pandemic (Novack et al., 1997; King et al., 2016).

In fact, empathy, that involves commitment to understanding what others are feeling by adopting their perspective and responding in supportive ways, has been associated with benefits not only for laypeople but also for health providers. Sharing emotions, concerns, and worries by both could make all the actors involved in a healthcare crisis feel more responsible and aware of how much everyone's contribution could be determinant in effectively coping with the stressful consequences of such an event (King et al., 2016). Empathy has also been demonstrated to be a core element of an effective therapeutic relationship and to be a protective factor for health professionals emotional exhaustion (Wilkinson et al., 2017). On the other hand, studies have shown how, despite being an important component in providing effective care, empathy also generates vulnerability for stress-related symptoms such as compassion fatigue and professional emotional exhaustion and burnout (Hensley, 2008). The cognitive and emotional effort involved in empathic responses might strain the already overwhelmed psychological resource clinicians have in periods of high stress—like the COVID-19 emergency—, contributing to burnout and even causing emotional pain (Gleichgerrcht and Decety, 2013). These contradictory effects of empathy can be explained by considering that empathy is by nature multidimensional, interpersonal, and shaped by context and settings (Lamothe et al., 2014). According to Davis (2018), a core component of empathy in the context of patient care is perspective taking. It consists of adopting the point of view of another person and seeing things from their perspective. Perspective taking has been demonstrated to increase patient satisfaction (Blatt et al., 2010), as well as physician's well-being (Shanafelt et al., 2005). Empathetic concern, on the other hand, which is conceptually closer to sympathy, is the emotional reaction of an individual who is attentive to others' experience and spontaneously engages in helping behaviors (Lebowitz and Dovidio, 2015). It is important to distinguish the two concepts because they may lead to different outcomes. While perspective taking has been viewed to be always beneficial in patient care, a too elevated level of empathic concern could interfere with objectivity in diagnosis and treatment (Gleichgerrcht and Decety, 2013). Therefore, some effective detachment between clinicians and their patients has been considered desirable to maintain both clinical neutrality and emotional balance (Hojat et al., 2003). Moreover, other dimensions such as personal authenticity and hope do interact with empathy-related processes and outcomes and should be

considered as other aspects to be trained in medical education programs (Shapiro, 2011a; Ünal, 2014; Yagil and Shnapper-Cohen, 2016).

Only when health professionals and citizens opt for a relationship where emotional disclosures about events could occur, could their interaction become a true partnership with shared decision-making authority and mutual responsibility for outcomes, thus reducing stress and frustration from both sides. To gain this objective, health systems are warranted to recognize that healthcare professionals are humans too by legitimizing their empathetic response; however, a practical plan to strengthen the healthcare providers psychological resilience and work engagement during pandemic emergencies is needed to prevent them from becoming "second victims" in this scenario (Scott et al., 2009) and to experience the "side effects" related to empathy. In other words, during health emergencies, like the one that we are currently experiencing with COVID-19, health professionals should be emotionally supported and safeguarded from the risk of forgetting their human side. If not, the consequences of the pandemic has to also take into account the psychological costs related to the increasing burnout rates among the health workforce.

This outbreak marks a vital moment where healthcare systems could begin to endorse an "epidemic of empathy" aimed at bringing science and humanism together to benefit patients and consolidate citizens' trust in healthcare providers during a healthcare crisis. Perhaps the greatest opportunity for managing people's fears during health emergencies—like the COVID-19 one—lies, in the short term, in restoring our connections with each other. Today, we are all called to rebuild a sense of community and the ties that bind us together as human beings.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

SB drafted and edited the manuscript. GG critically revised the manuscript. Both authors approved the contributions for publication.

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SARS-CoV-2 Risk Management in Clinical Psychiatry: A Few Considerations on How to Deal With an Unrivaled Threat

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The pandemic spread of the corona virus SARS-CoV-2 has even-handedly shattered national and international health systems and economies almost in an instant. As numbers of infections and COVID-19–related deaths rise from day to day, fears and uncertainties on how to deal with this unknown threat are extremely present both for individuals and societies as a whole. In this manuscript, we aim to exemplarily describe the bullet points concerning (a) the internal risk management, (b) the organizational and structural changes, and (c) the communicational strategies applied in a Psychiatric University Hospital in the Southern part of Germany. The authors are well aware about the fact that almost none of these considerations may be considered as evidence-based at the moment. However, the authors trust that these reflections and experiences may be useful as an orientation for similar risk constellations in other afflicted countries due to the temporal delay of the pandemic course.

Keywords: corona virus, SARS-CoV-2, clinical psychiatry, hospital management, pandemic, pandemia

INTRODUCTION

The outbreak of the novel coronavirus SARS-CoV-2, epicentered in Hubei Province of the People's Republic of China, has affected many other countries worldwide up to now. On January 30, 2020, the WHO Emergency Committee declared the case of a global health emergency (1). On March 11, the WHO made the assessment that COVID-19 can be characterized as a pandemic (2).

In many countries where the virus has spread quickly, medical systems have not been able to keep up with the demand for intensive medical care and mortality rates have been reported high. Italy, in particular, has at least in some regions been overrun by the spread, even with the entire country on lockdown, and the medical system has been overwhelmed, resulting in the need to ration medical care and therefore hazarding many deaths as a consequence (3).

In order to deal with this highly challenging situation, unprecedented measures have been taken. On the societal level the Federal Government of Germany announced (similar like most other

countries), an almost complete shutdown of public life with closure of schools, universities, restaurants, shops, etc., with the goal to slow down the spread of SARS-CoV-2. Concerning the health system, all available capacities were reorganized with the goal to provide as many treatment capacities for COVID-19 patients as possible. In particular, the number of beds on intensive care units equipped with ventilation support for COVID-19 patients showing respiratory failure was significantly increased. These two main measures were taken in order to avoid the dangerous mismatch between a sudden extreme need and a limited availability of treatment places on intensive care units.

One further experience from Italy was the particular role of the medical infrastructure regarding the spread of infections (4). With a large proportion of doctors and nurses being infected, the functioning of the health system was severely impaired and there was a high risk for all patients to become infected when they get in contact with the health system (4). However, not only the medical infrastructure but also the lack of protective materials such as surgical masks and FFP masks played an eminent role in the spread of infections.

This situation of enhanced infection risk and scarcity of protective materials poses a complex challenge for every health institution, as several—partly contradictory—goals have to be achieved: First, control the infection rate within the institution, both for patients and staff; second, try to avoid all hospitalizations, that are not extremely urgent; third, provide all available resources for supporting and empowering the intensive care units and fourth, take reasonably care for all other "non-COVID-19" patients. These goals have also been requested by the Federal Government of the Republic of Germany. The contradictory character of these goals is best illustrated by the general decision on how to allocate the resources on hand: an almost complete stop of admissions of patients would provide an excellent strategy for maximized infection control. However, the majority of patients would be left unattended rising the risk of exacerbations of medical conditions on a large scale. Good anti-infection strategies on intensive care units require an enormous amount of protection materials and testing capacities, but how could this be achieved in the context of a general scarcity of supplies and capacities?

In psychiatric hospitals, the situation is particularly demanding. Even less than other medical fields, psychiatry units are not set up for aggressive infection control, staff and patients are not used to wear protective gear, and a great proportion of people with psychiatric illnesses is usually treated on an ambulatory basis. The "treatment as usual" of psychiatric conditions involves intense social interactions which are usually performed with certain physical contact: patients attend therapeutic groups and occupational therapy sessions; they are used to dine in communal areas, watch television, and play games together in day rooms. Patients who are very ill with psychiatric disorders may resist hygiene measures, and they may intrude into the personal space of others. This is well in line with the experiences made in retirement homes where infection and death rates exponentially increased during the course of the pandemic. Parallels regarding the treatment of dementia patients can easily be drawn and were registered in our own experience.

Patients on an acute psychiatric unit may be agitated, uncooperative, or even violent, and it's not hard to imagine the distress of anyone who has a patient spit on them as we're all trying to remember not to shake hands. Moreover, a large proportion of hospital admissions in psychiatry occur as emergencies without any possibility to postpone the hospital stay. With almost all community-based treatment offers and outpatient clinics closed and a situation full of uncertainty and distress combined with social isolation, one also has to consider that the need for inpatient treatment of psychiatric patients developing an acute crisis may even increase.

To provide adequate therapy in the context of a highly contagious pandemic spread requires not only experienced personnel but also adequate spatial, financial, and material resources. Without any doubt, the SARS-CoV-2 pandemic represents a new challenge for psychiatric health care (3).

METHODS

In the present manuscript, we provide information about the measures taken, their feasibility, and the related experiences in the Psychiatric District Hospital of Regensburg located in the Southern part of Germany which also serves as the Department of Psychiatry and Psychotherapy of the University of Regensburg. The hospital provides 525 beds for inpatient treatment in all fields of clinical psychiatry including geriatrics and addiction medicine, a day clinic with 50 places and a large out-patient department. The Department of Psychiatry and Psychotherapy of the University of Regensburg serves a population of nearly 700,000 people as exclusive, single provider of inpatient psychiatric treatment. The hospital is run by a public enterprise (Medizinische Einrichtungen des Bezirks Oberpfalz; medbo) with more than 3,600 employees. Further institutions of the public enterprise include psychiatric hospitals in Wöllershof (distance: 95 km/59 miles) and Cham (60 km/37 miles), additional out-patient facilities in Amberg (70 km/43 miles) and Parsberg (45 km/27 miles), hospitals for forensic psychiatry, child and adolescent psychiatry, neurology, neurological rehabilitation, and residential homes for psychiatric patients.

Affected occupational groups included medical doctors, psychologists, nurses, social workers, music therapists, sport therapists, occupational therapists/ergotherapists, educationalists, and a great variety of technical and administrative supporters (IT, pharmacy, distribution, logistics, purchasing department, infrastructure, carpenters, kitchen staff, etc.).

No ethics approval was necessary for the considerations presented in this manuscript due to the fact that they exclusively rely on theoretical considerations and practical lessons learnt during the early stages of the 2020 SARS-CoV-2 pandemic.

RESULTS

The authors consider several items as important for the management of the SARS-CoV-2 threat in the context of a psychiatric hospital.

1. **Leading structure:** A "corona core team" (CCT) involving representatives of all medical and infrastructural fields of the health service provider was established in an early stage of the pandemic. The challenge to deal best with the SARS-CoV-2 pandemic can only be met, if all clinical and non-clinical departments join to work in close cooperation and are enabled to make necessary adjustments to the plans on a daily base.

   In our case, the CCT included the leading physicians and nurses of all hospitals of the enterprise (including the fields of neurology, neurological rehabilitation medicine, general psychiatry, geriatric medicine, addiction medicine, child psychiatry, and forensic psychiatry) and representatives of the hospital management. Moreover, representatives of pharmacy, the hospital blood lab, human resources, public relations, logistics, dispensary, IT and facility management, company medical officers, emergency room administration, and hygienics were involved from the start resulting in regular participation of 35–55 people. At least one representative of each department (either medical or nursing) was obligatory. The participation of all these participants turned out to be extremely important, as all decisions required sufficient knowledge about the current situation from all involved perspectives. As an example, regulations concerning the use of protective gear required detailed information about current availability, expected deliveries of new material, possibilities for re-use, etc. The team was leaded by the CMO (chief medical officer) of the district region by direct order of the president of the health service provider. The team met regularly on a daily basis, initially every workday, later in the course 7 days a week. Right from the start, no meetings were performed on a personal level due to the requirements of physical distancing, all communication was conducted *via* "zoom" web conferencing.
2. **Early shutdown of out-patient treatment facilities and reduction of the number of inpatients:** Outpatient treatments were completely closed down at a very early stage (at infection rate still 0). The shut-down involved both the ambulatory/day clinic (50 patients with 8 h of daily treatment) and the large outpatient clinic (> 8,000 patients/year). Nevertheless, patients were offered close-meshed phone contacts and web conferencing with their therapists. Prescription logistics and urgent treatments (such as intramuscular administration of long acting antipsychotics, regularly drawing blood under clozapine treatment, etc.) were nevertheless provided as accustomed to. According to a related consensus statement (5) intervals of blood tests for patients under clozapine treatment were prolongated. In addition, a patient-centered blog "stay-at-home" (https://www.medbo.de/bleibzuhause/) was launched providing therapeutic input of different fields (psychotherapy, sports, occupational therapy, …) twice a day (9:00 am and 3:00 pm), which could only be retrieved in a time frame of 1 h (in order to provide additional motivation to stay at home and keep in touch with familiar therapists). Moreover, the number of admitted inpatients was reduced as far as possible to gain resources for patient isolation and for transferring staff where necessary. Usually, the inpatient facilities of the hospital are occupied around 97% all over the year. The occupancy was reduced to approximately 60% to provide the necessary flexibility for an effective crisis management.
3. **Early shutdown of cross-sectoral facilities and activities:** The CCT decided to shut down all common facilities such as sporting areas, fitness facilities, occupational therapies/music therapies, etc., involving patients from more than one single ward at a very early stage (at infection rate still 0) to avoid spreading of infections across ward structures. This shut down involved the staff's canteen providing more than 500 hundred daily meals as well. In addition, no business trips were any longer authorized at all. Returning staff from holidays was obliged to contact the company's medical officers (on the phone or *via* email) before entering the hospital's area and re-starting work (especially when returning from Italy's regions "at risk"). Staff members were not allowed any secondary employment any longer and were offered to increase the number of working hours in the hospital to avoid financial damages.
4. **Early and consistent hygiene instructions of both staff and patients:** Patients and staff were instructed right from the start to follow basic physical distancing routines with at least 1.5 to 2 m distance whenever and wherever possible and to completely avoid shaking hands. Patients were instructed to check vital parameters such as routine blood pressure and heart rate measurements by themselves under staff observation to maintain physical distance. Physical examinations and medical procedures such as drawing blood and doing ECG controls were changed from a "conducting as a routine"-level to "conducting when explicitly ordered by doctor"-level. Therapeutic group interventions (on ward-level) and dining rooms were further allowed under requirement of reduced participant number and at least one empty chair between the attendees. Occupancy of inpatient resources were lowered from 100% level to 80% (before first infection in hospital) and later to a 50% benchmark (to be able to consolidate two wards as a new one and unleash staff resources for isolation zones and compensate for quarantine-associated "gaps"). This reduced occupancy led to the possibility to close common rooms and offer patients single room facilities wherever possible. Clinical visits (usually in patients' rooms) were changed to interdisciplinary conversations with the patient in a therapy room with regulations of physical distancing. A big problem in many psychiatric hospitals is that many patients are heavy smokers. Even before the pandemic, patients had to leave the wards to be allowed to smoke cigarettes; this rule was

specified including physical distance rules in order to reduce infection risks.

A difficult challenge was the uncertainty about the availability of protection material. At the daily CCT meetings, the exact instructions for the use of face masks and other protective gear for the different units were discussed depending on the urgency of the need and the current and expected future availability. When available on a large-scale patients and staff members were instructed to continuously wear surgical masks. In one case, six staff members of a single ward became infected (probably due to common dining in their break). However, probably due to the consistent use of surgical masks both for patients and team members no patients became infected in this situation.

Moreover, hygienic measures (such as cleaning and disinfection of door handles) were redefined following an intensified schedule.

5. **Internal communication and conferencing:** All conferences across locations and hospital departments and even patient consultations where possible were changed to video conferencing to avoid cross-sectional infections. All staff members not urgently needed on the ground were encouraged to work in home office (e.g., almost the entire billing and administration department). The IT department was ordered to provide home office opportunities in a "fast track approval" manner upon request of the particular team leaders.
6. **Staff members at risk:** Already at zero-infections-stage all members of medical professions (mainly medical doctors, nurses, social workers, and psychologists) were contacted by email and asked the following questions: a) Do you have already scheduled holiday plans in the next months? b) Do you need free time to care for your children in case of school lock down? c) Do you need to be employed in a protected area without patient contact (such as telephone counseling) due to any health issue (such as immune deficit, heart/lung/liver diseases, diabetes, or pregnancy)? d) Have you previously worked in an intensive care unit (if yes, how long)? and would you be willing to provide service in such an environment in case of urgent need?

   All data were assessed in a single table with restricted access to the CMO and delegates due to (individual, health-related) data protection regulations. Pregnant colleagues were immediately transferred to home office and telephone counseling workplaces as no reliable data on mid- and long-term outcomes were available at that time point. This was considered a major contribution on how to deal with individual worries and fears concerning the impact of the pandemic on our staff's lives. Many members of our personnel were not only worried by individual comorbidities and risk factors (such as age, etc.) but also by a putative impact of an infection on the lives of family members at risk. In case of potential (or documented) infection of staff members home quarantine measures were carried out thoroughly and the rest of the team was tested (at least when sufficient testing capacities were available).
7. **Early outgoing and visit restrictions:** On March 25, 2020, the State of Bavaria (Germany) declared the state of emergency and announced outgoing restrictions only allowing to leave home only in case of (a) receiving medical care, (b) shopping daily care items, (c) assisting others in need, (d) going to work, and (e) doing sports on individual level or with family members of the same household. Already one week before, all patients had been informed that they were not allowed to leave the area of the hospital (especially not to travel by bus or train) and that visitors were no longer allowed to enter the wards and could only meet their family members on a walk around the hospital's parks. Visitors were completely prohibited to enter the area of the hospital in case of acute illness (especially in case of common cold symptoms), having traveled to an "area at risk" (by classification of federal institutions) or having had contact to a confirmed COVID-19-case. Before and during the pandemic, acute patients (suicidal or dangerous) were legally involuntarily admitted to our hospital: some of the judges in charge continued to visit these patients (after a thorough explanation of infection protection requirements), others decided to communicate with these patients *via* web conferencing or telephone.
8. **Screening procedures and admittance strategies:** All *newly admitted* patients were regarded as "potentially infectious". A web-based pre-screening procedure has been established. Patients who contact the hospital with the intention to get admitted are advised to complete a web-based questionnaire that asks about the main complaint and includes also a few screening questions about their COVID-19 risk. The answers of the patients are visible for the medical doctors at the admittance unit and enable them to call the patient, to discuss whether the hospital admission is necessary or whether there exist alternatives. Moreover, a screening unit was established in the entrance of the hospital, which has to be passed by all patients before entering the emergency and admission department. The screening procedure involves questions concerning risk behavior, travel history, contact with infected persons, COVID-19-symptoms, and common cold symptoms. Body temperature is measured, and a SARS-CoV-2 PCR test is performed (starting April 9th, as soon as sufficient test capacities were available). Patients are only admitted to the hospital after careful consideration of the indication for in-patient treatment taking into account the potentially increased infection risk in the hospital. Therefore, a senior physician is involved in every single admittance case to assure that the psychiatric condition can only be managed by in-patient stay and no intensified "remote" therapeutic offers such as changes in medication or frequent phone calls/web conferencing. Patients with suspicion for SARS-CoV-2 infection are directly admitted to the psychiatric isolation units, all other patients are admitted into "admittance single rooms" at each of the wards (open and closed) in a diagnosis-specific manner for 24–48 h of "single-room-isolation as a precaution" with regular assessment of body

temperature and (if available depending on capacities) SARS-CoV-2 PCR testing.

All patients at all wards are assessed body temperature as a screening procedure once daily and instructed to immediately report any (even unspecific) symptoms of common cold or diarrhea (6). In addition, strategies to test for anosmia were clinically tested according to prior work by Russell (7) and Lechien (8).

9. **Establishment of isolation facilities and a "traffic light zone concept":** According to rising infection rates, one (formerly open) ward was transferred to an "isolation unit" with 12 rooms for the treatment of COVID-19-positive patients with psychiatric diseases. This was communicated to local authorities as part of an emergency case concept. The isolation unit was separated in a unit for cohort isolation (for patients with confirmed COVID-19) and a unit for single isolation (for patients who were considered at risk for SARS-CoV-2 infection at hospital admission and for patients who were close contact persons with confirmed COVID-19 patients). In the course of the pandemic, it turned out, that "contact individuals" (with ≥ 15 min of cumulative contact and a contact distance ≤ 2m) that needed quarantine of 14 days incubation time and were not dischargeable for quarantine at home occupied many of these resources. Moreover, for the patients at risk of infection, it took several days to rule out a potential SARS-CoV-2 infection, as a single negative test was not considered reliable enough. Therefore, even with few confirmed COVID-19 patients, there was an increasing demand for single isolation capacities. Therefore, a second ward with additional ten rooms was turned into a further "isolation unit" and the doctors' team of both wards formed an "isolation team" taking care for both neighboring wards covering 8:30 am to 8:00 pm 7 days a week. The members of this "isolation team" were released from "doctor on duty" shifts in charge of the whole rest of the hospital due to infection protection regulations.

   In addition, a "traffic light" zone concept was established: the concept was shaped to instruct all comprehensive service providers (e.g., property cleaning, catering, supply of materials, consultants of other medical fields, …) to move from green to yellow to red zone. The "green zone" was labeled as "sensitive" due to the "patients at risk" treated there (e.g., elderly patients in geriatrics), the "yellow zone" consisted of the "regular patients" and the "red zone" was formed by the isolation units described already above. **Figure 1** illustrates further details of each zone.

10. **Test as much as possible:** The SARS-CoV-2 pandemic is characterized by a great uncertainty about the infection status of an individual together with a high contagious potential of infected individuals (possibly without any clinical symptoms). At the current stage, only PCR antigen

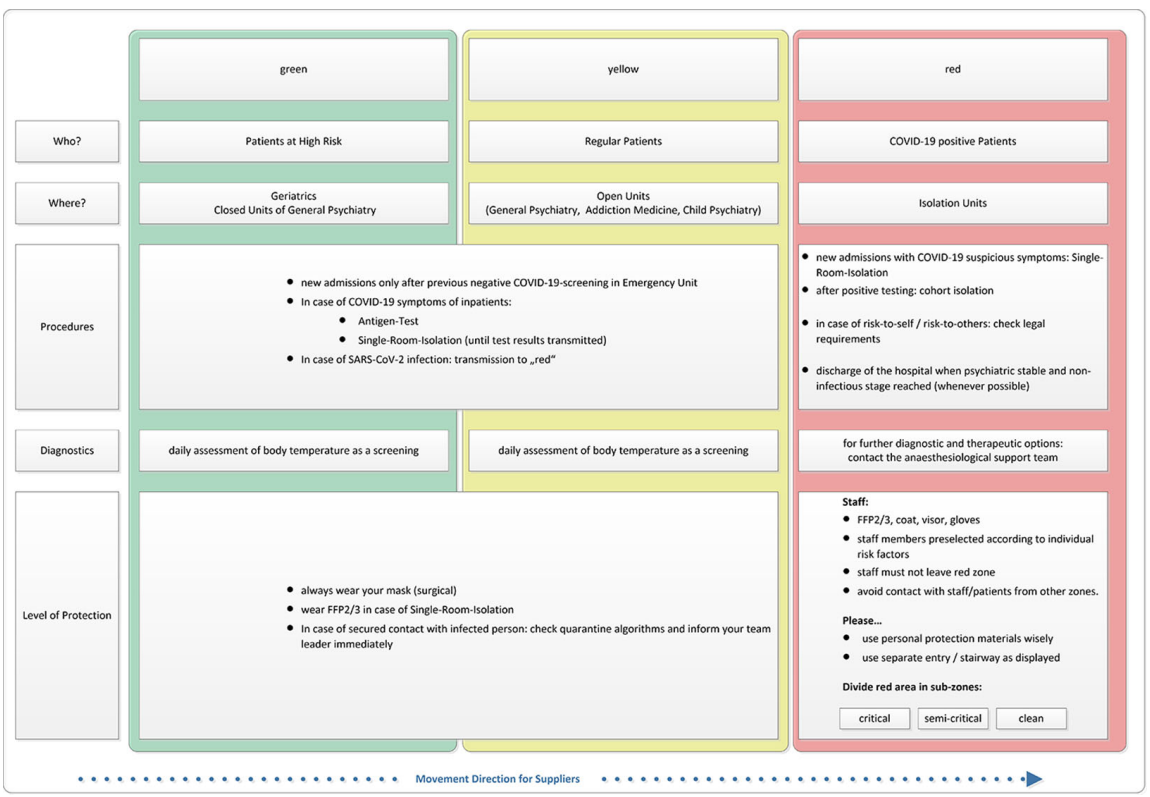

FIGURE 1 | "Traffic light" zone concept.

tests are available as established lab-tests to confirm the infection in an individual, but also these tests have a considerably high false-positive and false-negative risk (9). Moreover, the availability of these tests was limited at the start of the pandemic, resulting in long delays between testing and information about results. Despite all the uncertainties with PCR tests, we aimed at trying to test as many patients and staff as possible, to be able to make informed decisions. From the beginning, all patients and staff with symptoms suggestive of a SARS-CoV-2 infection were tested. In case of a positive test, all patients and the whole staff of the ward were tested. With increasing availability of test capacities, each patient was tested at admission and a system of regular tests in asymptomatic staff members was established. In order to take the possibility of false positive and false negative tests into account, we tried to perform multiple tests in symptomatic individuals. Moreover, we tried to make use of all available clinical information. As sudden loss of taste and smell is a frequently reported symptom (7, 8), we established olfactory tests as an additional screening tool. Moreover, in order to increase testing capacities, resources normally dedicated to research were utilized for routine laboratory testing. To date a total of 67 tests turned out and were confirmed as positive (both for staff and patients).

11. **Effects on teaching:** All teaching activities (for medical students as well as nursery training attendees) have to be provided by means of video systems feasible for lectures and seminars. Most of our teaching activities were conducted by means of zoom and moodle. A particular difficulty is how to deal with bedside teaching in small groups which is regarded an important feature in the training of psychiatric skills. It has—when writing these lines—yet to be decided by the authorities to what extent bedside teaching in medical training can be replaced by online courses according to pandemic exit strategies and legal issues as well.
12. **Effects on research:** The outbreak of the SARS-CoV-2 crisis exerted a dramatic impact on research activity both in basic science and clinical research. With regard to clinical science all research activities enrolling patients and volunteers in research studies had to be interrupted to minimize infection risks. On the other hand, clinical research staff resources had to be dedicated to patient care which was also reinforced by the government. In addition, both human and laboratory resources for basic sciences were used to support laboratory testing to optimize clinical management. It remains to be determined when research can restart successfully in respective pandemic exit strategies.
13. **Communication with regional health care authorities**: Official regulations concerning the management of the SARS-CoV-2 pandemic have regularly been issued by the official Health Authority in Germany (Robert-Koch-Institut; RKI) and the State Government of Bavaria (Landesamt für Gesundheit und Lebensmittelsicherheit; LGL). However, their exact interpretation and the transfer to our hospital's specific situation required close communication with the local authorities. Local health care authorities are by law authorized to control hygiene measures in each hospital of the district and have a right to require beds in case of severe urgency. An overall web-based platform was set up including all hospitals of the entire State of Bavaria where free beds and capacities for intensive care are to be communicated on a daily basis.

    As the local health care authorities were also overwhelmed with all their duties in the pandemic situation, we were glad about a responsive "fast track" contact with the responsible medical doctor of the district government.
14. **Transparent communicational strategies concerning both patients and colleagues:** As at least one member of the public relations department of our hospital took part in the daily meetings of the CCT a transparent and fast communication strategy *via* the intranet news feed or smartphone applications with daily updates (for internal information of the staff) and our public homepage (for advice on how to deal with the pandemic in case of seeking help in our hospital) was ensured. It turned out that it was necessary and regarded as helpful to frankly report infection rates among patients and staff and to communicate "hot spots" without any delay in order to preserve the trust of the employees in the management of the situation. This was even more the case because many of the head physicians had to avoid regular visits on all of the wards they were in charge of due to infection protection reasons. Podcasts and notifications of the president of our hospital turned out to be more than useful to maintain good spirits among the different staff members.

DISCUSSION

The self-efficacy of human beings seems to strongly rely on the stability of the notion that based on our *yesterday's experience* we trust that we can strongly rely on our *today's condition* and predict the environmental *changes of tomorrow*. This notion is strongly disrupted in the actual SARS-CoV-2–related crisis due to the exponential rise of infection rates challenging limited hospital capacities, the unstable supply of personal protection items and the fast evolving official recommendations/regulations that have to be taken into account when establishing risk management concepts in the context of psychiatric hospital care. The authors are convinced, that the dynamic character of this situation is the biggest challenge concerning communicational strategies both with patients and colleagues.

The need for additional labor power, the shift of colleagues experienced in intensive care procedures to other medical fields, the gap of colleagues "at risk" or "under quarantine" into home office and protected working spaces, the need for organizational and structural changes (such as "isolation units"), and the integration of colleagues of other areas of expertise into well-

rehearsed teams require an enormous amount of management capacities. These challenges must be taken into account as early as possible in order to provide sufficient personnel and spatial resources for these tasks. However, some pitfalls emerged and should not be concealed: one major issue (causing many disturbances) was that even after thorough discussions in the CCT, it was a challenge to provide specific information for all involved parties and maintain reliable information channels for weeks up to now. For example, many of the measures mentioned above required an intensified collaboration between members of administration, different occupational groups of the hospital, infrastructure, supply, IT, and legislation. Additionally, in the first phase of the pandemic, most colleagues were not allowed holiday leaves causing exhaustions on an individual and team level as well as administrative concerns due to the fact the huge amounts of holiday claims were postponed.

For almost all staff members, the current situation requires massive alterations from their daily routine. As the pandemic situation in general, the infection rates in the hospital, the availability of protective material as well as the public regulations are unpredictably changing on a day-to-day level, there is a strong need for frequent adjustments of the internal organization. It turned out, that our hospital's "step-wise emergency plan" in case of catastrophes was completely overrun by the dynamic of this pandemic. For many doctors and nurses this means that they have to change their working place within the hospital and take over new tasks. This usually happens with very short notice. Our experience is that the majority of our colleagues found a way to deal with this situation. However, some struggle hard when having to transfer their areas of expertise (such as advanced psychotherapeutic skills) to other settings (for example, the need for substantial knowledge of legal requirements in involuntary treatments). Moreover, many of our colleagues were not only worried by the potential impact of an infection on their own health state but expressed intense fear that they might be responsible for infections of family members at risk. The most important feedback from these colleagues was that a key requirement in this situation is clear, transparent, and reliable communication. In the meantime, centralized information on how to deal with the strain of working in a potential infectious surrounding and the possibility of social isolation due to quarantine is made available, e.g., *via* https://www.upd.ch/de/forschung/psychiatrische-rehabilitation/pandemiebewaeltigung-psychiatrie.php.

Regarding our patients, the requirements of "remote psychiatric care" drive the field forward requiring a fast implementation of new technologies (patient-centered blogs, individualized web-based psychotherapy) in our daily routines allowing therapists to provide psychiatric care from home office work spaces directly to connected patients. The medical field of psychiatry seems (in our own experience) to be more suitable for these new attempts than any other medical field because the assessment of psychopathological issues and the provision of therapy strongly rely on communication that can (at least on a temporary level) be provided in a remote way. However, a "core" of psychiatric patients *does* require immediate personal attendance and intensified in-patient treatment without any chance of temporal delay for example in case of acute psychotic symptoms with strong misjudgments of reality or suicidal ideations.

Many discussions took place in our institution on how our patients suffering from (in most cases) severe psychiatric conditions might manage to cope with the variety of restrictions attributed to the SARS-CoV-2 situation. However, it turned out that the vast majority of psychiatric patients is evidently very able to deal with fears and uncertainties (in many cases even exceeding the capability of the rest of the population). The authors are constantly surprised by the extensive amount of understanding and support they receive from their patients every day. However, at the time of writing this manuscript, we have only the experience of 4 weeks of closure of the outpatient clinic and 3 weeks of public shut-down. It is possible that with longer duration of the situation, more and more people will require support beyond phone or web conferencing consultation. This might be the case both for people with chronic psychiatric diseases and those, who develop psychiatric problems for the first time in their lives as a reaction to the burden caused by the pandemic.

All of the measures mentioned above were taken in view of an uncertainty of the economic situation. Of course, the shutdown of ambulatory and day clinics and the reduction of the number of inpatients in view of the necessity of additional resources for infection protection is a great economic burden. On the other hand, the Federal Government has promised to provide additional resources for hospitals adapting for crisis management including psychiatric hospitals with payments of 560 Euro per "lost inpatient day" in comparison to the year 2019 (since March 16, 2020).

The authors are well aware about the preliminary nature of all the considerations mentioned above and do not a bit want to give the impression "to know better" at all. However, we decided to publish these considerations that were followed in order to prepare our psychiatric hospital for a (hopefully) successful management of this crisis. We therefore hope to enable others in similar situations to avoid some of the lessons that we had to learn so far. We are not able and will never be able to judge the efficacy of the above mentioned measures, but this is the case for many preventive procedures that must be taken at the moment. Moreover, we are well aware that the situation of our hospital might differ from many other psychiatric hospitals, especially since the context is highly relevant for all taken measures and we —when writing these lines—have had only three weeks of experience with this situation.

Nevertheless, we can report, which measures have proven to be feasible in a large psychiatric hospital and which early experiences we have gathered with them. Our most important lesson is the enormous importance of an early establishment of reliable and transparent communicational strategies allowing to keep in touch with both patients and colleagues.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material; further inquiries can be directed to the corresponding author.

AUTHOR CONTRIBUTIONS

All authors contributed to the article and approved the submitted version.

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BRIEF RESEARCH REPORT
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COVID-19: Presumed Infection Routes and Psychological Impact on Staff in Administrative and Logistics Departments in a Designated Hospital in Wuhan, China

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Objective: Our aim was to explore the presumed infection routes and psychological impact of COVID-19 on staff in administrative and logistics departments (ALDs).

Methods: We gathered data from all 18 staff members with COVID-19 in ALDs in Zhongnan Hospital of Wuhan University, China. The baseline, job before diagnosis, presumed infection environment, use of protective equipment, and psychological status before and after diagnosis were collected and analyzed. A total of 18 uninfected staff members working alongside them in the same environment and 18 random matched infected doctors and nurses formed two control groups; the psychological impact of these three groups was then compared.

Results: Of the 18 members of staff, 88.89% were infected due to the working environment (hospital), and nine had face-to-face conversations with doctors and nurses in their daily work. Many staff members did not take any protective measures in their routine work. Before they were diagnosed, 12 staff members were aware of the seriousness of the epidemic, and most of the staff maintained a neutral attitude to the COVID-19 outbreak. A total of 77.78% of the staff experienced psychological stress or emotional changes after diagnosis, which were mainly caused by family health and disease related issues. Most of them managed their emotions by self-control and video calls with their families. There was no significant difference in psychological impact among the three groups, but uninfected staff members were fully aware of the seriousness of the epidemic.

Conclusions: Effective protective measures should be taken for staff members in ALDs. Psychological interventions are very important to help infected staff members in ALDs cope with psychological distress.

Keywords: COVID-19, SARS-CoV-2, nosocomial infection, staff, administrative and logistics departments, psychological intervention

INTRODUCTION

The novel coronavirus disease (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has been spreading rapidly worldwide, creating a tremendous public health burden (Li et al., 2020). As of February 11, 2020, there were a total of 1,716 infected healthcare staff members (63% in Wuhan) (Wu and McGoogan, 2020). Staff in administrative and logistics departments (ALDs) are also front-line workers, alongside doctors and nurses, who provide strong support for the orderly conduct of medical work. Compared with doctors and nurses, these staff members receive less attention from society. Through their work in hospitals, this group is likely to be directly or indirectly exposed to the SARS-CoV-2 with a high risk of infection. Additionally, they suffered high psychological pressures from an increased workload, fears of possible infection of their families and colleagues, and a lack of knowledge about protection from infectious diseases (Lai et al., 2020).

Public health emergencies can easily cause anxiety and panic among healthcare workers, and previous studies have shown that the severe acute respiratory syndrome (SARS) outbreak has had adverse psychological effects on healthcare workers (Bai et al., 2004). The incidence of stress disorder among doctors and nurses has reached 27.39% during the COVID-19 epidemic (Huang et al., 2020a). Unlike doctors and nurses, staff in ALDs lack knowledge of protection, diagnosis, and treatment; the psychological effects of the epidemic may thus be more serious, especially for those contracting the disease. Therefore, identifying their presumed routes of infection and psychological changes is also crucial to the success of fighting COVID-19. Several studies about psychological effects on healthcare workers during the COVID-19 outbreak have been published, but none of them have focused on infected ALD personnel (Jin et al., 2020a; Kisely et al., 2020). The current study thus aimed to explore the potential infection routes and psychological changes among hospital staff in ALDs and to provide scientific suggestions on preventing adverse effects among this population's during large-scale infectious diseases outbreaks.

METHODS

Study Design

This retrospective study was conducted in the Zhongnan Hospital of Wuhan University, one of the key hospitals at the epicenter of COVID-19 outbreak. The participants were confirmed as COVID-19 based on the diagnostic criteria of the National Health Committee of the People's Republic of China (Jin et al., 2020b; Ma et al., 2020). This study is part of a larger cross-sectional study and was reviewed and approved by the Committee for Ethical Affairs of Zhongnan Hospital (Approval number: 2020036). The study period was from February 15 to 29, 2020; and data about doctors and nurses have been published elsewhere (Jin et al., 2020a).

Measuring Instruments and Data Collection

Data were collected using a validated electronic questionnaire, including informed consent, which was jointly developed by experts from multidisciplinary fields, such as epidemiology, evidence-based medicine, and front-line clinicians during the COVID-19 epidemic. The readability and content validity of the questionnaire were tested by experts from several fields from different medical institutions, and the test-retest reliability was 0.82 (Wang et al., 2020a,b). The questionnaire items included basic information, exposure history, protective measures, clinical symptoms, treatment measures, and psychological changes. In terms of psychological items, we collected staffs' awareness and feelings about the epidemic before diagnosis, as well as their psychological changes and coping mechanisms after diagnosis, to get a preliminary understanding of the impact of the epidemic on ALD staffs. All 18 infected staff members in the ALDs of this hospital were contacted through the Division of Medical Affairs. To ensure the accuracy of results, we confirmed the exposure status through phone calls to all participates and their department directors.

Additionally, we compared the psychological impact between infected staff in ALDs with two control groups: one was 18 infected doctors and nurses, randomly selected from the 103 infected staff members (Jin et al., 2020a), and the other group was uninfected ALDs staff members, nominated by their infected colleagues who worked in the same environment. They were also investigated used the validated electronic questionnaire (Wang et al., 2020b).

Statistical Analysis

Categorical variables were described as counts and percentages; Wilcoxon signed rank sum tests and Fisher exact tests were conducted to compare the psychological impact between staff in ALDs and the two control groups. The data analysis was performed by the SAS software, version 9.4 TS1M6 (SAS Institute Inc., Cary, NC) and visualized by Microsoft PowerPoint 2016, where $P < 0.05$ was considered statistically significant.

RESULTS

Basic Information

All 18 staff members with COVID-19 in ALDs were included in this study (**Table 1**), and all have now recovered. Five were males and 13 were females, and their ages ranged from 28 to 59 years. A total of 88.89% thought they were infected by the working environment in hospitals, and one case did not know the source of infection. Nine staff members regularly had face-to-face conversations with doctors and nurses in the course of their work. More than half of staff thought that the way they got the infection was droplets and contact transmission.

Presumed Infection Routes

Table 1 presents detailed information of these 18 staff; four who worked as hospital environmental cleaners and often wore masks and gloves during work, while another one, responsible for operating the elevator, never wore masks or gloves. Three staff

TABLE 1 | Characteristics of COVID-19 patients among staff members in administrative and logistics departments.

Departments	Male/ Female	Age (years)	Job before diagnosis	Infectious environment	Protective equipment		Condition	Clinical outcome
					Masks	Gloves		
Security	2/1	43	Distributing medical materials	Hospital	✓✓✓✓	✓✓	2 Mild, 1 Moderate	Recovered
Finance	1/0	28	Dealing with staff' financial reimbursement	Hospital	✓✓✓	✓✓	Moderate	Recovered
CPC organization	0/1	37	Managing the work of cadres	Hospital	✓✓✓	✓✓✓	Moderate	Recovered
Logistics Support (Cleaning)	1/3	45	Environmental cleaning	3 in hospital, 1 unclear	✓✓✓	✓✓✓	1 Mild, 3 Moderate	Recovered
Logistics Support (Elevator operation)	0/1	51	Operating elevator	Hospital	×	×	Moderate	Recovered
Scientific Research	0/1	35	Managing laboratory	Other	✓	✓✓✓	Moderate	Recovered
Convalescent	1/0	59	Accompanying healthcare staff to patient's home	Hospital	×	×	Moderate	Recovered
Personnel Services	0/1	48	Receiving and handling staff' promotion materials	Hospital	✓✓✓	✓	Moderate	Recovered
Sterilized Supplying	0/2	52	Transporting patients, cleaning surgical instruments	Hospital	✓✓✓✓	✓✓✓✓	Moderate	Recovered
Medical Insurance	0/1	34	Submitting reports, handling medical insurance problems for patients	Hospital	✓✓✓	×	Moderate	Recovered
Nosocomial Infection	0/1	46	Routine works	Hospital	✓✓✓✓	✓✓✓	Moderate	Recovered
Operations Management	0/1	31	Calculating staff performance	Hospital	×	×	Moderate	Recovered

✓✓✓✓, always wear protective equipment, ✓✓✓, often; ✓✓, sometimes; ✓, occasionally; ×, never.

members in the Security Department who distributed medical materials to each department sometimes wore gloves. Two staff working in the Sterilized Supply Center transporting patients and cleaning surgical instruments always wore masks and gloves. One person in Convalescent Department who was responsible for accompanying doctors to patients' homes never wore masks and gloves at work. One person working in the Division of Operation Management to calculate the hospital's performance never took any protective measures. One person in the Division of Medical Insurance never wore gloves when handling insurance problems for patients. One person in the Division of Personnel Services occasionally wore gloves when receiving documents from staff. One person working in the Scientific Research Center as laboratory manager occasionally wore masks.

Psychological Status

The psychological status before and after diagnosis of these infected staff were shown in **Figure 1**. Before they were diagnosed, 12 staff said they were aware of the seriousness of the epidemic. Most staff's attitude remained neutral to COVID-19 outbreak, and none of them were pessimistic. During the treatment, 77.78% of staff experienced psychological stress or emotional changes, which were mainly caused by family health, disease related issues and negative news via the internet. They managed their emotions and stress by self-control, video calls with family members or colleagues, and communicating with others on WeChat. Most staff received comfort and care from leaders and colleagues, partners, and children.

Additionally, there was no significant difference for psychological impact between infected staff in ALDs and doctors and nurses before and after their diagnosis (**Tables 2**, **3**). In terms of the mental attitude toward the COVID-19 outbreak, no significant difference was also observed between uninfected and infected staff before diagnosis in ALDs. However, uninfected staff was fully aware of the seriousness of the epidemic compared with infected staff (**Table 4**).

DISCUSSION

It has been reported that the infection rates among healthcare workers during SARS and Middle East Respiratory Syndrome (MERS) were 20 and 26%, respectively (Al-Tawfiq and Memish, 2019). Unfortunately, the SARS-CoV-2 also infected a large number of healthcare workers. During previous infectious diseases outbreaks, studies on the healthcare staff's infection have focused on the front-line doctors and nurses, while the staffs in

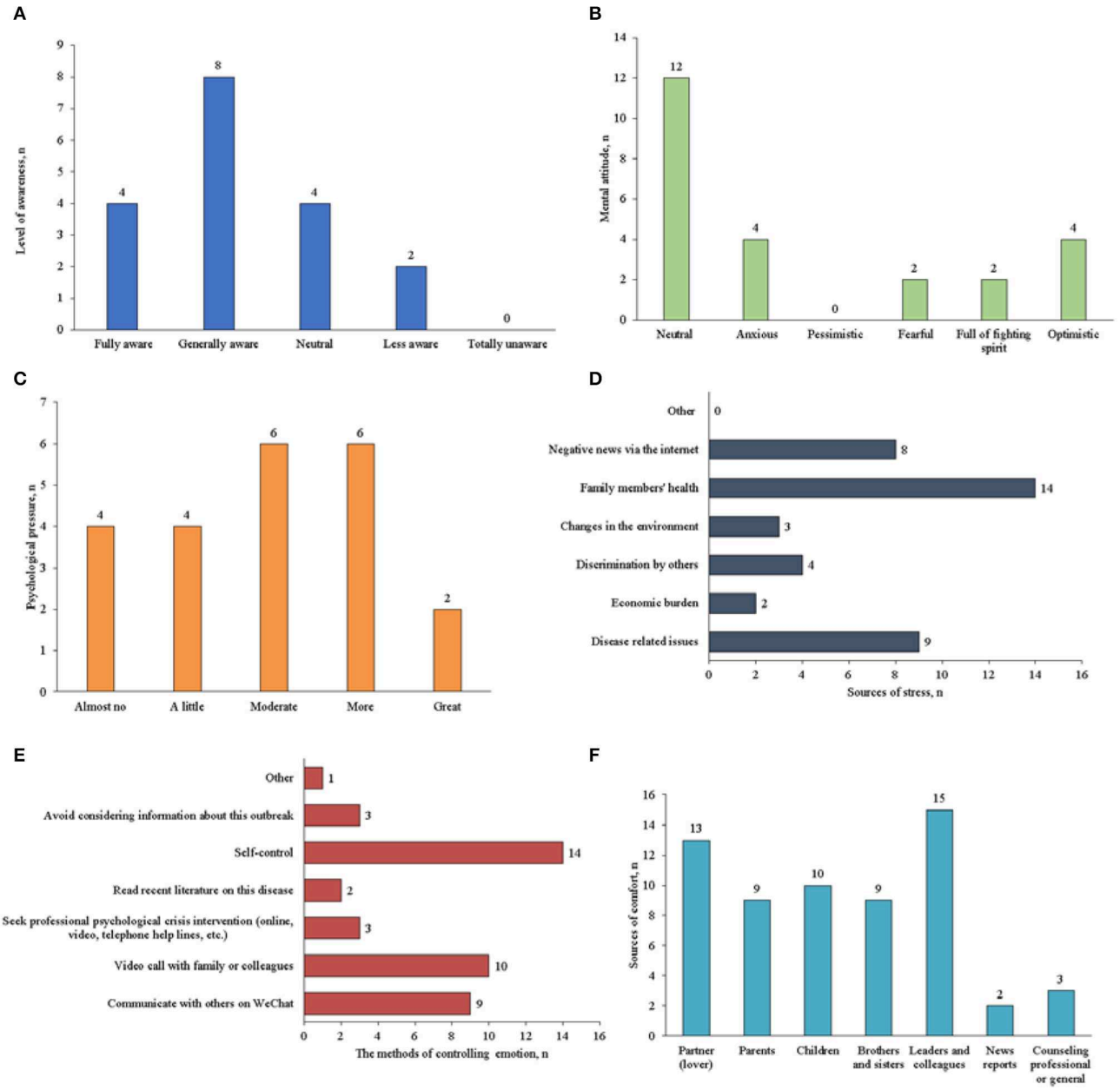

FIGURE 1 | Psychological status before and after diagnosis of the COVID-19 staffs in administrative and logistics departments (**A**: awareness of the epidemic before diagnosis; **B**: mental attitude before diagnosis; **C**: psychological stress or emotional changes after diagnosis; **D**: the possible causes of emotional change after diagnosis; **E**: the methods used to control stress or mood changes after diagnosis; and **F**: the sources of comfort and care after diagnosis).

ALDs were often ignored. These staff are crucial to the normal operation of the hospital, so protecting this population from infection is also crucial to success in fighting COVID-19.

Our study included all 18 infected staffs in ALDs in Zhongnan Hospital of Wuhan University: 27.78% were in the logistics support department and therefore regularly come into contact with medical wastes when cleaning the hospital. There is no air circulation in the overcrowded elevator, and the infection of the elevator operator will thus expose all occupants to the virus. A recent study indicated that both air and surfaces may be contaminated by SARS-CoV-2; we therefore suggest that these staff must wear gloves and masks correctly in their routine work (Ong et al., 2020). For departments that have contact with doctors and nurses, such as Personnel, Finance and Operation Management Departments, one infected staff member may transmit the virus to other staff and cause explosive infection both in the same department and also in clinical departments, and this potentially causes nosocomial infection. Hence, special

TABLE 2 | The psychological impact of infected staff members in administrative and logistics departments and doctors and nurses before diagnosis.

Before diagnosis	Cases ($n = 18$)	Doctors and nurses ($n = 18$)	*P*
Awareness	2.00 (2.00, 3.00)	1.50 (1.00, 2.00)	0.054
MENTAL ATTITUDE			
Neutral	12 (66.67%)	15 (83.33%)	0.443
Anxious	4 (22.22%)	4 (22.22%)	1.000
Pessimistic	0 (0.00%)	0 (0.00%)	1.000
Fearful	2 (11.11%)	0 (0.00%)	0.486
Full of fighting spirit	2 (11.11%)	0 (0.00%)	0.486
Optimistic	4 (22.22%)	2 (11.11%)	0.658

Awareness: 1 is fully aware of the seriousness of the epidemic, and 5 is totally unaware of the seriousness of the epidemic.

TABLE 3 | The psychological impact of infected staff members in administrative and logistics departments and doctors and nurses after diagnosis.

After diagnosis	Cases ($n = 18$)	Doctors and nurses ($n = 18$)	*P*
Psychological stress	4.00 (3.00, 4.00)	4.00 (2.00, 5.00)	0.859
THE POSSIBLE CAUSES			
Disease related issues	9 (64.29%)	13 (81.25%)	0.417
Economic burden	2 (14.29%)	0 (0.00%)	0.209
Discrimination by others	4 (28.57%)	7 (43.75%)	0.466
Changes in the environment	3 (21.43%)	5 (31.25%)	0.689
Family member's health	14 (100.00%)	13 (81.25%)	0.228
Negative news via the internet	8 (57.14%)	8 (50.00%)	0.730
Others	0 (0.00%)	1 (6.25%)	1.000
THE METHODS OF CONTROLLING STRESS			
Communicate with others on WeChat	9 (50.00%)	10 (55.56%)	1.000
Video call with family or colleagues	10 (55.56%)	11 (61.11%)	1.000
Seek professional psychological crisis intervention	3 (16.67%)	3 (16.67%)	1.000
Read recent literature on this disease	2 (11.11%)	6 (33.33%)	0.229
Self-control	14 (77.78%)	14 (77.78%)	1.000
Avoid considering information about this outbreak	3 (16.67%)	3 (16.67%)	1.000
Others	1 (5.56%)	0 (0.00%)	1.000
SOURCES OF COMFORT AND CARE AVAILABLE			
Partner (lover)	13 (72.22%)	16 (88.89%)	0.402
Parents	9 (50.00%)	9 (50.00%)	1.000
Children	10 (55.56%)	5 (27.78%)	0.176
Brothers and sisters	9 (50.00%)	4 (22.22%)	0.164
Leaders and colleagues	15 (83.33%)	15 (83.33%)	1.000
News reports	2 (11.11%)	2 (11.11%)	1.000
Counseling professional or general	3 (16.67%)	0 (0.00%)	0.229

windows should be set up, and gloves and masks should be worn when documents are submitted and collected, especially in the autumn and winter when infectious diseases are prone to occur. Additionally, hospitals can adopt the paperless offices in ALDs, thereby reducing direct and indirect contact with potentially contaminated materials. Staff in the Sterile Supply Department should wear more advanced protective equipment when cleaning surgical instruments and transporting patients (Suen et al., 2020). Staff in Convalescent Department should take the same protective measures as healthcare workers when visiting patient's home, as they may constitute an infection source to spread the virus to other ALDs and clinical departments. At the same time, we should pay attention to the disinfection of offices, and careful use of central air conditioning in ALDs.

The emerging virus outbreaks have had a significant psychological impact on healthcare workers. Several viral outbreaks have occurred in the past 20 years, such as SARS, MERS, and Ebola disease (Kisely et al., 2020), and previous studies have reported that doctors and nurses at the frontline involving diagnosis and treatment commonly reported psychological problems during SARS epidemic in 2003 (Bai et al., 2004; Lee et al., 2007) and the MERS outbreak of 2014 (Lee et al., 2018). Currently, several published studies highlighting psychological effects on healthcare workers during the COVID-19 outbreak indicate that healthcare workers are at increased risk of psychological distress (Jin et al., 2020a; Kisely et al., 2020). Most studies about the psychological impact focused on doctors and nurses who performed the tasks of diagnosis and treatment, while few studies have been conducted on the psychological effects of the COVID-19 epidemic on staff in ALDs who were not infected (Chen et al., 2020; Huang et al., 2020a,b; Lai et al., 2020; Xing et al., 2020). However, no studies have focused on the psychological state of staff in hospitals who have been infected. Thus, it can be argued that our study is of great significance for further understanding the psychological effects on staff in ALDs during virus epidemics. Our study indicated most of staff in ALDs experienced psychological stress or emotional changes. A total of 50% of them were anxious about their conditions due to a lack of professional knowledge. Almost everyone was concerned about health of his/her family members' health, and eight staff members were influenced by negative news via the internet. Additionally, most logistics staffs are not regular employees of the hospital, and they may thus suffer from the risk of unemployment due to the impact of the epidemic, which further increases their psychological burden. Consequently, psychological intervention treatment is very urgent to cope with the psychological stresses and emotional changes among this group of staff.

In our study, we found no significant difference in psychological impact between infected doctors and nurses and staff in ALDs—neither in the awareness and mental attitude to the epidemic before diagnosis or the psychological changes after diagnosis. The results indicated that working in hospital and having clinical professional knowledge does not affect the

TABLE 4 | The psychological status of infected and uninfected staff members in administrative and logistics departments.

Psychology	Infected ($n = 18$)	Uninfected ($n = 18$)	*P*
Awareness	2.00 (2.00, 3.00)	1.00 (1.00, 1.00)	0.007
MENTAL ATTITUDE			
Neutral	12 (66.67%)	11 (61.11%)	1.000
Anxious	4 (22.22%)	6 (33.33%)	0.711
Pessimistic	0 (0.00%)	2 (11.11%)	0.486
Fearful	2 (11.11%)	3 (16.67%)	1.000
Full of fighting spirit	2 (11.11%)	1 (5.56%)	1.000
Optimistic	4 (22.22%)	3 (16.67%)	1.000

Awareness: 1 is fully aware of the seriousness of the epidemic, and 5 is totally unaware of the seriousness of the epidemic.

psychological impact of COVID-19 epidemic on hospital staff. In ALDs, the mental attitude to the epidemic was not different between infected and uninfected staff, while uninfected staff members' awareness of the epidemic was higher than that of infected staff, which may have reduced the risk of infection by influencing their behavior. The main limitation of this study is that it was a single-center study with a small sample size. Although all infected staff in ALDs in this hospital were included, more studies are needed to verify the results. Additionally, some memory bias maybe exist among participates.

In conclusion, reasonable effective protective measures should be taken for staff in ALDs, such as setting up specialized windows for departments that have prolonged contact time with healthcare workers, adopting paperless offices to reduce contact with potentially contaminated materials, choosing appropriate protective equipment, disinfecting offices properly, and using central air conditioning carefully. Most staff experienced psychological stress during their isolation period after diagnosis, and psychological interventions are thus very urgent when it comes to coping with psychological distress among this group of people. Verification is needed using multi-center studies with a larger sample size in the future.

DATA AVAILABILITY STATEMENT

All datasets presented in this study are included in the article/supplementary material.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Committee for Ethical Affairs of Zhongnan Hospital of Wuhan University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

X-TZ, X-HW, and LC: The conception and design of the study. LC, L-SL, Y-HJ, Z-YP, and X-TZ: Collection and assembly of data. L-SL, Y-HJ, and X-TZ: Analysis and interpretation of the data and Drafting the article. Y-HJ, LC, Z-YP, X-TZ, and X-HW: Revising it critically for important intellectual content. All authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Psychological Symptoms During the Two Stages of Lockdown in Response to the COVID-19 Outbreak: An Investigation in a Sample of Citizens in Northern Spain

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Spain has been in a state of emergency since 14th March due to the COVID-19 crisis. This state of emergency means that the population must comply with strict rules such as lockdown (confinement to their homes except for essential trips) and social distancing. The aim of this study was to examine the psychological state of the general population in a sample recruited in Northern Spain. Sociodemographic and psychological data were gathered, assessing variables such as stress, anxiety, and depression. A questionnaire was administered at the beginning of the lockdown and three weeks later. The sample was recruited using an online questionnaire by means of a non-probabilistic snowball sampling methodology. A total of 1,933 people participated in this study. The results reveal that more than a quarter of the participants have reported symptoms of depression (27.5%), anxiety (26.9%) and stress (26.5%) and as the time spent in lockdown has progressed, psychological symptoms have risen. In relation to gender, data indicate that men have higher levels of depression than women, and similar levels of anxiety and stress. Greater symptomatology has also been found among the younger population and in people with chronic diseases. We discuss the need to continue carrying out these types of studies to prevent and treat psychological problems that could emerge amidst this pandemic.

Keywords: stress, anxiety, depression, lockdown, COVID-19

INTRODUCTION

In December 2019, an outbreak of new coronavirus pneumonia emerged in Wuhan (Hubei, China) (Chen et al., 2020). In early 2020, coronavirus disease (COVID-19) began to spread, firstly throughout China, and then rapidly throughout the world, with Europe in general and some countries in particular like Spain becoming strongly affected by contagion and deaths caused by the pandemic (De Giorgio, 2020). This rapid and unprecedented pandemic has created significant mental health problems (Torales et al., 2020) such as stress, anxiety and, depression for both medical professionals and the general population alike (Liu S. et al., 2020).

In the Basque Autonomous Community, a region located in Northern Spain, the coronavirus alarm was triggered in March 2020. In this region of 2,167,707 inhabitants, the first case was detected on February 28, after which there has been a rapid rise in cases. On 12th March the Basque Government temporarily suspended classes in all educational centers from nurseries to the University. On March 13th the Council of the Basque Government declared a health emergency and on March 14th the Spanish Government declared the state of emergency and ordered a lockdown in which all citizens were confined to their homes, creating an unprecedented situation (Department of Health of the Basque Government, 2020).

When this research began on 11th March 2020, 225 cases and 11 deaths had been confirmed in the Basque Autonomous Community. On March 18, 1,190 cases, 50 deaths and 18 recovered. On April 2, 7,827 cases, 444 deaths and 367 recovered. And finally on April 12th, at the end of this study, 11,018 cases, 831 deaths and 1,209 recovered had been confirmed on that territory (Basque Governement, 2020).

Beyond the medical risks, the psychological and social impact of this pandemic is indisputable. A number of previous research studies have focused on understanding how society defines the origin and impact of emerging infectious diseases, underlining the importance of being able to cope with such crises on an emotional level (Idoiaga et al., 2017a).

Although COVID-19 has emerged very recently, due to the unprecedented nature of this pandemic several studies have already been carried out to examine its consequences, primarily in China but also in Europe (Fagiolini et al., 2020; Porcheddu et al., 2020; Qiu et al., 2020). Research from China, the first affected country, suggests that the fear of this pandemic can lead to mental illness such as stress disorders, anxiety, depression, somatization and behaviors such as increased alcohol and tobacco consumption (Shigemura et al., 2020). Moreover, the application of strict lockdown measures in that country is affecting many aspects of people's lives, triggering a wide variety of psychological problems, such as panic disorder, anxiety, and depression (Qiu et al., 2020).

A study carried out between 31st January and 2nd February 2020 with 1,210 people in 194 cities of China, administered the Depression, Anxiety and Stress Scale (DASS-21). The aim of this study was to conduct an online survey using snowball sampling techniques to better understand (among other variables) the levels of psychological impact, anxiety, depression and stress in the early stages of the COVID-19 outbreak. The results revealed that 16.5% of participants showed moderate to severe depressive symptoms; 28.8% showed moderate to severe anxiety symptoms; and 8.1% reported moderate to severe stress levels (Moghanibashi, 2020; Wang et al., 2020a). Moreover, poor health was significantly associated with a greater psychological impact and higher levels of stress, anxiety, and depression (Wang et al., 2020a).

It is therefore clear that the COVID-19 pandemic represents a source of stress due to uncertainty and lack of knowledge (Craske and Stein, 2017; Yenan et al., 2020) and financial difficulties (Tran et al., 2020b). However, we should not assume that this pandemic affects the entire population equally at either a medical level (CDC, 2020; Garg, 2020) or a psychological level (Liu S. et al., 2020; Yeen and Zhao, 2020). From a medical perspective, COVID-19 is particularly severe for the elderly and for people with chronic diseases (Wenjun et al., 2020), although serious adverse effects have also been found in children (Licciardi et al., 2020).

Nonetheless, from a psychological perspective, young adults have shown high levels of psychological symptoms in response to the COVID-19 outbreak (Lai et al., 2020). In fact, in a nationwide survey of psychological distress in China with more than 52,000 participants, people between 18 and 30 years and those above 60 presented the highest posttraumatic distress index scores (Qiu et al., 2020). These high levels of distress among young people could be due to the fact that they tend to gather a large amount of information from social media, which could easily trigger stress (Bao et al., 2020). In contrast, distress in older people could be explained by the fact that this population is suffering from the highest mortality rates as a result of COVID-19. During the COVID-19 pandemic, psychiatric patients were prone to develop anxiety and depression due to lack of access to psychiatric care (Hao et al., 2020). Workers were prone to adverse mental health due to perceived risk of contracting COVID-19 at the workplace (Tan et al., 2020). Healthcare workers experienced high levels of anxiety due to concerns about spreading COVID-19 to their family members (Chew et al., 2020).

Further, lockdown is also a very important factor in psychological well-being, since previous studies of isolation similar to that being experienced in the current health crisis found that younger age and gender predicted a negative psychological impact of the lockdown (Taylor et al., 2008; Altena et al., 2020). In addition, a recent study has demonstrated that post-traumatic stress symptoms in Wuhan residents following the outbreak of COVID-19 were particularly high among women under 35 years of age and in those people who had reported watching the news three times a day (Gao W. et al., 2020; Huang and Zhao, 2020).

Therefore, and as previously noted, gender could be another variable to be considered in the psychological response to the pandemic. In fact, much of the research has shown that women appear to present more severe symptoms of depression, anxiety and distress in comparison with men (Lai et al., 2020; Liu N. et al., 2020; Qiu et al., 2020). However, another recent research study in China that analyzed anxiety disorder, depressive symptoms, and sleep quality found that one in three participants showed anxiety disorders, but mood states did not differ between males and females during the COVID-19 epidemic, which contrasts with the findings of previous research showing that women are more likely to suffer from anxiety when compared with men (Huang and Zhao, 2020).

Finally, recent studies have also shown that this increased anxiety resulting from COVID-19 could be particularly prevalent among people with a history of psychiatric problems (Hao et al., 2020). Moreover, some researchers have also pointed out that people with chronic diseases are expected to have higher levels of psychological symptoms (Applegate and Ouslander, 2020), since COVID-19 tends to be more severely manifest in those people with multiple underlying diseases (Dong et al., 2020).

In any health crisis, fear, uncertainty, and stigmatization are common and it is therefore important to apply appropriate medical and mental health interventions (Xiang et al., 2020). Thus, in an international public health emergency of the sort that we are currently experiencing, it is important to investigate the psychological impact of the pandemic among specific populations in order to develop tailored strategies aimed at reducing the symptoms that could occur during the crisis (Wang et al., 2020a).

Therefore, the present study aims to measure the levels of stress, anxiety, and depression in a sample of people from a region highly affected by COVID-19—the Basque Autonomous Community in Northern Spain. The general population is expected to have symptoms of stress, anxiety, and depression from the situation generated by the COVID-19 crisis. What is more, those stress, anxiety and depression levels are expected to increase as the period of lockdown progresses (Brooks et al., 2020; Sha et al., 2020) since confinement leads to these types of psychological problems (Cava et al., 2005). In order to analyze this possible progression, stress, anxiety and depression were measured in two stages: (1) the time at which the government declared the state of emergency, and (2) at 2–3 weeks after lockdown.

It was also anticipated that the levels of anxiety, depression and stress will not be homogeneous across society, and that there will therefore be specific and significant differences between groups. In particular, potential differences will be analyzed according to gender, age and previous chronic diseases with women expected to present higher levels of psychological symptoms than men, as indicated in several studies conducted in China. Additionally, younger people and those with a prior history of chronic diseases are expected to show higher levels of stress, anxiety, and depression than the general population.

MATERIALS AND METHODS

Participants

A total of 1,993 people from the Autonomous Community of the Basque Country aged between 18 and 82 years participated in the study (M = 33.80, SD = 16.65), 55.5% (n = 1,106) were aged between 18 and 30 years, 31.9% (n = 636) between 31 and 59 years, and 12.6% (n = 251) were over 60 years old. Of the sample 79.5% (n = 1,584) were female, 20.1% (n = 401) were male and 0.4% (n = 8) were other. In addition, 17.2% (n = 343) of the sample reported having a chronic disease and 82.8% (n = 1,650) reported having no disease. Finally, the questionaires were completed in two periods of the health crisis, 1,112 (55.8%) of the participants completed the questionnaire between the 11th and 18th of March and 881 (44.2%) between the 2nd and 12th of April.

Measures and Instruments

In the *ad hoc* survey carried out to gather sociodemographic data of the participants, which adopted a closed answer format, the participants were asked about sex, age, province, date of completion of the questionnaire and whether or not they had a chronic illness. Subsequently, the participants were categorized into three age groups (18–35, 36–59 and over 60 years).

The Depression Anxiety and Stress Scale—21 (*DASS-21*, Ruiz et al., 2017) was administered. The DASS-21 scale is composed of 21 Likert-type items that represent 3 factors: Depression (Items: 3, 5, 10, 13, 16, 17, and 21), Anxiety (Items: 2, 4, 7, 9, 15, 19, and 20) and Stress (Items: 1, 6, 8, 11, 12, 14, and 18). The response options for this scale were: 0: It did not happen to me; 1: It happened to me a little, or for some of the time; 2: It happened to me a lot, or for a good part of the time; and 3: It happened to me a lot, or most of the time, using questions such as: "I overreacted in certain situations," "I have felt uneasy." As each subscale of the *DASS-21* consists of 7 items and the total values of anxiety, depression and stress are calculated by the sum of the values of each of the items. Therefore, the total value achievable on each subscale is within the range of scores 0–21. In relation to the reliability of the scale the Cronbach's alpha coefficient for this study varied depending on the factor: for depression, $\alpha = 0.88$, for anxiety, $\alpha = 0.81$ and for stress, $\alpha = 0.85$. DASS-21 was used to measure mental health of the general population (Wang et al., 2020b) and healthcare workers (Tan et al., 2020) during the COVID-19 pandemic.

Procedure

The first step was to secure permission from the university ethics committee to carry out this study. The approval of the Ethics Committee of the UPV/EHU was obtained [M10/2020/055]. All the people participated on a voluntary basis, received information about the procedure of the investigation and gave their consent before participating in the study. Therefore, the Ethics Committee, in compliance with the Helsinki Declaration of the World Medical Association, gave their approval for the procedure followed here. The sample was recruited by non-probabilistic snowball sampling. Once the Google Forms questionnaire had been created, it was disseminated through virtual platforms, social networks, and through corporate emails sent out by the researchers. The first stage of the study was defined as the week in which the state of emergency was declared in Spain (from 3 days before to 4 days after), that is, from the 11th to the 18th of March. The second stage of the study took place 2–3 weeks later, when people had been in lockdown for 20 days, that is, from the 2nd to the 12th of April. A total of 2,200 people responded. Once the database had been analyzed using the Excel program, an analysis of the response items was carried out and a pattern of non-response of more than 50% was observed in some subjects, the rest of the participants answered all the questions. Therefore, we decided to remove these subjects from the sample, leaving a total of 1,993 participants in the work matrix. Of this final 1,993, data from 8 respondents identifying like others in their gender were not used to show gender differences, as they were not a sufficient population to conduct the relevant analyses below.

Data Analysis

The data were imported from the Excel calculation matrix into the statistical program SPSS v.25 to perform the appropriate analyses. Before proceeding to explain the relevant analyses, the assumptions of normality and homocedasticity of variances

were checked to decide on the use of parametric or non-parametric tests. Specifically, the Kolmogorov-Smirnov statistical test indicated that the data did not follow a normal distribution in all variables of the study. However, it should be noted that there is support in the scientific literature for the robustness of parametric tests even when there is a violation of the assumptions of normality and homocedasticity, taking into account the asymmetry and kurtosis of the data, which in most variables did not exceed 1. With regard to the analyses performed, it should be noted that descriptive analyses were carried out to study the frequencies of the dependent and independent variables in the sample. Subsequently, comparative analyses were carried out between the dependent and independent variables in two groups of the sample (use of total scores; 0–21), specifying the interval coefficients and the effect sizes of the family of standardized mean differences with Cohen's (1988). Finally, an ANOVA was carried out in order to observe the differences of the dependent variables in the case of having an independent variable in three groups (age). For the difference between the groups, Bonferroni's tests between groups were used.

RESULTS

Descriptive Analysis of the Sample

Of the participants in this the study, 27.5% reported symptoms of depression, 26.9% anxiety and 26.5% stress. In relation to the symptoms studied, **Table 1** displays the percentages of respondents who did and did not report suffering from any type of symptomatology.

Comparison of Means Between the Dependent and Independent Study Variables

Table 2 shows significant differences between men and women in relation to depressive symptomatology, t (571) = 2.17, p = 0.02, d_{Cohen} = 0.13, with a small effect size. Women show a lower mean (M = 3.26; SD = 3.84) than men (M = 3.77; SD = 4.30). Likewise, as expected, there are differences in the symptoms of depression, anxiety, and stress according to the time point at which the data were collected from the sample; depression, t (1991) = 7.32, p = 0.001, d_{Cohen} = 0.49, anxiety t (1991) = 3.95, p = 0.001, d_{Cohen} = 0.17 and stress t (1991) = 6.92, p = 0.001, d_{Cohen} = 0.31 Also, a moderate effect size on depression was found, followed by stress and with a small effect size anxiety.

Finally, we analyzed differences between symptoms based on whether participants reported suffering from a chronic disease. The results of these analyses are shown in **Table 2**. In relation to depression, patients with chronic disease show significant differences, t (1991) = 2.36, p = 0.018, d_{Cohen} = 0.13. Those who showed higher mean scores (M = 3.81; SD = 4.38) were those who were not chronically ill (M = 3.26; SD = 3.83). A similar pattern of results was observed for anxiety, t (1991) = 2.97, p = 0.003, d_{Cohen} = 0.16, chronic patients showing higher mean scores (M = 3.01, SD = 3.77) than non-chronic patients (M = 2.46, SD = 3.05).

An unifactorial ANOVA was conducted to analyze the variability of the studied symptoms according to age. This analysis revealed significant differences between the age groups for depression, anxiety and stress. The largest effect size among the three age categories was found when measuring stress, F(2, 1990) = 30.01, p = 0.001, η^2 = 0.29. However, in order to confirm which of the comparisons between the age groups yielded a significant difference in terms of symptomatology, *post hoc* analysis was conducted using a Bonferroni test (given the assumption of equal variances). The results indicate that when comparing the 18–30 and 31–59 age categories, significant differences only emerged for the depression scores. Further, significant differences were found between the 18–30 and over 60 years age groups for the three symptoms. Similar differences also emerged between the 31–59 and over 60 years age groups (see **Table 3**).

DISCUSSION

A number of the participants in this study appear to have shown levels of stress, anxiety and depression since the outbreak of COVID-19 in Northern Spain, as also found in several studies in China and Europe (Altena et al., 2020; Asmundson and Taylor, 2020; Gao J. et al., 2020; Sani et al., 2020; Wang et al., 2020a). Among the participants of this study, more than a quarter have reported symptoms of depression (27.5%), anxiety (26.9%) and stress (26.5%). Although there is a significant proportion of people with psychological symptoms, it should be stressed that these data provide more grounds for optimism than those found in other studies. For example, in an analysis of the psychological burden caused by SARS (Su et al., 2007) and even the COVID-19 in China (Huang and Zhao, 2020) it was found that one in three participants had anxiety disorders. The reasons for this higher symptomatology could lie in the fact that, in addition to the concerns about being infected, these previous studies were conducted in situations of prolonged and stringent lockdown measures.

Our findings have also shown that stress, anxiety and depression levels are higher when measured two-three weeks after starting the lockdown, since the participants who responded during the second phase appear to suffer more from these symptoms. This increase in symptomatology is of concern since it is not yet known how much longer the population will be in lockdown and it has been shown that confinement has a psychological impact on individuals (Brooks et al., 2020). For example, lockdown could lead to a lack of sufficient sunlight, which causes a fall in serotonin levels that is associated with emotional disorders such as anxiety and depression (Lambert et al., 2002). It is important to keep these data in mind because if the lockdown measures are kept in place over a long period of time, people may become psychologically disturbed, and could even suffer from problems such as post-traumatic stress disorder (Bao et al., 2020; Petzold et al., 2020).

TABLE 1 | Frequencies and percentages of symptoms studied as a function of independent variables.

Depression	No	Yes	Anxiety	No	Yes	Stress	No	Yes
Sex								
Men	69.8%	30.2%	Men	72.8%	27.2%	Men	72.6%	27.4%
Women	73.3%	26.7%	Women	73.2%	26.8%	Women	74%	26%
Age								
18–30	68.4%	31.6%	18–30	69.7%	30.3%	18–30	69.9%	30.1%
31–59	76.7%	23.3%	31–59	74.1%	25.9%	31–59	74.3%	25.7%
<60	81.3%	18.7%	<60	86.9%	13.1%	<60	88.8%	11.2%
Period of the health crisis								
>18 March	78.2%	21.8%	>18 March	77%	23%	>18 March	78.1%	21.9%
<2 April	65.6%	34.4%	<2 April	68.6%	31.4%	<2 April	68.1%	31.9%
Chronic illness								
Yes	68.2%	31.8%	Yes	68.5%	31.5%	Yes	70.3%	29.7%
No	73.6%	26.4%	No	74.2%	25.8%	No	74.4%	25.6%

TABLE 2 | Types of symptoms according to gender.

		n	*M*	*SD*	*t*	*p*	95% CI	d_{Cohen}
Depression	Women	1584	3.26	3.84	−2.31	0.021*	−0.94, −0.78	0.13
	Men	401	3.77	4.30				
Anxiety	Women	1584	2.51	3.11	−1.11	0.266	−0.58, 0.15	0.06
	Men	401	2.71	3.52				
Stress	Women	1584	5.23	4.15	−1.22	0.225	−0.77, 0.20	0.07
	Men	401	5.52	4.48				
Depression	11–18 March	1.112	2.80	3.57	−7.32	0.001***	−1.63, −0.94	0.49
	2–12 April	881	4.71	4.25				
Anxiety	11–18 March	1.112	2.30	2.93	−3.95	0.001***	−0.85, −0.29	0.17
	2–12 April	881	2.86	3.47				
Stress	11–18 March	1.112	4.71	3.95	−6.92	0.001***	−1.67, −0.93	0.31
	2–12 April	881	6.01	4.44				
Depression	C.D Yes	343	3.81	4.38	2.36	0.018*	0.09, 1.00	−0.13
	C.D No	1.650	3.26	3.83				
Anxiety	C.D Yes	343	3.01	3.77	2.97	0.003**	0.19, 0.93	−0.16
	C.D No	1.650	2.46	3.05				
Stress	C.D Yes	343	5.58	4.47	1.40	0.162	−0.14, 0.84	−0.07
	C.D No	1.650	5.29	4.17				

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. C.D = Chronic disease.*

TABLE 3 | Types of symptomatology according to age and *post hoc* comparisons.

DV	Age (years)	*n*	M	SD	*F*	*p*	η^2	*Post-hoc*
Depression	18–30	1106	3.84	4.15	21.61	0.001***	0.21	1–2
	31–59	636	2.95	3.73				1–3
	60–82	251	2.30	3.97				2–3
Anxiety	18–30	1106	2.84	3.35	21.05	0.001***	0.21	1–2
	31–59	636	2.49	3.21				1–3
	60–82	251	1.41	1.89				2–3
Stress	18–30	1106	5.66	4.34	30.01	0.001***	0.29	1–3
	31–59	636	5.36	4.16				2–3
	60–82	251	3.41	3.26				

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.*

In addition, the results show, as expected, that people with chronic diseases were more likely to suffer from symptoms of anxiety and depression. These results are consistent with research showing that people with severe illness or multiple illnesses suffer from higher levels of psychological symptoms amid this health crisis (Dong et al., 2020). Therefore, any psychological containment plan should consider these individuals and provide them with specifically adapted tools and strategies to cope—both physically and psychologically—with COVID-19.

In relation to gender, our findings are particularly striking, since unlike the results found in other research studies, our data indicate that men have higher levels of depression than women, and similar levels of anxiety and stress (Lai et al., 2020; Liu N. et al., 2020). These results also run counter to other published works suggesting that women are being hit harder and will suffer more from the consequences of this COVID-19 crisis (Guo et al., 2016; Gao W. et al., 2020). The reason for these discrepant results could be that, as is usually the case in psychosocial studies in Spain (INE, 2016), more women participated in this study, and the men who did agree to take part may have done so due to their feelings of apprehension regarding the crisis.

In terms of age, young adults (18–30) and adults aged between 31 and 59 years have higher levels of stress, anxiety and depression in comparison with the elderly (60–82 years). In fact, people with the highest levels of anxiety and depression are the young adults in the 18–30-year age range. These findings are, in part, consistent with those of studies conducted in China where young adults reported a higher prevalence of depressive and anxiety symptoms (Yeen and Zhao, 2020). This apparently higher symptomatology among young people could be caused by the large amount of information that they receive from social media, including fake news, which could easily trigger stress (Bao et al., 2020; Huang and Zhao, 2020; Kumar and Somani, 2020). Moreover, given that the younger participants of our sample were mostly students, this stress could also be associated with the added burden experienced by young students, given their need to adapt to the new educational context without face-to-face classes (Aracena et al., 1992; Martín, 2007; Vélez et al., 2010; Antúnez and Vinet, 2012). In this regard, whilst the educational institutions implemented online educational strategies from the beginning of this health crisis, it appears that these did not serve to reassure the youth in these moments of uncertainty. Therefore, if this young population is also considered to be vulnerable to emotional disorders, it will be vitally important that educational institutions put into place prevention and intervention programs aimed at reducing these levels of depression, anxiety and stress (Aracena et al., 1992; Cova et al., 2007).

The findings obtained in our sample also shows that the level of stress is equally high for young adults and adults. To be able to limit the risk of this symptomatology we should take into account that in previous pandemics it was found that the most frequent stressors in adults were the duration of lockdown measures, fear of being infected, frustration, boredom and inadequate information (Brooks et al., 2020). Other researchers have also found that lockdown could create post-traumatic stress in adults, particularly in relation to financial losses (Mihashi et al., 2009) and stigma (Wester and Giesecke, 2019).

Whilst the Spanish Government has implemented very stringent containment measures to prevent the further spread of the COVID-19 outbreak, our study highlights the importance of conducting research to investigate the way in which these measures could have a psychological impact on the population. Appropriate social intervention to promote psychological well-being should also be implemented, as pointed out by some studies in China (Huang and Zhao, 2020). To begin with, it would be advisable for the media to disseminate only accurate and reliably sourced information. It is important to manage the vast body of unfiltered information transmitted by the media and social networks (Bao et al., 2020). In fact, in Spain, alarming videos on COVID-2019 are circulating freely and are accessible to almost all individuals, particularly young people, which could also be a factor in their apparent psychological vulnerability. For all of these reasons, it is critical to ensure effective communication in order to avoid public health risks. Thus, in emergency situations such as the one we are currently experiencing, it is more important than ever for experts such as medical professionals and governing bodies to be prepared to transmit information to the public in an effective and direct manner (Sandman, 2003; Idoiaga et al., 2017b; Ruiz de Azúa et al., 2020; Tran et al., 2020a,b).

Moreover, psychological counseling should be made available an official public platform adapted to different target groups (Liu S. et al., 2020). Cognitive behavior therapy and mindfulness therapy are particularly useful to improve mental health during COVID-19 pandemic (Ho et al., 2020). In different countries, numerous psychiatric hospitals, psychological counseling centers and university psychology departments have set up specialized telephone lines to provide psychological counseling services (Bao et al., 2020; Fagiolini et al., 2020). Furthermore, it would also be important to provide specific aid to each target group, with particular emphasis not only on people with chronic illnesses but also young people.

In the Basque Country, psychological services were launched in the Basque Health Service (Osakidetza) from the moment that the cases of COVID-19 began to increase. These services not only attend to patients and their families but also to all of the primary care professionals working in the hospitals (particularly emergency services, ICUs, respiratory and infectious services, and the Health and Emergency Council). The aim of this service is to detect, and if necessary, provide care and support for professionals in Osakidetza who have psychological/emotional disorders and who treat COVID-19 patients (Osakidetza, 2020). However, this aid service is only available for infected people and as this study has shown, lockdown itself can also cause serious deterioration in mental health, even in those people not infected.

As recommendations for the general public, we should, above all, highlight the importance of self-care and the need to balance free time with other activities, to monitor the amount of time spent watching the news or receiving information from the media, to maintain normal working hours, to rest as much as possible, to exercise regularly, to focus on the quality of sleep, and, particularly, to avoid paying too much attention to information about epidemics before going to sleep (Huang and Zhao, 2020).

In sum, this research contributes toward identifying the symptomatology shown by the population in Northern Spain

at two different phases of the COVID-19 crisis. The increase in psychological symptoms forces reflection on the importance of taking preventive measures so that these symptoms do not worsen over time (Li et al., 2020). There are a number of factors that might play a role in the psychological state of the population. First, the time spent in lockdown is increasing, and this could lead to a worsening of the population's mental health as there is great uncertainty about what may happen in the future. Second, the young adult population—although not a risk group for COVID-19 at a clinical level—is at risk from a psychological perspective since young people are suffering the most according to this study. Therefore, it is important to address their psychological needs and to provide them with specific attention, since in comparison with older people they are likely to have fewer tools to cope with this situation. The chronically ill population also requires attention, not only by addressing their physical health through social distancing, but also by addressing the psychological difficulties that they might be experiencing amid this pandemic. It is also important to mention that although this study was carried out in the north of Spain, the needs detected from the findings can be generalized to other populations since several studies have detected that the COVID-19 is generating psychological symptoms in the general population (Altena et al., 2020; Asmundson and Taylor, 2020; Gao J. et al., 2020; Sani et al., 2020; Wang et al., 2020a).

The study has some limitations that will have to be considered for future studies. One of the limitations of this study is that it is a non-probabilistic sample and a cross-sectional study. Besides, although information has been collected on chronic diseases, it has not been specified which chronic diseases and what level of severity the subjects have. This is an aspect that will have to be taken into account in future studies. Furthermore, other significant variables such as the level of education or income have not been collected. These variables would be very interesting to collect in a future study. In addition to these variables, it will be interesting to continue collecting data on stress, anxiety and depression in the population as new measures are being taken for people such as social distancing. Furthermore, the fear of new outbreaks may also be creating psychological symptoms in the population.

CONCLUSION

In a sample recruited in Northern Spain, the present study explored the psychological status of people assessed at different stages of lockdown during the COVID-19 outbreak. Our findings reveal some of the variables that could contribute toward a worsening state of mental health in this new and unprecedented situation of tension and uncertainty. Therefore, it is important to monitor the state of mental health of the population in order to prevent and treat possible mental illnesses in the future.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee for Research Related to Human Beings (CEISH) of the University of the Basque Country UPV/EHU [M10/2020/055]. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

NI, MP, and NO-E were involved in the conceptualization of the project and in the acquisition and analysis of the data. MD was involved in the interpretation of the data. All authors were involved in the drafting and revising of the work for intellectual content, provided approval for submission of the contents for publication, and agreed to be accountable for the accuracy and integrity of the project.

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Psychological Impact and Associated Factors During the Initial Stage of the Coronavirus (COVID-19) Pandemic Among the General Population in Spain

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The outbreak of COVID-19 in Spain started at the end of February. By 9th April 2020 Spain was the second country in confirmed cases and in deaths. On March 14, 2020, the Spanish Government declared the state of alarm to limit viral transmission. During such state, citizens must stay confined at home with few justified exceptions. This whole situation drastically changed the life of the population, which can cause a wide range of psychosocial impacts. This study explored the psychological impact of the COVID-19 pandemic in the general adult population (*N* = 3055) during the first stages of the outbreak in Spain, as well as their anxiety, stress and depression levels. We also examined the extent to which the following variables were associated to participants' mental health: (1) demographics; (2) degree of concern about the pandemic; (3) environmental conditions during the home confinement, (4) changes in daily life as a consequence of the pandemic; (5) contact with the COVID-19 disease; (6) actual and perceived severity of the crisis; (7) information about the COVID-19, (8) perceived health status and (9) leisure activities conducted within the last 24 h. Our results show that Spanish consider the current COVID-19 health crisis as fairly severe, and the majority felt that the COVID-19 crisis had greatly impacted on their daily life, including changes in their daily routines and cancelation of important activities. About 36% of the participants reported moderate to severe psychological impact, 25% showed mild to severe levels of anxiety, 41% reported depressive symptoms, and 41% felt stressed. Women, young, and those who that lost their job during the health crisis showed the strongest negative psychological symptoms. What worried Spaniards the most was the likelihood of suffering an economic crisis derived from the pandemic. We found factors associated with better mental health, such as being satisfied with the information received about the health crisis, conducting leisure activities, and the perception of being in good health. These findings can be used to design psychological interventions to help coping with COVID-19 pandemic, both in Spain and other countries.

Keywords: COVID-19, pandemic, psychological impact, psychological crisis intervention, stress, anxiety, depression

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INTRODUCTION

In December 2019, the new coronavirus disease 2019 (COVID-2019) started spreading in the Chinese city of Wuhan (Hubei province). The most typical symptoms of the disease are fever, myalgia, fatigue, and dry cough. Other referred symptoms are chills, coryza, sore throat, nausea, vomiting, and diarrhea (Chen et al., 2020; Huang et al., 2020). These symptoms are usually mild, and some infected people are asymptomatic (Rothe, 2020; Ryu et al., 2020). According to the World Health Organization (World Health Organization, 2020), about 80% of infected people easily recover from COVID-19, without the need of any specific treatment. However, about 1 out of 6 cases of infection courses with severe pneumonia (Bermejo-Martin et al., 2020), which can lead to respiratory failure, cardiac injury, acute respiratory distress syndrome and death (Holshue, 2020). COVID-19 virus spreads from person to person via virus-laden respiratory droplets produced when an infected person talks, coughs, exhales or sneezes. These droplets can be inhaled by the people nearby, and/or fall over objects and surfaces, which another person can touch, and then touch their nose, eyes or mouth and get infected (World Health Organization, 2020; Centers for Disease Control and Prevention, 2020). COVID-19 is considered a highly contagious virus (Yang and Wang, 2020). Thus, even though only a minority of infected people develop severe symptoms, COVID-19 is a global health threat. In fact, on the 30 January 2020, the WHO declared the health outbreak caused by COVID-19 a public health emergency of international concern. Considering its rapid spread, it is not surprising that the first cases of infected people in Europe were reported only a few weeks after. The first transmission was reported in Italy, on February 21st 2020, and it soon became the largest COVID-19 outbreak outside Asia (Spina et al., 2020). Shortly after, by the end of February, the outbreak started in Spain. On March 11 2020, the WHO upgraded the status of the COVID-19 outbreak from epidemic to pandemic. According to official data (European Centre for Disease Prevention and Control, 2020), by April 9th 2020, there were nearly 1.5 million cases worldwide and over 87,000 deaths. The majority of infected people live in the United States. Spain is the second country in confirmed cases (146,690) and the third in deaths (14,555). As of April 3rd, the number of daily new cases in Spain per day seem to have stabilized and even begun to decrease, although the number of active cases is still increasing. This is mainly due to the severe movement restrictions taken by the Spanish Government in order to mitigate the spread. This unusual situation of health emergency and the social restrictions taken to control the COVID-19 spread are likely to have negative consequences on Spaniards mental health (Wang et al., 2020; Xiang et al., 2020). However, there is a lack of information regarding the psychological impact of the COVID-19 pandemic in the general Spanish population. The aim of the present study is to fill this gap in the literature.

As indicated, different measures have been taken in Spain to mitigate the virus spread. One of the first measures taken (between the 11 and the 13 of March depending on the Spanish province) was canceling every on-site educational activity from kindergarten to the University. Shortly after, on March 14, 2020, the Spanish Government declared the state of alarm, which came into effect the following day when extraordinary measures were implemented to limit viral transmission at a national level. The state of alarm was first declared until the 29 of March, and then extended twice, the first time until April 11, and the second until April 26. During the state of alarm, citizens are allowed to be on public roads and streets only for the purchase of essential items (e.g., food, medicines), attend health centers, go to work (only for jobs considered essential, such as food suppliers), return to the usual residence, assist and care for dependants and other cases of force majeure.

This whole situation has drastically changed the life of people living in Spain in a matter of days. The population is experiencing a new, unpredictable and rapidly evolving situation. They have to stay confined at home, family dynamics have remarkably changed, travel is restricted, and there has been a reduction in leisure activities and social life. The work situation has also changed thoroughly; many people have temporary or permanently lost their jobs, many are working from home, sometimes with insufficient preparation for doing so, and those who work in sectors considered essential appear to experience heavy workloads, increased levels of stress and a greater exposure to the virus. The Spanish health system has been overwhelmed and there have been shortages of space in the hospitals (mostly in the Emergency rooms and in the Intensive Care Units, UCIs), of health equipment (mostly ventilators) and of personal protective equipment (PPE). This situation seems to be lived with a high level of fear and concern about the pandemic and its consequences. In fact, in Wuhan, residents compared this health crisis with "the end of the world" (Lima et al., 2020).

The majority of the research conducted about COVID-19 relates to its clinical characteristics (Xu et al., 2020), likelihood of survival (Ruan, 2020), genomic characterization of the virus (Lu et al., 2020) and drug and therapeutic options (Al-Tawfiq et al., 2020). Significantly less scientific efforts have been placed into analyzing the psychological impact of COVID-19 pandemic. Moreover, given that the outbreak started in China, the scarce literature about the psychological consequences of this global health crisis relate to Chinese population. According to Xiang et al. (2020), patients with confirmed COVID-19 or with compatible symptoms may experience fear of the consequences of the disease, and some symptoms, such as fever or shortness of breath can aggravate mental distress and anxiety. In addition, the unpredictability of the current crisis, and the misinformation derived from it makes the whole situation more stressful (Bao et al., 2020). These psychological difficulties to cope with the current situation are aggravated with the extreme measures taken by the Governments of different countries to ameliorate the virus spread, especially by keeping people in quarantine. According to the recent review conducted by Brooks et al. (2020), being forced to stay at home leads to negative psychological effects such as fear, frustration and anger. The negative impact of the confinement can have long-lasting effects. In line with this review, people in China experienced boredom, loneliness and anger while being confined, as well as an increase in psychological problems, such as anxiety, stress and depression (Duan and Zhu, 2020). In such a difficult context, many authors recognize

that taking care of the population's mental health is essential (Brooks et al., 2020; de Carvalho et al., 2020; Duan and Zhu, 2020; Zandifar and Badrfam, 2020), and that more research is needed in different parts of the world to fully understand the negative psychological consequences of the pandemic and, accordingly, formulate psychological intervention to mitigate them (Xiang et al., 2020).

Studies related to previous outbreaks such as Ebola, swine flu or MERS have revealed that such situations cause a deep and wide range of negative psychosocial impacts. Common psychological reactions are fear of contracting the virus and falling sick (Rubin et al., 2010; Al Najjar et al., 2016), of dying, of suffering if being infected, of separation from relatives and stigma, as well as feelings of helplessness (Hall et al., 2008). Such negative emotions tend to intensify with the restrictions usually taken by the authorities to ameliorate the virus spread, such as closure of schools and business (Van Bortel, 2016). For instance, during the Middle East respiratory syndrome-novel coronavirus outbreak (MERS CoV) in Jeddah (Western Saudi Arabia), 57.7% of interviewed people reported moderate levels of anxiety (Al Najjar et al., 2016). In an effort to understand mental health status of the Chinese general population during the early stage of COVID-19 outbreak, Wang et al. (2020) conducted a cross-sectional study with a sample of more than 1,000 adults. In line with Al Najjar et al.'s (2016) findings, 53.8% of the participants reported a moderate to severe psychological impact. The authors also registered depression, anxiety, and stress levels derived from health emergency. Considering depression, 13.8% reported mild depression symptoms, 12.2% were considered to suffer from moderate depression, and 4.3% from severe depression. Chinese also suffered from anxiety (7.5% mild, 20.4% moderate and 8.4% severe). In addition, 24.1% reported suffering from mild stress while 8.1% reported moderate or severe stress levels. Sun et al. (2020) explored the prevalence and risk factors of acute posttraumatic stress symptoms (PTSS) in a sample of 2,091 Chinese adults 1 month after the COVID-19 outbreak, and found that 4.6% of the participants reported PTS. In another study, Liu et al. (2020) explored the prevalence of PTSS a month after the COVID-19 outbreak in the Chinese areas that have been more affected by the COVID-19. According to their results, 7% of the participants suffered from PTSS. In both studies, the negative psychological symptoms were more prevalent for women.

Given the high amount of people infected in Spain, the escalating number of deaths, and the severe restrictions taken by the Spanish government to ameliorate the virus spread, especially the quarantine, it is quite likely that Spanish mental health is being diminished. To the best of our knowledge, the psychological impact and mental health of the general population living in Spain during the COVID-19 pandemic is unknown. We believe there is an urgent need to deepen our knowledge about Spaniards mental health as a first step to develop psychological interventions, so that the lasting psychological negative consequences of the pandemic can be reduced. We have two main aims. The first one is to explore the mental health status of the general adult population in Spain during the first stages of the COVID-19 outbreak, in terms of psychological impact caused by the pandemic (including intrusion, avoidance, and hyperarousal symptoms), anxiety, depression, and stress. The second one is to examine the extent to which the following variables are associated to psychological impact, anxiety, depression, and stress: (1) demographic variables (e.g., age, gender, monthly family income); (2) degree of concern about the current COVID-19 pandemic; (3) environmental conditions during the home confinement (e.g., number of cohabitants, size of the house); (4) work-related variables (e.g., employment status); (5) changes in daily life as a consequence of the pandemic (e.g., whether the way of working or studying has changed significantly); (6) contact with the COVID-19 disease (e.g., knowing someone who is infected by coronavirus); (7) actual severity of the crisis (number of cases and deaths in Spain) and perceived severity of the crisis; (8) information-related variables (e.g., time spent reading/watching information about coronavirus in the last 24 h); (9) perceived health status (e.g., symptoms experienced in the last 14 days); and (10) leisure activities in which the participant has engaged in the last 24 h.

MATERIALS AND METHODS

Participants

Inclusion criteria were living in Spain during the current COVID-19 crisis and being at least 18 years old. Exclusion criteria were not understanding Spanish well enough to complete the questionnaires. These were stated in the informed consent that was presented before the questionnaire.

A total of 3,055 adults from all Spanish provinces (50) filled the questionnaires. Over half the respondents (N = 1,683; 55%) submitted the questionnaires on the first day of data collection, in line with previous similar studies (Wang et al., 2020). Sociodemographic characteristics are comprehensively presented in **Table 2**. Most respondents were women (75.1%), young adults (age M = 32.15 years, SD = 12.95; range 18–88), married or cohabiting with partner (38%) or single (34.5%), without children (74.1%), living in a 80–120m^2 residence (38.4%) with an open air space such as a patio or balcony (64.4%), with a household size of 2–4 people (78.6%), employed or self-employed (53.2%), and well educated (72% hold at least a University degree).

Most participants lived in the provinces of Madrid (52.3%), Barcelona (5.5%), Vizcaya (4%), Guadalajara (3.6%), and Valencia (3.3%). Participants had been born mostly in Spain (94.4%), with the rest indicating 34 different countries of birth — Romania (0.7%), Argentina (0.7%), Colombia (0.5%), Venezuela (0.4%), and France (0.4%) were the most prevalent.

Instruments

Demographics

Participants provided information regarding their gender, age, birth country, Spanish province of residence, marital status, number of children, education level, and monthly family income.

Impact of Event Scale-Revised (IES-R; Weiss and Marmar, 1996; Weiss, 2007)

The IES-R is a 22-item self-administered questionnaire designed to measure the magnitude of symptomatic response in the

past 7 days to a specific traumatic life event. The response format is a 5-point scale ranging from 0 (not at all or hardly ever) to 4 (a great deal). It is a revised version of the older version, the IES (Horowitz et al., 1979), which included 15 items and two subscales: avoidance and intrusion. The IES-R includes three subscales that measure the three main symptoms of Posttraumatic Stress Disorder (PTSD): avoidance (items 5, 7, 8, 11, 12, 13, 17, and 22), intrusion (items 1, 2, 3, 6, 9, 16, and 20) and hyperarousal (items 4, 10, 14, 15, 18, 19, and 21). A total score can also be obtained as a result of the sum of the scores of the three subscales. To make our data comparable to those by the study conducted by Wang et al. (2020) in Chinese population, the total IES-R score was divided into 0–23 (normal), 24–32 (mild psychological impact), 33–36 (moderate psychological impact), and >37 (severe psychological impact). The IES-R has been validated in the Spanish general population by Baguena et al. (2001), and also in Spanish cancer patients (Gil-Moncayo and Costa-Requena, 2007) showing adequate psychometric properties. In the present study, the instructions and the items were adapted to refer to the current COVID-19 sanitary crisis. The internal consistency of the scores was good for the three subscales (avoidance: $\alpha = 0.88$; intrusion: $\alpha = 0.88$; hyperarousal: $\alpha = 0.87$) and for the total scale ($\alpha = 0.95$).

Depression, Anxiety, and Stress Scales (DASS-21; Lovibond and Lovibond, 1995)

The DASS-21 is a 21-item self-report instrument for mental health assessment consisting of three 7-item subscales: depression (items 3, 5, 10, 13, 16, 17, and 21), anxiety (items 2, 4, 7, 9, 15, 19, and 20), and stress (1, 6, 8, 11, 12, 14, and 18). Participants indicate on a 4-point Likert scale ranging from 0 (Did not apply to me at all) to 3 (Applied to me very much, or most of the time) the degree in which a symptom has been present over the past week. Scores for each subscale were computed by summing the item responses and doubling the result up (Lovibond and Lovibond, 1995; Le et al., 2019) to make them comparable to similar COVID-19 research (Wang et al., 2020). The subscales scores can be allocated on one of 5 levels of severity, as described in Wang et al. (2020) – for depression, normal (0–9), mild (10–12), moderate (13–20), severe (21–27), and extremely severe (28–42); for anxiety, normal (0–6), mild (7–9), moderate (10–14), severe (15–19), and extremely severe (20–42); and for stress, normal (0–10), mild (11–18), moderate (19–26), severe (27–34), and extremely severe (35–42). The DASS-21 has been demonstrated to be a reliable and valid measure in Spanish populations (Bados et al., 2005) and has been previously used in SARS-related research (McAlonan, 2007; Wang et al., 2020). The internal consistency of the scores in the current sample was good for the three subscales (depression: $\alpha = 0.89$; anxiety: $\alpha = 0.86$; stress: $\alpha = 0.88$) and the general distress scale ($\alpha = 0.94$).

Degree of Concern

Participants were asked about the degree to which they were concerned (not at all concerned or very little, somewhat concerned, rather concerned, very concerned) about the following: (1) Health care workers not having the capacity to diagnose and treat the coronavirus; (2) A loved one being infected by coronavirus, (3) Food or health products (such as masks or gloves) shortage, (4) The measures taken by the Government to control the pandemic not being enough, (5) The economic impact of the pandemic, (6) The situation of collective nervousness, (7) Not knowing when this crisis is going to end, and (8) Their psychological state during the crisis.

Living and Environmental Conditions During the Home Confinement

Participants provided information about how many people were living together, dependent cohabitants during the home confinement (including children and their ages, as well as other dependents), size of the residence (in squared meters), whether the residence had any open air area (such as a patio or a terrace), the average number of hours a day spent at home during the last week, and the number of days spent without leaving their home.

Work-Related Information

Participants provided information regarding their work status, significant modifications in the development of their daily work due to the COVID-19 pandemic, whether they were working during the crisis (options: yes, I'm attending to my workplace, yes, I'm teleworking; no, I stopped working as a consequence of the coronavirus crisis; no; I lost my job because of the coronavirus crisis; no, I didn't work before the crisis started), whether they thought that there were at risk of losing their jobs as a consequence of the pandemic, and whether they thought that their income was likely to decrease due to the pandemic.

Significant Changes in Daily Life

Participants indicated their perceived degree to which the current crisis was affecting their daily life, whether they had had to cancel important activities, whether they had had substantial modifications in the working/studying method, and whether they had to cancel/postpone any travels.

Contact With the COVID-19 Disease

Participants indicated whether they knew someone infected by coronavirus, had had close contact with someone then diagnosed with coronavirus in the previous 14 days, had had close contact with someone who had coronavirus symptoms in the previous 14 days, had had symptoms of coronavirus themselves, had taken the coronavirus test with a negative result, had taken the coronavirus test with a positive result, or had experienced nothing of the above.

Actual and Perceived Severity of the Situation

Respondents indicated the degree to which they perceived the current crisis as severe (0–10) and we also collected the official number of people infected by coronavirus and of deaths by coronavirus in Spain the day that they filled the questionnaires (these data were obtained from the WHO website, World Health Organization, 2020).

Information About the COVID-19 Pandemic

Participants indicated the main information media they had used to receive information about the COVID-19 crisis, their need

for more information, and the number of hours invested in the previous 24 h in watching/reading information about the coronavirus crisis.

Health Status

Participants indicated their perceived health level (from 0 = very bad, to 10 = excellent), their perception of belonging to the high-risk population in case of being infected by coronavirus, the symptoms they had experienced in the previous 14 days (fever of at least 38°C, sore throat, headaches, muscle or joint pain, cough, respiratory distress, fatigue, none of the above), and their utilization of any health services related to coronavirus during the last 14 days.

Leisure Activities During Home Confinement

Participants provided information regarding whether they had carried out the following activities in the previous 24 h: physical exercise, watching films/series, reading, watching TV, making crafts or any artistic activity, playing, browsing or sharing contents in social networks, talking to someone (face to face or via telephone, instant messaging, videocalls. . .), other leisure activities, or none of the above.

Procedure

The study was approved by the ethics committees at the first and second authors' universities. Given the restrictions imposed over the face-to face interaction during the data-collection period, data were collected online, through a Google Forms questionnaire. Data collection period comprised between the 17th of March 2020 (2 days after the state of alarm was implemented in Spain and a week after the WHO declared the outbreak a pandemic) and the 24th of March 2020. Participants were contacted by email and social networks (Facebook, Instagram, Twitter, LinkedIn, and WhatsApp), following a snowball approach. All respondents provided informed consent prior accessing the questionnaires.

Data Analyses

Descriptive statistics were computed for the sociodemographic characteristics of the sample and the study variables, consisting of frequencies and percentages for categorical variables and means and standard deviations (*SD*) for scale and ordinal variables. For the mental health variables, skewness and kurtosis values were obtained (see **Table 1**) with no further interpretation due to the large sample size (Field, 2009; Ghasemi and Zahediasl, 2012).

Parametric tests were then carried out, since again the large sample size (>30) allows for the shape of the data to not cause problems in these instances (Ghasemi and Zahediasl, 2012; Kwak and Kim, 2017). Differences in mean level of mental health variables between categories of dichotomous variables (e.g., perceived risk of losing job) were assessed via *t*-test, taking the test results adjusted for non-homogeneous variances when necessary if a significant Levene's test was found. For multiple-category variables (e.g., gender group, age groups, education, marital status, impact on work), one-way ANOVA was used, with *post hoc* Tukey (for homogeneous variances) or Games-Howell (for non-homogeneous variances) between group comparisons in case of a significant overall *F*-value. Appropriate effect size statistics that adjust for differences in group sizes were obtained — Hedges' *g* for *t*-tests and η^2 for ANOVAs. Bivariate associations between mental health variables (psychological impact, anxiety, stress and depression) and age (continuous variable) were assessed via Pearson's correlation coefficient *r*. Spearman's correlation coefficient ρ was used to test bivariate associations between mental health variables and ordinal variables (i.e., degree of concern, perceived severity, perceived health).

All tests were two-tailed, with a significance level of $p < 0.05$. Statistical analyses were performed using SPSS Statistics 25.0.

TABLE 1 | Means, standard deviations, Skewness and Kurtosis for Impact of event, stress, anxiety, and depression.

	Mean	*SD*	Skewness		Kurtosis	
			Value	*SE*	Value	*SE*
Impact of event	27.95	19.21	0.66	0.04	−0.35	0.09
Stress	11.04	10.04	0.83	0.04	−0.15	0.09
Anxiety	6.23	8.19	1.71	0.04	2.68	0.09
Depression	9.88	9.98	1.18	0.04	0.66	0.09

SD, standard deviation. SE, standard error.

RESULTS

Psychological Impact and Mental Health

The psychological impact of COVID-19 pandemic in Spain, measured through the IES-R scale, revealed a sample mean score of 27.94 (*SD* = 19.21; see **Table 1**). A total of 930 respondents (30.4%) showed severe psychological impact (score > 37), 188 (6.2%) reported a moderate psychological impact (score 33-36); 441 (14.4%) scored in the range for mild psychological impact (score 24–32), and 1,496 participants (49%) reported minimal psychological impact (score < 23).

The global mental health, as assessed by the DASS-21 scale showed a mean score of 27.14 (*SD* = 25.54). Regarding the DASS-21 subscales (see **Table 1**), the mean score for anxiety was 6.23 (*SD* = 8.19). A total of 2,118 respondents (69.3%) were considered to have normal levels of anxiety (score 0–6), 162 participants (5.3%) showed mild anxiety (score 7–9), 346 (11.3%) showed moderate anxiety (score 10–14), 147 (4.8%) showed severe anxiety (score 15–19) and 282 (9.2%) showed extremely severe anxiety (score > 20). With regards to depression, the mean score was 9.88 (*SD* = 9.98). A total of 1,805 respondents (59.1%) showed normal levels (score 0–9), 347 (11.4%) mild depression (score 10–12), 451 (14.8%) moderate depression (score 13–20), 191 (6.3%) severe depression (score 21–27) and 261 (8.5%) extremely severe depression (score > 28). Finally, the mean for stress was 11.04 (*SD* = 10.04). Of participants, 1,772 (58%) showed normal stress levels (score 0–10), 599 (19.6%) mild stress (score 11–18), 408 (13.4%) moderate stress (score 19–26), 22 (6.9%) severe stress (27–34), and 64 (2.1%) extremely severe stress (>35).

Demographics

Table 2 shows the descriptive data for all demographic variables as well as the associations between such variables and

TABLE 2 | Association between demographic variables and the psychological impact of the COVID-19 pandemic as well as mental health status during the pandemic (*N* = 3055).

Variables	*N* (%)	Impact of event				Stress				Anxiety				Depression			
		M (*SD*)	*t*/*F**	*p*	g/η^2*	*M* (*SD*)	*t*/*F**	*p*	g/η^2*	*M* (*SD*)	*t*/*F**	*p*	g/η^2*	*M*(*SD*)	*t*/*F**	*p*	g/η^2*
Gender**																	
Male	744 (24.4)	21.35 (17.04)	11.75[1]	<0.001	0.46	8.01 (8.63)	10.47[1]	<0.001	0.41	4.12 (6.52)	9.39 [1]	<0.001	0.34	7.71 (8.91)	7.30 [1]	<0.001	0.29
Female	2293 (75.1)	30.10 (19.42)				12.02 (10.27)				6.92 (8.57)				10.56 (10.18)			
Other	18 (0.6)	26.83 (16.46)				11.67 (8.97)				4.78 (6.86)				13.56 (12.15)			
Country of origin																	
Spain	2283 (94.4)	27.90 (19.28)	−0.60	0.55	0.05	11.02 (10.07)	−0.49	0.62	0.04	6.16 (8.19)	−1.74	0.08	0.14	9.80 (9.98)	−1.88	0.06	0.15
Other	172 (5.6)	28.80 (18.17)				11.41 (9.40)				7.28 (8.23)				11.27 (9.79)			
Region																	
Madrid	1598 (52.3)	27.22 (18.75)	−2.18[1]	0.03	0.08	11.04 (9.81)	−0.02	0.98	0	6.05 (8.02)	−1.25	0.21	0.05	9.52 (9.73)	−2.06 [1]	0.04	0.08
Other	1457 (47.7)	28.75 (19.69)				11.04 (10.28)				6.42 (8.38)				10.27 (10.23)			
Marital status																	
Married/cohabiting with a partner	1160 (38)	24.72 (18.15)[a]	27.61[1]	<0.001	0.04	9.23 (9.13)[a]	31.59[1]	<0.001	0.04	5.07 (7.32)[a]	19.47[1]	<0.001	0.03	7.20 (8.54)[a]	44.07[1]	<0.001	0.06
In a relationship but not cohabiting	748 (24.5)	33.26 (20.74)[b]				13.74 (10.99)[b]				7.97 (9.35)[b]				12.51 (10.94)[b]			
Single	1054 (34.5)	28.42 (18.55)[c]				11.59 (9.99)[c]				6.56 (8.14)[c]				11.26 (10.14)[b]			
Separated/ divorced	76 (2.5)	19.25 (15.33)[d]				5.89 (6.53)[d]				2.47 (4.51)[d]				6.86 (7.89)[a]			
Widow(er)	17 (0.6)	24,53 (17.76)[abcd]				4.71 (5.05)[d]				4 (9.22)[abcd]				4.94 (5.25)[a]			
N° of children																	
No children	2265 (74.1)	29.21 (19.35)[a]	12.86	<0.001	0.01	11.80 (10.23)[a]	17.11[1]	<0.001	0.02	6.75 (8.38)[a]	12.06[1]	<0.001	0.01	10.89 (10.29)[a]	31.24[1]	<0.001	0.03
One	294 (9.6)	24.35 (19.35)[b]				8.95 (9.60)[b]				4.74 (7.43)[b]				7.62 (8.91)[b]			
Two	388 (12.7)	24.54 (17.99)[b]				8.80 (8.91)[b]				4.60 (7.25)[b]				6.51 (8.12)[b]			
Three or more	108 (3.6)	23.50 (17.03)[b]				8.80 (8.61)[b]				5.17 (8.15)[ab]				7.06 (7.89)[b]			

(Continued)

TABLE 2 | Continued

Variables	*N* (%)	Impact of event				Stress				Anxiety				Depression			
		***M* (*SD*)**	***t*/*F****	***p***	***g*/η^2***	***M* (*SD*)**	***t*/*F****	***p***	***g*/η^2***	***M* (*SD*)**	***t*/*F****	***p***	***g*/η^2***	***M*(*SD*)**	***t*/*F****	***p***	***g*/η^2***
Education level																	
No studies	3	52.33 (7.09)^{df}	4.92^{1}	<0.001	0.01	28 (10)^{ab}	4.37^{1}	<0.001	0.01	11.33 (17.93)^{abc}	4.46^{1}	<0.001	0.01	27.33 (12.86)^{abc}	10.92^{1}	<0.001	0.02
Primary education	29	24.24 (19.56)^{eg}				7.93 (9.08)^{ab}				6 (8.78)^{abc}				8.56 (9.83)^{abc}			
Secondary compulsory education	91 (3)	32.01 (20.78)^{bcde}				11.98 (10.31)^{ab}				9.30 (9.19)^{a}				12.41 (11.51)^{c}			
Secondary post-compulsory education	294 (9.6)	28.50 (19.60)^{bcde}				11,13 (10.35)^{ab}				6.49 (9.10)^{ab}				11.66 (11.22)^{c}			
Professional training	439 (14.4)	27.47 (20.14)^{bcde}				10.55 (10.33)^{ab}				6.22 (8.22)^{ab}				9.87 (10.51)^{bc}			
University degree	1435 (47)	29.12 (19.47)^{bde}				11.68 (10.30)^{a}				6.49 (8.23)^{ab}				10.52 (10.05)^{c}			
Master's degree	610 (20)	26.13 (17.59)^{acde}				10.38 (9.23)^{ab}				5.56 (7.63)^{bc}				8.15 (8.53)^{b}			
Ph.D	154 (5)	22.40 (16.76)^{afg}				8.66 (8.20)^{b}				4.01 (6.35)^{c}				5.80 (6.88)^{a}			
Montly income* **																	
<1000 €	293 (9.6)	30.41 (19.74)^{bc}	5.97^{1}	<0.001	0.01	12.78 (10.77)^{a}	3.58^{1}	<0.01	0.01	7.80 (8.80)^{b}	6.63^{1}	<0.001	0.01	12.81 (11.26)^{a}	10.27^{1}	<0.001	0.02
1000 – 1500 €	496 (16.2)	29.83 (20.51)^{bc}				11.52 (10.42)^{ab}				7.12 (8.98)^{bd}				11.25 (10.57)^{ab}			
1500 – 2000 €	524 (17.2)	30.35 (19.55)^{b}				11.71 (9.98)^{ab}				6.99 (8.56)^{bcd}				10.36 (10.02)^{bc}			
2000 – 2500 €	491 (16.1)	26.37 (17.92)^{ac}				10.33 (9.98)^{b}				5.63 (7.55)^{ad}				9.36 (9.84)^{bcd}			
2500 – 3000 €	380 (12.4)	27.54 (19.07)^{abc}				10.75 (9.99)^{ab}				5.95 (8.31)^{ab}				9.02 (9.33)^{cd}			
3000 – 3500 €	302 (9.9)	26.26 (18.75)^{ac}				10.36 (9.24)^{ab}				5.36 (7.51)^{ac}				8.65 (8.97)^{cd}			
>3500 €	541 (17.7)	25.10 (18.24)^{a}				10.08 (9.68)^{b}				5.01 (7.33)^{a}				8.18 (9.13)^{d}			

(Continued)

TABLE 2 | Continued

Variables	*N* (%)	Impact of event				Stress				Anxiety				Depression			
		***M* (*SD*)**	***t*/*F****	***p***	***g*/η^2***	***M* (*SD*)**	***t*/*F****	***p***	***g*/η^2***	***M* (*SD*)**	***t*/*F****	***p***	***g*/η^2***	***M*(*SD*)**	***t*/*F****	***p***	***g*/η^2***
Age groups																	
18 – 24	1201 (39.3)	32.06 (19.76)[a]	29.64[1]	<0.001	0.05	13.18 (10.64)[a]	33.60[1]	<0.001	0.05	7.49 (8.81)[a]	18.18[1]	<0.001	0.03	12.80 (10.70)[a]	48.28[1]	<0.001	0.07
25 – 34	795 (26)	28.38 (19.22)[b]				11.52 (10.02)[b]				6.66 (8.38)[a]				9.81 (9.83)[b]			
35 – 44	476 (15.6)	23.90 (18.02)[c]				9.21 (8.89)[c]				5.06 (7.09)[b]				7.02 (8.10)[c]			
45 – 54	334 (10.9)	23.63 (16.74)[c]				8.38 (8.51)[c]				4.38 (6.99)[bc]				6.99 (8.46)[c]			
55 – 64	188 (6.2)	22.36 (17.25)[c]				7.15 (8.28)[c]				3.85 (6.67)[bc]				5.82 (7.67)[cd]			
>65	61 (2)	13.95 (12.90)[d]				3.38 (4.85)[d]				2.13 (5.43)[c]				3.80 (5.29)[d]			
	M(*SD*)	Pearson's *r*		*p*		Pearson's *r*		*p*		Pearson's *r*		*p*		Pearson's *r*		*p*	
Age	32.14 (12.96)	−0.206		<0.001		−0.226		<0.001		−0.171		<0.001		−0.245		<0.001	

**Differences in mean level between categories of dichotomous variables were assessed via t-test and Hedges' g effect size statistic was obtained (interpretation: negligible < 0.20 < small < 0.50 < medium < 0.80 < large). For multiple-category variables, one-way ANOVAs were used, and categories with a different superscript letter show a significant difference between them in the psychological impact variable mean. In these cases, the effect size was assessed via η^2 (interpretation: negligible < 0.01 < small < 0.06 < medium < 0.14 < large). **For gender comparison, given the low number of people who responded "other" (N = 18) only men and women have been included. The means are included for the three categories (men, women, and other), but mean differences were only tested between women and men via t-test. ***For monthly income 28 persons selected the option "rather not to say." These analyses have been conducted with the participants who indicated their family monthly income. [1]Homoscedascity could not be assumed for these variables and thus the t-test results adjusted for non-homogeneous variances were used, and in the case of ANOVAS, post hoc Games-Howell tests were used.*

psychological impact, stress, anxiety and depression. Women showed significantly higher levels in all the variables. The mean age was 32.14 (*SD* = 12.96). Over 65% of the participants were 34 years old or younger. Pearson's correlational analyses revealed that the psychological impact of the COVID-19 crisis seems to ameliorate as people get older. Thus, participants aged 18–24 showed the highest psychological impact, followed by the group aged 25–34. No differences were found in the psychological impact reported by people who were between 35 and 64 years old. Participants who were 65 years old or over showed the lowest psychological impact. Participants living in Spanish regions different from Madrid reported higher levels of psychological impact and depression (even though the situation, in terms of infected people and deaths caused by COVID-19, was more severe in Madrid). As for marital status, mean differences were significant for all the study variables. The *post hoc* tests for psychological impact showed that mean differences were significant between those who were in a relationship but not cohabiting (who showed the highest psychological impact) and those who were married, separated, and single. Married participants and those cohabiting with their partner showed significantly lower psychological impact than single participants, while separated participants showed significantly lower distress than those who were single or married. As for stress, the *post hoc* test showed that mean differences between all groups (but widowed participants, probably due to the small sample size of this group) were significant. The most stressed, anxious, and depressed participants were those who were in a relationship but not cohabiting, followed by single participants. Those who had children showed lower psychological impact, stress, anxiety, and depression than those with no children. *Post hoc* tests revealed no differences between participants with one, two or three, or more children. Considering educational level, participants with a Ph.D. showed lower psychological impact, stress, anxiety, and depression than those with high school studies, professional training, and university undergraduate studies. Participants with high family monthly income (3,000–3,500 €/month) showed lower psychological impact than those whose family income was lower than 2,000 €/month. All the effect sizes were small (see **Table 2**), except for differences in depression by marital status and by age groups, which were medium.

Degree of Concern

Table 3 shows the mean scores in each of the concerns about the COVID-19 that were included in the study, as well as the Spearman's correlations between each concern and psychological impact of the event, stress, anxiety, and depression. The average level of concern (mean of all the items) was 2.93 (*SD* = 0.55; range 1–4). What worried participants the most was the economic impact of the pandemic (*M* = 3.37; *SD* = 0.72), a loved one being infected by coronavirus (*M* = 3.35; *SD* = 0.75) and not knowing when this health crisis is going to end (*M* = 3.05; *SD* = 0.84). All the concerns showed positive and significant associations with psychological impact, stress, anxiety and depression. The concern that was more strongly associated with distress was "My psychological state during the crisis" followed by "Not knowing when this crisis is going to end."

Living and Environmental Conditions During the Home Confinement

Most of the participants had a household of two people (24.5), three people (25.9) or four people (28.2), and 10.1% lived alone. Differences in distress by household size were significant for psychological impact, stress and depression (see **Table 4**) with small effect sizes. The *post-hoc* tests for psychological impact revealed that differences were significant only between individuals with a household of one/two (who suffered the lower psychological impact) and participants with a household of four people. As for stress, differences were significant between participants with a household of one or two people (the less stressed) and participants with a household of three or four people (the most stressed). The lower psychological impact was found in participants with a household of two, and their depression levels were significantly lower than of those with a household of three or four, who showed the highest depression levels.

Participants who did not have kids were compared to those who had kids but not living with them, those living with kids aged less than 5 years old, 6–10 years old, 11–15 years old, and older than 16 years old. Participants with children aged less than 5 years old showed equivalent levels of psychological impact and anxiety than those with no children. However, participants with children who were older than 10 years old and those who had children but did not live with them showed lower psychological impact and anxiety than those without children. Participants with children aged <5 years old and with children between 6 to 10 years old were equally stressed as participants with no children. However, participants with children older than 11 years old and those who have kids that did not live with them showed lower stress levels. With regards to depression levels, participants with children (irrespective of their age) showed lower levels of depression than participants with no children. Participants living with elderly family members did not show differences in their levels of distress compared to those not living with elderly people. Effect sizes were small, expect for the effect size of having kids who lived elsewhere on stress, which was medium.

The size of the residence was associated with the respondents' mental health. Participant with houses sized more than 120 square meters showed lower psychological impact, stress, anxiety and depression. In order to explore whether there was an association between the resident density of the house and the levels of distress, an overcrowding index was calculated based on the residence size and the household size. Participants living with a low overcrowding index showed lower distress than those with a high overcrowding index. Respondents whose residence had an open-air space showed slightly lower psychological impact. At the time of data collection, almost 30% of the participants had been confined at home for more than 5 days. The more days without leaving their home, the higher the distress levels. In the week prior participating in the study (i.e., before the state of alarm, but after the start of the outbreak in Spain), 77% of the respondents had

TABLE 3 | Association between types and degree of concern about the COVID-19 pandemic and the psychological impact of the COVID-19 pandemic as well as mental health status during the pandemic (*N* = 3055).

Concerns	*M* (*SD*)	Impact of event	Stress	Anxiety	Depression
Health care workers not having the capacity to diagnose and treat the coronavirus (1–4)	2.97 (0.99)	0.19***	0.10***	0.12***	0.09***
A loved one being infected by coronavirus (1–4)	3.35 (.75)	0.28***	0.17***	0.19***	0.13***
Food or health products (such as masks or gloves) shortage (1–4)	2.54 (1)	0.24***	0.14***	0.17***	0.11***
The measures taken by the Government to control the pandemic not being enough (1–4)	2.93 (0.90)	0.28***	0.16***	0.17***	0.13***
The economic impact of the pandemic (1–4)	3.37 (0.72)	0.20***	0.11***	0.09***	0.09***
The situation of collective nervousness (1–4)	2.95 (0.87)	0.30***	0.22***	0.20***	0.17***
Not knowing when this crisis is going to end (1–4)	3.05 (0.84)	0.41***	0.30***	0.27***	0.29***
My psychological state during the crisis (1–4)	2.37 (1.01)	0.59***	0.55***	0.48***	0.54***
Average level of concern (1–4)	*2.93 (0.55)*	*0.49****	*0.35****	*0.35****	*0.31****

*Spearman's rho correlation coefficient (ρ) was used for correlation calculations between concerns and mental health variables. ***$p < 0.001$.*

spent an average of 20–24 h at home. No significant associations were found in terms of hours spent at home the week before. All effect sized were small.

Work-Related Information

Descriptive data for work-related variables as well as their association with psychological impact, stress, anxiety, and depression are included in **Table 5**. Many participants (35%) were teleworking, while 15% had temporarily stopped working due to the crisis, 3.2% lost their jobs due to the crisis and 10.4% continued working on site. More than 36% of the participants perceived a risk of losing their jobs and more than 44% a risk of decreased income because of the pandemic. Differences were significant for all the work-related variables included. *Post hoc* tests showed that participants with the highest psychological impact, stress, and anxiety levels were students, while those least affected were retired. There were no differences between self-employed, employed, and unemployed participants for psychological impact, stress, and anxiety. For depression, students and unemployed respondents showed higher levels than the rest of participants, while retired individuals showed lower depression symptoms than the rest of groups. With regards to the work situation during the crisis, participants who were working on site, those who had lost their jobs due to the crisis, and those who had stopped working due to the crisis showed higher levels of psychological impact, stress, anxiety, and depression than respondents who were teleworking. Finally, participants with higher perceived levels of losing their jobs during the COVID-19 crisis (considering only the participants who were working before the crisis started) and those with higher perceived risk of reduced family income as a consequence of the crisis reported significantly higher scores in all the variables included. All the effect sizes were small (see **Table 5**).

Significant Changes in Daily Life

A total of 57% of the participants considered that the COVID-19 crisis had impacted to a great deal or extremely on their daily life (see **Table 6**). Those respondents who considered that the impact of COVID-19 crisis in their daily life had been high showed increased levels of psychological impact, stress, anxiety, and depression (*post hoc* tests revealed that all the differences were significant except the comparison between the categories "almost none impact" and "a little impact" for the variables stress, anxiety, and depression). More than 84% of the participants indicated that since the COVID-19 crisis started, they had suffered substantial modifications in their work or studies routines, more than 88% had to cancel significant activities, and more than 65% had canceled or postponed any travels. Those who reported significant modifications or cancelation of relevant activities and travels showed worse mental health (in all the variables) that those who did not. The effect sizes for the ANOVA that compared the levels of impact of the event and stress by the degree of perceived impact of the COVID-19 on their daily lives were moderate, while the rest were small.

Contact With the COVID-19 Disease

Only 11 people in the sample had taken the COVID-19 test. Of them, eight received negative results and three positive results. **Table 7** shows the frequency and percentage of participants who know someone with COVID-19 (31.5%), have had close contact in the previous 14 days with someone diagnosed with COVID-19 (9.5%), have had close contact with someone with COVID-19 symptoms or (suspected) infected material (24.2%), and have showed COVID-19 symptoms themselves (6.5%). Participants who have had close contact with someone diagnosed COVID-19 showed significantly higher psychological impact, stress, and anxiety that those who did not. Respondents who knew someone diagnosed with COVID-19 and those who have had close contact with someone with symptoms showed slightly higher stress and anxiety than those who did not. Participants with COVID-19 symptoms showed higher psychological distress in all the variables. All the effect sizes were at best small.

Actual and Perceived Severity of the Situation

The average perceived severity of the COVID-19 outbreak in Spain was 8.49 (*SD* = 1.24; range 0–10). Perceived severity was significantly associated to psychological impact of the event (Spearman's rho, $\rho = 0.22$; $p < 0.001$), stress ($\rho = 0.13$; $p < 0.001$), anxiety ($\rho = 0.14$; $p < 0.001$), and —very weakly— with depression ($\rho = 0.07$; $p < 0.001$). Concerning actual severity, by 17th March 2020, the day in which the data collection started

TABLE 4 | Association between living and environmental conditions during the home confinement and the psychological impact of the COVID-19 pandemic as well as mental health status during the pandemic (*N* = 3055).

Variables	*N* (%)	Impact of event				Stress				Anxiety				Depression			
		***M* (*SD*)**	***t*/*F****	***p***	***g*/η^2***	***M* (*SD*)**	***t*/*F****	***p***	***g*/η^2***	***M* (*SD*)**	***t*/*F****	***p***	***g*/η^2***	***M*(*SD*)**	***t*/*F****	***p***	***g*/η^2***
Household size																	
One person	308 (10.1)	26.05 (18.43)[a]	4.25	<0.01	0.01	9.50 (9.85)[a]	5.78[1]	<0.001	0.01	6.02 (8.07)	1.43 [1]	0.21	0	9.36 (9.80)[ab]	3.95[1]	<0.01	0.01
Two people	750 (24.5)	25.88 (18.72)[a]				9.88 (9.37)[a]				5.71 (7.98)				8.67 (9.42)[a]			
Three people	790 (25.9)	28.29 (19.40)[ab]				11.49 (10.31)[b]				6.29 (8.45)				10.51 (10.21)[b]			
Four people	863 (28.2)	29.89 (19.55)[b]				12.05 (10.27)[b]				6.76 (8.40)				10.60 (10.35)[b]			
Five people	257 (8.4)	28.72 (19.54)[ab]				11.14 (9.90)[ab]				6.04 (7.63)				9.77 (9.78)[ab]			
6 or more	87 (2.8)	27.91 (18.33)[ab]				12.16 (10.31)[ab]				5.95 (7.49)				9.68 (8.43)[ab]			
Living with kids																	
Don't have kids (Reference)	*2129 (69.69)*	*28.99 (19.26)*				*11.73 (10.24)*				*6.63 (8.24)*				*10.85 (10.26)*			
Have kids but not living with me	118 (3.86)	19.99 (17.35)	−5.63	<0.001	0.47	5.64 (7.86)	−8.42	<0.001	0.60	3.10 (5.91)	−6.48	<0.001	0.44	6.00 (7.29)	−7.22	<0.001	0.48
At least one kid < 5 years	212 (6.94)	27.15 (19.18)	−1.40	0.16	0.10	11.10 (10.07)	−0.91	0.37	0.06	6.24 (8.46)	−0.66	0.51	0.05	8.04 (9.12)	−4.49	<0.001	0.28
At least one kid 6–10 years	153 (5.01)	25.80 (18.37)	−2.15	0.03	0.17	10.34 (9.34)	−1.84	0.07	0.14	4.73 (7.01)	−3.35	<0.01	0.23	7.01 (8.10)	−5.87	<0.001	0.38
At least one kid 11–15 years	181 (5.92)	24.54 (18.01)	−3.32	<0.01	0.23	8.72 (8.92)	−4.54	<0.001	0.30	4.61 (7.77)	−3.50	<0.01	0.25	7.52 (9.33)	−4.80	<0.001	0.33
At least one kid 16–20 years	181 (5.92)	24.85 (18.98)	−2.94	<0.01	0.22	8.76 (9.27)	−4.31	<0.001	0.29	5.54 (8.44)	−1.74	0.08	0.13	7.31 (8.80)	−5.40	<0.001	0.35
Living with elderly																	
No	2824 (92.44)	27.77 (19.11)	−1.84	0.07	0.13	10.99 (10.00)	−0.84	0.40	0.06	6.14 (8.07)	−1.78[1]	0.08	0.14	9.83 (9.91)	−1.01	0.31	0.07
Yes	231 (7.56)	30.19 (20.31)				11.58 (10.42)				7.29 (9.59)				10.52 (10.68)			
***M*[2] residence**																	
<50	194 (6.4)	28.02 (19.27)[ab]	2.90	0.03	0	11.03 (10.28)[ab]	3.44	0.02	0	6.65 (8.40)[ab]	4.05[1]	<0.01	0	10.54 (9.86)[ab]	3.23[1]	0.02	0
50–80	925 (30.3)	28.94 (19.48)[a]				11.36 (10.12)[a]				6.65 (8.56)[a]				10.23 (10.42)[a]			

(Continued)

TABLE 4 | Continued

Variables	*N* (%)	Impact of event				Stress				Anxiety				Depression			
		***M* (*SD*)**	***t*/*F****	***p***	***g*/η^2***	***M* (*SD*)**	***t*/*F****	***p***	***g*/η^2***	***M* (*SD*)**	***t*/*F****	***p***	***g*/η^2***	***M*(*SD*)**	***t*/*F****	***p***	***g*/η^2***
80–120	1173 (38.4)	28.26 (19.14)[ab]				11.43 (10.17)[a]				6.39 (8.19)[a]				10.12 (9.91)[a]			
>120	763 (25)	26.26 (19.91)[b]				10.04 (9.61)[b]				5.35 (7.63)[b]				8.92 (9.52)[b]			
Overcrowding index																	
<1.17	1780 (58.27)	26.60 (18.96)	4.57[1]	<0.001	0.17	10.41 (9.81)	4.06[1]	<0.001	0.15	5.92 (8.18)	2.46[1]	0.01	0.09	9.40 (9.79)	3.14[1]	<0.01	0.12
≥1.17	1275 (41.73)	29.83 (19.41)				11.92 (10.23)				6.66 (8.20)				10.55 (10.20)			
Open-air space																	
Yes	1966 (64.4)	27.33 (19.18)	2.39	0.02	0.09	10.86 (10.10)	1.37	0.17	0.05	6.06 (8.15)	1.63	0.10	0.06	9.89 (10.04)	−0.07	0.95	0
No	1089 (35.6)	29.07 (19.24)				11.37 (9.91)				6.55 (8.28)				9.86 (9.87)			
Days without leaving residence																	
0	660 (21.6)	26.08 19.33)[a]	5.20 [1]	<0.001	0.01	10.24 (10.16)[a]	4.20[1]	<0.01	0.01	5.60 (7.88)[a]	4.52[1]	<0.001	0.01	8.57 (9.34)[a]	7.16[1]	<0.001	0.01
1	380 (12.4)	26.94 (18.24)[a]				10.71 (9.35)[ab]				5.67 (7.63)[a]				8.91 (8.80)[ac]			
2	283 (9.3)	27.83 (16.92)[ab]				10.96 (9.01)[ab]				5.59 (7.08)[a]				9.39 (9.03)[abc]			
3	373 (12.2)	26.28 (19.32)[a]				9.97 (9.26)[a]				5.81 (7.68)[a]				9.42 (9.80)[ac]			
4	452 (14.8)	27.92 (18.60)[ab]				11.10 (9.77)[ab]				6.29 (8.28)[a]				10.59 (10.19)[bc]			
5 or more	907 (29.7)	30.48 (20.21)[b]				12.20 (10.84)[b]				7.25 (9.02)[b]				11.23 (10.93)[b]			
Daily h. at home																	
<10	66 (2.2)	27.95 (20.80)	0.09	0.96	0	12.64 (11.67)	0.64	0.59	0	8.03 (9.27)	1.26	0.29	0	10.15 (10.58)	1.91	0.13	0
10–14	212 (6.9)	28.05 (19.74)				10.80 (10.44)				6.17 (8.34)				8.99 (9.30)			
15–19	425 (13.9)	27.49 (19.21)				11.17 (10.09)				6.44 (8.08)				9.06 (9.42)			
20–24	2352 (77)	28.02 (19.13)				10.99 (9.94)				6.14 (8.17)				10.10 (10.11)			

**Differences in mean level between categories of dichotomous variables were assessed via t-test and Hedges' g effect size statistic was obtained (interpretation: negligible < 0.20 < small < 0.50 < medium < 0.80 < large). For multiple-category variables, one-way ANOVAs were used, and categories with a different superscript letter show a significant difference between them in the psychological impact variable mean. In these cases, the effect size was assessed via η^2 (interpretation: negligible < 0.01 < small < 0.06 < medium < 0.14 < large). [1]Homoscedascity could not be assumed for these variables and thus the t-test results adjusted for non-homogeneous variances were used, and in the case of ANOVAS, post hoc Games-Howell tests were used.*

TABLE 5 | Association between work-related variables and the psychological impact of the COVID-19 pandemic as well as mental health status during the pandemic (N = 3055).

Variables	*N* (%)	Impact of event				Stress				Anxiety				Depression			
		M (*SD*)	*t*/*F**	*p*	*g*/η^2*	*M* (*SD*)	*t*/*F**	*p*	*g*/η^2*	*M* (*SD*)	*t*/*F**	*p*	*g*/η^2*	*M* (*SD*)	*t*/*F**	*p*	*g*/η^2*
Employment status																	
Employed	1412 (46.2)	26.16 (18.41)[a]	18.55[1]	<0.001	0.02	10.04 (9.45)[a]	21.87[1]	<0.001	0.03	5.68 (7.71)[a]	9.13[1]	<0.001	0.01	8.24 (8.99)[a]	39.79[1]	<0.001	0.05
Self-employed	215 (7)	26.15 (19.40)[a]				10.25 (10.42)[a]				5.67 (8.51)[ab]				8.05 (9.55)[a]			
Unemployed	258 (8.4)	29.09 (21.12)[ac]				11.02 (10.18)[a]				6.86 (9)[ab]				11.25 (10.97)[b]			
Retired	82 (2.7)	16.95 (14.36)[b]				5.15 (6.64)[b]				2.83 (5.82)[c]				4.59 (6.01)[c]			
Student	1037 (33.9)	31.26 (19.51)[c]				13.06 (10.55)[c]				7.16 (8.59)[b]				12.61 (10.59)[b]			
With invalidity	23 (0.8)	26.17 (19.30)				8 (7.98)				6.87 (8.22)				9.48 (10.72)			
Homemaker	28 (0.9)	32.29 (16.85)				12.64 (9.48)				6.79 (7.80)				9.07 (10.35)			
Working during crisis**																	
Yes, on site	318 (10.4)	30.21 (20.86)[a]	7.81[1]	<0.001	0.01	11.85 (10.77)[a]	5.80[1]	<0.01	0.01	7.18 (8.47)[a]	7.40[1]	<0.001	0.01	8.92 (9.33)[ab]	14.37[1]	<0.001	0.02
Yes, from home	1070 (35)	25.42 (17.99)[b]				9.81 (9.20)[b]				5.19 (7.41)[b]				7.88 (8.78)[a]			
No, I stopped due to the crisis	457 (15)	28.95 (19.33)[a]				11.30 (10.19)[a]				6.59 (8.32)[a]				10.42 (10.14)[bc]			
No, I've lost my job due to crisis	98 (3.2)	30.03 (21.32)[ab]				12.29 (10.98)[ab]				7.08 (9.84)[ab]				12.96 (11.66)[c]			
Risk of losing job***																	
No	1115 (36.5)	24.01 (17.99)	−8.27[1]	<0.001	0.42	9.09 (9.12)	−7.06[1]	<0.001	0.36	4.91 (7.32)	−5.91[1]	<0.001	0.30	7.27 (8.49)	−7.35[1]	<0.001	0.38
Yes	657 (21.5)	31.71 (19.46)				12.54 (10.39)				7.29 (8.63)				10.71 (10.08)			
Risk of decreased income																	
No	1355 (44.4)	24.31 (17.76)	−9.61[1]	<0.001	0.35	9.23 (9.16)	−9.13[1]	<0.001	0.33	4.97 (7.28)	−7.76[1]	<0.001	0.28	8.13 (8.83)	−8.95[1]	<0.001	0.32
Yes	1700 (55.6)	30.85 (19.83)				12.48 (10.47)				7.22 (8.73)				11.28 (10.60)			

**Differences in mean level between categories of dichotomous variables were assessed via t-test and Hedges' g effect size statistic was obtained (interpretation: negligible < 0.20 < small < 0.50 < medium < 0.80 < large). For multiple-category variables, one-way ANOVAs were used, and categories with a different superscript letter show a significant difference between them in the psychological impact variable mean. In these cases, the effect size was assessed via η^2 (interpretation: negligible < 0.01 < small < 0.06 < medium < 0.14 < large). **Analyses conducted with the sample of 1943 participants who had a job just before the COVID-19 outbreak. ***Analyses conducted with the sample of 1772 participants who were employed during the COVID-19 outbreak. [1]Homoscedascity could not be assumed for these variables and thus the t-test results adjusted for non-homogeneous variances were used, and in the case of ANOVAS, post hoc Games-Howell tests were used.*

TABLE 6 | Association between the presence of significant changes in daily life due to the COVID-19 pandemic and the psychological impact of the COVID-19 pandemic as well as mental health status during the pandemic (*N* = 3055).

Variables	*N* (%)	Impact of event				Stress				Anxiety				Depression			
		***M* (*SD*)**	***t*/*F****	***p***	***g*/η^2***	***M* (*SD*)**	***t*/*F****	***p***	***g*/η^2***	***M* (*SD*)**	***t*/*F****	***p***	***g*/η^2***	***M* (*SD*)**	***t*/*F****	***p***	***g*/η^2***
Impact on daily life																	
Almost none	51 (1.7)	4.86 (7.52)[a]	63.49[1]	<0.001	0.08	4.86 (7.53)[a]	54.24[1]	<0.001	0.07	2.78 (5.08)[a]	31.40[1]	<0.001	0.04	5.22 (7.40)[a]	36.98[1]	<0.001	0.05
A little	370 (12.1)	6.75 (8.27)[b]				6.75 (8.27)[a]				3.86 (5.78)[a]				6.94 (8.28)[a]			
Quite	892 (29.2)	9.57 (8.90)[c]				9.57 (8.90)[b]				5.23 (7.13)[b]				8.48 (8.88)[b]			
A great deal	1078 (35.3)	11.72 (9.93)[d]				11.72 (9.93)[c]				6.41 (8.16)[c]				10.14 (9.92)[c]			
Extremely	664 (21.7)	14.77 (11.14)[e]				14.77 (11.14)[d]				8.83 (10.00)[d]				13.34 (11.37)[d]			
Work/Studies modifications																	
No	264 (8.6)	22.38 (16.66)	−5.87[1]	<0.001	0.34	8.65 (9.23)	−4.69	<0.001	0.28	4.83 (7.06)	−3.39[1]	<0.01	0.19	7.96 (9.11)	−3.67[1]	<0.001	0.22
Yes	2571 (84.2)	28.80 (19.35)				11.48 (10.13)				6.40 (8.25)				10.15 (10.01)			
Cancelation of activities																	
No	356 (11.7)	23.01 (18.76)	−5.18	<0.001	0.29	8.15 (9.65)	–5.82	<0.001	0.33	4.55 (6.80)	−4.81[1]	<0.001	0.23	7.46 (9)	−5.33[1]	<0.001	0.28
Yes	2699 (88.3)	28.60 (19.18)				11.42 (10.03)				6.45 (8.34)				10.20 (10.06)			
Cancel/postpone any travels.																	
No	1051 (34.4)	26.37 (19.13)	−3.29	<0.01	0.13	10.20 (9.97)	−3.35	<0.01	0.13	5.91 (7.74)	−1.58[1]	0.12	0.06	9.53 (10.07)	−1.39	0.17	0.05
Yes	2004 (65.6)	28.78 (19.21)				11.48 (10.05)				6.39 (8.42)				10.06 (9.93)			

**Differences in mean level between categories of dichotomous variables were assessed via t-test and Hedges' g effect size statistic was obtained (interpretation: negligible < 0.20 < small < 0.50 < medium < 0.80 < large). For multiple-category variables, one-way ANOVAs were used, and categories with a different superscript letter show a significant difference between them in the psychological impact variable mean. In these cases, the effect size was assessed via η^2 (interpretation: negligible < 0.01 < small < 0.06 < medium < 0.14 < large). [1]Homoscedascity could not be assumed for these variables and thus the t-test results adjusted for non-homogeneous variances were used, and in the case of ANOVAS, post hoc Games-Howell tests were used.*

TABLE 7 | Association between the degree of contact with the COVID-19 disease and the psychological impact of the COVID-19 pandemic as well as mental health status during the pandemic (*N* = 3055).

Variables	*N* (%)	Impact of event				Stress				Anxiety				Depression			
		M (*SD*)	*t*	*p*	*g**	*M* (*SD*)	*t*	*p*	*g*	*M* (*SD*)	*t*	*p*	*g*	*M* (*SD*)	*t*	*p*	*g*
Know someone with COVID-19																	
No	2094 (68.5)	27.51 (19.13)	−1.85	0.07	0.07	10.73 (9.95)	−0.2.55	0.01	0.10	6 (8.01)	−2.15[1]	0.03	0.09	9.90 (10.04)	0.160	0.87	0.01
Yes	961 (31.5)	28.90 (19.37)				11.72 (10.20)				6.71 (8.57)				9.84 (9.86)			
Close contact with someone diagnosed COVID-19																	
No	2764 (90.5)	27.71 (19.09)	−2.03[1]	0.04	0.13	10.82 (9.93)	−3.45[1]	<0.01	0.23	6.06 (8.06)	−3.18[1]	<0.01	0.22	9.76 (9.90)	−1.91[1]	0.06	0.13
Yes	291 (9.5)	30.23 (20.27)				13.10 (10.78)				7.84 (9.23)				11.01 (10.68)			
Close contact with someone with COVID-19 symptoms or (suspected) infected material																	
No	2316 (75.8)	27.77 (19.34)	−0.90	0.37	0.04	10.71 (10.03)	−3.19	<0.01	0.21	6.05 (8.14)	−2.07	0.04	0.09	9.76 (10.03)	−1.22	0.22	0.05
Yes	739 (24.2)	28.50 (18.82)				12.07 (10)				6.77 (8.34)				10.27 (9.82)			
Had COVID-19 symptoms																	
No	2855 (93.5)	27.76 (19.21)	−2.10	0.04	0.15	10.86 (10.04)	−3.78	<0.001	0.28	6.03 (8.12)	−4.90	<0.001	0.36	9.73 (9.95)	−3.25	<0.01	0.24
Yes	200 (6.5)	30.71 (19.98)				13.63 (9.62)				8.96 (8.74)				12.09 (10.13)			

[1]*Homoscedascity could not be assumed for these variables and thus the t-test results adjusted for non-homogeneous variances were used. *g = Hedges' g effect size statistic. Interpretation: negligible < 0.20 < small < 0.50 < medium < 0.80 < large.*

(2 days after the state of alarm was implemented by Spanish Government) there were 11,273 cases and 497 deaths by COVID-19 in Spain. The last day of the data collection (24th March) there were 39,673 cases and 2,696 deaths. The actual severity of the situation showed a small though significant relation to perceived severity; the association between the number of infected people the day that each participant filled the questionnaires and his/her perceived severity was 0.10 ($p < 0.001$), and the association with the number of deaths was 0.09 ($p < 0.001$). The number of infected and death people by COVID-19 the day that the participant filled the questionnaire was unrelated to psychological impact, anxiety, or depression. There was only a significant and very weak association between number of infected people and stress ($r = 0.04$; $p = 0.04$).

Information About the COVID-19 Pandemic

The most frequently used sources of information about the COVID-19 situation was TV (the main source for 40.7% of the participants) followed by social media (24.6%) and written press (20.1%). In general terms, participants whose main source of information was the radio showed lower distress than participants who preferably used TV, social media and written press. Respondents who indicated that they needed more information about the current situation (44.2%) showed poorer mental health. Participants who expressed being "somewhat satisfied" or "very satisfied" with the information received about the COVID-19 crisis showed lower distress than those who were somewhat or very dissatisfied. As for hours getting information about the COVID-19 situation in the last 24 h, 42.8% of the participants recognized having spent more than 2 h. Participants who spent three or more hours (21.8%) getting informed showed higher psychological impact, anxiety and depression than those who spent less time in this task (see **Table 8**). All effect sizes were at best small.

Health Status

The mean for perceived health status (0–10) was 7.77 ($SD = 1.51$). There were no significant differences in perceived health level when the different age groups were compared ($p = 0.053$). Higher perceived level of health was associated to lower psychological impact (Spearman's rho, $\rho = -0.19$, $p < 0.001$), stress ($\rho = -0.25$, $p < 0.001$), anxiety ($\rho = -0.27$, $p < 0.001$), and depression ($\rho = -0.27$, $p < 0.001$). Participants who considered themselves part of the high-risk population in case of being infected with COVID-19 (19.1%) reported significantly higher levels of psychological impact, anxiety, stress and depression symptoms than those who thought that were not in the high-risk population group. Those who reported having suffered any of the symptoms of COVID-19 (33.3%), sore throat (25.1%), headache (43.5%), muscle or joint pain (18.7%), cough (28.30%), fatigue (15.2%), and shortness of breath (9.3%) scored higher in all the variables. The differences were especially significant for shortness of breath. A total of 171 participants (5.6%) had called the COVID-19 hotline and showed significantly higher levels of psychological distress ($p < 0.05$ in all the variables) (see **Supplementary Table 1**). All effect sizes were small except for fatigue, with a moderate effect size on stress and anxiety, and shortness of breath, with a moderate effect on psychological impact, stress, and depression and a large effect on anxiety.

Leisure Activities During the Home Confinement

Most frequent leisure activities during confinement were talking to someone via telephone, instant messaging or videocalls (96.8%), browsing or sharing social network contents (85.2%), watching films or shows (85%), watching TV (79.1%), reading (52.4%), and practicing sports or physical exercise (48.7%). The total number of leisure activities in which participants had engaged during the previous 24 h was computed, and its correlation with psychological distress was calculated. Correlations were negative and significant for stress ($r = -0.11$; $p < 0.001$), anxiety ($r = -0.11$; $p < 0.001$), depression ($r = -0.14$; $p < 0.001$), and —although weaker— for psychological impact of the event ($r = -0.05$; $p < 0.001$). We compared the levels of distress of those who had engaged on each leisure activity and those who had not. Practicing physical activity and/or watching films or shows were associated to lower stress, anxiety and depression scores. Reading and making handicrafts or art activities were related to lower scores in all the variables (see **Supplementary Table 2**). All effect sizes were small at best.

DISCUSSION

The COVID-19 pandemic is a global health threat. As of 9th April, Spain is the second country in confirmed cases of infected people (146,690) and the third in number of deaths (14,555; European Centre for Disease Prevention and Control, 2020). As COVID-19 is transmitted from one person to another, several Governments, including the Spanish, have implemented extreme restriction measures to people's movements in order to ameliorate the virus spread. The uncertainty of how this new illness will develop together with the unusual situation of being confined at home is most likely leading Spaniards to suffer negative psychological consequences (Brooks et al., 2020; Wang et al., 2020). Despite the urgent need claimed by several authors to systematically examine the psychological health of the population being most affected by the COVID-19 pandemic (Brooks et al., 2020; de Carvalho et al., 2020; Duan and Zhu, 2020; Zandifar and Badrfam, 2020), scientific data on this matter is so far scarce. To fill this gap in the literature, this study focused on the psychological impact that the first stages of COVID-19 crisis had on Spanish psychological health. Specifically, we collected data on the psychological impact of the COVID-19 crisis on adult Spaniards' mental health, including psychological impact in terms of symptomatic responses (avoidance, intrusion, and hyperarousal), as well as stress, anxiety, and depression symptoms.

Our results showed that most participants had experienced significant life changes due to this health crisis. These include changes in the financial and/or work situation, a severe

TABLE 8 | Association between variables related to information about the COVID-19 pandemic and the psychological impact of the COVID-19 pandemic as well as mental health status during the pandemic (N = 3055).

Variables	*N* (%)	Impact of event				Stress				Anxiety				Depression			
		M (*SD*)	*t*/*F**	*p*	g/η^2*	*M* (*SD*)	*t*/*F**	*p*	g/η^2*	*M* (*SD*)	*t*/*F**	*p*	g/η^2*	*M* (*SD*)	*t*/*F**	*p*	g/η^2*
Main source of information																	
TV	1244 (40.7)	28.80 (19.55)[a]	3.08[1]	<0.01	0.01	10.87 (10.08)[a]	2.49[1]	0.02	0.01	6.27 (8.19)[a]	2.53[1]	0.01	0.01	9.91 (10.05)[ad]	4.81[1]	<0.001	0.01
Written press (digital/ paper)	614 (20.1)	27.30 (19.68)[ab]				11.67 (10.67)[a]				6.34 (8.88)[a]				9.62 (10.03)[ad]			
Radio	98 (3.2)	22.70 (17.66)[b]				7.90 (7.41)[b]				3.41 (6.39)[b]				6.67 (7.48)[bc]			
Social media	751 (24.6)	29.08 (19.02)[a]				11.59 (9.78)[a]				6.67 (7.99)[a]				11.20 (10.37)[a]			
Messaging apps	165 (5.4)	24.84 (16.37)[ab]				9.96 (9.50)[ab]				6.12 (8.07)[ab]				8.35 (8.97)[cd]			
Family, friends or coworkers	116 (3.8)	25.98 (18.28)[ab]				10.29 (9.80)[ab]				4.78 (6.62)[ab]				8.62 (9.42)[abc]			
Official sources	30 (1)	23.00 (16.95)[ab]				11.13 (11.43)[ab]				6.60 (8.92)[ab]				8.20 (8.98)[abc]			
No specific source or other	37 (1.2)	25.00 (20.32)[ab]				10.38 (9.43)[ab]				5.95 (7.80)[ab]				7.03 (6.66)[cd]			
Need for more information																	
No	1706 (55.8)	26.34 (18.44)	−5.18[1]	<0.001	0.19	10.49 (9.67)	−3.36[1]	<0.01	0.12	5.47 (7.53)	−5.67[1]	<0.001	0.21	9.46 (9.65)	−2.60[1]	0.01	0.10
Yes	1349 (44.2)	29.99 (19.98)				11.73 (10.44)				7.18 (8.87)				10.41 (10.36)			
Satisfaction with information																	
Very dissatisfied	355 (11.6)	31.82 (20.94)[a]	16.59[1]	<0.001	0.02	12.74 (11.07)[a]	19.10[1]	<0.001	0.02	7.95 (9.69)[a]	16.25[1]	<0.001	0.02	11.33 (11.12)[a]	10.74[1]	<0.001	0.01
Somewhat dissatisfied	884 (28.9)	30.14 (19.64)[a]				12.52 (10.30)[a]				6.98 (8.38)[a]				10.77 (10.20)[a]			
Somewhat satisfied	1358 (44.5)	26.81 (18.71)[b]				10.35 (9.69)[b]				5.90 (8.04)[b]				9.55 (9.81)[b]			
Very satisfied	458 (15)	24.11 (17.39)[c]				8.913 (9.03)[c]				4.41 (6.44)[c]				8.02 (8.70)[c]			

(Continued)

TABLE 8 | Continued

Variables	*N* (%)	Impact of event			Stress			Anxiety			Depression		
		M (SD)	*t/F**	*p*	g/η^{2*}	*M (SD)*	*t/F**	*p*	g/η^{2*}	*M (SD)*	*t/F**	*p*	g/η^{2*}	*M (SD)*	*t/F**	*p*	g/η^{2*}
Hours getting information (last 24 h)																	
Less than 1h	583 (19.1)	25.54 (18.56)[a]	11.80[1]	<0.001	0.02	9.97 (9.60)[a]	6.23[1]	<0.001	0.01	5.46 (7.94)[a]	7.72[1]	<0.001	0.01	9.17 (9.41)	2.83[1]	0.02	0
1–2 h	1163 (38.1)	26.62 (18.51)[a]				10.66 (9.72)[ac]				5.73 (7.71)[a]				9.67 (9.79)			
2–3 h	643 (21)	28.26 (18.61)[ab]				11.06 (9.69)[abc]				6.36 (8.26)[ab]				9.80 (9.80)			
3–5 h	385 (12.6)	31.52 (19.87)[bc]				12.64 (10.88)[bd]				7.29 (8.71)[b]				10.86 (10.75)			
Over 5h	281 (9.2)	32.86 (22.20)[c]				12.58 (11.35)[cd]				8.09 (9.34)[b]				11.08 (11.02)			

**Differences in mean level between categories of dichotomous variables were assessed via t-test and Hedges' g effect size statistic was obtained (interpretation: negligible < 0.20 < small < 0.50 < medium < 0.80 < large). For multiple-category variables, one-way ANOVAs were used, and categories with a different superscript letter show a significant difference between them in the psychological impact variable mean. In these cases, the effect size was assessed via η^2 (interpretation: negligible < 0.01 < small < 0.06 < medium < 0.14 < large). [1]Homoscedascity could not be assumed for these variables and thus the t-test results adjusted for non-homogeneous variances were used, and in the case of ANOVAS, post hoc Games-Howell tests were used.*

restriction in movements and cancelation of important activities. All these took place in a very short period of time and, consequently, our findings show that Spaniards perceived the current situation to be quite severe. Regarding the effects of the health crisis on the Spanish population, 63% the participants reported minimal to mild acute stress symptoms during the initial stage of the pandemic outbreak, a number that paints a more favorable picture than data from China, where about 45% fell into that category (Wang et al., 2020). Nevertheless, over a third of Spaniards showed symptoms of moderate or severe psychological impact, a number below China's 54% (Wang et al., 2020), though still worrying. Concerning stress and depression, Spaniards showed moderate to severe levels to a higher degree (22 and 30%, respectively) than Chinese participants (8 and 17%). Lastly, regarding anxiety, Spanish (24%) showed similar levels to those of the Chinese population (29%). In the current study, participants' perceived health level was negatively associated with psychological impact, stress, anxiety, and depression symptoms. This means that perceptions of the severity of the situation were more strongly associated with subsequent negative psychological impact than objective aspects of the experience. In fact, those who had experienced symptoms that could be related to COVID-19, such as cough or shortness of breath, showed poorer psychological health, although they did now know whether they were infected. This relation was stronger for those who considered to be part of the high-risk population. Interestingly, perceived health level was not related to age, which suggests a stronger need to pay special attention to those who perceived themselves as vulnerable, despite their actual risk. These results suggest that, in line with previous studies (Brooks et al., 2020; Liu et al., 2020), the uncertainty of the health situation as well as its development and consequences can lead to suffering from stress, anxiety, and depression even when showing just mild (maybe) related COVID-19 symptoms, such as cough. Taken together, these results highlight the great negative psychological impact that the COVID-19 pandemic is having on the population in the early stages of the outbreak, although it must be kept in mind that most effect sizes were small. These numbers could also signal toward the future development of negative psychological outcomes that are common in the aftermath of crises and disasters, such as posttraumatic stress disorder, generalized anxiety or major depression disorders, and substance abuse (Boscarino, 2015; Mazumder, 2015).

In accordance with other studies carried out in China about the COVID-19 pandemic (Liu et al., 2020; Sun et al., 2020; Wang et al., 2020), women and young adults were the ones that suffered the greater psychological impact, though again we must remind the reader about the small effect sizes in most cases. This result should not come as a surprise if we consider the ways that gender roles differentially affect women and men (Wenham et al., 2020). For instance, many of the industries most affected by the COVID-19 health crisis employ mostly women, who consequently are at higher risk of job and income loss (Ramos, 2020). Moreover, women are usually the informal caregivers within families, so the necessary restrictive measures, such as schools and childcare facilities closures, increase their

burden at home (Mantovani et al., 2020; Ramos, 2020). This can substantially reduce women's ability to perform their work duties, whether they are working from home or on site (Gausman and Langer, 2020). This leads women to experience more difficulties to keep their job, limiting their work opportunities and financial status (Wenham et al., 2020). Women also constitute the majority of health-care workforce, therefore being more likely to be infected by the coronavirus (Wenham et al., 2020) and to put their families at risk. It should also be noted that higher rates of domestic violence against women are usually registered during times of crisis and quarantines (Gausman and Langer, 2020; Ramos, 2020), which constitutes another source of distress. Our results can contribute to the understanding of gendered impacts of disease outbreaks identified not only for the current COVID-19 but for past outbreaks such as Ebola or the Zika virus (Wenham et al., 2020). This is fundamental to comprehend the primary and secondary effects of health emergencies as well as to design interventions that fit the patients' needs.

As for age, some literature in the field of disaster indicates that the elderly are particularly vulnerable to the negative psychological sequelae of critical situations, such as PTSD (Jia et al., 2010). However, in line with our results, most of the studies have found that age constitutes a protective effect that in our case had a medium effect size. Older disaster victims usually show lower stress, anxiety, and depression symptoms than younger participants, and this trend may be explained by their greater life experience, previous disaster exposure or by having to face fewer life responsibilities (see Ngo, 2001 for a review). Future studies should explore the psychological impact of the COVID-19 pandemic in a larger sample of elderly population, and whether younger and older participants recover differently from the psychological sequelae of the COVID-19 crisis.

Being married or cohabiting with partner was a protective factor against psychological suffering with a medium effect size, as has usually been found in the literature (Frech and Williams, 2007; Kalmijn, 2017), while being in a relationship but not cohabiting was an important risk factor, also in line with research reporting on the positive effects of cohabiting (e.g., Kalmijn, 2017). For people in relationships but not cohabiting, the home confinement situation may resemble that of a long-distance relationship, which studies have linked to increased individual and relationship stress (Du Bois et al., 2016) and to possible disruption of psychobiological linkage between partners (Diamond, 2019). Since technology-mediated communications have proved beneficial in separated couples (Tong and Walther, 2011; Carter and Renshaw, 2016), these should be an obvious recommendation to alleviate the impact of the health crisis. Interestingly, having children appeared to be a protective factor against psychological suffering, although one of a small effect size. One could have expected that being confined at home with children leads to higher levels of anxiety and stress, especially to those who have to work from home while taking care of their children. Our data showed otherwise, in line with results from studies showing that parenthood increases subjective well-being (Nomaguchi, 2012; Radó, 2019), which appears to be the case even in the extreme circumstances of the COVID-19 health crisis. Also related to people cohabiting, we found that the lower the house population density, the better the mental health, with a small effect size. This is in line with previous studies showing the negative impact of crowding on mental health and psychological functioning (Evans and Wener, 2007; Thornock et al., 2020). It remains to be explored how long-term confinement at home impacts in the relationship with cohabitants, given that conflicts may be enhanced by this unusual and potentially stressful situation (Mesa Viera et al., 2020). Our results show that the negative psychological impact of the lockdown increase as the days pass by. Thus, in accordance Brooks et al. (2020), we recommend that quarantine should last no longer that necessary and information about the rationale of this very restrictive measure as well as of the positive effects that it has in this health crisis should be regularly provided.

Similar to Wang et al.'s (2020) results, lower educational level and family income were associated with stronger negative psychological effects. Being employed was linked to better mental health. More than 12% of employed participants had been forced to stop working altogether or had lost their job during the first days of national lockdown, a number that can only be expected to increase as the crisis develops. People who had lost their job or had stopped working during the health crisis and those who were working on site reported the highest levels of psychological impact, stress, anxiety, and depression. This result points to the significant challenge created by this crisis on an organizational level, where the most favorable outcome for people would be to keep their job and work remotely from home. Again, the small sizes of the effects must be considered. In line with the importance of work-related variables and economic stability for keeping mental health in times of crisis, it is worth noticing that what worried Spaniards the most was not health-related, but had to do with the economic recession that most likely will follow the current health crisis. This is only normal considering that the mental health problems related to the 2008 financial and banking crisis, which was especially hard in Spain, are still present in the Spanish population (Iglesias-García et al., 2017; Rivera et al., 2017). In fact, according to our findings, many people are in fear of losing their job and/or suffering a decrease in their family income. Thus, if we want to prevent a great deal of long-lasting psychological suffering for Spanish and people in other countries experiencing a similar situation, the urgent call made by some European governments to look for a united approach to deal with the upcoming economic recession should be seriously considered.

Our data correspond to the first week of home confinement in Spain, and so the results only provide information about the population's mental health at the beginning of the health crisis, which may explain the generally small effect sizes found. The COVID-19 pandemic is still ongoing and the psychological consequences derived from this health emergency (Liu et al., 2020; Sun et al., 2020; Wang et al., 2020) are likely to have a lasting effect long after the pandemic is under control, which should be explored in

future longitudinal studies (Brooks et al., 2020). Such studies might find larger effect sizes. Hence, there is an urgent need of psychological interventions aimed at ameliorating the negative psychological impact of the COVID-19 (Duan and Zhu, 2020; Xiang et al., 2020). Our findings have implications for the design of such psychological interventions. We believe interventions should be provided in two different moments (Zhang et al., 2020). First, during the outbreak, so that the psychological negative effect of the health crisis can be ameliorated and the expected increase in these symptoms as the lockdown continues can be diminished. This will most likely help people to cope with and adapt to the current situation, lowering the risk of suffering future psychopathologies (de Carvalho et al., 2020).

A first step toward psychological interventions during the outbreak is through mass media. Our findings —although the small effect sizes must again be considered— suggest that people who are more satisfied with the information received about COVID-19 show the lower psychological distress, as well as those who spent no more than 3 h per day getting informed. Thus, it is necessary to help people look for information only in official sources by, for instance, clearly indicating them on TV, radio, and newspapers. Another recommendation would be to not rely on social networks and the TV as the main source of information, in favor of the radio. It is also necessary to give the general public some specific guidelines to follow during the lockdown so that they can take care of their mental health. This include investing their time in leisure activities (Brooks et al., 2020) that will most likely keep their mind busy and, thus, minimize rumination (Hilt and Pollak, 2012). Moreover, physical activity has been seen to improve people's mood (Penedo and Dahn, 2005) and is a good strategy to cope with the downsides of confinement (Brooks et al., 2020). Finally, when the person feels that they cannot cope with the negative psychological symptoms derived from the current health crisis, online-based therapy can be a good option (Abbott et al., 2008).

Second, interventions should also be provided once the situation progressively goes back to normal. Considering that PTSS can remain a long time after the event took place (Neria et al., 2011) or even occur with delayed onset (Smid et al., 2009; Utzon-Frank et al., 2014), and that the same applies to depression symptoms (Bonde et al., 2016), mental health experts should be prepared to deliver therapeutic interventions with those who will psychologically suffer from the current health crisis in the upcoming years. Additionally, in the case that new secondary outbreaks of COVID-19 occur in the future, it seems crucial to explore their psychological impact.

This study is not without limitations. First, we followed a snowball sampling technique. This was quite successful, leading to a sample of more than 3,000 participants, but it has some downsides. There was an oversampling of people living in Madrid. The questionnaire was launched national-wide but, at the time of the data collection, the COVID-19 outbreak was more severe in Madrid. This might have motivated people living in that province, as compared to residents from other regions, to fill the questionnaire. We also count with a large sample of young participants, while only 2% of the participants were 65 years old or over. This may probably be explained by the way the questionnaire was disseminated. Due to the state of alarm, dissemination was done through social media technologies (i.e., WhatsApp, Twitter, and Instagram). This required the use of information and communication technologies, which is less common for older people. In addition, more women than men participated in the study, coherently with previous research acknowledging that it is more difficult to recruit male than female participants (Korkeila et al., 2001; Dunn et al., 2004), and variable distribution shape might differ between this sample and the population, which is why the findings of this study should only be generalized with caution. Second, the present study reports on data on the early stages of the COVID-19 pandemic in Spain and most of the effect sizes were small. Consequently, results should be taken with caution and future studies should further explore the relative contribution of these variables at later stages of the health crisis, when its effects might be more prominent. Third, as already noted our aim was to provide a clear picture of the psychological impact of the pandemic in the Spanish population on its early stages. Considering the lack of tests to check whether a person was infected with COVID-19 during these first weeks of the outbreak, it is normal that only eleven of the 3,055 participants were tested for COVID-19 and the result was negative for most of them. These people showed much lower negative psychological consequences of the pandemic than the rest, but results need be taken with caution as this small subsample cannot be seen as representative. A second data collection conducted a few weeks after the state of alarm declaration may reveal whether these results can be generalized. As for the variables included in this research, more recently discovered COVID-19 markers such as loss of smell and taste (Menni et al., 2020) should be added in future studies exploring the associations between COVID-19 symptomatology and psychological impact.

CONCLUSION

The COVID-19 pandemic has negative psychological effects on Spanish people. Those who suffer the most are women, young people, and those who consider themselves to be in the risk-population group. Our findings can help design such interventions so that people who have seen their psychological health diminished during the pandemic can better cope with this difficult situation, both in Spain and other parts of the world. Considering this current health crisis will most likely have long lasting effects (Liu et al., 2020; Sun et al., 2020), follow-up studies are needed to obtain a clear picture of the magnitude of the psychological impact of COVID-19 pandemic.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Comité de Ética de la Universidad Pontificia Comillas y Comité de Ética del Centro Universitario Cardenal Cisneros. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

RR-R, HG-H, and SC conceptualized and designed the study, and were involved in data collection. RR-R and HG-H performed the data analyses. RR-R prepared the first draft of the manuscript. HG-H and SC revised and improved the quality of the analyses performed, critically revised the draft, and made important contributions. All the authors read and approved the final version of the manuscript.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.01540/full#supplementary-material

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Psychosocial and Socio-Economic Crisis in Bangladesh Due to COVID-19 Pandemic: A Perception-Based Assessment

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Background: The spread of the COVID-19 pandemic, the partial lockdown, the disease intensity, weak governance in the healthcare system, insufficient medical facilities, unawareness, and the sharing of misinformation in the mass media has led to people experiencing fear and anxiety. The present study intended to conduct a perception-based analysis to get an idea of people's psychosocial and socio-economic crisis, and the possible environmental crisis, amidst the COVID-19 pandemic in Bangladesh.

Methods: A perception-based questionnaire was put online for Bangladeshi citizens of 18 years and/or older. The sample size was 1,066 respondents. Datasets were analyzed through a set of statistical techniques including principal component and hierarchical cluster analysis.

Results: There was a positive significant association between fear of the COVID-19 outbreak with the struggling healthcare system ($p < 0.05$) of the country. Also, there was a negative association between the fragile health system of Bangladesh and the government's ability to deal with the pandemic ($p < 0.05$), revealing the poor governance in the healthcare system. A positive association of shutdown and social distancing with the fear of losing one's own or a family members' life, influenced by a lack of healthcare treatment ($p < 0.05$), reveals that, due to the decision of shutting down normal activities, people may be experiencing mental and economic stress. However, a positive association of the socio-economic impact of the shutdown with poor people's suffering, the price hike of basic essentials, the hindering of formal education ($p < 0.05$), and the possibility of a severe socio-economic and health crisis will be aggravated. Moreover, there is a possibility of a climate change-induced disaster and infectious diseases like dengue during/after the COVID-19 situation, which will create severe food insecurity ($p < 0.01$) and a further healthcare crisis.

Conclusions: The partial lockdown in Bangladesh due to the COVID-19 pandemic increased community transmission and worsened the healthcare crisis, economic burden, and loss of GDP despite the resuming of industrial operations. In society, it

has created psychosocial and socio-economic insecurity among people due to the loss of lives and livelihoods. The government should take proper inclusive steps for risk assessment, communications, and financial stimulus toward the public to alleviate their fear and anxiety, and to take proper action to boost mental health and well-being.

Keywords: COVID-19, perception-based questionnaire, principal component analysis (PCA), linear regression model, fear, social conflict

INTRODUCTION

The novel coronavirus disease (COVID-19) began spreading in November 2019, in Wuhan, China. Following this, the World Health Organization (WHO) announced COVID-19 as a global pandemic on March 11th, 2020 (1). COVID-19 has advanced into a pandemic, starting initially as small clusters of transmission that combined into larger clusters in many countries, subsequently resulting in a widespread transmission (2). Social isolation, institutional and home quarantine, social distancing, and community containment measures were applied without delay (3). Through quick administrative action and raising awareness for individuals on social-distancing, stringent steps were taken to manage the spread of the disease by canceling thousands of locations that involved social gathering including offices, classrooms, reception centers, clubs, transport services, and travel restrictions, leaving many countries in complete lockdown (4). The remarkable actions and ventures in public health to quarantine mass numbers has prevented this virus from spreading exponentially between humans in China, Singapore, Hong Kong, and South Korea, despite initial cases (2, 5).

However, a surge of COVID-19 outbreaks in all inhabitable continents, with 84,187 deaths alone in the USA, indicates that the infection had passed the tipping point (1, 6). Today, as of the 26th of May 2020, total global COVID-19 cases have risen to 5,637,381, with the total number of deaths escalating to 3,49,291 (7). The accelerating spread of COVID-19 and its outcomes around the world has led people to experiencing fear, panic, concern, anxiety, stigma, depression, racism, and xenophobia (8). Bangladesh confirmed their first COVID-19 case on the 8th of March 2020 (9), followed by a nationwide lockdown from 26 March which had been extended several times until 30th May 2020 to prevent human transmission. The government deployed armed forces to facilitate social distancing on March 24th. Emergency healthcare services and law enforcement were exempt from this announcement. Yet more than 11 million people left Dhaka to return to their home districts and thus helped spread the diseases nationwide. Moreover, from the 25th of April 2020, all ready-made-garment (RMG) factories, industries, private offices, and business centers were allowed to open, leading to a "partial lockdown" in the country. The migration of RMG workers to the industrial districts and less community awareness about the disease has increased the transmission among millions of people.

The Institute of Epidemiology Disease Control and Research (IEDCR), under the Ministry of Health and Family Welfare (MFHW) and Directorate General of Health Services (DGHS), is responsible for researching epidemiological and communicable diseases such as COVID-19 in Bangladesh, as well as disease control and surveillance. Initially, IEDCR was the single and centralized laboratory for COVID-19 testing in Bangladesh (9). The DGHS, on the other hand, is the responsible body for the coordination of testing and sample collections of COVID-19 patients (10). As of the 26th of May 2020, according to IEDCR, the total number of COVID-19 positive cases stands at 36,751 with 522 deaths (**Figures 1A,B**). According to IEDCR, those aged between 21 and 40 are with the highest number of cases (55%), while those aged above 60 have had fatal cases of the disease (42%). At present, the fatality rate in Bangladesh is 1.41% (26th May 2020) which was initially 10.4% (8th April 2020) (9).

Although the number of laboratories for COVID-19 testing has increased to 48, all these labs are in major urban areas of Bangladesh and to get tested requires long waiting hours. More often the tests have been done after the patients had died. Very recently, more than 15% of those tested daily have tested as positive (**Figure 1C**), and the ratio of testing is 1,620/1 million people. In addition, it also takes a long time to get the result of the tests. Furthermore, there are only 1,169 Intensive Care Unit (ICU) beds in the country, of which 432 beds are in government hospitals and 737 in private hospitals. It is predicted that as the number of patients rise, the required number of ICU facilities will not be adequate (9). In addition, the healthcare staff and doctors were given low quality/no personal protective equipment (PPE) which has caused a high infection rate among them (11). Moreover, as laboratory staff, healthcare staff, and doctors have become increasingly infected, there is also a shortage of specialized trained personal to perform COVID-19 tests, meaning patient treatment will be disrupted.

Amidst the lockdown, due to the fear of contact transmission, private hospitals and clinics are not providing any services (11). The shortage of healthcare facilities for primary and critical care patients have therefore been depleted. The healthcare workers who have treated patients and become infected have been criticized socially and have faced social stigma from local people. In many locations public protests were observed against the establishment of quarantine facilities, COVID-19 care hospitals, and clinics. Social humiliation was a common practice of law enforcement authorities and government officials. On many occasions, family members left the infected and the deceased in the hospitals. The deceased were even denied burials in local graveyards, which are basic cultural rights as a Muslim (12). Moreover, the lockdown hit hard for those who earn daily wages and low and middle-income people who lost their jobs and their income source. The anxiety and fear of death

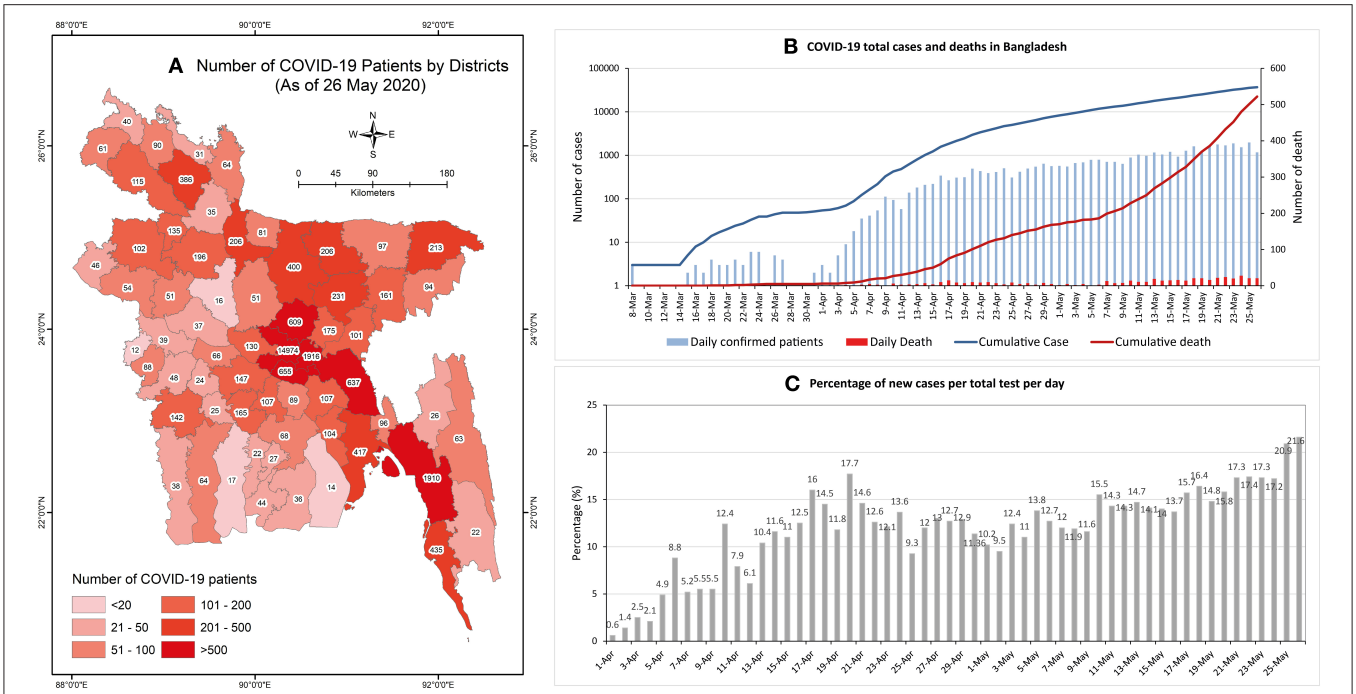

FIGURE 1 | (A) Map of the study area showing the number of COVID-19 confirmed patients in the 64 districts of Bangladesh. **(B)** Daily confirmed COVID-19 patients and death count. **(C)** Percentage of new cases per total test per day (Data source: IEDCR).

from hunger or death from infection led to several suicide cases (13). Predictably, any contagious epidemic outbreak has harmful effects on individuals and society (14). Considering the population density, educational status, social structure, cultural norms, healthcare capacity, and often flawed policies taken by the Government of Bangladesh, it is hard to lock down a country of 165 million people. Moreover, Bangladesh hosts the largest refugee camps in the world in the Cox's Bazar district. The Rohingya refugees who fled from Myanmar reside in the camps of Cox's Bazar. 21 confirmed cases were found in the camps while the district had reported 435 confirmed cases (9). This depicts the scenario of public anxiety which should be immediately dealt with by the Government, along with the alliance groups, with proper information.

Amidst the current societal levels of anxiety and fear, the possibility of natural disasters such as tropical cyclones and monsoon floods and the potential for a dengue outbreak, seasonal influenza, or other infections are potentially overlooked. Furthermore, the consequences of incorrect disposal of used personal protective equipment (PPE) from COVID-19 hospitals without proper treatment in landfill sites has the potential for further disease transmission among the waste management personal and further environmental transmission. Considering the given circumstance, this study was designed to analyze the psychosocial, socio-economic, and possible environmental crisis based on public perception in Bangladesh due to the COVID-19 outbreak. This assessment may inform the government and policymakers of countries with a similar socioeconomic and cultural structure to Bangladesh.

METHODOLOGY

Study Procedure

To understand the possible psychosocial, socio-economic, and environmental impact of the COVID-19 outbreak in Bangladesh, we considered and identified several relevant and possible items based on the socio-economic situation, political analysis, the existing healthcare system, environmental analysis, possible emerging issues utilized from scenario developments, analysis of local and global reports of the COVID-19 pandemic from the print and electronic media, and a literature review. We prepared the questionnaire considering the demographic characteristics of Bangladesh, societal mental health conditions (MH), the healthcare system in Bangladesh (HSB), governance and political issues (GPI), socio-economic issues (SEI), immediate emerging issues (IEI) and enduring emerging issues (EEI). A total of 46 items were considered in the drafted questionnaires to understand people's perception of the COVID-19 outbreak in Bangladesh. Furthermore, expert consultation was considered to set and validate these 46 items.

We prepared the online-based questionnaire through Google to operate the survey nationwide. An introductory paragraph describing the objective of the questionnaire was shared with the respondents through email and through social platforms commonly used by Bangladeshi groups on Facebook, Messenger, LinkedIn, and WhatsApp. Relevant people were selected for targeted sampling. An online database of target participants was prepared by reviewing relevant websites and online social platforms of different groups in Bangladesh.

The sample group was targeted considering Bangladeshi citizenship, their age, current activities, occupation, social and economic responsibilities, and engagement related to COVID-19 response, planning, and policymaking. The questionnaire survey was conducted from 28 March to 30 March 2020 during the lockdown period. The respondents belonged to different social categories, such as university faculty members and scholars, government officials, development workers or practitioners, doctors, engineers and technologists, youth leaders and students, businessmen and industry officials, banking and finance corporates, and independent researchers, among others. The answers to the survey questionnaire were voluntary. Data from 1082 respondents were collected through this online survey initially using the simple random sampling method following Keeble et al. (15). Following the removal of 16 incomplete questionnaires, 1,066 responses were finally retained for this study. A five-point (1 to 5) Likert scale was used for testing the statement descriptions that ranged from strongly disagree to strongly agree with the statements (**Table 1**).

There was a limitation of the rapid assessment on the public-perception on the psychosocial and socio-economic crisis in Bangladesh due to the COVID-19 pandemic. As the study was conducted during the lockdown period, it was not possible to reach to general people physically. Therefore, we had to keep our samples limited to internet users only. There are more than 95 million mobile internet users in Bangladesh and, as a youth-dividend country, the majority of the mobile internet users are young educated people.

Data Analysis

The descriptive statistics [e.g., frequencies, percentages, and *T*-test (data provided in **Supplementary Tables**)] were employed to understand respondents' characteristics. An investigation of psychometric characteristics was included in the Classical Test Theory (CTT) analysis. A set of statistical techniques, including linear regression analysis (LRA), principal component analysis (PCA), and hierarchical cluster analysis (CA), were applied to explore the association between the items. PCA is a data reduction tool that demonstrates each potentiality of parameters and their confidence level in large sample datasets. Before conducting the PCA, Kaiser-Maier-Olkin (KMO) and Bartlett's sphericity tests were applied to confirm the necessity of this analysis. The results of the KMO at >0.5 (the KMO value was 0.931 in this work) and the significance of Bartlett's sphericity test at $p < 0.01$ supported our datasets to be fitted for the PCA (16). The number of factors chosen was based on the Kaiser's principle, where the only factors with eigenvalues>1.0 were considered. Cronbach's alpha was employed to test the consistency and reliability of the factor loadings in this study. Cronbach's alpha values at >0.06 (the Cronbach's alpha value was 0.896) are regarded to be suitable in social science research (17). The CA is a crucial means of detecting associations among many psychosocial and environmental parameters. CA assists to demarcate a population into various groups based on the same feature of a set of the dataset that may reveal causes, effects, and/or the source of any unidentified relationships among the items. Furthermore, hierarchical clustering was used to determine the probable number of clusters. Statistical Package for the Social Sciences (SPSS) v. 25.0 was used for the analysis of the datasets.

Ethics Statement

The consent of the respondents was taken before the survey, and their anonymity was guaranteed. All the participants were informed about the specific objective of this study before proceeding to the questionnaire. Participants were able to complete the survey only once and could terminate the survey at any time they desired. Anonymity and confidentiality of the data were ensured. Formal ethical permission of this study was taken from the respective authority.

RESULTS

Demographics Information

A total of 1,066 (=n) responses were recorded in this study. The proportion of male to female respondents was 3:2 [males (n = 661; 61.5%) and females (n = 405; 38.5%)]. The composition of age groups of the respondents was as follows: 75.2% (18–30 years old), 16.7% (31–40 years old), 6.7% (41–50 years old), 1.1% (51–60 years old), and 0.3% (>60 years old). The average age of the respondents was 27.80 years (SD ± 10.05). On average, the respondents had 12.5 years of formal education (SD ± 8.1). 60% of the youth group were mostly students or at the brink of finishing their studies. The remaining 40% of the respondents were from various professions, including doctors and healthcare workers, civil service officials, non-government officials (NGOs), teachers and scholars, policymakers, researchers, and businessmen.

A Descriptive Overview of the People's Perception

The descriptive statistics containing the 46 statements are shown in **Table 1**. The category of statements were grouped as follows: Mental health condition (MH) comprised five statements (MH1-5), the healthcare system of Bangladesh (HSB) comprised ten statements (HSB1-10), the governance and political issues (GPI) comprised 7 statements (GPI1-7), the socio-economic issues comprised 11 statements (SEI1-11), the immediate emerging issues comprised 7 statements (IEI1-7), and for enduring emerging issues 6 statements were considered (EEI1-6). In the following section of Mental Health Status, Healthcare System, Governance and Political Perspective, Socio-Economic Aspects, and Emerging Issues, we have discussed the descriptive statistics.

Mental Health Status

In the statement of "*I am afraid of the recent outbreak of coronavirus in Bangladesh*" (MH1) 46.2% of the respondents strongly agreed, followed with a mean of 4.15 ± 1.01. In the second statement (MH2), "*I am afraid of getting infected with coronavirus*" the difference among strongly agreed (32.7%) and agreed (33.5%) statement with a mean value of 3.89 ± 1.08. For statement three, 46.5% of the respondents strongly agreed to the (MH3) "*I am afraid of losing my life or my relatives' life due to this outbreak*" with a mean value of 4.08 ± 1.08. In the fourth

TABLE 1 | Descriptive statistics and item-total correlation.

Sector	Statement	Denote	Strongly disagree % (*n*)	Disagree % (*n*)	Neither agree nor disagree % (*n*)	Agree % (*n*)	Strongly agree% (*n*)	Mean	Std. deviation	Skewness	Kurtosis	Corrected item-total correlation
Mental health condition (MH)	I am afraid of the recent outbreak of coronavirus in Bangladesh	MH1	2.9 (310)	5 (53)	12.4 (132)	33.5 (357)	46.2 (493)	4.152	1.012	−1.271	1.203	0.381
	I am afraid of getting infected with coronavirus	MH2	3.7 (39)	7.8 (83)	22.3 (238)	33.5 (357)	32.7 (349)	3.839	1.080	−0.747	−0.07	0.355
	I am afraid of losing my life or my relatives' lives due to this outbreak	MH3	3.4 (36)	7 (75)	13.8 (147)	29.3 (312)	46.5 (496)	4.085	1.087	−1.131	0.525	0.360
	All the news of infection and deaths from COVID-19 in different media is increasing my fear	MH4	3.2 (34)	5.9 (63)	15 (160)	32.4 (345)	43.5 (464)	4.071	1.051	−1.11	0.659	0.376
	It makes me uncomfortable to be detached from regular activities due to lockdown	MH5	3.6 (38)	4.6 (49)	12.3 (131)	27.9 (297)	51.7 (551)	4.195	1.052	−1.369	1.301	0.344
Healthcare system in Bangladesh (HSB)	The healthcare system of Bangladesh is too fragile to deal with the recent outbreak of COVID-19	HSB1	3.2 (34)	3.8 (41)	8.7 (93)	22.3 (238)	61.9 (660)	4.359	1.010	−1.736	2.476	0.360
	A huge population is a pressure to the existing healthcare system to deal with COVID-19	HSB2	2.3 (25)	2.1 (22)	5.3 (57)	22.2 (237)	68 (725)	4.515	0.873	−2.237	5.195	0.421
	There is a lack of awareness of basic healthcare issues amongst most of the citizens of Bangladesh	HSB3	1.3 (14)	1.3 (14)	5.9 (63)	24.1 (257)	67.4 (718)	4.549	0.776	−2.147	5.378	0.456
	There is a lack of trained doctors and healthcare professionals to deal with the COVID-19	HSB4	2.9 (31)	3.8 (41)	13 (139)	28 (299)	52.2 (556)	4.227	1.008	−1.374	1.451	0.305
	There is a lack of healthcare facilities needed to combat the COVID-19 outbreak in Bangladesh	HSB5	1.3 (14)	0.9 (10)	4.8 (51)	17.5 (187)	75.4 (804)	4.648	0.734	−2.645	8.058	0.537
	There is a lack of healthcare infrastructure to deal with COVID-19	HSB6	1.3 (14)	1.8 (19)	4.9 (52)	19 (203)	73 (778)	4.606	0.776	−2.432	6.482	0.511
	There is a severe lack of bio-medical and hospital waste management facilities in Bangladesh	HSB7	0.7 (7)	1.1 (12)	7.3 (78)	22.4 (239)	68.5 (730)	4.569	0.734	−1.927	4.103	0.533
	There is a lack of COVID-19 testing facilities in Bangladesh	HSB8	1.6 (17)	0.9 (10)	3.1 (33)	12.4 (132)	82 (874)	4.722	0.715	−3.295	12.001	0.508
	There is a lack of budget or financial support in response to this outbreak	HSB9	5.3 (57)	7.9 (84)	11.9 (127)	25.7 (274)	49.2 (524)	4.054	1.186	−1.162	0.354	0.309
	Most of the poor people will not have access to existing healthcare facilities if they are infected by COVID-19	HSB10	1.1 (12)	1 (11)	6.1 (65)	15.9 (170)	75.8 (808)	4.643	0.741	−2.495	6.901	0.554
Governance and Political issues (GPI)	The Bangladesh government can deal with this outbreak	GPI1	28 (299)	26.2 (279)	21.9 (233)	15 (160)	8.9 (95)	2.506	1.284	0.436	−0.905	−0.054
	The government is taking this outbreak seriously	GPI2	19.9 (212)	25.2 (269)	22.5 (240)	23.5 (251)	8.8 (94)	2.762	1.257	0.121	−1.088	−0.011
	The government is making proper decisions in the right time	GPI3	32.6 (347)	30.7 (327)	19.1 (204)	12.3 (131)	5.3 (57)	2.272	1.190	0.664	−0.52	−0.078
	The government is involving other sectoral actors to combat the COVID-19 outbreak	GPI4	12.3 (131)	18.9 (202)	36.1 (385)	23.8 (254)	8.8 (94)	2.979	1.128	−0.105	−0.654	0.040

(Continued)

TABLE 1 | Continued

Sector	Statement	Denote	Strongly disagree % (*n*)	Disagree % (*n*)	Neither agree nor disagree % (*n*)	Agree % (n)	Strongly agree% (n)	Mean	Std. Deviation	Skewness	Kurtosis	Corrected Item-Total Correlation
	The government needs support from the people to reduce the impact of COVID-19	GPI5	1.6 (17)	1 (11)	5.2 (55)	23.6 (252)	68.6 (731)	4.566	0.776	−2.319	6.367	0.435
	The government needs to formulate a policy and action plan and implement it immediately	GPI6	1 (11)	0.8 (9)	4.1 (44)	17.5 (187)	76.5 (815)	4.675	0.690	−2.73	8.888	0.499
	Developed nations are going to support Bangladesh in response to COVID-19	GPI7	4.2 (45)	9.8 (104)	38.6 (411)	31.6 (337)	15.9 (169)	3.451	1.007	−0.308	−0.156	0.257
Socio-economic issues (SEI)	Shut down or lockdown of regular activities is a good decision to reduce the chance of infection from COVID-19	SEI1	1.5 (16)	1.2 (13)	4.8 (51)	27.4 (292)	65.1 (694)	4.534	0.774	−2.186	5.877	0.341
	Shut down or lockdown or social distancing will have an economic and social impact in the future	SEI2	1.1 (12)	1.4 (15)	6.5 (69)	27.2 (290)	63.8 (680)	4.511	0.774	−1.935	4.453	0.486
	Formal and informal business will be hampered	SEI3	0.7 (7)	1 (11)	6.3 (67)	30.9 (329)	61.2 (652)	4.508	0.719	−1.701	3.719	0.513
	Poor people living hand-to-mouth will be severely affected	SEI4	0.8 (9)	0.6 (6)	3.1 (33)	9.9 (106)	85.6 (912)	4.788	0.604	−3.639	15.449	0.525
	Most of the poor people living in urban areas have to leave due to not having any options for income	SEI5	1.4 15	3 (32)	8.6 (92)	26.1 (278)	60.9 (649)	4.420	0.875	−1.7	2.797	0.430
	Many people will lose their livelihood/ jobs at this time	SEI6	1.3 (14)	2.5 (27)	9.6 (102)	31.8 (339)	54.8 (584)	4.362	0.856	−1.515	2.416	0.490
	There will be a lower supply of basic goods/ products for daily use	SEI7	2 (21)	5.6 (60)	12.8 (136)	36.8 (392)	42.9 (457)	4.130	0.971	−1.149	0.956	0.412
	Prices of the most basic products will be higher than usual	SEI8	1 (11)	4 (43)	10.7 (114)	33.5 (357)	50.8 (541)	4.289	0.887	−1.303	1.46	0.401
	Poor people will suffer from food and nutritional deficiency	SEI9	0.9 (10)	1.2 (13)	4 (43)	24.4 (260)	69.4 (740)	4.601	0.712	−2.301	6.604	0.531
	The formal education system will be hampered	SEI10	1.7 (18)	2.3 (25)	9.5 (101)	29.4 (313)	57.1 (609)	4.379	0.877	−1.628	2.756	0.448
	There is a chance of social conflict due to this outbreak	SEI11	3.8 (40)	6.4 (68)	20.6 (220)	34.3 (366)	34.9 (372)	3.902	1.068	−0.863	0.201	0.408
Immediate emerging issues (IEI)	There is a chance of community transmission of COVID-19 in Bangladesh	IEI1	0.9 10	1.2 (13)	12.2 (130)	29.3 (312)	56.4 (601)	4.389	0.817	−1.373	1.897	0.459
	A huge number of people will be infected	IEI2	1.2 (13)	3.5 (37)	16.9 (180)	30.1 (321)	48.3 (515)	4.208	0.926	−1.056	0.639	0.466
	There is a chance of not detecting most of the infected patients due to the lack of health facilities, which leads to undermining the number of actual infected cases	IEI3	0.9 (10)	1.2 (13)	7.9 (84)	21.1 (225)	68.9 (734)	4.557	0.769	−1.99	4.303	0.508
	There is a chance of increasing the number of deaths by not having proper health facilities	IEI4	0.8 (9)	1.3 (14)	5.7 (61)	25 (266)	67.2 (716)	4.563	0.736	−2.04	4.96	0.594
	Lack of bio-medical waste management facilities in the hospitals will create environmental transmission	IEI5	0.7 (7)	1.1 (12)	6.7 (71)	30 (320)	61.5 (656)	4.507	0.728	−1.698	3.573	0.583

(Continued)

TABLE 1 | Continued

Sector	Statement	Denote	Strongly disagree % (*n*)	Disagree % (*n*)	Neither agree nor disagree % (*n*)	Agree % (n)	Strongly agree% (n)	Mean	Std. Deviation	Skewness	Kurtosis	Corrected Item-Total Correlation
	Many people will be psychosocially shocked due to this outbreak	IEI6	0.6 (6)	2.1 (22)	12.2 (130)	38.7 (413)	46.4 (495)	4.284	0.800	−1.064	1.111	0.498
	The government will lose its trust from the people	IEI7	3.8 (41)	7.4 (79)	27.1 (289)	25.2 (269)	36.4 (388)	3.829	1.118	−0.642	−0.362	0.341
Enduring emerging issues (EEI)	There is a chance of a disaster like a flood, cyclone, or landslide in 2020 considering the climate change vulnerability of Bangladesh	EEI1	2.6 (28)	7.1 (76)	32.8 (350)	32.6 (348)	24.8 (264)	3.698	1.004	−0.417	−0.254	0.329
	If any disaster (flood, cyclone, landslide) occurs after/during the COVID-19 situation then it will create a double burden to the country	EEI2	0.4 (4)	1.2 (13)	5.5 (59)	18.8 (200)	74.1 (790)	4.650	0.676	−2.202	5.301	0.544
	There is a chance of severe food scarcity due to these events (COVID-19 + Disasters) in the country	EEI3	0.6 (6)	2.7 (29)	13.2 (141)	33.1 (353)	50.4 (537)	4.300	0.840	−1.116	0.89	0.459
	High possibility of huge economical loss	EEI4	0.5 (5)	0.7 (7)	5 (53)	27.2 (290)	66.7 (711)	4.590	0.661	−1.875	4.59	0.555
	High possibility of increasing the poverty level	EEI5	0.5 (5)	2.3 (25)	8.5 (91)	31 (330)	57.7 (615)	4.431	0.783	−1.449	2.065	0.574
	High possibility of severe socio-economic and health crisis	EEI6	0.5 (5)	1.5 (16)	6.3 (67)	32.6 (347)	59.2 (631)	4.485	0.723	−1.57	3.004	0.602

statement (MH4), *"All the news of infection and deaths from COVID-19 in different media is increasing my fear"* 43.5% of the respondent strongly agreed, with a mean response of 4.07 ± 1.05. 51.7% of the respondents strongly agreed with the fifth statement (MH5) *"It makes me uncomfortable to be detached from regular activities due to lockdown"* with a mean value of 4.19 ± 1.05.

Healthcare System

62% of the respondents strongly agreed to the statement that the healthcare system of Bangladesh is fragile and unable to deal with the recent outbreak of COVID-19 (HSB1), with a mean value of 4.36 ± 1.01. For the second statement, 68% of respondents with a mean value of 4.51 ± 0.87 strongly agreed that *"a huge population is a pressure to the existing healthcare system to deal with COVID-19"* (HSB2). 67% of the respondents with a mean value of 4.55 ± 0.776 strongly agreed that *"there is a lack of awareness of basic healthcare issues in most of the citizens of Bangladesh"* (HSB3). Moreover, 52% of the respondents with a mean value of 4.22 ± 1.0 strongly agreed that there is "*a lack of trained doctors and healthcare professionals to deal with the COVID-19"* (HSB4). With a mean value of 4.64 ± 0.73, 75.4% of the respondents strongly agreed that "*the lack of healthcare facilities will be unable to combat the COVID-19 outbreak in Bangladesh*" (HSB5). Again, 73% of respondent with a mean of 4.6 ± 0.77 strongly agreed with *"the lack of healthcare infrastructure to deal with COVID-19"* (HSB6). For statement seven, 68.5% of respondents with a mean value of 4.56 ± 0.734 strongly agreed that *"there is a severe lack of bio-medical and hospital waste management facilities in Bangladesh*" (HSB7). Moreover, 82% of respondents with a mean value of 4.72 ± 0.71 strongly agreed that *"there is a lack of COVID-19 testing facility in Bangladesh"* (HSB8). 49.2% of respondents (4.05 ± 1.86) strongly agreed that *"the budget is inadequate or there is a lack of financial support to respond to this outbreak"* (HSB9). Finally, 75.8% of respondents with a mean value of 4.64 ± 0.74 strongly agreed that *"most of the poor people will not have access to the existing healthcare facilities if they are infected with COVID-19"* (HSB10).

Governance and Political Perspective

Regarding the statement of *"the Bangladesh government can deal with this outbreak"* (GPI1), the public opinion did not vary significantly with a mean value of 2.50 ± 1.28. Similar responses were also found in response to *"the Government is taking this outbreak seriously"* (GPI2) with a mean value of 2.76 ± 1.26 and *"the Government is taking proper decisions at the right time"* (GPI3) with a mean value of 2.27 ± 1.19. 68.6% of respondents strongly agreed that *"the Government needs support from the general public to reduce the impact of COVID-19"* (GPI5) with a mean value of 4.56 ± 0.77 and that *"the Government needs to formulate a policy and action plan and implement it immediately"* (GPI6) with a mean value of 4.67 ± 0.69. About 31.6% of respondents agreed that *"developed nations are going to support Bangladesh in response to COVID-19"* (GPI7) with a mean value of 3.45 ± 1.0.

Socio-Economic Aspects

Nearly 61–65% of respondents strongly agreed that *"the shut down or lockdown of regular activities was a good decision to reduce the chance of infection of COVID-19"* (SEI1) (mean 4.53 ± 0.77), *"this will have an economic and social impact in the future"* (SEI2) (mean 4.51 ± 0.77), and that *"both formal and informal businesses will be hampered" (SEI3)* (mean 4.5 ± 0.71). For the fourth statement, 85.6% of respondents strongly agreed that *"poor people living off daily wages will be severely affected"* (SEI4) with a mean of 4.78 ± 0.60, while 60.5% strongly agreed that *"most of the poor people living in urban areas have to leave the city due to not having any options for income"* (SEI5) (mean 4.42 ± 0.87). 54.8% (mean 4.36 ± 0.85) of the respondents agreed that *"many people will lose their livelihood/ jobs at this time"* (SEI6). A further 42.9% (mean 4.13 ± 0.97) strongly agreed that *"there will be a reduced supply of basic goods/ products for daily use"* (SEI7) and 50.8% (mean 4.28 ± 0.89) strongly agreed that *"there was or will be increased prices for basic products"* (SEI8). Consequently, "*poor people will suffer food and nutritional deficiency*" (SEI9) was strongly agreed with by 69.4% respondents (mean value of 4.6 ± 0.712). *"The shutdown of education institutes will hamper those currently receiving formal education"* (SEI10), to which 57% respondents strongly agreed (mean value of 4.38 ± 0.88). For *"If there is a chance of social conflict due to this outbreak"* (SEI11), the mean response was 3.9 ± 1.06.

Emerging Issues

56.4% (mean 4.39 ± 0.82) of respondents strongly considered that "*there is a chance of community transmission of COVID-19 in Bangladesh*" (IEI1) and that *"a huge number of people will be infected"* (IEI2) with a mean value of 4.208 ± 0.93. Moreover, 69% of the respondents strongly agreed (mean value 4.56 ± 0.74) that *"there is a chance that many infected patients will not be detected due to a lack of testing facilities and this will not show the actual number of infected cases"* (IEI3). Approximately 61–67% of the respondents strongly agreed that *"there is a chance of an increasing numbers of deaths from infection due to a lack of proper health facilities"* (IEI4) with a mean value of 4.56 ± 0.74. "*A lack of bio-medical waste management facilities in the hospitals will create further transmission"* (IEI5) received a mean value of 4.50 ± 0.73. For the sixth statement, 46.4% of respondents (mean value of 4.28 ± 0.88) strongly agreed that *"there will be many people psychosocially shocked due to this outbreak"* (IEI6) and that *"the general public will lose trust in the government"* (IEI7) was strongly agreed with by 36.4% respondents with a mean value of 3.83 ± 1.12.

We have considered emerging enduring issues (EEI), such as potential natural calamities and infectious disease outbreaks, as the monsoon season is approaching. Six statements were considered for enduring emerging issues (EEI1-6). Regarding the statement that *"there is a chance of a disaster such as a flood, cyclone, or drought in 2020 considering the vulnerability of Bangladesh to climate change"* (EEI1), there was a mean response of 3.7 ± 1.0. But the statement *"if any disaster (flood, cyclone, landslide) occurs after/during COVID-19, the situation will create a double burden to the country"* (EEI2) was strongly agreed with by 74% of respondents with a mean of 4.65 ± 0.68. 50.4% of respondents agreed with a mean of 4.3 ± 0.84 that *"there is a chance of severe food scarcity in the country due to these events (COVID-19 + Disasters)"* (EEI3). A strong agreement from participants (varied from 50 to 66%) was observed for the statements: *"there is a high possibility of huge economical loss"* (EEI4) with a mean value of 4.59 ± 0.66, "*there is a high possibility of increasing poverty level"* (EEI5) with a mean value of 4.43 ± 0.78, and *"there is a high possibility of severe socio-economic and health crisis"* (EEI6) with a mean value of 4.48 ± 0.72.

Results From Regression Analysis

The Association of Affected Psychosocial Wellbeing and the Fragile Healthcare System During COVID-19 Outbreak

From the regression analysis, among the 45 variables, only five variables showed statistically significant associations with the fragile healthcare system of Bangladesh (HSB1) to deal with the recent outbreak of COVID-19 in the country (**Table 2**). HSB2, HSB5, and IEI1 statistically pose a significant positive effect on the fragile healthcare system of Bangladesh ($p < 0.01$). This relationship implies that a huge population and a lack of healthcare facilities are contributing to the community transmission of COVID-19 in Bangladesh. The presence of community transmission in Bangladesh within a short time is present as predicted by the IEDCR, who announced a mild-level community transmission possibility in Bangladesh on 1st April 2020 in their press release (9). This assumption is further validated by the number of deaths from COVID-19 reported in the news, after the announcement of the partial lockdown, and the opening of RMG factories from 25 April 2020. The number of COVID-19 patients increased significantly in industrial zones. There was also a positive significant association between the fear of the COVID-19 outbreak (MH1) with the struggling healthcare system ($p < 0.05$). Also, the negative association between HSB1 and government political decision GPI1 ($p < 0.05$) reveals that the Government is unable to make proper decisions at the right time due to the poor governance in the existing healthcare system.

The Affected Psychosocial Wellbeing and Socio-Economic Fear of COVID-19 and the Government's Decision to Lockdown

The results of linear regression showed that among the 45 variables, only 10 variables showed statistically significant associations with fear of the COVID-19 outbreak (**Table 2**). For instance, mental health variables MH2, MH3, and MH4 statistically pose a significant positive effect on fear of the COVID-19 outbreak ($p < 0.01$). On the other hand, there is a statistically positive association between fear of the COVID-19 outbreak ($p < 0.05$)and the healthcare system in Bangladesh (HSB1 and HSB8), due to the lack of testing facilities and a fragile healthcare system contributing to the fear that has been experienced due to the COVID-19 pandemic in Bangladesh. The socioeconomic issues (SEI 10) and immediate emerging issues (IEI2) have a statistically significant positive impact ($p < 0.01$), e.g., obstruction to the formal education system, and the potentiality of a huge number of people becoming infected may

TABLE 2 | Multiple linear regression models for selected statements using perceptions as independent variables ($n = 1,066$).

Perception statement (multiple R^2 value)	Constant of model	Significant (1% and 5% level) regression coefficients for independent variables (standard error of regression coefficients)									Standard error of regression model (ANOVA, F-statistic)
MH1 (0.472)	0.297	+0.314 MH2 (0.03)	+0.14 MH3 (0.03)	+0.181 MH4 (0.026)	+0.053 HSB1 (0.026)	+0.087 HSB8 (0.046)	+0.049 GPI7 (0.025)	−0.075 SEI10 (0.032)	+0.104 IEI1 (0.036)	0.117 IEI2 (0.033)	0.75162 (20.264)
HSB1 (0.252)	0.514	0.075 MH1 (0.037)	0.125 HSB2 (0.036)	0.296 HSB5 (0.058)	−0.076 GPI3 (0.032)	0.118 IEI1 (0.043)					0.89242 (7.619)
GPI1 (0.242)	1.847	−0.083 HSB4 (0.041)	−0.206 HSB9 (0.033)	0.253 GPI2 (0.039)	0.149 GPI3 (0.04)	0.127 GPI7 (0.038)	0.224 SEI2 (0.062)	−0.225 SEI3 (0.072)	0.084 SEI11 (0.04)		1.14184 (7.237)
SEI2 (0.479)	−0.238	0.054 MH3 (0.023)	0.085 HSB5 (0.038)	0.056 GPI1 (0.016)	0.045 GPI3 (0.02)	0.517 SEI3 (0.032)	0.098 SEI4 (0.04)	0.049 SEI8 (0.025)	0.048 SEI10 (0.025)	0.084 EEI6 (0.038)	0.57089 (20.859)
IEI1 (0.396)	0.66	0.078 MH1 (0.027)	0.077 MH3 (0.026)	0.062 HSB1 (0.023)	0.169 HSB7 (0.039)	0.082 SEI6 (0.031)	0.077 SEI11 (0.023)	0.246 IEI2 (0.028)	0.178 IEI3 (0.036)		0.64904 (14.864)
EEI2 (0.428)	0.495	−0.047 MH2 (0.022)	0.046 HSB2 (0.021)	0.09 SEI4 (0.036)	0.11 SEI9 (0.031)	0.088 IEI5 (0.031)	0.085 EEI1 (0.018)	0.112 EEI3 (0.024)	0.178 EEI4 (0.037)	0.07 EEI6 (0.034)	0.52213 (16.989)

contribute to the fear development of the COVID-19 outbreak in this country. There was also a positive significant association between the chance of community transmission of COVID-19 for immediate emerging issues (IEI1) with fear of the COVID-19 outbreak ($p < 0.05$).

Results from the regression analysis further showed eight variables have a significant statistical association with the governance and political capacity to deal with the COVID-19 outbreak in Bangladesh (GPI1). A significant positive association was found among the governance and political issues (GPI1 with GPI2 and GPI3) and socioeconomic issues (SEI2) ($p < 0.01$), implying that the government's decision to lockdown activities was at the proper time and has enhanced the people's perception of the capacity of Government to deal with the COVID-19 outbreak (**Table 2**).

The Potential Arising of Social Conflicts From COVID-19 and Governance and Political Association

However, the negative association between governance and political issues (GPI1) and the healthcare system of Bangladesh (HSB9) ($p < 0.01$) shows that a perceived lack of budget created a gap in the response to COVID-19 (**Table 2**). Moreover, a negative association of governance and political issues (GPI1) with the healthcare system of Bangladesh (HSB4) and socioeconomic issues (SEI3) ($p < 0.05$) shows a perceived lack of trained doctors and healthcare professionals, and that a hampering of formal and informal business activities are reducing the government's capacity to deal with the COVID-19 outbreak. Nevertheless, a positive association of governance and political issues GPI1 with socioeconomic issues SEI11 ($p < 0.05$) and governance and political issues GPI7 ($p < 0.01$) shows that there is a perceived possibility of social conflict due to this outbreak if not managed properly, and that the Bangladesh Government will need support from developed nations and allied forces to deal with this outbreak. It should be mentioned here that containment, risk mitigation, and suppression plans must be as inclusive as possible or risk undermining response efforts.

The Potential Socioeconomic Crisis of the COVID-19 Outbreak and the Suffering Poor Communities

The regression analysis showed that, among the 45 variables, nine showed a significant statistical association with the future impacts of implementing lockdown and social-distancing activities (SEI2). A significant positive association of socioeconomic issues (SEI2) with governance and political issues (GPI1) and socioeconomic issues (SEI3) ($p < 0.01$) shows that the Government took the right decision by shutting down regular activities and implementing the social distancing approach (**Table 2**). But due to this initiative, the formal and informal business sectors and the economy will be hampered. Again, a positive association of socioeconomic issues (SEI2) with mental health (MH3) and healthcare services (HSB5) ($p < 0.05$) reveals that this decision of shutting down normal activities was imposed due to the fear of losing lives due to COVID-19 and having a lack of healthcare facilities. However, a positive association of socioeconomic issues SEI2 with SEI4, SEI8, SEI10, and enduring emerging issues EEI6 ($p < 0.05$) shows that due to this shut

down poor people will be severely affected, the price of the basic products will increase, the formal education system will be hampered, and the possibility of severe socio-economic and health crises will increase.

Other Infectious Disease Risk Management During COVID-19 Outbreak

In the regression analysis, eight variables are statistically associated with the possibility of community transmission of COVID-19 (IEI1). A significant positive association between mental health variables (MH1, MH3), healthcare system variables (HSB1, HSB7), Socioeconomic variables (SEI6, SEI11), and immediate emerging issues (IEI2, IEI3) ($p < 0.01$) reveals that community transmission will increase the number of infected people which will create further fear and mental pressure of others of losing their lives due to COVID-19 infection (**Table 2**). The fragile healthcare system of Bangladesh will be unable to detect most of the infected patients due to a lack of health facilities, which leads to undermining the actual infected cases. As of the last day of the survey for this study on 30 March 2020, the testing rate of COVID-19 was at its lowest in Bangladesh compared to the other similar countries (10 people/1 million). However, as the laboratories increased, the number of testing has increased along with this, with 878 people/1 million. This is still inadequate compared to the population density. Also, the inadequate disposal method of COVID-19 hospital bio-medical waste management and associated facilities could increase community transmission. Subsequently, due to the community transmission of COVID-19, many people will lose their lives and livelihoods, which might lead to creating social conflict, as a worst-case scenario.

Combating Environmental and Climate-Induced Natural Disaster Risks During the COVID-19 Outbreak

The regression analysis further identified nine variables that are significantly associated with the possibility of climate-induced extreme natural events (flood, cyclone, landslides, etc.) occurring during/after the COVID-19 pandemic. The pandemic along with natural disasters may create a double burden to the country due to enduring emerging issues (EEI2). The positive association between EEI2, SEI9, IEI5, EEI1, EEI3, and EEI4 ($p < 0.01$) shows that there is a perceived possibility of a climate-change-induced disaster after the COVID-19 situation which would create severe food insecurity (**Table 2**). Poor people will suffer most from food and nutritional deficiency and the country will face enormous economic loss. Also, after the COVID-19 situation, a lack of bio-medical and solid waste management will add more problems. Moreover, a positive association between EEI2, HSB2, and EEI6 reveals that, after the COVID-19 emergency, existing poverty will create further socio-economic and health crises.

Overall Relationship Assessment Among the Variables From CTT, PCA, and CA

CTT and PCA revealed a confidence level of controlling factors in Bangladesh during the COVID-19 outbreak and how these components are correlated to the psychosocial, socio-economic, and environmental crisis components (**Tables 1**, **3**). Cluster analysis (CA) further detected the total status of regional variations, and how socio-economic and environmental crises influences psychosocial development (**Figure 3**).

Results From CTT and PCA

From the CTT analysis, according to the corrected inter-item correlation analysis, among 46 variables, four variables have low corrected item-total correlations (i.e., the ability of the government to deal the outbreak, −0.054; seriousness of the government, −0.011; government is taking a proper decision, −0.078; and other sectoral involvement to COVID-19, −0.04). The remaining 42 variables in the scale had an acceptable corrected item-total correlation (0.257 to 0.602) and the Cronbach's alpha (0.896) was acceptable.

From PCA, nine principal components (PCs) were originally based on standard eigenvalues (surpassed 1) that extracted 55.28% of the total variance as displayed in **Table 3**. The scree plot was adopted to detect the number of PCs to be retained to provide insight into the underlying variable internal structure (**Figure 2**). The loading scores were demarcated into three groups of weak (0.50–0.30), moderate (0.75–0.50), and strong (>0.75) (18–20).

The PC1 (First) showed 8.967% of variance as it encompassed a confidence level of weak positive loading of the healthcare system in Bangladesh (HSB1-3: 0.334–0.459); with results being moderate positively loaded for the healthcare system in Bangladesh (HSB4-10: 0.50–0.746). The PC2 (Second) indicated 8.587% of the variance and was loaded with moderate positive loading for socio-economic issues (SEI5-9: 0.606–0.702 and SEI11: 0.548) and weak positively loaded for socio-economic issues (SEI2-4: 0.336–0.493 and SEI10: 0.418).

The PC3 (Third) showed 7.196% of the variance and was moderate positively loaded for immediate emerging issues IEI1-5 (0.546–0.665). The PC4 (Four) indicated 6.792% of the variance, and was loaded with a significant level of strong positive loadings for immediate emerging issues IEI4 (0.751); results were moderate positively loaded for immediate emerging issues IEI2-3 (0.541–0.683) and immediate emerging issues IEI5-6: 0.659–0.686), and were weak positively loaded for immediate emerging issues IEI1 (0.345).

The PC5 (Five) and PC6 (Six) indicated 6.023 and 5.603% of the total variances, and loaded a significant level of strong positive loading for mental health issues MHI2-3 (0.764–0.832) and government and political issues GPI2-3(0.783–0.787); results were moderate positively loaded for mental health issues MHI1 (0.746), MHI4 (0.613), government and political issues GPI1 (0.571), and GPI4 (0.698). Results were weak positively loaded for mental health issues MHI5 (0.41) and government and political issues GPI7 (0.574).

The PC7 (Seven), PC8 (eight), and PC9 (nine) showed 5.304, 3.743, and 3.064% of the total variances and were moderate positively loaded for government and political issues GPI5-6 (0.627–0.651), socioeconomic issues SEI1 (0.574), SEI2-3 (0.636–0.637), and immediate emerging issues (IEI1:0.519); results were weak positively loaded for socio-economic issues SEI4 (0.397), SEI9-10 (0.317–0.322), healthcare sector of Bangladesh HSB1-2

TABLE 3 | Varimax rotated principal components.

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9
MH1	0.122	−0.034	0.25	0.03	0.746	−0.048	0.065	0.049	0.055
MH2	0.041	0.051	0.162	0.094	0.832	−0.041	0.05	−0.047	−0.061
MH3	0.064	0.07	0.172	0.112	0.764	−0.071	0.052	−0.071	−0.031
MH4	0.103	0.088	0.005	0.029	0.613	0.012	0.106	0.118	0.32
MH5	0.171	0.123	−0.036	−0.002	0.41	0.126	0.067	0.313	0.213
HSB1	0.347	−0.047	0.168	0.055	0.106	−0.173	0.098	0.3	0.383
HSB2	0.334	0.031	−0.088	0.204	0.126	−0.024	0.353	0.12	0.43
HSB3	0.459	0.187	0.052	0.076	0.162	−0.123	0.244	0.03	0.197
HSB4	0.637	0.018	−0.008	0.105	0.024	0.003	−0.031	0.009	0.065
HSB5	0.743	0.065	0.218	0.071	0.073	−0.058	0.165	0.124	0.071
HSB6	0.746	0.056	0.213	0.122	0.086	−0.028	0.057	0.072	0.045
HSB7	0.682	0.089	0.216	0.108	0.034	−0.051	0.147	0.166	0.119
HSB8	0.689	0.149	0.221	0.031	0.026	−0.013	0.231	0.034	−0.027
HSB9	0.54	0.263	−0.058	0.166	0.137	0.004	−0.172	−0.143	−0.081
HSB10	0.5	0.292	0.26	0.135	0.095	−0.052	0.286	−0.072	−0.026
GPI1	−0.162	−0.001	0.065	−0.183	−0.061	0.571	0.029	0.062	0.078
GPI2	−0.017	−0.05	−0.186	−0.012	−0.056	0.787	0.111	0.1	−0.059
GPI3	−0.074	−0.07	−0.158	0.012	−0.05	0.783	−0.044	0.026	−0.039
GPI4	0.018	−0.041	−0.096	0.035	−0.001	0.698	0.078	0.001	−0.047
GPI5	0.205	0.047	0.175	0.098	0.032	0.214	0.651	0.133	0.006
GPI6	0.233	0.211	0.298	0.033	0.033	0.044	0.627	0.011	0.039
GPI7	0.056	0.156	0.205	0.068	0.151	0.432	0.085	−0.246	0.088
SEI1	0.053	0.086	0.071	0.068	0.152	0.085	0.574	0.09	0.063
SEI2	0.092	0.336	0.135	0.211	0.035	0.115	0.157	0.636	−0.018
SEI3	0.108	0.37	0.103	0.267	0.035	0	0.225	0.637	−0.024
SEI4	0.115	0.493	0.107	0.188	0.105	−0.045	0.397	0.291	−0.136
SEI5	0.109	0.606	0.051	0.124	0.052	0.055	0.131	0.111	−0.024
SEI6	0.059	0.657	0.192	0.171	0.073	−0.036	0.05	0.164	0.002
SEI7	0.106	0.702	0.014	0.18	0.042	−0.024	−0.035	−0.108	0.152
SEI8	0.106	0.636	0.014	0.12	−0.003	−0.151	0.126	0.024	0.151
SEI9	0.132	0.638	0.107	0.205	0.02	−0.057	0.322	0.115	−0.054
SEI10	0.072	0.418	0.158	0.261	0.001	0.151	0.033	0.317	0.089
SEI11	0.137	0.548	0.208	0.058	0.101	0.059	−0.29	0.201	0.229
IEI1	0.151	0.058	0.663	0.111	0.153	−0.031	0.025	0.177	0.093
IEI2	0.126	0.122	0.655	0.164	0.291	−0.078	0.057	−0.062	−0.036
IEI3	0.263	0.108	0.591	0.145	0.084	−0.198	0.261	0.125	−0.007
IEI4	0.267	0.111	0.642	0.253	0.135	−0.081	0.28	0.039	−0.001
IEI5	0.239	0.121	0.546	0.244	0.151	−0.03	0.239	0.068	0.156
IEI6	0.064	0.277	0.383	0.141	0.078	0.087	0.256	−0.039	0.424
IEI7	0.104	0.281	0.453	0.033	0.04	−0.251	−0.083	−0.034	0.37
EEI1	0.041	0.157	0.114	0.345	0.131	0.043	−0.085	−0.107	0.519
EEI2	0.182	0.146	0.261	0.541	0.043	−0.061	0.236	0.102	0.181
EEI3	0.157	0.227	0.068	0.683	0.082	0.008	0.002	−0.124	0.187
EEI4	0.154	0.208	0.119	0.75	0.093	−0.041	0.093	0.244	0.004
EEI5	0.119	0.321	0.194	0.686	0.09	−0.027	0.067	0.16	0.021
EEI6	0.171	0.27	0.274	0.659	0.029	−0.059	0.11	0.191	0.073
Eigenvalues	4.125	3.95	3.31	3.124	2.771	2.577	2.44	1.722	1.41
% of Variance	8.967	8.587	7.196	6.792	6.023	5.603	5.304	3.743	3.064
Cumulative %	8.967	17.555	24.75	31.543	37.566	43.169	48.473	52.215	55.28

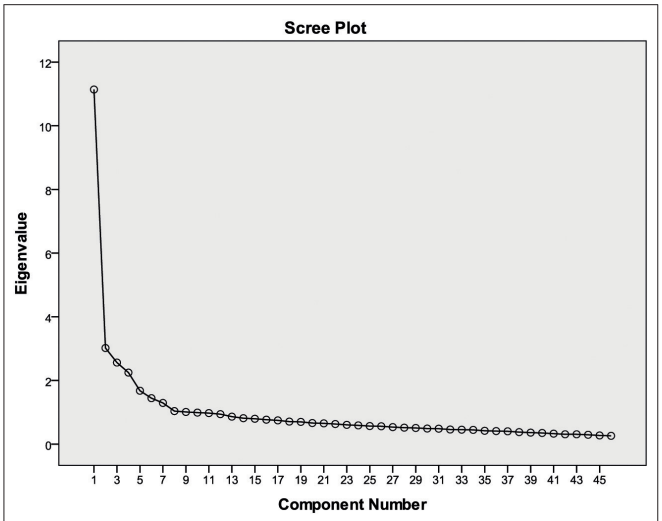

FIGURE 2 | Scree plots of the eigenvalues of PCA.

(0.383–0.430), mental health issues MHI5 (0.313), and immediate emerging issues IEI6-7(0.370–0.424).

Results From the Cluster Analysis (CA)

In the CA all the parameters were classified into four major groups: cluster-1(C1), cluster-2 (C2), cluster-3(C3), and cluster-4(C4) (**Figure 3**). C1 was composed of two sub-clusters of C1-A and C1-B; C1-A was composed of issues surrounding an increase in the number of deaths due to not having proper health facilities, a lack of bio-medical waste management facilities in Bangladesh that will create more problems, many people experiencing psychosocial issues due to this outbreak, with a large number of people becoming infected, and there being a chance of not detecting most of the infected patients due to the lack of health facilities leading to undervaluing the actual infected cases (IEI4-6, IEI2-3). C1-B was composed of socio-economic issues that may lead to poor people suffering from a lack of food, thereby leading to nutritional deficiency (SEI2-6 and SEI9). C2 consists of socio-economic issues (SEI7-11). C3 consisted of three sub-clusters of C3-A, C3-B, and C3-C. C3-A covered governance and political issues GPI5-6, and socio-economic issues (SEI1). C3-B consisted of immediate emerging issues IEI1-7, while C3-C was composed of issues related to the healthcare system in Bangladesh (HSB1-10). Cluster-4 consisted of three sub-clusters of the C4-A health system in Bangladesh and immediate emerging issues (HBS9, IEI1), C4-B covered mental health issues (MHI1-5), and C4-C contained governance and political issues (GPI1-4 and GPI7).

DISCUSSION

Societal Fear and Anxiety Over COVID-19 in Bangladesh

This perception-based study tried to visualize the psychosocial as well as socioeconomic stresses due to the COVID-19 pandemic in Bangladesh. Any major epidemic outbreak has negative effects on individuals and society (14), and people's fear due to COVID-19 is rational in the sense that the fatality rate of the virus is around 1% and it can kill healthy adults along with the elderly or those with existing health problems (21). It is crucial to assess the COVID-19 pandemic independently based on its attributes and not on past epidemics like SARS or MERS (22).

More than 929 COVID-19 symptom-like deaths were reported from leading newspapers and electronic media from 8th of March 2020 to 30th of April 2020. The reported case numbers certainly underestimate the actual number of infected persons given the limited number of urban testing centers, the shortage of test kits, and the long waiting times for tests and test results (9). The COVID-19 outbreak caused other critical care and infectious disease patients to be deprived of basic healthcare facilities. Patient-management decisions, early diagnosis, rapid testing, and detection are urgently needed (23, 24). The decentralization of testing and treatment facilities is required for the healthcare system to combat the pandemic. The government needs to aid in implementing testing facilities in both public and private clinical laboratories all over Bangladesh.

For a developing country, resources need to be assembled appropriately and promptly. With limited screening and testing of Covid-19 in Bangladesh, and the presence of only 48 laboratories mostly located in urban areas, it is difficult to predict when transmission of the disease will peak and when the curve will flatten (25). Predictably, community transmission in the country is happening and people are being infected and infecting their community, in some cases even without showing symptoms. It is further predicted that COVID-19 and dengue together is a deadly combination. As the monsoon season approaches, the risk of dengue infection is on the rise. It is a timely step taken by the DGHS to conduct dengue tests on suspected Covid-19 patients, as both diseases share common symptoms (reported on 9 May 2020, by DGHS in a daily press briefing on COVID-19).

Role of Governance and Risk Communication to Reduce Societal Fear in Bangladesh

Successful governance is only possible with a competent early warning system, efficient analysis of the situation, and the interpretation, sharing, and use of relevant knowledge and information (26). Public health instructions should be established based on scientific evidence to reduce the anxiety and distress caused by misinformation and rumors. Epidemiological outcomes need to be informed on in time so that they can be accurately evaluated and explained (27). Societies where underserved communities exist strongly fear government information and politics. Public risk communications are therefore needed to prevent misinformation from social media and electronic media. The psychosocial risk (mental health impacts) for children in this situation are apparent, as they are out of touch with schools, classmates, and playmates, and deprived of physical activities and social activities; these issues need to be addressed. Moreover, the isolation and quarantine of parent/s can mentally traumatize them and result in negligence, mistreatment, and abuse in the absence of parents/caregivers

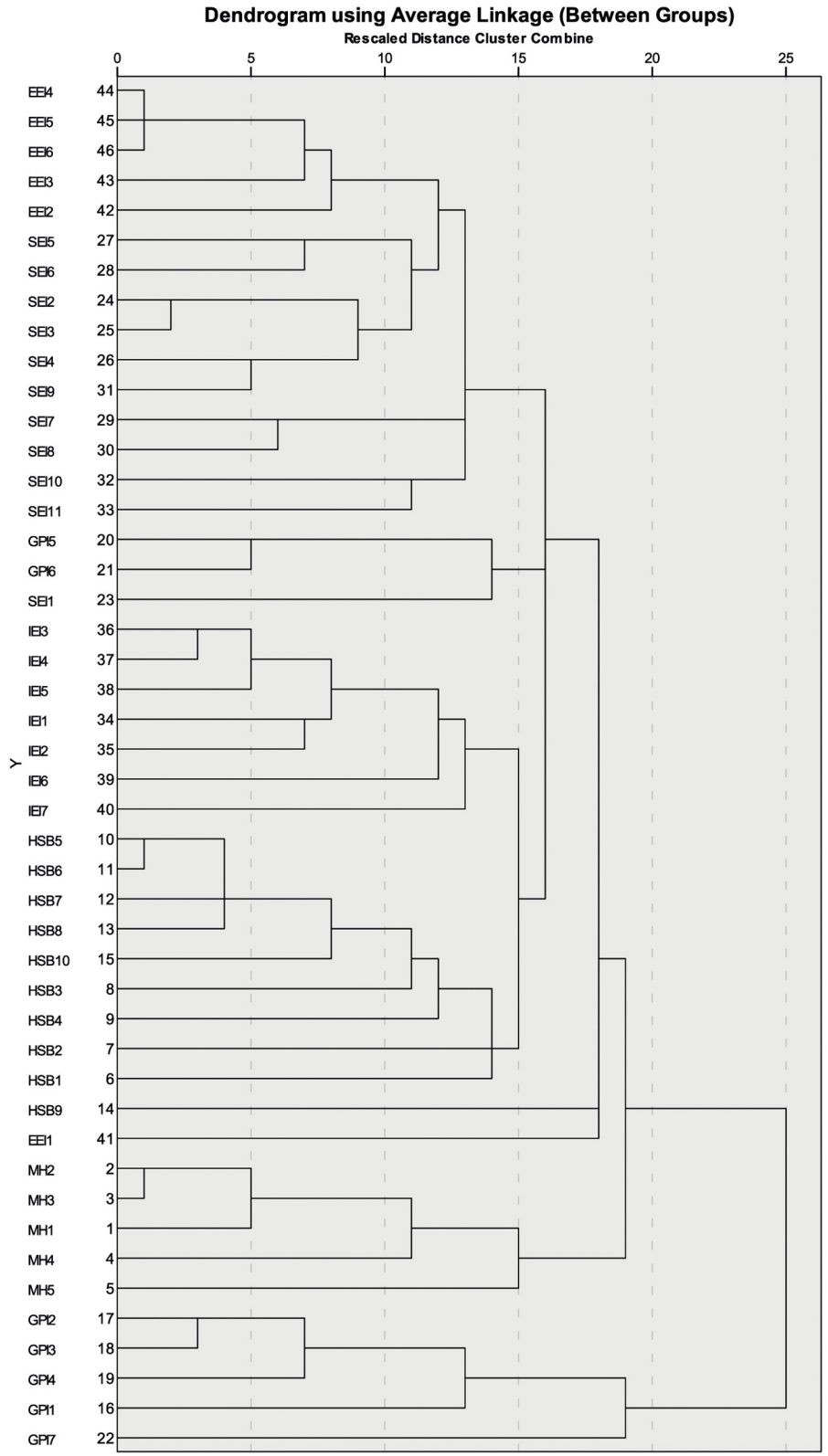

FIGURE 3 | Dendrogram showing the clustering of people's perceptions on the COVID-19 outbreak in Bangladesh.

(28). In addition, due to lockdown and the required maintenance of family hygiene, the burden of these activities is increased for women, considering the patriarchal nature of the country (where predominantly all household activities are performed by women). Moreover, increased levels of violence against women and girls are experienced, as in the lockdown it is almost impossible for victims to escape those family members who are the perpetrators (29). Furthermore, in the Rohingya refugee camps, it will have catastrophic outcomes (3). These kinds of risks, awareness, and prevention methods should be effectively communicated to the public.

As the pandemic continues, each new day brings in new conversations on social media and alarming developments of misinformation and propaganda, resulting in unnecessary psychological trauma and anxiety (30). Moreover, religious tension, personal tension, job insecurity, financial loss, and social insecurity could leave some people feeling particularly vulnerable and mentally unstable (22). Honest, transparent communication is vital for risk communication about the pandemic, while confusing or contradictory health messaging engenders mistrust and leads people to seek information from unreliable alternative sources and thus proliferates rumors (31).

The fear of becoming infected or fear for vulnerable family members has amplified along with the administrative procedures of testing and reluctance of other private clinics and hospitals to admit patients. At the Bbginning of this pandemic, Bangladesh had only 29 ICU beds in five dedicated hospitals in Dhaka for the treatment of COVID-19 patients. There were no ICU beds in hospitals outside Dhaka (32). This is a sign of weak governance in the healthcare system of Bangladesh. In this scenario, other critical care patients are denied admittance, experience negligence, and are often left to die without treatment. Moreover, the administrative procedure for the COVID-19 deceased, whether that be burial or cremation, has created more confusion and religious fear in the minds of the common people. Often, family members of the deceased have denied claiming the body due to fear of infection. In those cases, government authorities have intervened. Moreover, there is a rumor that the victims of COVID-19 are buried without the Muslim funeral procedures of bathing, which has created further religious tensions among people. It is, therefore, imperative that the Government manages people's fear and anxiety. Proper information should be circulated to reduce confusion. The Bangladeshi electronic and print media is not acting responsibly to disseminate truthful information and are instead reporting misguided stories on social media. Since the 26th of March, the Government of Bangladesh formed a division to monitor media to eradicate rumors or incorrect information being disseminated on social media platforms and in the mainstream media to protect the mental health of the people.

Resilience Development in Healthcare Sectors and Probable Climatic Disaster Management

The Bangladesh Meteorological Department (BMD) had forecasted heavy rainfall events and intermittent nor'westers and cyclones at many places across the country during April and May 2020 (33). Heavy rainfall and nor'westers related to high windspeed causes tremendous disasters by destroying standing crops and properties and cause death to people and livestock.

Fair and equitable sharing of health resources could mitigate further risks to public health by meeting community health needs and generating all-important trust and resilience (31) during further climatic disasters. The development of resilience is significant to combat any disasters, even a pandemic. Subsequently, to develop resilience in the healthcare systems and to tackle any pandemic, good governance is crucial, along with good coordination. In addition, it also requires financing, service delivery, medicines and equipment for health workers, and information (34). Moreover, governments, institutions, healthcare facilities, and the general public all hold a social and ethical responsibility to assess and mitigate risks for the most vulnerable communities, including homeless people, people without adequate insurance or employment, indigenous communities, immigrant communities, people with disabilities, and certain frontline healthcare workers and emergency responders. Prisons, nursing homes, orphanages, old care homes, homeless shelters, and refugee camps can become focuses for disease outbreaks as these settings often have inadequate access to basic healthcare facilities that increases the disease burden (31). The government should prepare policies and decisions on early recovery plans which should be inclusive to all ethnic groups, religious groups, minorities, and the wide range of vulnerable populations.

April and May are the months of natural disasters like tropical cyclones, tornados, and early flooding in Bangladesh, which may be evident within the coming days. Therefore, utilization of the health-emergency disaster risk management (Health-EDRM) framework is important to implement. Health-EDRM refers to the "systematic analysis and management of health risks, posed by emergencies and disasters, through a combination of (1) hazard and vulnerability reduction to prevent and mitigate risks, (2) preparedness, (3) response and (4) recovery measures" (35). Health-EDRM is an umbrella term which the WHO uses to refer to the broad intersection of health and disaster risk management (DRM). As the patients of other seasonal diseases such as Dengue are rising, and the possibility of a natural disaster remains, the healthcare system should be coping with the changing scenario of the COVID-19 outbreak in Bangladesh, where resilience is very important. The hotspot areas of the disasters have already been identified in the Bangladesh Delta Plan 2100 (36). Vulnerable areas should be given special emphasis in the coming months for the protection of crops, risk reduction, relief preparation, and rehabilitation.

Biomedical Waste Management Planning

Biomedical waste should be disposed of following national and international guidelines on the disposal of infectious biological hazardous materials (37). When an exponentially rapid spread of a disease or infection breaks out, the generation of biomedical waste and other related healthcare hazards may be considerably increased within a noticeably short period. If improperly treated, this waste may accelerate the spread of disease and pose a

significant risk to medical staff, patients, and waste management unit personnel. A complex short-term decision-making problem is required by the authorities to deal with the fast accumulation and transportation mode of the medical waste. Healthcare centers can either directly transport the waste to the treatment centers or they can transfer and consolidate via a temporary transit center (38). The use of PPE should be distinguished by different risk factors to adopt different epidemic prevention measures and reduce the waste of personal protective equipment, as these resources are already in short supply (34). Moreover, repeated use of disposable masks and not washing cloth masks could create further risk of infection that needs to be dealt with through proper information to the public (39). As the country does not have proper incineration facilities, the government should think of setting up mobile incinerator plants rapidly to responsibly manage bio-medical waste.

Inclusive Financing for the Disadvantaged Communities

As we have analyzed the scenario over the past months of partial, a loss of 33 billion BDT a day to GDP is incurring. More than 10 million people are becoming further marginalized due to the loss of wages and jobs (40). The dilemma of life vs. livelihoods has put people at high risk of community transmission in the industrial districts after the ready-made-garment (RMG) manufacturers trade organization BGMEA decided to open the factories even before the end of lockdown. It was predicted that the government would not get support from the allied forces. Weak governance and policy put emergency responders, such as medical doctors and healthcare staff, police, security forces, and army personnel, at risk of infection. Already, thousands of doctors and members of the police force have been infected and died during this time.

The socio-economic fall-out from this pandemic is already high, particularly for the disadvantaged poor communities, day laborers, wage earners, RMG-sector workers, and small and medium business start-ups. Already the country's RMG sector has lost many global orders due to the pandemic, and the remittance flow is at its lowest. Job insecurity and financial insecurity is foreseeable, and concerns of a global depression will affect the local market as well as investors. The prime minister of Bangladesh already declared a stimulus package of 72,750 crore BDT, of which 30,000 crore BDT has been announced for the RMG sector, other large industries, and the service sector in an attempt to defeat the economic losses due to the coronavirus situation (41). However, on priority-basis the financial incentives should be given to the poverty-stricken disadvantaged communities first, as well as insurance for healthcare professionals at the frontline, emergency responders, and caregivers responsible for emergency handling. Purchasing intensive care unit (ICU) beds, protective equipment, diagnostic test kits, mechanical ventilators, and additional supports is required for these mentally and physically affected persons who have survived COVID-19. It is also imperative to continue taking precautions, including screening, isolation of suspected cases, and social distancing, even after the pandemic is over.

Finally, combating the global pandemic is not easy. The 46 statements that we have included in this analysis aid in identifying the associations among the psychosocial, socio-economic, and possible environmental crisis based on public perception in Bangladesh. Risk mitigation measures concerning the psychosocial, socio-economic, and environmental components of the public are necessary to combat a global pandemic. Therefore, with great advancements in the speed and power of science, international collaborations are required to provide knowledge about the virus and disease recovery. Moreover, it is highly recommended by WHO and other stakeholders from the national level to raise the testing speed and facilities in Bangladesh. Multi-sectoral involvement and proper relief facilities for unprivileged populations must be ensured.

CONCLUDING REMARKS

Without ensuring fundamental needs would be met, the lockdown due to COVID-19 has imposed mental stress on the public. The weak governance in the healthcare systems and limited healthcare facilities exacerbated the general public's fear and anxiety. The centralized COVID-19 testing facility and limitations of dedicated hospital units for COVID-19 patients hampered other critical patients from receiving healthcare services. As a country vulnerable to climate change, there might be some additional risk factors of occurring natural disasters, such as a tropical cyclone, which may add further pressure on the country. The closure of all educational institutions may increase the number of mentally depressed young people. As the business centres (except for groceries, pharmacies, and other daily necessities) are closed, it has put further stress on the country's economy. An infectious outbreak of dengue might be on the way that may have a cumulative/synergistic negative impact with COVID-19 on public health in Bangladesh. However, numerous factors that can be considered in the context of the current COVID-19 outbreak in Bangladesh are as follows: risk of community transmission, healthcare capacity, governance coordination, relief for the low-income population, biomedical waste management, and preparation for possible natural disasters. The recommendations collected in the perception study can be summarized as a need to increase COVID-testing rates and increase medical facilities. The decentralization of the COVID-19 medical facilities is particularly important due to the forced migration of more than 11 million people from Dhaka city to 64 districts of Bangladesh after the announcement of partial lockdown. In addition, proper risk assessment and dependable risk communication, a multi-sectoral management taskforce development, care of biomedical waste, ensuring basic support to vulnerable people, and good governance was suggested to reduce the psychosocial and socio-economic impact of the COVID-19 outbreak in Bangladesh. Finally, this assessment process could help the government and policymakers to judge the public perceptions to deal with the COVID-19 pandemic in densely populated lower-middle-income countries like Bangladesh.

DATA AVAILABILITY STATEMENT

All datasets presented in this study are included in the article/**Supplementary Material**.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Department of Public Health and Informatics, Jahangirnagar University, Bangladesh. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MB-D, MS, and MR planned the studies and developed the questionnaire. Informatics and data analysis and interpretation were maintained by MB-D, AI, MS, and MR. MB and LB revised and improved the manuscript as suggested by the reviewers. All authors reviewed and read the manuscript before final submission.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2020.00341/full#supplementary-material

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Parents' Stress and Children's Psychological Problems in Families Facing the COVID-19 Outbreak in Italy

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Objectives: The present study aimed to explore the effect of risk factors associated with the COVID-19 outbreak experience on parents' and children's well-being.

Methods: Parents of children aged between 2- and 14-years-old completed an online survey reporting their home environment conditions, any relation they had to the pandemic consequences, their difficulties experienced due to the quarantine, their perception of individual and parent-child dyadic stress, and their children's emotional and behavioral problems.

Results: Results showed that the perception of the difficulty of quarantine is a crucial factor that undermines both parents' and children's well-being. Quarantine's impact on children's behavioral and emotional problems is mediated by parent's individual and dyadic stress, with a stronger effect from the latter. Parents who reported more difficulties in dealing with quarantine show more stress. This, in turn, increases the children's problems. Living in a more at-risk area, the quality of the home environment, or the relation they have with the pandemic consequences, do not have an effect on families' well-being.

Conclusions: Dealing with quarantine is a particularly stressful experience for parents who must balance personal life, work, and raising children, being left alone without other resources. This situation puts parents at a higher risk of experiencing distress, potentially impairing their ability to be supportive caregivers. The lack of support these children receive in such a difficult moment may be the reason for their more pronounced psychological symptoms. Policies should take into consideration the implications of the lockdown for families' mental health, and supportive interventions for the immediate and for the future should be promoted.

Keywords: COVID-19, parents, children, parent stress, children behavioral problems, children emotional problems

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INTRODUCTION

On 30th of January 2020, WHO declared a Public Health Emergency of International Concern after the first clusters of people infected by COVID-19 were diagnosed in China (WHO, 2020). The day after, the Italian Government started to define the first containment measures, such as checking people entering the country from China, in order to prevent the expansion of the contagion in the

country (Government, 2020). However, from the second half of February the number of Italian cases increased, especially in Northern Italy. This led the Government to announce on February 21st the first restrictive measures in what was defined as the first Red Zone, including defined territories in the regions of Lombardia and Veneto, the areas most affected by the infection. Since the pandemic kept spreading around the country, the Prime Minister issued on March 9th a decree which extended to the entire national territory the restrictions already in force locally. The rules were supposed to last until April 3rd, but were extended by two more decrees firstly until April 13th and, later, until May 3rd (Government, 2020). At the time of writing (April 26th, 2020), there were in Italy 199,000 confirmed cases and 26,977 deaths, more than half of which occurred only in Lombardia and Veneto. When the data of the present study were collected (between the 2nd and the 7th of April), those numbers were still increasing, showing that the end of the pandemic is still a long way off.

The measures, known as #Iamstayingathome (#IoRestoaCasa), include the closure of shops, except those selling crucial necessities, the cancellation of all sports events, and the shutdown of schools and universities across the country (Government, 2020). With schools, all the educative supporting services directed to children of all ages were closed, with teachers from primary grade onwards providing online lectures. Quarantine began for the entire population; everyone was banned from leaving home except for non-deferrable and proven work or health reasons, or other urgent matters. Smart working has been incentivized, but since most activities are closed many people lost their job or went through a severe reduction of their income.

The life condition of families suddenly and deeply changed. In the home environment, the educational role of parents for children has become even much crucial than before. Children have only their parents around them, to provide support with homework when necessary and promote a positive development and new learning experiences for toddlers and preschoolers (Wang et al., 2020). Parents have been left alone not only in taking care of home-schooling their children, but also in general in the management of their children and of the home environment. All other educational services are closed, babysitters and grandparents are not available, and contact with peers is not allowed. Many parents also must do smart-working, and handling time and spaces to work with children around may be very problematic. Though quarantine means that time that can be shared with loved ones has increased, it also poses a major burden on parents' shoulders, as they are called to take an educational role while also trying to live their own lives and get on with their everyday job commitments. This situation has significantly increased the risk of experiencing stress and negative emotions in parents, with a potentially cascading effect on children's wellbeing (Sprang and Silman, 2013).

Hence, despite its positive effect in reducing the number of new infected cases, the mobility restriction and social isolation associated with quarantine are major concerns for families' psychological wellbeing. Related to this, the health care situation of the country is fragile, calling for attention. Hospitals are overcrowded, and the number of deaths is still increasing, as well as the number of infected people and those recovering in hospitals (Government, 2020). It is becoming very common to know at least one person who tested positive to COVID-19 or was hospitalized, and, most regretfully, to have experienced the loss of a person due to COVID-19. This might generate fear and preoccupation in parents and children, even for families who do not have to face health problems (Liu et al., 2020). Literature concerning previous experiences all over the world that may have some aspects in common with the COVID-19 situation reported a high presence of psychological distress such as depression, stress, irritability, and post-traumatic stress symptoms associated with quarantine (Hawryluck et al., 2004; Brooks et al., 2020) with long-lasting effects continuing for years after the event (Liu et al., 2012).

The majority of studies conducted during previous pandemics and from the beginning of the COVID-19 outbreak examined psychological consequences on the general population, leaving the study of effects on parents and children mainly unexplored, with few exceptions (Brooks et al., 2020). One study found that levels of post-traumatic stress were four times higher in children who had been quarantined than in those who were not (Sprang and Silman, 2013). A preliminary study conducted in China reported the presence of psychological difficulties in children during the COVID-19 pandemic, with fear, clinging, inattention, and irritability as the most severe symptoms for younger children (Jiao et al., 2020). Still, mechanisms that might explain what specific COVID-19 related risk factors put children more at risk of negative outcomes, and what is the interplay between COVID-19 lockdown and parents' wellbeing on children's adjustment, have not been investigated yet. A deeper understanding of family processes, protective factors, and risk factors in the home environment might be important if the wellbeing of children is to be promoted in these difficult times (Wang et al., 2020).

The present study wants to shed light on families' well-being during the COVID-19 outbreak in Italy, by exploring parents' and children's individual and dyadic adjustment after one month of quarantine. Understanding parents' and children's reactions and emotions, and identifying risk and protective factors, is essential to properly address their needs to tailor present and future intervention programs (Sprang and Silman, 2013).

In general, little is known about which factors may be associated with protection against child behavioral and emotional problems during a health emergency. In order to fill this gap, the main aim of the present study was to explore how pandemic-related variables, structural aspects of the home and family environment, and parental subjective experience of stress and adjustment to the quarantine, affect the wellbeing of parents and children, and how in turn the well-being of parents and children are associated. Specifically, we explored both individual parent stress and dyadic perception of stress since it is well-know that both levels of stress may impair children's well-being (Belsky, 1984; Abidin, 1992; Madigan et al., 2018; Martin et al., 2019). We expected that implications of the COVID-19 outbreak might

Abbreviations: SDQ, Strengths and Difficulties Questionnaire; PSI, Parenting Stress Index Short form.

increase parents' psychological difficulties, particularly stress both at the individual and the dyadic level, with a consequent negative impact on children's emotional and behavioral well-being (Dalton et al., 2020).

METHODS

Study Design and Participants

Parents filled out an anonymous online survey, after reading the written consent form and explicitly agreeing to take part in the study. The survey was shared via social media for a limited time (from April 2nd to 7th, 2020), targeting parents of children aged 2- to 14-years-old. In the case of multiple children, the parent was asked to report on one child only. All the questionnaires, both parent- and child-related, were completed by the parent. There was no monetary compensation for participating. The final sample providing information on all study variables consisted of 854 parents living in Italy, of which 797 were mothers (*M*age = 38.96(6.02) (49% of whom had a high school degree or less, 37% a bachelor's or master degree, and 21% a higher education degree) and 57 were fathers (*M*age = 41.9(6.75) (41% of whom had a high school degree or less, 33% a bachelor's or master degree, and 26% a higher education degree). Children's mean age was 7.14 (3.38); 427 were boys. A total of 271 parents were resident in the north of Italy where most COVID-19 cases, were registered i.e., Lombardia and Veneto (from now on defined as the Red Area). Data reported in this study are part of a wider longitudinal research project designed with multiple purposes related to the investigation of the psychological impact of the COVID-19 outbreak in Italian parents and children. The study was approved by the ethical commitment of the Department and was conducted according to the American Psychological Association guidelines in accordance with the 1964 Helsinki Declaration.

Measures

COVID-Contact Risk Index

An *ad-hoc* index was computed to evaluate the amount of contact the parent had with people directly affected by the virus, following the assumption that the greater the number of contacts, and the closer the people affected by COVID-19 that the parent knows are to the parent, the greater the impact on psychological wellbeing would be. One point was given for each of the following if present: the parents tested positive for the virus, a familiar or close friend tested positive, a familiar/close friend was hospitalized, a familiar/close friend died. A half=point each was given if the parent knew a person (not familiar or close friend) who tested positive, was hospitalized, or died.

Home Environment Risk Index

An *ad-hoc* risk index was computed to evaluate the house and family situation, including factors supposed to be related to the quality of life condition. One point was given for each of the following: loss of job due to the pandemic, absence of external spaces (balcony or garden), total family income less than 1250 € per month, only one adult in the house in charge of the child, no Wi-Fi, no pets. To compute the index, this score was summed with the number of rooms/number of people ratio in the house.

Quarantine Parent Risk Index

Difficulties experienced by parents during the quarantine were investigated with a newly developed pool of 13 items. Parents were asked to indicate, using a 7-point Likert scale, how difficult they were perceiving, during the last week, dealing with several aspects related to the quarantine such as finding a relaxing space alone to unplug, time for the partner and for kids, and to do activities such as sport, reading, cooking, etc. (see Appendix 1 for the full list of items). Cronbach's alpha was 0.84, with 95% CIs [0.83–0.84].

Parent's Dyadic Parenting Stress

Perception of parent's stress in the parent-child interaction was investigated using the 15 items Parent/Child Dysfunctional interaction domain of the Parenting-Stress Index Short Form (PSI) (Abidin, 1995). The scale investigates with a 5-point rating scale the extent of parents' agreement or disagreement with statements describing the parent–child relationship as difficult to manage. Cronbach's alpha in the current study was 0.86, 95% CIs [0.86–0.86].

Parent's Individual Stress

Parent's individual perception of stress was investigated using the 7 items from the Stress subscale of the Depression Anxiety Stress Scale–Short form (DASS) (Lovibond and Lovibond, 1995). The scale provides on a 5-point rating scale a measure of individual symptoms indicating stress i.e., irritation and agitation. To obtain the total score, items are summed. Cronbach's alpha in the current study was 0.88, 90% CIs [0.88–0.89].

Children's Psychological Problems

Behavioral and psychological problems in children were investigated using the parent-report form of the Strengths and Difficulties Questionnaire (SDQ) (Goodman, 2001). The current study focuses specifically on the following subscales: emotional symptoms, hyperactivity-inattention, and conduct problems. Each subscale is measured by 5 items, rated on a 3-point scale. To obtain the total scores, items are summed. Cronbach's alpha in the current study were as follow: 0.64 for the emotional symptoms scale (90% CIs [0.62–0.66]), 0.73 for the hyperactivity-inattention scale (90% CIs [0.72–0.75]), and 0.53 (90% CIs [0.51–0.55]) for the conduct problems scale. Values were comparable to those reported in the Italian evaluation of the SDQ (Tobia and Marzocchi, 2018).

Analytic Plan

First, descriptive statistics and bivariate correlations among study variables were presented. Afterwards, two multivariate mediation models were tested, including as a predictor relevant quarantine-related risk factors (derived from the correlational analysis), as a mediator parents' stress (in one model dyadic parenting stress was explored as the candidate mediator, in the other model it was individual stress) and as outcomes children's psychological problems at the SDQ. Mediation models were compared with a with a null model and a main effect model, including only quarantine-related risk factors as the predictor. Akaike weights, providing the probability of a model to support new data

TABLE 1 | Descriptive and bivariate correlations.

	Mean (SD)	1	2	3	4	5	6	7	8	9
1.COVID-RI	0.33 (0.54)									
2. Home-RI	1.85 (0.91)	−0.05								
3. Quarantine parent-RI	46.29 (16.02)	0.07	−0.04							
4. Red Area		0.15**	−0.03	0.10*						
5. Child age	7.14 (3.83)	0.02	0.03	−0.22**	0.03					
6. PSI stress	22.01 (7.65)	−0.02	0.10*	0.20**	0.00	0.13**				
7. DASS stress	29.57 (10.28)	0.07*	0.05	0.36**	0.03	−0.08*	0.41**			
8. SDQ emotional symptoms	7.09 (1.84)	−0.01	0.02	0.17**	0.05	0.13	0.39**	0.32**		
9. SDQ Hyper.–inattention	8.90 (2.31)	−0.06	0.09*	0.22**	0.03	−0.21	0.44**	0.32**	0.32**	
10. SDQ conduct problems	7.23 (1.56)	−0.05	0.10*	0.23**	0.01	−0.05	0.47**	0.33**	0.38**	0.54**

*RI, Risk Index; Red Area: 1, Lombardia or Veneto; 0, all other regions. PSI stress, Dyadic parenting stress in the child-parent interaction as from the Parenting Stress index; DASS stress, Individual stress as from the Depression Anxiety Stress scale; SDQ, Strengths and difficulties questionnaire. *$p < 0.05$, ** $p < 0.001$.*

conditional on the set of models considered, were used for model comparison (Wagenmakers and Farrell, 2004). Parameters were investigated for the best fitting model. Finally, as a follow-up analysis, we explored whether results were comparable distinguishing between parents' living in the Red Area (including Lombardia and Veneto regions) with the rest of the sample. To this aim, we performed a multi-group analysis. Analyses were run using the statistical software R (Team, 2018), lavaan package (Rosseel, 2012). Plots were depicted using package ggplot2.

RESULTS

Descriptive Statistics

Means, SDs, and correlation values among variables of interest are reported in **Table 1**. Due to the large sample size, correlation values above 0.06 (i.e., trivial in effect size) were significant at $p < 0.05$; thus, for interpreting effects, we considered the strength of the association (namely Pearson's r) as an effect size. Results showed that overall there were no relevant associations of COVID-contact risk index and Home environment risk index with dyadic parenting stress (PSI), parent's individual stress (DASS), and children's psychological problems (SDQ).

Multivariate Regression Models

Because the only risk factor associated with parent's individual and dyadic stress and children's psychological problems was the Quarantine parent risk index, we did not include in the model the Home and COVID risk indices. Thus, models tested had as a predictor the Quarantine parent risk index, as the candidate mediator parent stress (dyadic and individual), and as outcomes children's emotional and behavioral problems.

For both the model including dyadic parenting stress as a mediator and individual stress as a mediator, the mediation model outperformed the null and main-effect regression model. Specifically, for the model including dyadic parenting stress as a mediator, Akaike weights were lower than 0.001 for both the null and the main effect model, and very close to 1.00 for the mediation model. The same weights were obtained for the comparison with the mediation model including individual stress. Standardized estimates of the two mediation models are reported in **Figures 1**, **2**. Parameters for indirect effects and proportion of variance explained for each outcome variable for the investigated models are reported in **Table 2**.

Follow-Up Analyses

Because of the significant association between study variables and age, we ran the analyses again, including the effect of the child's age on the mediator and outcome variables. Results remained stable overall. With a multi-group analysis, we finally explored whether results were comparable for residents in the Red Area (Lombardia and Veneto) vs. other regions. No relevant differences were identified. Results are available upon request to the corresponding author.

DISCUSSION

The COVID-19 outbreak is a completely new and unexpected situation currently affecting many countries. Italy was, after China, the second most highly affected country at the time, with the pandemic spreading very fast. In just a few weeks, the population found itself from thinking that the pandemic was happening far away, to being directly involved (Government, 2020). The closure of schools and the decision to keep children locked at home was obvious, but the consequences of all this for families' well-being were barely considered.

Our study is the first to examine the impact of the COVID-19 outbreak on parents' and children's wellbeing. We explored bivariate associations among the environment, family, and COVID-19 outbreak-related factors on parents' stress and children's psychological problems, and the interplay among these variables. Results showed that factors such as living in a more at-risk contagion zone or being in closer contact with the virus' effects do not relevantly affect parents' and children's well-being. This confirms findings from a preliminary study in China, where the difference in children's symptoms between areas identified by different levels of epidemic risk was not statistically significant (Jiao et al., 2020). Similarly, the quality of the environment, such as the physical characteristics of the living space, is not

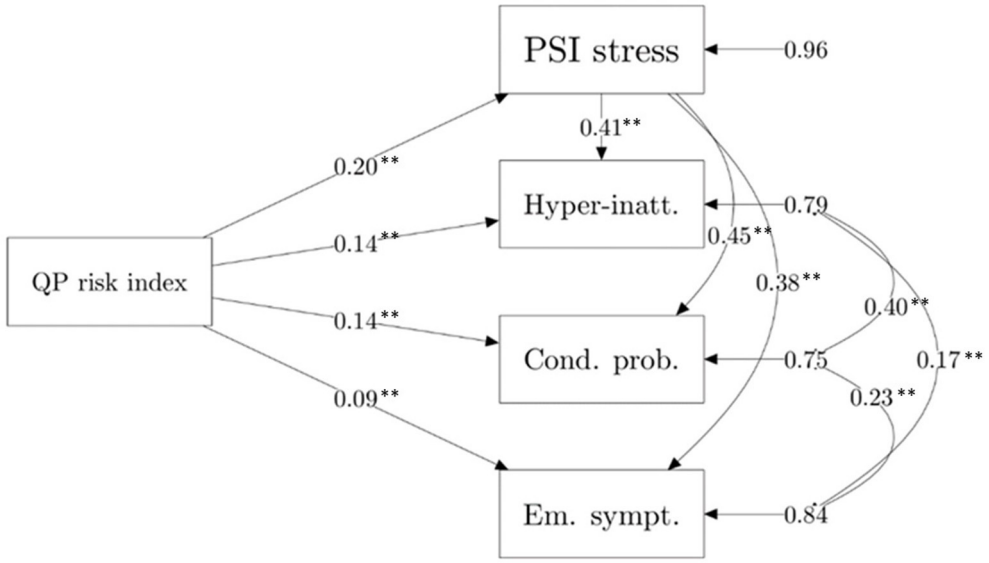

FIGURE 1 | Multivariate mediation model, including dyadic parenting stress (PSI stress) as a mediator. QP risk index, Quarantine parent risk index. $^{**}p < 0.01$.

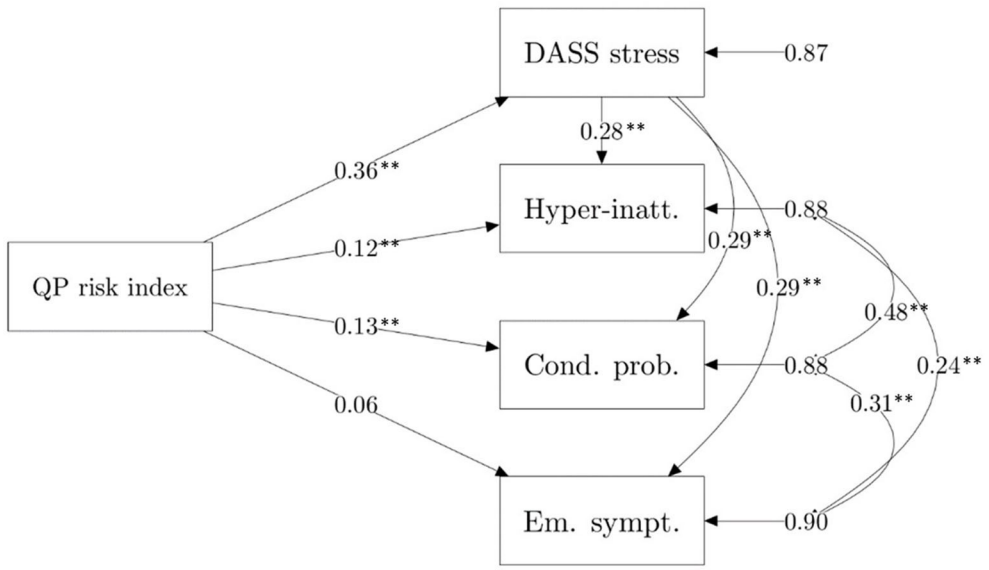

FIGURE 2 | Multivariate mediation model, including individual parent stress (DASS stress) as a mediator. QP risk index, Quarantine parent risk index. $^{**}p < 0.01$.

associated with parents' and children's psychological symptoms. Yet, it is the parents' individual perception of the situation, and more specifically how difficult they find it dealing with the many stresses the quarantine imposes, that is significantly associated with parent's stress and children's psychological problems, and that indirectly impacts on children's behavioral and emotional problems through the mediating role of parent's stress. Parents who report finding taking care of their children's learning, finding space and time for themselves, the partner, the children, and for the activities they used to do before the lockdown more difficult, are more stressed. This confirms studies that found an effect of the limitations associated with quarantine on the well-being of adults (Brooks et al., 2020). We further add to the literature that this stress is experienced both at the individual (e.g., being over-reactive, feeling nervous and irritated) and at the dyadic level (e.g., finding it difficult to enjoy interactions with the child, and child behavioral and emotional expressions). In addition, we pointed out that it is this stress that significantly impacts on children's well-being. Hence, it is mainly when the strains of quarantine affect the ability of the parent to enjoy and appreciate

TABLE 2 | Defined parameters.

	Dyadic parenting stress as mediator			Individual stress as mediator		
	ß	*p*	*R*-square	ß	*p*	*R*-square
Emotional symptoms			0.163			0.102
Indirect effect	0.074	<0.001		0.106	<0.001	
Total effect	0.167	<0.001		0.167	<0.001	
Conduct problems			0.245			0.124
Indirect effect	0.088	<0.001		0.103	<0.001	
Total effect	0.231	<0.001		0.231	<0.001	
Hyperactivity-inattention			0.214			0.117
Indirect effect	0.082	<0.001		0.100	<0.001	
Total effect	0.225	<0.001		0.225	<0.001	

the parent-child relational experience that the consequential negative impact on the child's well-being is stronger, a result with important implications for informing intervention programs that target the family and the child. Moreover, this impact is present at every age, even though our age range is quite wide. This underlines that the impact of the lockdown on parents and children is present with similar mechanisms for families with children younger than 14 years.

The effect we identified in our study may be explained in many ways. More stressed parents find it more difficult to understand their child's needs and to respond in a sensitive way (Abidin, 1992; Scaramella et al., 2008). Stress is often associated with rude behaviors and difficulties in explaining limits and discipline. Thus, children in these families may feel less understood by their parents and may react in more negative and aggressive ways (Pinquart, 2017). Moreover, we know that children have lower personal resources to deal with the many changes the pandemic is imposing on their life (Liu et al., 2020) and guidelines suggest parents should discuss and explain the situation with them, since correct information about what is happening and the reasons for the restrictions children have to face is crucial to prevent negative psychological consequences (Dalton et al., 2020). However, how and when to do that is completely left up to the parents' choice. We can speculate that more stressed parents may be too overwhelmed by the situation to find appropriate ways to be a supportive figure for their children and to find the best ways to address children's questions and fears (DiGiovanni et al., 2004). When children do not find responsive answers to their preoccupations from adults, they may show more distress, evidenced by more emotional and behavioral problems as well as inattention and difficulties in concentrating.

These results suggest many interesting implications that should be addressed in the present and in the future in Italy, and in all countries involved in the pandemic, if we want to promote children's wellbeing, and prevent the onset of more severe behavioral and emotional problems. The pandemic and the quarantine associated with it require using personal resources to deal with everyday life and fears and worries. Correct information and guidelines have to be given to adults about how this stressful situation may affect their personal and children's wellbeing. Public health should provide parents with knowledge about, for instance, how children at different ages express distress and the importance of sharing and talking about fears and negative emotions (Dalton et al., 2020). In this way even less resilient and more stressed parents may be helped in finding ways to understand and support their children (Belsky, 1984).

The closure of schools may have also contributed to this phenomenon. Firstly, because parents are left alone dealing with their children's education and learning, this may be a very challenging duty. Moreover, teachers have a role not only in delivering educational materials but also in offering an opportunity for children to interact, and to receive from them support and explanations. Organizing online courses in a way to also improve the possibility for children to interact with their teacher about things outside of the learning context should be a priority especially if school closures are to be prolonged. Moreover, the Government should take into consideration the impact of school closures on parents by finding ways to help them deal with the learning experience of children and with having children at home 24/7, while parents also have to manage home-working and childcare. This is going to be even more relevant if, during the second phase of the emergency, job activities will re-open, and parents will be asked to go back to work, but schools will be kept closed. How are parents supposed to deal with this?

Some limitations of the present study should be addressed. Firstly, this is a correlational study; a longitudinal exploration of the effects of quarantine on parents and the cascading effects on children over time would help in better understanding the phenomenon. Moreover, we have collected children's psychological symptoms from parent reports; although this data collection method is widely used it may be less informant than child reports or direct evaluation of children's well-being made by experts. Lastly, we may expect that quarantine risk is higher for more at-risk families i.e., families of separated parents, families with children with disabilities, very poor families, etc. The exploration of the phenomenon with those in at-risk situations would help in developing more tailored interventions.

If properly supported by healthcare professionals and other social connections, including the school environment, parents

and children can appropriately overcome this critical period of distress and avoid severe long-term consequences. Quarantine and social distancing are efficient ways to deal with the pandemic, but these experiences may have consequences on people's well-being. However, the media and public institutions concentrate primarily on physical health to recommend steps for the prevention and containment of the disease, leaving the impact on mental health undiscussed. Indeed, stable mental health is one of the keys to fight this ongoing pandemic and to restore a post-pandemic society; the well-being of parents and children must be under surveillance since problems on this side may have long-lasting implications.

As Bowlby suggested 30 years ago, "Man and woman power devoted to the production of material goods counts a plus in all our economic indices. Man and woman power devoted to the production of happy, healthy, and self-reliant children in their own homes does not count at all. We have created a topsy-turvy world" (Bowlby, 1988).

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Department of Neuroscience, Imaging and Clinical Sciences. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MS, FL, and MF conceptualized the study and organized the data collection. MS and FL wrote the first draft of the manuscript. FL and MP run the analyses and wrote the results section. All authors contributed to revision of the final version of the manuscript.

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The Psychological Impact of the COVID-19 Outbreak on Health Professionals: A Cross-Sectional Study

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Background: The COVID-19 pandemic had a massive impact on health care systems, increasing the risks of psychological distress in health professionals. This study aims at assessing the prevalence of burnout and psychopathological conditions in health professionals working in a health institution in the Northern Italy, and to identify socio-demographic, work-related and psychological predictors of burnout.

Methods: Health professionals working in the hospitals of the Istituto Auxologico Italiano were asked to participate to an online anonymous survey investigating socio-demographic data, COVID-19 emergency-related work and psychological factors, state anxiety, psychological distress, post-traumatic symptoms and burnout. Predictors of the three components of burnout were assessed using elastic net regression models.

Results: Three hundred and thirty health professionals participated to the online survey. Two hundred and thirty-five health professionals (71.2%) had scores of state anxiety above the clinical cutoff, 88 (26.8%) had clinical levels of depression, 103 (31.3%) of anxiety, 113 (34.3%) of stress, 121 (36.7%) of post-traumatic stress. Regarding burnout, 107 (35.7%) had moderate and 105 (31.9%) severe levels of emotional exhaustion; 46 (14.0%) had moderate and 40 (12.1%) severe levels of depersonalization; 132 (40.1%) had moderate and 113 (34.3%) severe levels of reduced personal accomplishment. Predictors of all the three components of burnout were work hours, psychological comorbidities, fear of infection and perceived support by friends. Predictors of both emotional exhaustion and depersonalization were female gender, being a nurse, working in the hospital, being in contact with COVID-19 patients. Reduced personal accomplishment was also predicted by age.

Conclusions: Health professionals had high levels of burnout and psychological symptoms during the COVID-19 emergency. Monitoring and timely treatment of these conditions is needed.

Keywords: COVID-19, burnout, depression, anxiety, post-traumatic stress, predictors, clinical psychology, cross-sectional study

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INTRODUCTION

At the end of 2019, the coronavirus disease (COVID-19) first appeared in China, in particular in Whang City, in Hubei province (Wang et al., 2020a). In March 2020, due to the global spread of the disease, COVID-19 was declared as a pandemic, causing widespread concern (World Health Organization, 2020b). In fact, COVID-19 is an international public health emergency unprecedented in modern history and it causes several health and psychological problems among general population including high level of anxiety, depression and stress (Ornell et al., 2020).

As of the first half of May, 2020, Italy was one of the most affected countries during this outbreak, counting over 223,000 individuals infected by COVID-19 and more than 31,000 casualties (World Health Organization, 2020a). The high prevalence of the disease in the Northern regions of the country led to a national reorganization of the hospital network and caused sudden changes in the personal and professional lives of healthcare professionals.

Epidemic studies proved that previous infectious diseases caused long-term and persistent psychopathological consequences among this category (Tam et al., 2004; Lee et al., 2007). For example, during and after the Severe Acute Respiratory Syndrome (SARS) outbreak in 2003, frontline healthcare professionals self-reported lack of support in the workplace and consequently severe psychological symptoms as acute distress (Tam et al., 2004). Also, in 2015, during the Middle East respiratory syndrome (MERS) outbreak, the medical staff showed an increased long-term risk of developing post-traumatic stress disorder (PTSD), leading to a boost in absenteeism from work (Lee et al., 2018). SARS and MERS experiences crucially compromised healthcare professionals' well-being. In fact, during epidemic emergencies, as it is happening during COVID-19, frontline care workers experience an unexpected increase in workload in a context of uncertainty and powerlessness, and are more vulnerable to the infection due to their direct contact with patients, which also increases in turn their concerning about infecting their families and colleagues (Liu et al., 2020; Ran et al., 2020). As of the end of April 2020, about 12,000 between doctors and nurses were infected by COVID-19, and 228 doctors and 26 nurses had died (Fusaroli et al., 2020; Manzoni and Milillo, 2020). Non-frontline healthcare workers are also at risk for increased stress due to reduced accessibility to formal psychological support, less first-hand medical information on the outbreak, less intensive training on personal protective equipment and infection control measures (Tan et al., 2020a).

During pandemics, general population have been safeguarded with several precautionary measures including shutdown or slowdown in daily activities, social distancing, reductions in interactions between people, wearing face masks and have good ventilation to reduce the possibility of new infections (Tan et al., 2020b; Wang et al., 2020b; Wilder-Smith and Freedman, 2020). On the contrary, healthcare professionals were exposed to longer work shifts, in order to manage the growth of health care demand (Huang et al., 2020; Ornell et al., 2020). These critical conditions are exacerbated by the need of wearing personal protective equipment which cause discomfort and difficulties in breathing.

At the beginning of the spreading of the virus, hospitals had limited availability of personal protective equipment and guidelines or treatment were not well-established (Xiang et al., 2020). Therefore, many professionals felt confused and unprepared to treat adequately patients infected by the new virus (Huang et al., 2020). As a consequence, they perceived feelings of uncertainty, helplessness, alienation, isolation and difficulties in managing the workload. Furthermore, operators had to face loneliness, perception of stigma and rigid expectations, which can lead to several emotional and psychological outcomes as anger, anxiety, insomnia, and stress related to the uncertainty of the outbreak (Ran et al., 2020; Zhang et al., 2020). All the above-mentioned risk factors can induce more likely the onset of burnout (Ornell et al., 2020).

Burnout can be defined as a psychological syndrome characterized by chronic exhaustion, cynicism and ineffectiveness and it emerges as a response to the presence of highly stressful conditions in the workplace (Maslach and Goldberg, 1998). The presence of burnout among health operators, in particular but not limited to doctors and nurses, has a very strong impact both on their physical and psychological health and on the efficiency of their organization and work (Portoghese et al., 2014; Low et al., 2019; Woo et al., 2020). Usually, burnout occurs following long-term exposition to organizational risk factors but critical emergences, like pandemics, can easily trigger emotional exhaustion (Kim and Choi, 2016).

During pandemics or other critical situations, protective factors can help healthcare professionals to cope with the emergency. For instance, after SARS, health professionals reported that clear directiveness and support from the supervisors, adequate training, precautionary measures, social, religious, and familiar support were the most effective coping strategies (Chan and Huak, 2004; Cheng and Wong, 2005; Maunder et al., 2006). Personality traits also proved to influence health professionals' responses to the pandemics. In fact, during SARS emergence, optimism, resilience and altruism reduced psychological distress among healthcare workers (Bai et al., 2004; Lee et al., 2007).

Furthermore, after MERS, medical staff sustained that several factors including strict protective measures and guidance, the presence of a cohesive team, positive attitudes in the workplace and the recognition of their efforts by the hospital helped them to face the situation (Khalid et al., 2016).

Recent scientometric analysis found that the most common research topics include emergency care and surgical, viral pathogenesis, and global responses in the COVID-19 pandemic but there is a lack of mental health research and only few studies addressed the impact of the COVID-19 pandemic on healthcare professionals' well-being (Tran et al., 2020). Therefore, the main objective of this study is to identify the prevalence of burnout and psychological distress in health professionals during the early phases of the pandemic. The secondary objective of this study is to assess the demographic, psychological, and work-related predictors of burnout.

MATERIALS AND METHODS

This study is part of a broader project, the COV-BHP study, which is a prospective cohort study aimed at identifying the prevalence and predictors of burnout and psychological distress in health professionals working in the Hospitals of the Istituto Auxologico Italiano. The Istituto Auxologico Italiano is a scientific and clinical institution operating with three main hospitals in Lombardy and Piedmont (Northern Italy), the regions with the higher transmission rates and mortality in Italy (Dipartimento della Protezione Civile, 2020). About 800 health professionals work in this Institution. All of them were informed about the study through an institutional e-mail message, which also reported an anonymous link that enabled to be enrolled in the study after giving an informed consent. The e-mail was sent on April 16, 2020 and data collection was discontinued on May 11, 2020. The whole study was performed using online questionnaires implemented using the Qualtrics software, version 03/2020 (Qualtrics, Provo, UT). The study was approved by the Institutional Ethical Committee.

Measurement Instruments

Data collected in the survey included:

- Socio-demographic and clinical factors: gender, age, occupation, current working situation (full-time working in the Hospital, part-time working in the Hospital, working from home, being quarantined), medical or psychopathological comorbidities;
- COVID-19 emergency-related work factors: number of hours per week spent working, exposure to COVID-19 cases (no exposure, exposure to suspect COVID-19 cases, exposure to confirmed COVID-19 cases), working in wards dedicated exclusively to the care of patients with COVID-19 patients, number of days since the professional's working situation changed because of COVID-19;
- COVID-19 emergency-related psychological factors: single items measured through a cursor on a pointed scale from 0 to 100, adapted from a previous study on MERS epidemic (Kim and Choi, 2016). COVID-19 emergency-related psychological factors included fear of COVID-19 infection due to work-related exposure ("I am afraid of being infected with COVID-19 since I deal with COVID-19 patients"), perceived support from family and friends ("My family supports me even if my work carries risks of infection," "My friends supports me even if my work carries risks of infection")of for caring for COVID-19 patients"); chances to find spiritual comfort ("In facing the COVID-19 crisis, I find comfort in spirituality");
- State Anxiety: State-Trait Anxiety Inventory—State form (STAI-S) (Spielberger et al., 1983). The STAI-S measures participant's state anxiety, i.e., the transitory state of fear and emotional tension as a response to a perceived threatening situation. The STAI-S includes 20 items on a 4-points Likert scale (not at all, somewhat, moderately so, very much so), with higher values indicating higher state anxiety. Examples of its items are "I am tense" and "I am worried." The cut-off value of 40 was employed to identify participants with clinical levels of anxiety (Spielberger et al., 1983). This scale has been widely validated and its Italian translation has shown good psychometric properties (Pedrabissi and Santinello, 1989);
- Psychological distress: Depression, Anxiety and Stress Scale-21 (DASS) (Lovibond and Lovibond, 1995). This scale includes 21 items measured on a 4- points Likert scale (never, sometimes, often, almost always) which measure the three psychological subdimensions of psychological distress, namely anxiety (e.g., "I felt I was close to panic"), depression (e.g., "I felt that I had nothing to look forward to") and stress (e.g., "I found it difficult to relax"). Higher values indicate higher psychological distress. Clinical levels of depression, anxiety and stress were detected identifying values above the 75° percentile based on normative data (Henry and Crawford, 2005). This scale has been validated in Italian and provides reliable and valid measurements of psychological distress in health workers (Bottesi et al., 2015);
- Post-traumatic symptoms: Impact of Event Scale—Revised—6 items version (IES-6) (Weiss, 2007). The IES-6 is a reduced version of the 22-items IES-R instrument. It is a self-report questionnaire assessing psychological distress in response to a traumatic event. It includes 3 subscales, representing symptoms clusters of post-traumatic stress: intrusion (e.g., "I thought about it when I didn't mean to"), avoidance (e.g., "I tried not to think about it") and hyperarousal (e.g., "I felt watchful or on guard"). Respondents are asked to indicate on a 5-point Likert scale ranging from never (score 0) to often (score 4) how frequently each symptom was experienced during the past week. The cut-off of 9 was used to dichotomize the total score (Thoresen et al., 2009). The Italian translation showed psychometric features similar to the original version (Giorgi et al., 2015);
- Burnout: Maslach Burnout Inventory (MBI) (Maslach et al., 1997). The MBI is a 22-items questionnaire on a 5-points Likert scale which assesses the three theoretical components of burnout syndrome, namely emotional exhaustion ("I feel emotionally drained from my work," depersonalization ("I feel I treat some patients as if they were impersonal objects") and personal accomplishment ("I deal very effectively with the problems of my patients). Higher scores in the emotional exhaustion and depersonalization scales indicate greater burnout, whereas higher scores in the personal accomplishment subscale indicate less burnout. Cutoffs for moderate and severe emotional exhaustion were $\geq$17 and $\geq$27, for moderate and severe depersonalization $\geq$7 and $\geq$13, and for moderate and severe reduced personal accomplishment $\leq$38 and $\leq$21 (Maslach et al., 1997). The MBI Italian translation has been validated for its use on health workers (Sirigatti et al., 1988).

Statistical Analysis

Descriptive statistics are presented as counts and proportions for categorical variables and means and standard deviations for continuous variables. For descriptive purposes, scores of the burnout and psychological distress questionnaires were categorized using the appropriate cut-offs. Associations between categorical variables and burnout components were assessed

using point-biserial correlations, whereas associations between continuous variables and burnout components calculating Person's r coefficient. Predictors of the burnout components, analyzed as continuous variables, were then assessed using elastic net linear regressions. Briefly, elastic net regression is a penalized linear regression analysis technique which enables to address multicollinearity between the predictors and to select the most important ones. This is done by regularizing (shrinking) their estimated β coefficients applying a penalization based on two hyperparameters. The first hyperparameter is α, which identifies the type of penalty, which ranges from a ridge penalty (based on the squared magnitude of the coefficients) when α approaches 0 to a lasso penalty (based on the absolute magnitude of the coefficients) when α approaches 1. The second hyperparameter is λ, which identifies the amount of penalization (Zou and Hastie, 2005).

We used 10-fold repeated (10 times) cross-validation to train and tune our model over a grid of α and λ hyperparameters on half of the sample, which constituted the training dataset. The model was refit on the training dataset with the best performing hyperparameters to calculate the final penalized β coefficients. The model was then applied to the other half of the sample, which constituted the testing dataset, to calculate model performance. The above procedure was repeated for each of the three dependent outcome variables. Elastic net regression was performed using the R (version 3.5.1) packages *caret* (Kuhn, 2015) and *glmnet* (Friedman et al., 2010).

RESULTS

Description of the Sample and Prevalence of Psychological Symptoms

Three hundred and thirty out of the about 800 health professionals working in the Institution participated to the online survey. **Table 1** reports the demographic, work-related and psychological characteristics of the participants of this research.

Figure 1 represents the prevalence of burnout and psychological distress in the participants. Two hundred and thirty-five health professionals (71.2%) had state anxiety scores above the cutoff. Regarding burnout, 107 (35.7%) had moderate and 105 (31.9%) severe levels of emotional exhaustion; 46 (14.0%) had moderate and 40 (12.1%) severe levels of depersonalization; 132 (40.1%) had moderate and 113 (34.3%) severe levels of reduced personal accomplishment. Clinical levels of depression were identified in 88 participants (26.8%), clinical levels of anxiety in 103 (31.3%) and clinical levels of stress in 113 participants (34.3%). Finally, 121 (36.7%) reported symptoms of post-traumatic stress.

TABLE 1 | Demographic, work-related, and psychological characteristics of the study participants.

Variable	*N*	%	Mean	SD
Gender				
Male	124	37.4		
Female	206	62.6		
Age			44.6	13.5
Occupation				
Doctor	140	42.2		
Nurse	86	26.0		
Nurse assistant	38	11.5		
Physiotherapist	35	10.6		
Other	32	9.7		
Work status				
Working in the hospital	232	70.3		
Working from home or being quarantined	98	29.7		
Working in contact with COVID-19 patients				
Yes	238	72.2		
No	92	27.8		
Working in a COVID-19 ward				
Yes	188	56.8		
No	142	43.2		
Work hours during the last week			25.8	16.8
Having been infected by COVID-19				
Yes	88	26.5		
No	242	73.5		
Medical comorbidities				
Yes	80	24.2		
No	250	75.8		
Psychological comorbidities				
Yes	12	3.6		
No	318	96.4		
Fear of infection (range 0–100)			53.3	33.9
Support from family (range 0–100)			81.1	31.1
Support from friends (range 0–100)			74.2	32.9
Support from spirituality (range 0–100)			38.2	36.4
MBI—Emotional exhaustion (range 0–54)			22.3	11.4
MBI—Depersonalization (range 0–30)			4.7	5.4
MBI—Personal accomplishment (range 0–48)			33.7	6.8
STAI—State anxiety (range 20–80)			47.3	11.9
DASS-21—Anxiety (range 0–21)			3.3	3.6
DASS-21—Depression (range 0–21)			4.0	4.2
DASS-21—Stress (range 0–21)			6.8	4.8
IES-6—Intrusion (range 0–8)			4.0	2.3
IES-6—Avoidance (range 0–8)			2.8	1.9
IES-6—Hyperarousal (range 0–8)			3.2	2.1

MBI, Maslach Burnout Inventory; STAI, State-Trait Anxiety Inventory; DASS-21, Depression Anxiety Stress Scales; IES-6, Impact of Event Scale-6.

Predictors of Burnout

The associations between categorical and continuous predictors and burnout components are plotted in **Figure 2**. Variables with association coefficients > 0.3, corresponding to a weak or moderate effect, were age, occupation, being home, work hours, psychological comorbidities, contact with COVID-19 patients, fear of infection, support from family and support from friends.

Finally, elastic net regressions were performed. After model tuning, the best hyperparameter for the Emotional Exhaustion

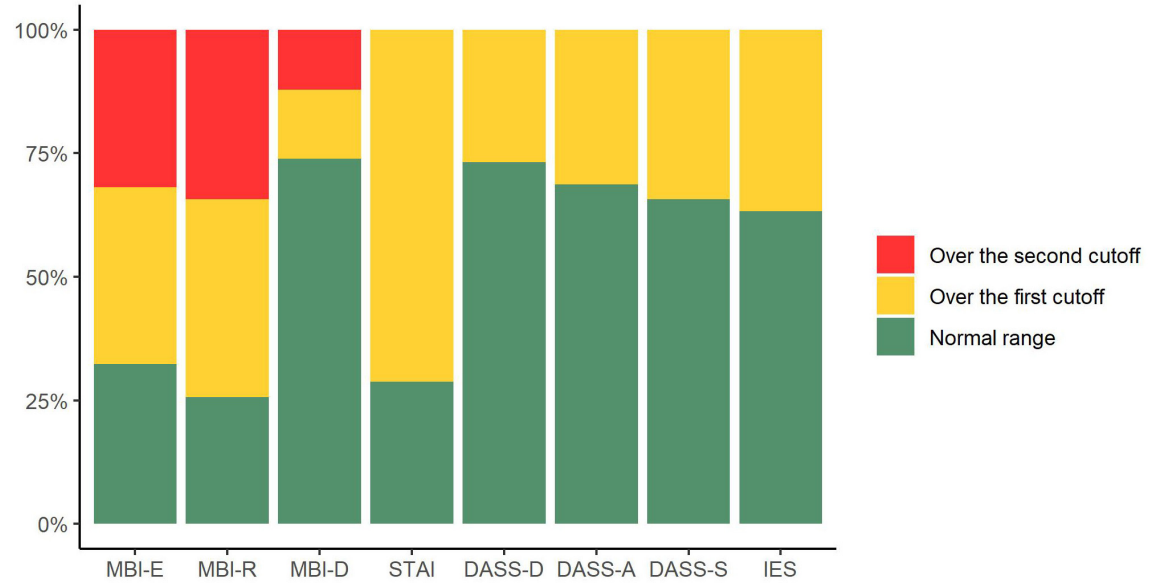

FIGURE 1 | Prevalence of burnout, state anxiety, trait anxiety, depression, stress, and post-traumatic symptoms in health professionals participating to the study. MBI-E, Maslach Burnout Inventory-Emotional Exhaustion; MBI-R, Maslach Burnout Inventory-Reduced personal accomplishment; MBI-D, Maslach Burnout Inventory-Depersonalization; STAI, State-Trait Anxiety Inventory; DASS-D, Depression Anxiety Stress Scales 21-Depression; DASS-A, Depression Anxiety Stress Scales 21-Anxiety; DASS-D, Depression Anxiety Stress Scales 21-Stress; IES, Impact of Event Scale-6.

subscale were $\alpha = 0.21$ and $\beta = 0.17$; for the Depersonalization subscale were $\alpha = 0.28$ and $\beta = 0.17$; for the Personal Accomplishment subscale were $\alpha = 0.16$ and $\beta = 0.60$. Selected predictors and their coefficients are reported in **Table 2**.

DISCUSSION

The main aims of this study were to assess the prevalence of burnout among health professionals during the COVID-19 pandemic and to evaluate its predictors. Results show that severe levels of burnout and psychopathological symptoms had high prevalence, and that the work-related and psychological factors associated with the necessity to cope with the COVID-19 emergency increase the risks of negative psychological consequences.

Moderate to severe levels of emotional exhaustion and reduced personal accomplishment were present in more than 60% of the sample, and moderate to severe levels of depersonalization in more than 25% of the sample. These results are novel since, to our knowledge, prevalence of burnout among health professionals during the COVID-19 pandemic has not been studied before. More importantly, these results have clear implications for both the professionals' health and efficiency of the health care systems. From the perspective of the professionals, burnout is associated with increased risks of both physical and psychological long-term detrimental consequences (Salvagioni et al., 2017). From the perspective of the health care systems, burnout is associated with increase in sick leave, absenteeism, job withdrawal and poor work efficiency (Salvagioni et al., 2017). Given the potential extended duration of the pandemic (Giordano et al., 2020), the negative impact of the high prevalence of burnout might worsen and reduce the capacity of health systems to cope with the increased demand of care that is likely to occur both in the short- and in the long-term (Boukhris et al., 2020; Leocani et al., 2020; Liebensteiner et al., 2020).

Analysis of burnout was complemented with the assessment of other psychological disorders. This helped to overcome the limitations of the cutoffs of burnout measures (Schaufeli and Van Dierendonck, 1995; Bianchi, 2015). In particular, prevalence of clinical levels of depression, anxiety, stress was higher than 25% in our sample. A previous rapid review with meta-analysis on 12 studies performed in China and one study performed in Singapore found that anxiety, depression and insomnia prevalence among health professionals during the COVID-19 outbreak was 23.2, 22.8, and 38.9%, respectively (Pappa et al., 2020). Taken together, these findings confirm that the impact of the pandemic on the health professionals' psychological health is massive. The respondents also showed very high levels of state anxiety, which might suggest the presence of a pervasive state of tension that could help the development or worsening of burnout and psychological distress symptoms. In addition, more than one participant out of four also showed post-traumatic symptoms. Previous studies performed after the SARS pandemic show conflicting results regarding the presence of post-traumatic symptoms among health workers, potentially attributable to the preparedness to face the emergency (Chan and Huak, 2004; Lee et al., 2007). The high prevalence of these symptoms that was found in this study might suggest the lack of preparation to face the emergency, and that the COVID-19 emergency has the potential to trigger traumatizing experiences for health professionals.

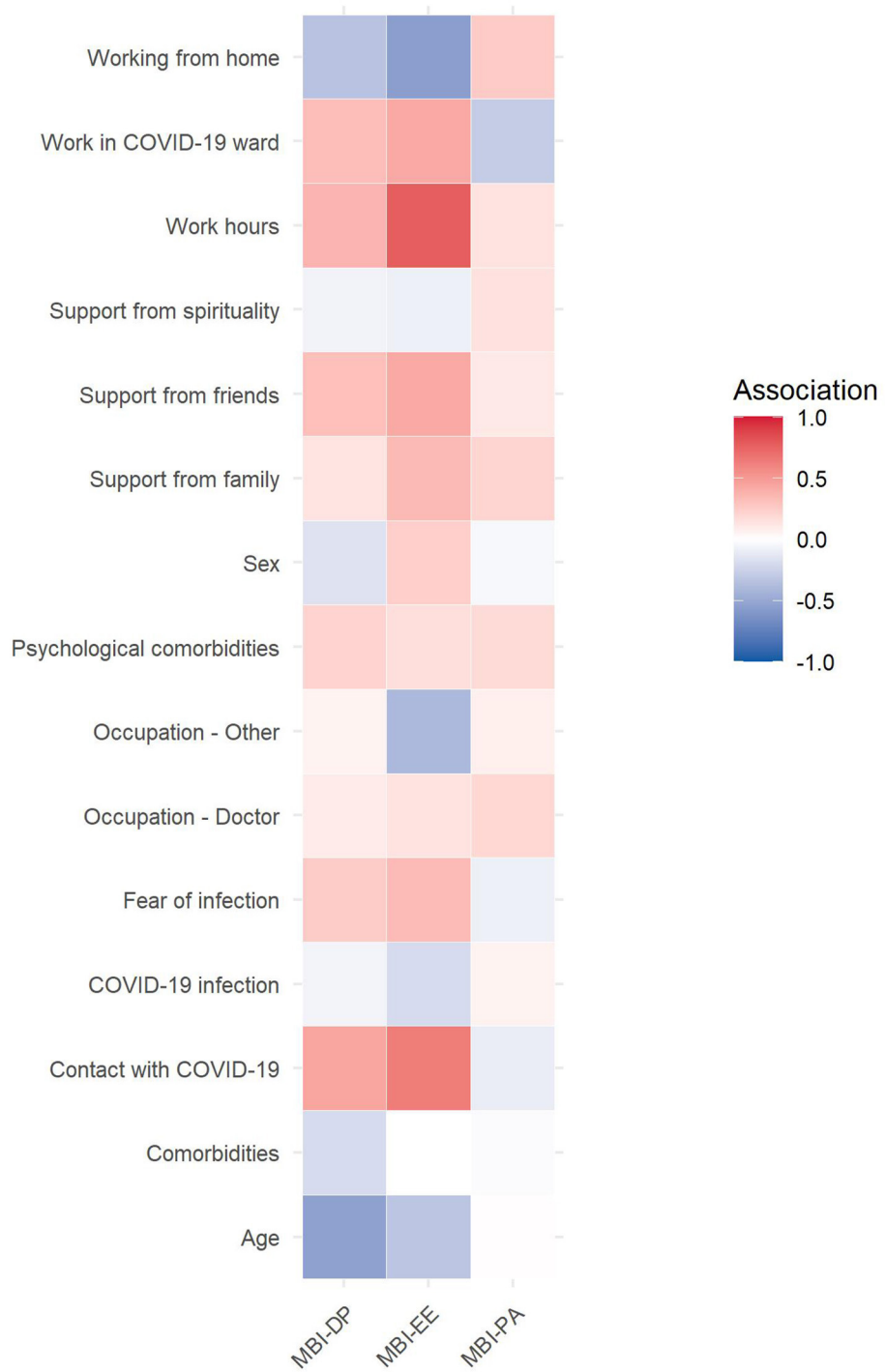

FIGURE 2 | Heatmap of the association between socio-demographic, COVID-19-related, and psychological factors and burnout components. Note. Association between categorical variables and burnout were assessed using point-biserial correlation, association between continuous variables and burnout calculating Pearson's r coefficients.

The regression models clearly show that the increased workload, the constant contact with COVID-19 patients and the psychological aspects related to their care are related to the levels of burnout. On the one hand, this calls for political and organizational decisions. Although the main focus of health care systems is on minimizing transmission, treating the infection, and saving lives, attention should be made to reduce the work-related burden on health professionals. Attention should

TABLE 2 | Results of the elastic net regression models investigating the predictors of the components of burnout.

	Emotional exhaustion	Depersonalization	Reduced personal accomplishment
	β[a]	β[a]	β[a]
Female gender	0.04	0.05	
Age			0.10
Occupation—Doctor (vs. nurse)			
Occupation—Other (vs. nurse)	−0.05	−0.07	
Work status—working from home or being quarantined (vs. working in the hospital)	−0.06	−0.07	
Work hours	0.20	0.18	−0.04
Presence of medical comorbidities			
Presence of psychological comorbidities	0.11	0.03	−0.01
Having been infected by COVID-19			
Being in contact with COVID-19 patients	0.08	0.09	
Working in a COVID-19 ward			
Fear of infection	0.14	0.14	−0.04
Support from family			
Support from friends	−0.05	−0.06	0.05
Support from spirituality			
Prediction R^2	0.13	0.14	0.11

Predictors were standardized before the analyses. All coefficients are penalized by the elastic net. Coefficients were computed using half of the sample and prediction R^2 using the other half of the sample. Coefficients shrunk to 0 are not displayed. [a]penalized beta.

be focused on promoting positive and protective strategies to cope with the emergency developed with the support of a dedicated psychologist.

On the other hand, these results show that presence of previous psychological comorbidities, fear of infection and feelings of isolation due to perceived lack of support from friends should be taken into account by interventions aimed at preventing the development of burnout in health professionals.

Timely recognition of this problem should help implement adequate prevention or rehabilitation strategies. In their review, Wiederhold et al. (2018) highlight that a successful intervention for burnout should take into account the broad range of causes and should incorporate a variety of different therapeutic tools. For this reason, it is necessary to promote monitoring of the health status, including mental health, of health workers during these moments of crisis. Several strategies could be implemented during and after the emergency to support health professionals working with COVID-19 patients, which include work-hour regulation programs, the implementation of strategies to reduce the pressure of difficult decision-making, planning official and unofficial rewards, providing individual or group psychological support programs, promoting focus groups to advance proposals for improvement of the organization of the work, providing individual and group skill training programs as well as online cognitive behavior therapy or mindfulness-based therapy (Ho et al., 2020).

The main limitation of this study is the heterogeneity of the sample. Although the inclusion of health professionals with different occupations and working in different wards allowed to provide a more complete picture of the impact of the pandemic, the variety of the respondents' characteristics. In addition, similarly to other studies performed during epidemics (Maunder et al., 2006; Lee et al., 2007), the respondent rate was low, indicating the risk of the auto-selection of the sample. Moreover, the cross-sectional nature of this study limits our understanding of the risk factors of burnout and suggests that longitudinal studies are needed for this purpose. Finally, the assessment of burnout, psychological distress and post-traumatic symptoms was performed using self-reported instruments which were not confirmed by medical records or specialistic evaluations.

In conclusion, this study shows that health professionals have a high risk of incurring in burnout or psychological conditions due to the COVID-19 pandemic. Continuous monitoring and timely treatment of these conditions is needed to preserve the professionals' health and to enhance the healthcare systems preparedness to face the medium- and long-term consequences of the outbreak.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because due to the nature of this research, participants of this study did not agree for their data to be shared publicly, so supporting data is not available. Requests to access the datasets should be directed to e.giusti@auxologico.it.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Comitato Etico dell'Istituto Auxologico Italiano. The participants provided their electronic informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

EG, EP, CS, and CM were responsible for drafting the manuscript. All authors critically revised it for important intellectual content, gave final approval to the finished manuscript, and agreed to be accountable for all aspects of the work.

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OPINION
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The Ethical Use of Telepsychiatry in the Covid-19 Pandemic

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INTRODUCTION

In a statement to the press, Dr. Hans Henri P. Kluge, World Health Organization (WHO) Regional Director for Europe, stressed that it is important not to lose sight of the mental health implications of Covid-19 for everyone, noting that "[i]t is absolutely natural for each of us to feel stress, anxiety, fear, and loneliness during this time" (1). If mentally healthy individuals react with fear and stress to the Covid-19 pandemic, it is not difficult to imagine that such reactions make those who have mental disorders especially vulnerable to harm.

CHALLENGES FOR PATIENTS WITH MENTAL DISORDERS IN TIMES OF COVID-19

Yao, Chen, and Xu (2) listed four reasons to explain why patients with mental disorders may be at particular risk in the Covid-19 pandemic. First, patients with mental disorders may be at increased risk of infection because they are less aware of the dangers or because they adhere less to official measures. Second, poor symptom recognition combined with stigmatization means that Covid-19 infection may not be detected as quickly, and treatment following infection may be compromised by various psychiatric comorbidities. Third, patients with mental disorders may be more vulnerable to the public panic and anxiety triggered by the pandemic, which may aggravate the symptoms of the underlying mental disease. Finally, face-to-face outpatient treatment may be impeded as a result of various government measures, including quarantine. Importantly, the undersupply of services for patients with mental disorders not only increases existing healthcare inequities but potentially facilitates the spread of Covid-19 through increased infection and difficulties with adherence with public health restrictions among these patients (2). How can continuous care for patients with mental disorders be guaranteed within the confines of social distancing?

TELEPSYCHIATRY AS A POSSIBLE SOLUTION

Telepsychiatry has been discussed as a possible solution for the care of patients with mental disorders (3, 4) and is increasingly used worldwide during the Covid-19 pandemic (5). Telepsychiatry is already well established in some countries like Australia and Canada and the

effectiveness of telepsychiatry, as well as the satisfaction of its users, has been shown in various studies (6–8).

Especially in a crisis like the Covid-19 pandemic, the treatment of patients through telepsychiatry shows some specific advantages: Because telepsychiatry services maintain social distance, they eliminate the risk of infection for both patients and therapists; the patient can remain at home, and the therapist can work from their home, office, or practice. In this way, psychotherapy can be maintained or initiated even under quarantine. Patients who would otherwise attend for outpatient psychotherapy can continue their treatment remotely with the same therapist, so ensuring continuity of care and potentially improving compliance and adherence. Telepsychiatry makes even brief crisis intervention possible when physical distance prevents inpatient treatment, so potentially reducing the number of hospitalizations during the Covid-19 pandemic.

ETHICAL CHALLENGES AND HOW TO POTENTIALLY FACE THEM

We have identified six areas of ethical challenges in delivering telepsychiatry/psychotherapy: (1) data security, privacy, and confidentiality; (2) clinical safety of telepsychiatry recipients; (3) competency and preparedness for telepsychiatric clinicians; (4) legal, regulatory, and financial concerns; (5) informed consent for services; and (6) social justice concerns. At first sight, the benefits of telepsychiatry solutions, which are relatively cost-effective and technologically straightforward, seem convincing. However, the associated ethical challenges must not be overlooked. In particular, risks to data security, privacy, and confidentiality may increase when using freely available software, which may be less secure (9). Lustgarten and colleagues (10) offer some important recommendations regarding good and safe use of technologies. Crucially, clinician should ensure that telepsychotherapy is appropriate for the patient in question. For example, this approach may not be suitable for patients with concrete suicidal ideation because rapid reaction to emergency situations may be hindered by physical distance. Kocsis and Yellowlees (11) assert a consensus around applicability for most patients with any mental disorder being treatable telepsychiatrically, unless acutely dangerous to others or themselves. Clinicians providing telepsychiatric treatment should monitor their patients for safety and refer to "actual" services accordingly. As a further prerequisite, the therapist must be qualified to provide telepsychiatric services. Implementing treatment at a distance requires particular competencies and special knowledge, which, ideally, should be trained, proven, and accredited to further assure standard of clinical care (12). Especially regarding newly emerging technologies such as the use of mobile apps, new competencies and challenges may be faced by clinicians (13). Creating and maintaining a therapeutic relationship in the virtual environment even with a previously-established therapeutic alliance may still give rise to misunderstandings, frustrations, or interruptions due to technological or network failures. Some standard psychotherapy parameters may be compromised: for example, establishing the basic standard of eye contact in the clinician-patient relationship is challenging with virtual environments. In such circumstances, the patient's sense of familiarity or intimacy may change, especially when communicating with a therapist from the privacy of their homes (14). However, online telepsychiatric care may also offer some advantages for the therapeutic relationship, which can vary depending on the patient's disorder (11, 13). Clinicians should explore capitalizing on these advantages. There are also potential legal implications; for example, licensing, care reimbursement, and malpractice insurance issues may arise if telepsychiatry is provided across national borders (15, 16). During the Covid-19 pandemic, some states in the USA changed their licensing requirements, sometimes allowing practitioners to treat patients even from a state where they were not licensed (5). Clinicians who practice telepsychiatry should inform themselves about the current requirements of their practice jurisdiction and where their patients are located. To allow the patient to make a careful decision about the advantages and disadvantages of telepsychiatry, clinicians should permit adequate time to provide an appropriate informed consent procedure (17). Murphy and Pomerantz (18) have compiled an updated version of a questionnaire with the most important aspects of informed consent for online psychotherapy, which should aid psychotherapists' informed-consent practices. Still another concern regarding telepsychiatry is the social justice issue of fair access to this technology. Many low and medium-income, and even some high-income countries, have limited access to telepsychiatry and telepsychotherapy: online access, video/audio connectivity, broadband capability, a safe and private setting to engage care (which is lacking with the homeless), not to overlook access to clinicians (19). Many patients or clients may not have the technology and personnel available to them to meet our aforementioned guidance about competence and quality of services. Additionally, telepsychiatry and related services may or may not be paid by public funding. These limitations are particularly acute with the patients with sever mental disorders, whose political voice has always been marginal (20). In these situations, taking care of patients to the best of our ability should be a prevailing value. Moreover, health care inequities are not limited to any country's income level. For example, the U.S. American Psychiatric Association has advocated for equitable payment for telephony-based, audio-only telepsychiatry to reduce inequities in access to telepsychiatry for those who do not have access to broadband cellular or wifi connectivity, which enable video-based telepsychiatry (21). We would encourage clinicians using and refining telepsychiatric services to advocate for more equitable support for such services in their respective countries.

For further ethical arguments for and against different forms of online psychotherapy, see Stoll, Müller, and Trachsel's review (22). Concerning general guidelines, Sansom-Daly and colleagues (16) discuss some international guidelines concerning telemental health using videoconferencing. In addition, we recommend to consult the following guidelines

from the APA Joint Task Force for the Development of Telepsychology Guidelines (23) and from Yellowlees and colleagues (24).

DISCUSSION

In conclusion, extraordinary times require extraordinary public measures and modes of treatment, and telepsychiatry may offer a means of preventing service undersupply for patients with a mental disorder during public health crises such as the Covid-19 pandemic. However, any therapist considering this approach should take due account of the individual patient's needs and specific situation, allowing sufficient time to complete the necessary preliminaries and ensuring that they are well informed about current guidelines in the jurisdiction or state in question. Mental healthcare practitioners should always be guided by the principle that a high standard of care must be maintained in responding to the current crisis and the associated risks for the individuals with mental disorders, who are especially vulnerable to service undersupply.

Finally Shore and colleagues (5) open up some important questions: what will happen after the pandemic? Will the changes now being made by various governments, psychiatric institutions, and psychotherapists regarding telepsychiatry be maintained? How will this change and shape the professional field of psychiatry? How these questions will be answered in the future will be determined not only by health policy, but also by each individual practicing psychotherapist, their systems of practice, and also by researchers studying the topic of telepsychiatry.

AUTHOR CONTRIBUTIONS

JS, JZS, and MT were all involved in the writing and editing of the manuscript. All authors contributed to the article and approved the submitted version.

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Combatting Social Isolation Among Older Adults in a Time of Physical Distancing: The COVID-19 Social Connectivity Paradox

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Social isolation is an important public health issue that has gained recognition during the COVID-19 pandemic because of the risks posed to older adults based on physical distancing. The primary purposes of this article are to provide an overview of the complex interconnectedness between social isolation, loneliness, and depression while introducing the COVID-19 Connectivity Paradox, a new concept used to describe the conflicting risk/harm continuum resulting from recommended physical distancing. In this context, examples will be provided for practical and feasible community-based models to improve social connectivity during COVID-19 by adjusting the processes and modalities used to deliver programs and services to older adults through the aging social services network. The COVID-19 pandemic has highlighted the need for clinical and community-based organizations to unite and form inter-sectorial partnerships to maintain the provision of services and programs for engaging and supporting older adults during this difficult time of physical distancing and shelter-in-place and stay-at-home orders. The aging social services network provides a vital infrastructure for reaching older underserved and/or marginalized persons across the U.S. to reduce social isolation. Capitalizing on existing practices in the field, older adults can achieve distanced connectivity to mitigate social isolation risk while remaining at safe physical distances from others.

Keywords: social isolation, loneliness, social connectivity, paradox, distanced connectivity, screening, service provision, aging network

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INTRODUCTION

Prior to COVID-19, social isolation among older adults was a major public health issue gaining international recognition as being detrimental to quality of life and premature mortality. As social beings, our social relationships (both quality and quantity) largely impact our health and well-being, as well as risk for illness and death (1). While social support has a long-standing determination as a key social determinant of health (SDOH) (2), social isolation, whether perceived or actual, has only recently emerged as a recognized SDOH. The negative ramifications of social isolation and low social

connectivity have been equated to the health risks of high blood pressure, physical inactivity, obesity, or smoking 15 cigarettes a day (3–5).

Older adults are particularly vulnerable to social isolation because of aging-related role transitions (e.g., retirement, caregiving, loss of family/friends), physical changes (e.g., changes in health status, mobility, sensory function), and societal views (e.g., ageism). Despite the progress made combatting social isolation and loneliness by organizations across the healthcare sector, aging services network, and public health system, the fight against social isolation remains in its infancy. And, in the new era of the COVID-19 pandemic, innovative, and effective efforts to blunt the impacts of social isolation and bolster social connectivity are more critical than ever before.

At the time of this writing, the United States has the largest burden of COVID-19 confirmed cases and deaths worldwide (6, 7). Older adults are especially at risk for COVID-19 complications because they have higher rates of disease and co-morbidities, on average, compared to younger adults (8, 9). Chronic disease, coupled with the biological and physiological changes associated with aging, make older adults particularly susceptible to COVID-19 transmission, severe illness response, and diminished recovery.

To remain safe from the virus, older adults must strictly limit their contact with others through physical distancing (i.e., remaining 6 or more feet from others, also known as social distancing) (10). This plus shelter-in-place and stay-at-home orders limit interactions with family, friends, caregivers, and organizations. While obviously helpful to prevent exposure to and the spread of COVID-19, limited physical interactions with others directly softens (or negates) ongoing efforts to reduce social isolation and improve connectivity among older adults. Herein lies the basis of the COVID-19 Social Connectivity Paradox. How do we quickly and effectively modify our existing strategies to improve connectivity in a time of recommended and required physical distancing? How do we take the "human" out of human services in clinical and community settings? How do we introduce and implement opportunities for meaningful connectivity without physical interactions? How do we capitalize on the strengths of older adults and their contributions to society during crisis to ensure they support their loved ones and facilitate connectivity among their peers?

Although in no way intended to be a comprehensive review, the purposes of this article are to: (1) provide a definition and overview of the complexities of social isolation and its interconnectedness with loneliness and depression; (2) explain the COVID-19 Connectivity Paradox, a new concept used to describe the conflicting risk/harm continuum resulting from recommended physical distancing; (3) highlight screeners and assessments needed to rapidly and accurately identify older adults at-risk for social isolation; and (4) provide examples of practical and feasible community-based models to improve social connectivity during COVID-19 by adjusting the processes and modalities used to deliver programs and services to older adults through the aging social services network. Older persons who are vulnerable to COVID-19 are also vulnerable to social isolation. Therefore, this article aims to offer practical solutions for use in the aging social services network so older marginalized persons can avoid further health problems and inequities resulting from the COVID-19 pandemic.

DEFINITIONS

Social isolation can be defined as the "relative absence of social relationships" (11). It is an objective measure that describes a physical separation from people and can be quantified by looking at the size of one's social network, level of social integration (e.g., belonging to social groups or a faith community; frequency of social contacts), and whether one lives alone or is partnered (12, 13). Late-life social isolation has been linked to poor health, depression, cognitive decline, and mortality (3), and the lack of social contact among older adults was recently associated with $6.7 billion in additional Medicare spending annually (14, 15).

Loneliness can be defined as perceived isolation (16), or a disconnect between social ties an older adults has and those they want (17). This feeling of being alone can be accompanied by distress that results from the discrepancies between ideal and perceived social relationships (18). However, it is important to note that being alone does not always yield negative feelings (i.e., one can be alone but not lonely) (19). Loneliness can be emotional (e.g., negative feelings because of not having a companion or emotional support) or social (e.g., negative feelings because of a perceived lack of a wider social network) (16). Like with social isolation, older persons who are lonely have greater risk of negative functional and health outcomes and premature death (20).

Depression in later life is well-documented and can be assessed by well-validated tools. Depression is a substantial public health issue. The World Health Organization identified depression as the leading cause of disability worldwide, citing a 20% increase over the last decade (21). Approximately 15–27% of older adults experience depressive symptoms (22), and the burden is higher for more marginalized older adults who receive social services (23). Late-life depression has been associated with reduced quality of life and function, poor self-rated health, excess service utilization, and increased disability, morbidity, and mortality, including suicide (24–27).

The above conditions of social isolation, loneliness, and depression represent overlapping yet distinct expressions and experiences among older adults. These conditions are interrelated and interconnected, can manifest sequentially or in concert, and have the ability to intensify one another. For example, a known risk factor for late-life depression is the increasing isolation due to role changes as one ages (e.g., retirement, caregiving, widowhood, declining mobility) (28–31). Additionally, the co-occurrence of social isolation and loneliness is largely documented, and while commonly not disentangled, collectively have ramifications for behavioral and mental health as well as all-cause mortality (32–34). Therefore, situations and events that cause one of these conditions can also evoke the other conditions simultaneously or sequentially. As such, efforts to combat any one of these conditions may also have larger impacts on the entirety of these conditions,

dependent upon their existence, degree of severity, and the intervention/strategy/solution employed.

Furthermore, while social isolation and loneliness are often used interchangeably, each describes different aspects of lacking or limited social connectedness. Therefore, it may be more appropriate to focus on older adults' lack of social connectedness to more accurately pinpoint the root issues faced by the older adult and more appropriately introduce interventions and solutions to mitigate the problem. Social connectedness represents the structural (e.g., network size, marital status), functional (e.g., perceived social support, loneliness), and quality (e.g., positive or negative such as relationship quality or strain) aspects of social relationships (35, 36).

Several identified factors and mechanisms indicate that a lack of social connectedness can impact health (13). Quantifiable or qualitative lack of social connections can impact an older adult's lifestyle (e.g., physical activity, nutrition, sleep, smoking, risk-taking behavior like substance use) or their adherence and compliance with managing health (e.g., taking medications, following recommended changes to diet, physical activity, and substance use). To design and deliver appropriate and effective public health interventions to improve connectivity, efforts are needed to clearly identify and specify the type of social disconnection and the pathway by which it impacts health. This is especially important in the time of COVID-19 in that the structural, functional, and quality aspects of social connectedness have been disrupted by shelter-in-place and stay-at-home orders as well as fear of infection and conscious efforts to remain physically distanced.

THE COVID-19 SOCIAL CONNECTIVITY PARADOX

As described above, meaningful interactions with others as well as objective and subjective elements of connectedness are important to the physical and mental health of older adults. Many older adults stay quite active: they continue to work, take care of grandchildren, volunteer in community organizations, provide caregiver support to spouses or other relatives, and engage with friends and family. However, COVID-19-related physical distancing recommendations and orders to shelter-in-place and stay-at-home have directly interrupted older adults' social connectivity in terms of structure, function, and quality. To protect themselves, older adults must avoid the people, places, and services they rely on for companionship, support, and resources. Based on their higher COVID-19-related vulnerability, many older adults have limited physical and social interactions with loved-ones and the people they rely on for support. Many older adults have also restricted their patronage to businesses, community organizations, and healthcare facilities for safety reasons (whether by their own decision or because of temporary establishment closures). While it is encouraging that older adults have followed recommendations to limit human contact to avoid COVID-19 exposure, these altered and truncated interaction patterns greatly diminish social connectedness and increase older adults' risk for social isolation, loneliness, and depression. As such, the COVID-19 Social Connectivity Paradox posits that a common set of actions simultaneously protects and harms older adults during this pandemic. More specifically, the paradox postulates that as the level of an older adult's physical interactions with others increases, it can protect against social isolation and disconnectedness, although it can increase the risk of COVID-19 exposure. Conversely, as the level of an older adult's physical interactions with others decreases, it can increase risk for social isolation and disconnectedness, although it can protect against risk of COVID-19 exposure. As depicted in **Figure 1**, within the COVID-19 Social Connectivity Paradox, a common action (interacting with others) can simultaneously increase risk (illustrated in red) for one risk factor while diminishing risk (illustrated in green) for another.

While the COVID-19 Social Connectivity Paradox itself is logical, its ramifications warrant attention because it is intensifying the effects and magnitude of social isolation, disconnectedness, and associated mental health issues. Based on news and social media reports, older adults are keenly aware that they are at higher risk for severe morbidity and mortality from COVID-19. Such heightened awareness causes older adults to be more diligent and vigilant about protective measures against the virus, but it also limits their social mobility and connectivity while evoking fear and anxiety. Therefore, to avoid COVID-19 exposure, older adults must knowingly or unknowingly place themselves at risk for social isolation and disconnectedness. While physical distancing during COVID-19 may initiate social isolation risk among many older adults based on the abrupt and severe nature of the situation, the ramifications of this risk may be dramatically accelerated and/or exacerbated for older adults who were already experiencing social isolation and limited connectedness before the COVID-19 pandemic. The ramifications of COVID-19 Social Connectivity Paradox will be seen for months or years to come, based on the estimated duration of COVID-19-related physical distancing and the projected resurgence of COVID-19 during cold and flu seasons. As such, immediate solutions are needed to improve social connectivity and connectedness among older adults both now and beyond the time of pandemic cautions.

PROGRESSION TOWARD LEVERAGED, ACTION-ORIENTED RISK SCREENING AND ASSESSMENT

A variety of validated scales and measures exist to assess social isolation and associated concepts (e.g., loneliness, social integration, disconnectedness). Each tool was developed to examine a specific concept or construct within these interconnected and overlapping concepts. Each contains its own set of items and is used to identify the presence of the concept or construct and its associated risk. Examples of existing of commonly used, validated assessment tools include the Berkman-Syme Social Network Index (37), Revised UCLA Loneliness Scale (38, 39), Duke Social Support Index (40), Lubben Social Network Scale (41), de Jong Gierveld Loneliness Scale (42, 43), Cornwell Perceived Isolation Scale (44), and

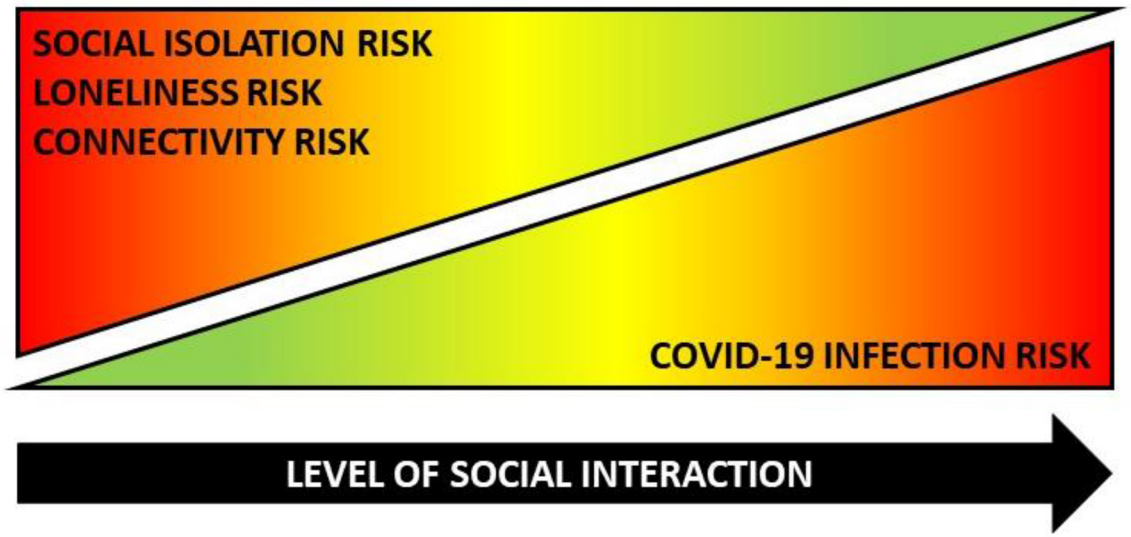

FIGURE 1 | The COVID-19 social connectivity paradox.

Campaign to End Loneliness Measurement Tool (45). Such tools are extremely valuable at identifying risk when appropriately and purposively used during research investigations among a specific population (13). The utility of these instruments is vast to identify risk and prompt the need for action. However, a risk score alone (based on a statistically defined threshold) only raises awareness about the existence of a problem. These scales are mostly unidimensional and may not capture the complexity of the situation. Additionally, in most cases, it does not specifically define or describe tailored recommendations for action to increase connectivity among older adults in real time, which raises ethical questions about the benefits of screening/assessment in the absence of action (e.g., additional screening, referral, treatment). While existing tools have merit, they provide a sound and solid foundation for developing and creating new scales, measures, and screeners that are contextually appropriate for use during the COVID-19 pandemic and beyond.

Many clinical and community organizations recognize the importance of addressing social isolation and have started to create or adopt processes to identify risk and attempt to rectify the issue. Despite their respective budding efforts, screening efforts within clinical and community settings remain challenging, as does linking at-risk older adults to needed resources, and services in a timely manner. To date, screening for social isolation risk has not been incorporated into routine clinical care, unlike screening for other key preventable public health risk factors like smoking and high blood pressure (12). Screening for social isolation in clinical care can help improve care, outcomes and population health by providing more precision in diagnoses and treatment, foster better and more shared decision making about treatments that are feasible and appropriate, identify stressful social risk factors so clinicians can connect older adults to helpful community-based public health and social services to address (with their consent), and improve clinical systems' ability to tailor their supports and services to their population's needs (46). At present, clinical-community integration for social isolation screening and referral (i.e., despite the direction, whether the screening originates from the clinical or community sector) is disjointed and at times fragmented. Continuity in screening methods, frequent communication mechanisms, and seamless referral systems are needed to ensure the older adult is identified, monitored, and supported throughout their journey to connectivity. As with other recommended public health screenings (e.g., for depression), it is important that adequate systems for referral, treatment, and follow-up be in place before screening for social isolation risk (47). Without these process, protocols, and mechanisms in place, older adults may be identified for social isolation risk through screening efforts, but the organizations/professionals to which they should be connected, referred, and visited may be unable to sufficiently fill the need. As such, in the time of COVID-19, we are given a unique opportunity to create options, initiate innovations, and improve opportunities to support older persons who are socially disconnected.

EXAMPLES OF FEASIBLE AND PRACTICAL SOLUTIONS DURING COVID-19 AND BEYOND

In the time of COVID-19 and physical distancing, traditional practices must be rapidly altered and translated to serve and engage older adults, combat social isolation, and facilitate connectivity. Because physical interactions with older adults should be limited, the field must rethink effective solutions for what we will refer here using the term "distanced connectivity." Distanced connectivity attempts to maintain and

repair the fractured or diminished structural, functional, and quality aspects of physical social connectedness through the telephone, computer, or other smart devices. Strategies include the integration of brief and interactive screenings to identify risk and make service referrals during telephonic interactions as well-technology-based intervention delivery and social support. In addition to strategies having the capability to safely reach older adults over time and space, they also have the ability to engage older adults as volunteers and supports during crisis to assist themselves and others to offset social isolation. Within this section, specific examples from the field are provided to illustrate efforts to mitigate the escalating rates of social isolation and associated distress among older adults during the COVID-19 pandemic in the United States.

Telephonic Reassurance and Engagement

During COVID-19, many organizations are pivoting their efforts to increase distanced connectivity. Some are bolstering existing telephonic efforts while others are altering face-to-face initiatives and services to be delivered telephonically or via the internet. These transitions require the repurposing of personnel and reallocation of funds, which can create strain on the clinical, and community organizations offering the service. To meet the needs of older adults during COVID-19-related physical distancing, many organizations are using telephonic reassurance and engagement efforts. Often this includes having community health workers, social workers, clinicians, and other personnel make telephone calls to older adults for the purposes of checking on their general well-being, identifying needs, engaging them cognitively, offering an opportunity for socializing, and linking them to available services and resources. Telephonic reassurance and engagement efforts can take many forms from brief, unstructured interactions to longer, structured activities with specified objectives. Regardless of the format, effective distanced connectivity via telephone can improve the functional and quality aspects of social connectedness.

An inter-sectorial clinical-community example of a telephonic reassurance and engagement solution during COVID-19 includes a pilot in Maryland. This effort uses care coordinators and volunteers at an Area Agency on Aging (AAA) to call older adults who are members of the senior center or who have been referred by local clinical partners for services. Because face-to-face services are limited, the AAA is making structured calls to identify needs related to nutrition, caregiving, and other social determinants of health. Integrated into a battery of measures and talking points is the *Upstream Social Isolation Risk Screener* (U-SIRS). Completed telephonically in an interview format in Maryland, the U-SIRS is a 13-item brief screener to measure upstream social isolation risk among community-dwelling older adults and link them to appropriate resources, services, and programs. Designed as an interactive and actionable tool, the U-SIRS can be completed independently by an older adult, but its potential impact is heightened when completed with or alongside professionals and community navigators (e.g., clinical organizations and healthcare professionals, community-based organizations, community health workers and promotores, evidence-based program deliverers). The U-SIRS lives on an electronic platform (i.e., can be completed on a computer, tablet, and/or smartphone) to facilitate a tailored screening experience. After completion, the older adult's responses are used to generate a custom report in real-time, which can then be saved or shared with others. Risk level is identified using a stoplight analogy [i.e., high [red], medium [yellow], and low [green] risk]. In the time of COVID-19, the community navigator reviews the list of recommended services and programs, prioritizes them in order of need (and what is available given closures), and assists to make linkages to local services and resources that best match the older adult's needs. Follow-up calls will occur to reassess risk, service utilization, and need. To date, hundreds of older adults have been engaged with the U-SIRS in Maryland (Maintaining Active Citizens—Maryland Living Well-Center of Excellence) and other states during the COVID-19 pandemic.

Virtual Program and Service Delivery

Given the heightened COVID-19 risks for older adults, face-to-face delivery of evidence-based health and wellness programs has temporarily ceased during the pandemic. These evidence-based programs offer older persons access to quality community- and home-based supports to prevent falls, encourage physical activity, promote mental health, support caregivers, and self-manage multiple chronic conditions. Thus, these behavioral interventions reach older underserved communities where they live, work, pray, and play and provide important supports for persons with limited or no access to health care (48)–the same older communities who are vulnerable for COVID-19. Given the previous widespread availability of these programs nationwide (49, 50), their temporary closure means that thousands of older adults are unable to attend one-on-one and small group workshops to learn about disease self-management, fall prevention, physical activity, and many other topics. Typically delivered in various settings (e.g., healthcare organizations, residential facilities, senior centers, faith-based organizations), this service interruption is unfortunate because these programs provide older adults with the valuable information and support as well as the ability to facilitate social interactions with peers. As such, the Administration on Aging (ACL) and National Council on Aging (NCOA) have responded with recommendations for the aging services workforce to maintain distanced connectivity with older adults (see details at https://acl.gov/COVID-19 and https://www.ncoa.org/covid-19-resources-for-professionals). A coordinated set of resources, toolkits, webinars, factsheets, and other communications have been released to help organizations pivot their efforts to deliver evidence-based programs and services virtually (e.g., asynchronous learning independently, teleconferencing in one-on-one or group formats) or in mailed self-learning format. Efforts to transition face-to-face delivery modalities to virtual and mail-based offerings are an attempt to provide older adults with the services they need and maintain interaction and engagement during physical distancing.

Many examples exist of evidence-based programs that have been translated for virtual delivery (https://www.ncoa.org/news/ncoa-news/center-for-healthy-aging-news/track-health-promotion-program-guidance-during-covid-19). One is the Program to Encourage Active, Rewarding Lives (PEARLS)

(51). PEARLS is appropriate for COVID-19 times because it addresses late-life depression symptoms, which are risk factors and consequences of social isolation and loneliness. PEARLS is being evaluated with funding from AARP Foundation as an intervention to improve social connectedness for low-income older persons. PEARLS is traditionally a home-based collaborative care model that trains front-line social service providers to teach problem-solving and activity planning skills help older persons create a "new normal" as they age in order to minimize symptoms of depression and improve social connections through activities and relationships (51). In March 2020, when shelter-at-home orders and other public health guidelines required social service agencies to provide care remotely, PEARLS organizations began offering PEARLS by phone or video-conferencing plus mailed materials (i.e., telePEARLS) based on organizational, provider, and participant accessibility, feasibility, and appropriateness. Older PEARLS participants are benefiting from PEARLS calls to: (1) get emotional, social, and instrumental support; (2) identify new ways of connecting socially in physically distanced times; and (3) learn new skills to reduce anxiety, depression, and stress as well as feelings of social isolation and loneliness. This suggests that virtual delivery of evidence-based programs like PEARLS can reach older marginalized persons to manage chronic physical and mental health conditions, access up-to-date COVID-19 information and essential services, such as food and medications, and feel more connected in times of physical distancing.

DISCUSSION

Prior to the threat of catching a virus that affects older adults more severely than younger people, many older people were seen as active, continuing to work, care for others, volunteer, and engage with family and friends. Nonetheless, the prevalence of social isolation, loneliness, and depression were becoming increasing acknowledged as hidden problems within the aging population. Social isolation is becoming intensified and complicated during the COVID-19 pandemic. While the newly-required physical isolation provides protection against the virus, social isolation has a range of negative consequences that may be amplified by the stress and uncertainty of the contemporary reality. Existing and emerging efforts to combat social isolation can be strategically modified to combat the COVID-19 Social Connectivity Paradox. In this unprecedented time of physical distancing, providers of all types are recognizing the limits to service accessibility and are creating innovative solutions. Older adults can still remain socially connected despite remaining physically distanced (52). Distanced connectivity that serves older adults most vulnerable to both COVID-19, and the devastating effects of social isolation, must be central to those solutions.

The importance of screening for social isolation and limited connectedness cannot be underscored enough. Screening for risk in clinical and community settings is essential, but screening and assessments become more powerful if they are linked to specific and purposeful action. Most measures are static and were developed in non-COVID times; therefore, efforts are needed to better understanding how to recalibrate the sensitivity of risk identified with these assessments in the context of pandemic precautions and restricted social interaction. For example, as anecdotally documented in the U-SIRS implementation, many older adults who had low social isolation risk prior to COVID-19 are now reporting medium or high social isolation risk because of limited connectivity based on physical distancing and stay-at-home and shelter-in-place orders. Further, rather than using a single measure for social isolation or associated issues of connectivity during COVID-19 (and generally), multiple measures should be employed simultaneously, in concert, to paint a more comprehensive picture of the social isolation and the related needs of the older adult. Additionally, social isolation screening efforts should not only occur once; rather, they should be ongoing and repeated to monitor improvement.

Spurred by the conditions of COVID-19, interventions employed to improve social connectedness should target the underlying mechanisms of change (53). with documented evidence of the ability to reduce isolation and loneliness. Masi et al. (54) offer a user typology for selecting appropriate interventions based on what the intervention is targeting. Effective interventions are those that help with improvement of social skills, enhance social support, increase opportunities for social interactions, and address maladaptive social cognition. Multidimensional screening for low social connectedness can be helpful to identify what aspects of social relationships are missing in the lives of older adults, which can then guide intervention selection appropriate for each older person.

Increasingly, the aging social services network is being recognized for its important role in providing quality, accessible health, and social care to older underserved and/or marginalized persons such as those experiencing poverty, living alone, providing caregiving, and living with physical disabilities (55). During the pandemic, social service organizations are working to provide essential access to older communities in need. Organizations are seeking effective ways to provide support remotely, and older persons are looking for connections to maintain their health, get their basic needs met, and obtain accurate information. Offering evidence-based interventions by telephone or video-chat offers a critical opportunity to learn best practices for offering tele-services that lessen the negative physical, social, and mental impacts of COVID-19 (56). Leading Age's *Social Connectedness and Engagement Technology Tool* provides important guidance for what products are currently available to help organizations choose platforms that fit the needs of their organization and community (57).

The benefits to distanced connectivity via telephonic and virtual service delivery and interactions are undeniable; however, these tele-services are not always accessible to older underserved and/or marginalized communities and social service organizations. Many rapidly emerging strategies to promote distanced connectivity may exacerbate existing digital

divides (58, 59). For many older persons, access to reliable internet is limited, and former sources of connectivity such as libraries and senior centers are unavailable. Even if access is available, barriers exist to older adults using technology, including limited technological literacy and negative attitudes about ease of use and security issues (60). COVID-19 may necessitate both the universal access to reliable, broadband internet and ways to improve accessibility, feasibility, and appropriateness of technology for older persons because physically distanced times require virtual ways to connect and access resources.

CONCLUSION

The COVID-19 pandemic has highlighted that social isolation is a major public health issue and remaining physically distant can paradoxically be both protective and harmful to older adults. The pandemic also underscores the need for clinical and community-based organizations to unite and form inter-sectorial partnerships to maintain the provision of services and programs for engaging and supporting older adults during this difficult time of physical distancing and shelter-in-place and stay-at-home orders. Older adults can themselves be mobilized and capitalized upon as volunteers and supports so they can remain engaged, combat social isolation risk, and facilitate connectedness among their families and peers. The aging social services network provides a vital infrastructure for reaching older underserved and/or marginalized persons across the U.S. to reduce social isolation. Pre-COVID-19, awareness about the pervasiveness and seriousness of social isolation had begun to spur inter-sectoral partnership and coordinated community action to address its enormous human and financial tolls. These efforts are now more critical than ever because many older adults know they must physically isolate; however, they may not know the importance of maintaining strong social connections or have the tactics or ability to do so virtually. This article provides a perspective about the current situation during the pandemic. Yet, more awareness by the professional and lay communities, as well as more detailed data, are needed to identify the short- and longer-term consequences of COVID-19, as well as the short- and longer-term benefits of distanced connectivity efforts, on social isolation, loneliness, and depression among older adults.

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MS conceptualized, wrote, and revised the manuscript. LS wrote and revised the manuscript. EC critically revised the manuscript. All authors are accountable for the content of the work and approve the final version of the manuscript.

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Global Psychological Implications of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) and Coronavirus Disease-2019 (COVID-19). What Can Be Learned From Italy. Reflections, Perspectives, Opportunities

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On December 31, 2019, the Chinese authorities announced that in the city of Wuhan, Hubei Province, central-eastern China, a cluster of pneumonia cases of unknown etiology had developed. A new coronavirus (SARS-CoV-2) that causes serious problems like pneumonia and even death, has been discovered. This new disease (COVID-19) has spread also in Italy starting from the first recognized case on February 20. Beyond its biological implications, this coronavirus allows us many psychological reflections. A new virus is indeed a potentially serious problem for mankind, but it can also be an opportunity to bring the focus back to us, to observe what is happening, who we are and how we are reacting both as individuals and as a population. Even positive implication of this pandemic was discussed.

Keywords: pandemic, psychosocial factors, stress, quarantine, black swan

> *"It is important not to underestimate the small opponents: you can see an elephant, a little mosquito, but not a virus"*

The novel coronavirus disease (COVID-19) – first revealed in late December 2019 in the city of Wuhan of Hubei Province (Wang et al., 2020a) – has recently been considered pandemic by World Health Organization (World Health Organization [WHO], 2020).

At the moment if you Google "COVID-19" (i.e., the disease), the search engine returns about 5.09 billion results, and about 3 billion if you Google "Coronavirus," a term used to describe a large family of viruses known to cause several respiratory syndrome (e.g., SARS; MERS). A search for "SARS-CoV-2" (i.e., name of the virus) gives fewer results, just under 357 million, but this is easily explained by the fact that the general population tends to look for the terms most used by the media: "Coronavirus" and "COVID-19." Inspired by an Editorial appeared in The New England Journal of Medicine (Jones, 2020) an idea was born, that is to compare on Google the terms related to novel coronavirus and another very known virus and its related syndrome: "HIV" and "AIDS," respectively. The numbers are impressive: "AIDS" gives just under300 million results and "HIV" just over 231 million.

That said, it is possible to make a biological–psychological comparison, taking into account the rapidity of the effects: faster in the case of SARS-CoV-2 and slower in the case of HIV. In fact, a virus is biologically all the stronger the more it is able to remain latent in the human body, and this is the case with HIV, because in doing so it is more "silently contagious." Conversely, SARS-CoV-2 is a "noisily infectious" virus, which makes it easier to trace, making restrictive measures all the more urgent. Without entering into discussions of an epidemiological nature which, in any case, are not widely understood by the general public (e.g., the difference between mortality and deadliness) what psychological considerations can be made?

In Italy, the arrival of the virus has unleashed an unprecedented media bombardment and thrown our authorities in confusion. In an initial period lasting about 10 days there was excessive media exposure on the part of the Prime Minister, whose continuous updates on the spread of the COVID-19 triggered alarmism followed by mass behaviors such as long queues outside supermarkets to raid all kinds of product (including toilet paper) and fear of entering Chinese-run businesses or of frequenting ethnic Chinese people, even if born in Italy. Moreover, due to the media bombardment, there are at least three problems: (i) much useful information for the general population is hidden; (ii) the load of information about COVID-19 leads population to be more confused (e.g., virologists, immunologist, and epidemiologists on TV are giving conflicting information on the use of masks or gloves); and (iii) authorities and associated health experts in their public appearances have often used catastrophing and emphasizing style of communication for some situations associated with the pandemic COVID-19.

It is possible to think that this information approach was necessary and urgent in order to change social patterns of behavior (i.e., social distancing; use protective measures; and general reduction of citizen transfers). This load of information, although sometimes confused, may have been helpful to induce worry in the general population so that social patterns of behavior changed. The other side of the coin is that because of this pattern of information, general population could find an answer to worry and justify a given behavior (e.g., do not use the mask because it is harmful; Allington et al., 2020; Bao et al., 2020; Liu, 2020).

The extreme difficulty with which our brain processes excess and complex information contributes to unjustified worry and alarmism (Feng et al., 2015). Because we struggle to access and properly analyze a media bombardment of this kind, we tend to create artificial logical structures that include only the information that enables us to develop representative models of reality.

This can lead, for example, to defense mechanisms in social relations, leading us to associate a terrorist attack with a man speaking Arabic, or to think someone is affected by COVID-19 just because they are Chinese or because they have sneezed. This causes phenomena such as discrimination and the construction of stereotypes. In addition to this, during a situation of media uncertainty (i.e., retractions and continuous updates) such as that brought about by this coronavirus, a lot of information is ignored or mistaken for fake news (Shimizu, 2020).

Thus the huge media bombardment and the vast quantity of results from googling "Coronavirus," "COVID-19," and "SARS-CoV-2" give the impression of a psychological and emotional contagion (Kramer et al., 2014; Ferrara and Yang, 2015) so that in literature appears a new term a neologism "Coronaphobia" (Asmundson and Taylor, 2020). This emotional involvement that is capable of generating distress, altered risk perception, and also leading to cyberchondria, a clinical phenomenon characterized by repeated Internet searches for medical information which leads to excessive concerns about physical health (Mathes et al., 2018). This phenomenon may explain the vast quantity of Google search results on a given disease, which also depends on the fear of contracting or avoiding it, as in the case of COVID-19.

Cyberchondria is positively associated with symptoms of anxiety (Mathes et al., 2018) and may lead to increased levels of distress, worry, unnecessary medical expenses (Fergus, 2014), and altered risk perception (Rübsamen et al., 2015). Wang et al. (2020b) investigated psychological indexes in Chinese people following COVID-19 outbreak demonstrating a psychological impact from moderate-to-severe; in particular one-third of them reported moderate-to-severe anxiety.

However, even before SARS-CoV-2 made the "species jump," anxiety disorders were one of the most common classes of disorders worldwide and the sixth leading contributor to disability worldwide (Baxter et al., 2014). In America it is estimated that adult people with anxiety disorder is about 40 million, with lifetime morbid risk estimated at 41.7% in the general population (Kessler et al., 2012).These disorders significantly impact quality of life and functioning across life domains (Norberg et al., 2008). And add to this the anxiety disorders are associated with psychiatric and physical comorbidity (e.g., Kuvačić et al., 2018), increases in medical service utilization, and significant societal costs associated with loss of productivity and work impairment (e.g., Barattucci et al., 2019).

In addition, attribute-framing bias can be added to cyberchondria (Kreiner and Gamliel, 2019). This bias leads us to evaluate positively framed objects more favorably than the same objects framed negatively. For example, it is the dynamic that leads us to choose a yogurt that promises us 20% fresh fruit, ignoring the concentrate that constitutes an abundant 50% of the product. It is not a major problem as long as it only concerns our breakfast, but it is much more serious when, during an epidemic, 2% of deaths leads us to ignore the 98% that survived.

The brain structures that mediate fear-related emotions, such as anxiety, are very complex and involve archaic areas of the brain such as the amygdala, hippocampus, ventromedial hypothalamus, insular cortex, etc (for review, Garcia, 2017), structures that are activated specifically but not exclusively to saving our lives and that make us feel anxious precisely in order to protect us from a potential danger, even if in the case of anxiety the danger is future and not present. After all, the literature shows our natural predisposition to remember unpleasant events and negative information, activating the brain areas that underlie them in such a way as to anticipate the danger (e.g., Kellermann, 1984).

Specifically, the amygdala and its neural network mediate emotional learning and behavior, playing a major role in mediating fear and other emotions linked to anxiety disorders such as generalized anxiety disorder, panic, substance or medication-induced anxiety, social anxiety disorder, and others. These emotions and their neural network are controlled by frontal areas of the brain that are able to deactivate or reduce the activity of the areas related to emotional activation (e.g., Guendelman et al., 2017). Moreover, when human beings are anxious their perception of reality, and therefore of the disease, can vary, and it has been demonstrated that anxiety is associated with difficulties in decision making (for review, Bishop and Gagne, 2018; Zhang and Gu, 2018), but it has also been demonstrated that emotional regulation is followed by less risky decisions (Morawetz et al., 2019).

The numbers we have described on Google searches clearly show us how high the SARS-CoV-2 anxiety is at this particular moment. This, of course, should not necessarily be seen as a problem, since it is not unusual to feel temporary anxiety when facing stressful situations, uncertainty, or extreme challenges. The emotions of anxiety and fear in confronting a real threat are part of the survival instinct. Anxiety can make us be more careful about taking a number of precautions that prevent SARS-CoV-2 infection, but the question is: why does this not happen, or no longer happen, for HIV? It is possible to think that the problem is both mediatic and related to the perception of the looming new danger.

Taleb (1960) described the so-called "black swan" effect (2008), i.e., the strong impact that some rare and unpredictable events have on the mind and the tendency of people to retrospectively find simplistic explanations for these events. An example of this effect can be given by September 11, a date before which no one would have ever expected anyone to fly a plane into a building in order to carry out a terrorist attack. The black swan effect seems to be paradoxically fitting for SARS-CoV-2 despite the fact that history tells us that this event is not a real "black swan," because a new virus is certainly neither rare nor unpredictable. Think for example, about Ebola (see for review, Jacob et al., 2020), SARS-CoV (Sun et al., 2020), H1N1, H5N1, and H3N2 (Guarner and Falcón-Escobedo, 2009), Hendra and Nipah (Eaton et al., 2006), etc.

However, fear and anxiety linked to death are resurgent globally every time a new virus appears in the world and becomes pandemic, paradoxically becoming first a "black swan," and then decreasing and leading to a sort of "psychological habituation" (Ziferstein, 1967). This can explain why HIV is so "psychologically silent" in Google searches, because there is a perception that the virus has been defeated (in truth it has only become a chronic condition) since, thanks to treatment (and its accessibility), the life expectancy of HIV+ has increased in the world, even though people still die of AIDS, especially in sub-Saharan Africa, and often from opportunistic diseases (UNAIDS, 2019).

Yet such a strong reaction to a virus has not been seen before in Italy. Here, the situation is more complicated than we thought: in the Northern Italy, Lombardia region, two large clusters of outbreaks have spread starting from a 38-year-old man from the city of Codogno, who presented at the hospital on February 20. The virus is spreading very quickly and efficiently so that many regions are increasing intensive care beds, revolutionizing entire hospital wards. Our healthcare professionals are facing disease pulling 12-h shifts in critical situations and this phenomenon is leading to serious psychological distress in this population here (Anmella et al., 2020; Barello et al., 2020; De Giorgio, 2020; ISS, 2020; Ramaci et al., 2020a) as well as in other countries (Bohlken et al., 2020; Heath et al., 2020; Ornell et al., 2020; Tsamakis et al., 2020).

Italy's government measures are very severe and extraordinary and the country is in lockdown since two months (De Giorgio, 2020).

In the other nations a similar framework is showing up and as already written by Crawford et al. (2016): "*The world remains ill prepared to handle sustained responses and global pandemics,*" and this also seems to apply psychologically: a previous virus does not make us immune from the fear, distress and anxiety that causes the next one. For this reason it is right, as is happening in our country, to apply the correct prophylactic measures (i.e., "quarantine") in order to dilute the spread of the pathogen, even if poorly tolerated by the population (Brooks et al., 2020).

However, there is yet another opportunity to change our psychological approach to events of this kind. First of all, there should be more attention to research funding, which is drastically scarce in Italy, and to public health, which is a source of absolute pride in our country: anyone who falls ill in Italy, wherever they come from, even if they do not have an identity document or a credit card, is treated for free.

Secondly, this umpteenth "black swan" brought about by a virus once again makes us aware of the importance of education in emotional regulation. Knowing how to manage emotions well, for example, through mindfulness practices – which can increase well-being and decrease anxiety and depression in healthy, professionals and patient populations (De Giorgio et al., 2017a,b; Grazzi et al., 2017; Padovan et al., 2018; Ramaci et al., 2020b) – can allow people to have a balanced reaction and a clearer understanding of the phenomenon, thanks also to the neuro-bio-physiological effects that these practices have on the brain. In fact, it has been widely proven in the literature that these types of practices are able to structurally and functionally modify the areas of the brain that regulate the networks related to emotions (see for review, Young et al., 2019) and even reduce the size of the amygdala (Taren et al., 2013).

It is also necessary to practice "positive emotional contagion." In fact, it has been widely demonstrated (see, e.g., Cirelli et al., 2018) that distress is closely related to anxiety, and this is also confirmed from the neurobiological point of view (Daviu et al., 2019). At this current time the media talk about nothing but infections and deaths, and this can help to feed the vicious cycle of anxiety-distress. The effect that distress has on the immune system must be taken into great consideration. Indeed, the effects of distress on diseases such as viral or bacterial infection are

often associated with several immune dysregulation (see, e.g., Powell et al., 2013). Moreover, the protective role of dispositional optimism has also been demonstrated (Levy et al., 2019), and has been linked to lower levels of inflammation markers, better antioxidant levels and lipid profiles, and lower cortisol responses under stress (see, e.g., Carver and Scheier, 2014). Data confirm how dispositional optimism can affect distress also in its biological aspects, keeping the immune system free from dysregulation and reactive to viral or bacterial infections.

Therefore, for example, the media should place greater emphasis on those who have recovered rather than new cases of infection and death, but even the World Health Organization website (World Health Organization [WHO], 2020) also reports data on confirmed cases, deaths and affected nations. Indeed, it is necessary to keep in mind that health and authority experts (virologists, immunologist, and epidemiologists) together with journalists are creators of the information conveyed through the media. These authors of information should choose and product good and positive information that could be understood and "reached" by general population. Information can be collected and transferred, for example, from COCHRANE a global independent network of researchers, professionals, patients, carers, and people interested in health (Cochrane, 2020).

Finally, as in every moment of crisis, we should not forget the etymology of the word: crisis is an agricultural term that derives from the Greek verb krino, to separate, to group – in a broader sense, to discern, to judge, to evaluate. The verb was used in reference to threshing, which involves separating the grain from the straw and chaff, that is, the envelope covering the grain of wheat. This gave both the first meaning of "to separate" and the metaphorical meaning of "to choose." It is therefore possible to grasp its positive nuance, since a crisis can be a period of reflection, evaluation, discernment, and become a prerequisite for a rebirth, for a next flourishing.

Therefore, from this umpteenth crisis, let us try to take the opportunity for growth, beyond the leveling and the habituation, the waiting for the next black swan, the next fear, the next distress, the next anxiety. Because we are all dependent on each other and we are all responsible for each other. Let us think of ourselves as we really are: *waves of the same sea, leaves of the same tree, flowers of the same garden.*

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The author confirms being the sole contributor of this work and has approved it for publication.

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Don't Walk So Close to Me: Physical Distancing and Adult Physical Activity in Canada

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Background: In response to the COVID-19 pandemic, physical distancing measures have been implemented globally. Canadians have been instructed to stay at home, which has likely resulted in significant changes in their physical activity. Using data from a national physical activity tracking app (PAC app), we aimed to determine device-measured physical activity levels immediately prior to and following the implementation of physical distancing measures in Canada to provide evidence for the development of physical activity recommendations for future pandemics or second wave infections.

Methods: Demographic and physical activity data were extracted from the ParticipACTION app (PAC app), using a 10-week (10 February to 19 April 2020) quasi-experimental design to determine changes in physical activity 4 weeks pre-pandemic and 6 weeks post-pandemic declaration. Weekly physical activity levels were monitored through wearable fitness trackers and health apps linked to the PAC app, to record moderate-to-vigorous physical activity (MVPA), light physical activity (LPA), and steps. Repeated measure ANOVA was used to determine changes over time (mean ± SE).

Findings: A total of 2,338 Canadians who were mostly 35–44 years old (26.6%) and female (90.2%) were included in the analysis. MVPA, LPA, and steps significantly declined immediately following the declaration of the pandemic (MVPA: pre-pandemic: 194.2 ± 5.2 min, post-pandemic: 176.7 ± 5.0 min, $p < 0.001$; LPA: pre-pandemic: 1,000.5 ± 17.0 min, post-pandemic: 874.1 ± 15.6 min, $p < 0.001$; steps: pre-pandemic: 48,625 ± 745 steps, post-pandemic: 43,395 ± 705 steps, $p < 0.001$). However, 6 weeks following pandemic declaration, MVPA (week 6: 204.4 ± 5.4 min, $p = 0.498$) had returned to pre-pandemic levels. LPA (week 6: 732.0 ± 14.3 min, $p = < 0.001$) and steps (week 6: 41,946 ± 763, $p < 0.001$) remained significantly lower than pre-pandemic levels at week 6.

Interpretation: Although MVPA returned to pre-pandemic levels, significant and sustained declines in incidental LPA and steps were observed. Attenuating the loss of incidental physical activity should be a public health priority in response to future pandemics or a second wave of a COVID-19 infection, as it may have significant long-term implications for the physical and mental health of Canadians.

Keywords: COVID-19, pandemic, social distancing, moderate to vigorous physical activity, light physical activity, steps, incidental physical activity

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INTRODUCTION

On 11 March 2020 the World Health Organization (WHO) characterized the COVID-19 outbreak as a pandemic (World Health Organization, 2020). This has led to significant changes in daily life with specific recommendations and restrictions varying around the world. To inhibit the spread of COVID-19 in Canada, the Government of Canada (2020) has implemented physical distancing across the country. This has included the closure of schools, parks, playground facilities, trails, leisure facilities, and the introduction of physical distancing measures to keep people 2 m (6 ft) apart. During this time of physical distancing and instructions to "shelter in place," it is intuitive to assume there will be consequences for children, youth, and adult physical activity participation and reaching the Canadian physical activity guidelines of 150 min of moderate-to-vigorous physical activity (MVPA) per week may be difficult (Canadian Society for Exercise Physiology, 2011). Initiatives to mitigate these consequences are necessary (Chen et al., 2020; Hongyan et al., 2020).

The British Association of Sport and Exercise Sciences (BASES) expert statement on physical activity and exercise during Covid-19 "Lockdowns" and "Restrictions" (British Association of Sport and Exercise Sciences, 2020) highlights a range of potential concerns as a result of lockdown procedures. Increases in sedentary behavior resulting from lost opportunities for incidental physical activity at school, work, and through active travel and exercise de-training, where the health benefits of previous physical activity are lost, may result. Finally, there may be consequences for mental health given the preventive role physical activity may play in protecting against such conditions (e.g., Mammen and Faulkner, 2013).

Physical activity may also have a more direct role in alleviating the consequences of the COVID-19 pandemic (Sallis and Pratt, 2020). For example, physical activity may target two key biological processes that react to infection – strengthening the immune system and reducing inflammation (Hojman, 2017). Physical activity is also effective in preventing and treating secondary conditions, such as heart disease and diabetes (Powell et al., 2018), that appear to be associated with increased risk of serious illness and death as a result of infection. As Sallis and Pratt (2020, p. 2) strongly conclude, "due to its multiple benefits, physical activity should not be an afterthought during this pandemic. Being active should be a key recommendation."

Canadian public health guidance continues to recommend "going outside to exercise but staying close to home" while maintaining physical distancing from others (Government of Canada, 2020); however, surveillance of physical activity during physical distancing has been limited. Fitbit and Garmin, manufacturers of wearable fitness trackers, have released data collected from millions of device users around the world. During the week of 22 March 2020, Fitbit reported a decline in step count across every country examined compared to 2019, with European countries showing a more dramatic change ranging from a 7% (Germany) to 38% (Spain) decline in step counts. Canada saw a 14% decline in step count (Fitbit Staff, 2020). Garmin documented a worldwide decline in step count of ~500 steps/day from 15 March compared to 30 March 2020 and a transition to indoor activities such as virtual cycling (Garmin, 2020).

The data generated and methodological description from these company reports is extremely limited and the scientific rigor not reported, thus contextualizing physical activity recommendations based on this data is questionable. Differential effects may be observed in habitual or incidental physical activity versus purposeful exercise. Given the available sociocultural and physical supports, age, and gender may also influence physical activity participation. COVID-19 restrictions are unique by geographic area and effects on physical activity may not be uniform across Canada and globally. Recommendations may need to be tailored for different types of activity, sub-populations, or regions of Canada.

The purpose of this study was to investigate changes in the physical activity of Canadians 4 weeks prior to and 6 weeks following the implementation of physical distancing protocols in Canada, using data from a free and nationally promoted physical activity tracking app, the ParticipACTION app (PAC app). Findings will inform the development of tailored physical activity recommendations both at the current time but also in preparation for potential future restrictions as a result of a second wave of infections.

MATERIALS AND METHODS

Study Design and Population

This was a 10-week quasi-experimental study examining changes in physical activity pre- and post-pandemic declaration (11 March 2020). The population was Canadian users (18+ years) of a free, publicly available physical activity tracking app – the PAC app. All of the 105,595 PAC app users were eligible for study inclusion. This secondary data analysis was reviewed and approved by the University of British Columbia Office of Research Ethics (#H20-01249).

Data Collection

The PAC app is a nationally promoted physical activity app developed by ParticipACTION, a Canadian non-profit organization promoting physical activity. The PAC app delivers custom content, notifications, and weekly active minutes goals to each user based on their unique profile and rewards them with internal app awards (achievement badges) and external prizes (ballots for prize draws). The PAC app uses machine learning and continuous data collection processes collecting physical activity tracking, platform engagement, and user feedback. The app is unique in that it is a "national" app that is part of a broader social marketing strategy by ParticipACTION that includes strategic communications ("Everything gets better when you get active campaign") and community challenges ("Community Better Challenge"). The continuous data collection process also allows for tracking the physical activity of Canadians who use the app.

Weekly summaries of app usage and individual physical activity were extracted from the internal app database. Data were extracted starting the week of 10 to 16 February 2020 – 4 weeks prior to the pandemic declaration – and continued until 13 to 19 April 2020 – 6 weeks following the pandemic declaration.

Measures

Physical activity measures included objectively measured MVPA, light physical activity (LPA), and steps. Physical activity intensity was defined based on the device synced to the app. Currently, the PAC app is compatible and draws data from three manufacturers of wearable devices and their associated apps (Garmin, Fitbit, and Apple Watch), and two activity tracking apps with no associated wearable devices (Apple Health and Google Fit). For wearable devices, physical activity intensity was defined based on the device specific definitions, which typically use heart rate or step cadence. For example, a heart rate ≥60% heart rate maximum is classified as MVPA on Garmin devices. Heart rate is determined using the built-in monitors of the wearable device, and heart rate maximum was estimated using the equation: 220 minus age. When heart rate is not available, intensity is based on movement detection using the user's smartphone built-in accelerometer, whereby MVPA was classified as a step rate ≥100 steps per minute and LPA as < 100 steps per minute. All activity data presented in the current study is recorded through a physical activity tracker (e.g., Fitbit) or app (e.g., Apple Health app) that is synced to the PAC app. To account for data syncing errors, limits were placed on the number of minutes of physical activity recorded per week (3,360 min for MVPA and 6,720 min for LPA). No restrictions were placed on step count.

Demographic information acquired during app registration was also extracted from the database. Such variables included age category, gender, and province or territory of residence.

Statistical Analysis

All statistical analyses were completed using SPSS version 26.0. All app users with available data during the period of study (10 Feb to 19 Apr 2020) were included; however, preliminary examinations of the dataset revealed significant amounts of missing data in the sample (>50% of individual users did not have data on a given week). Additionally, the missing data were not missing at random as individuals with fewer minutes of activity were less likely to have complete datasets. As any attempts to impute missing data may introduce significant bias into the sample (Sterne et al., 2009), analyses were performed on complete cases only. A complete case was identified as an app user with physical activity data for all 10 weeks (10 February – 19 April 2020).

Demographic characteristics for complete cohort and completed cases were reported using frequency analysis and Pearson Chi-square analysis determined frequency differences between the age, gender, region, and physical activity levels groups. Activity data were reported as mean ± SE. Changes in physical activity over time (10 weeks) including MVPA, LPA, and steps were analyzed using one-way repeated measures ANOVAs with Bonferroni correction for multiple comparisons. Physical activity characteristics were also assessed over time by demographic and physical activity levels using mixed two-way repeated measures ANOVAs and reported using simple main effects with Bonferroni correction for multiple comparisons to assess interactions between the groups. Level of significance was set at $p < 0.05$ and effect sizes (η^2_p) were determined using partial eta-squared analysis. These effects can be interpreted as small (0.01), medium (0.06), or large (0.14; Cohen, 1988).

RESULTS

In the 10 weeks of the study, 23,173 Canadians logged on to the PAC app at least once and 2,338 (10.1%) had complete datasets. The majority of app users were 45–54 years old (26.7%), female (76.6%), and living in Ontario (34.7%). In the subset of users with complete data, the majority of users were 35–44 years old (26.6%, $p < 0.001$), female (90.2%, $p < 0.001$), and living in Ontario (34.0%, $p = 0.096$). Users with complete datasets were also more likely to meet the Canadian physical activity guidelines of ≥150 min of MVPA per week at week 1 (10 to 16 February 2020) compared to the whole cohort (complete data: 43.9% vs. whole cohort: 34.6%; $p < 0.001$) and are not considered sedentary (Tudor-Locke et al., 2012) by taking ≥5,000 steps per day (complete data: 83.4% vs. whole cohort: 80.3%; $p < 0.001$). **Table 1** presents complete demographic characteristics of both cohorts.

Changes in Physical Activity During the Pandemic

As expected, there were significant differences over time for MVPA ($\eta^2_p = 0.009$; $p < 0.001$), LPA ($\eta^2_p = 0.119$; $p < 0.001$), and steps ($\eta^2_p = 0.069$; $p < 0.001$) in the sub-sample. In the 4 weeks prior to the pandemic, 10 February to 2 March 2020, MVPA remained relatively constant, with no significant difference during this time (**Figure 1A**; $p = 0.208–1.00$). MVPA significantly declined the week the pandemic was declared (9 Mar 2020) compared to the 4 weeks prior to the pandemic (**Figure 1A**; $p < 0.001$). This was followed by a further decline in MVPA during the week of 6 April 2020 (**Figure 1A**; $p < 0.001$); however, MVPA returned to pre-pandemic levels by 13 April 2020 (**Figure 1A**; $p = 0.498–1.00$). LPA (**Figure 1B**) and steps (**Figure 1C**) were also relatively stable prior to 9 March 2020 ($p = 0.149–1.00$); however, significant declines in both were observed beginning the week of 9 March 2020 (**Figures 1B,C**; $p < 0.001$). Further declines in LPA and steps were observed during the week of 6 April 2020; however, by 13 April 2020, these levels returned to the levels of activity observed after the implementation of physical distancing (23 March to 5 April 2020), though these activities remained lower than pre-pandemic levels (10 February to 2 March 2020; **Figures 1B,C**; $p < 0.001$).

Differences in Physical Activity by Activity Level at Week 1

Physical activity at week 1 (10 February 2020) of this investigation significantly impacted the amount of physical activity performed throughout the pandemic. App users who met the Canadian physical activity guidelines of ≥150 min of MVPA per week recorded significantly more MVPA (**Figure 2A**; $\eta^2_p = 0.018$, $p < 0.001$), LPA (**Figure 2B**: $\eta^2_p = 0.144$, $p < 0.001$), and

steps (**Figure 2C**; η^2_p = 0.093, p < 0.0001) compared to app users who did not meet the Canadian physical activity guidelines. Interestingly, inactive app users (<150 min MVPA/week) demonstrated some resilience to declines of MVPA during the pandemic. Simple main effects analysis revealed increases in MVPA from the week of 10 February 2020 compared to the weeks of 17 to 24 February and 9 March, with further increases in MVPA observed during the remaining weeks of the pandemic (weeks of 16 March through 13 April 2020; η^2_p = 0.09, p = < 0.001). The MVPA of active adults (≥150 min of MVPA/week) followed the activity pattern of the whole cohort analysis. There were no observed differences in the pattern of response of LPA and steps between the active and inactive groups.

TABLE 1 | Demographic characteristics.

	Whole cohort (*n* = 23,173)		Complete data cohort (*n* = 2,338)	
	n	%	*n*	%
Age category				
18–24 years	990	4.3	70	3.0
25–34 years	3,425	14.8	317	13.6
35–44 years	5,422	23.4	622	26.6
45–54 years	6,185	26.7	599	25.6
55–64 years	5,192	22.4	540	23.1
65 + years	1,680	7.3	186	8.0
Unknown (18+)	277	1.2	4	0.2
Gender				
Female	17,749	76.6	2,109	90.2
Male	5,177	22.3	229	9.8
Other	245	1.1	0	0.0
Regions				
Atlantic Canada	2,330	10.1	263	11.3
British Columbia	4,090	17.7	422	18.2
Ontario	8,010	34.7	788	34.0
Quebec	3,669	15.9	332	14.3
The North	110	0.5	11	0.5
The Prairies	4,843	21	503	21.7
Unknown	119	0.5	19	0.8
Physical activity levels – week 1	**10,414**	**44.9**		
≥150 min MVPA per week	3,602	34.6	1,027	43.9
<150 min MVPA per week	6,812	65.4	1,311	56.1
≥5,000 Steps per day	8,359	80.3	1,950	83.4
<5,000 Steps per day	2,055	19.7	388	16.6

Difference in Physical Activity by Age

No interactions were observed between age and physical activity over time for MVPA (**Figure 3A**; η^2_p = 0.003, p = 0.445). However, significant interactions, in that different age categories recorded different amounts of activity each week were observed in LPA (**Figure 3B**; η^2_p = 0.007, p < 0.001) and steps (**Figure 3C**; η^2_p = 0.006, p = 0.002), though these effects were small. Simple main effect analysis revealed that in general, older adults (55–64 and 65+ year olds) recorded less LPA and steps compared to younger adults (25–34, 35–44, and 45–55-year-olds). These findings persisted over the 10 weeks of data collection, which suggests that older adults recorded less incidental physical activity prior to the pandemic which continued into the pandemic.

Differences in Physical Activity by Gender

No significant interactions were observed for gender (**Figure 4**; MVPA: η^2_p = 0.001, p = 0.154; LPA: η^2_p = 0.000, p = 0.624; steps: η^2_p = 0.001, p = 0.146), though a significant main effect was observed over time (MVPA: η^2_p = 0.006, p < 0.001; LPA: η^2_p = 0.044, p < 0.001; steps: η^2_p = 0.032, p < 0.001). Males accumulated more MVPA (**Figure 4A**) and steps (**Figure 4C**) than their female counterparts; however, a statistically significant difference was not detected, which may be due to the relatively small number of males with complete data.

Differences in Physical Activity by Region

Significant interactions between regions of Canada and time were observed for all activity measures, in that people who live in different regions of Canada recorded different amounts of activity each week [**Figure 5**; (A) MVPA: η^2_p = 0.005, p = 0.001; (B) LPA: η^2_p = 0.006, p = 0.001; (C) steps: η^2_p = 0.007, p < 0.001], albeit these effects were small. Simple main effects analysis revealed that in general, Quebec recorded less MVPA (**Figure 5A**), LPA (**Figure 5B**), and steps (**Figure 5C**) compared to other regions in Canada. These finding persisted throughout the entire 10 weeks of the investigation suggesting that changes in physical activity due to the pandemic were not associated with region.

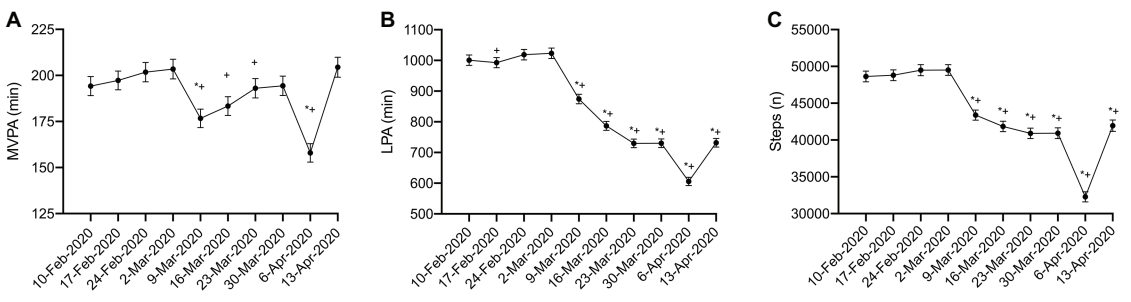

FIGURE 1 | Physical activity during physical distancing. **(A)** moderate-to-vigorous physical activity (MVPA); **(B)** light physical activity (LPA); **(C)** Steps; (*) represented significant difference from 10-Feb-2020; (+) represented significant difference from 2-Mar-2020. For clarity, only selected significant differences are indicated on the figure.

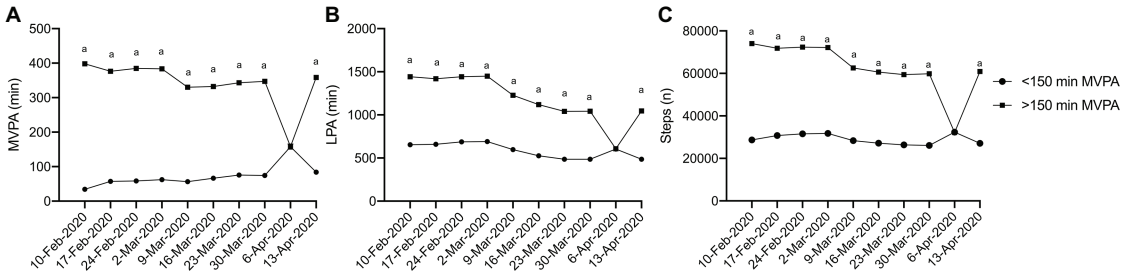

FIGURE 2 | Physical activity during physical distancing week 1 activity level. **(A)** MVPA; **(B)** LPA; **(C)** Steps; (a) represents a significant difference between the two groups. For clarity, only selected significant differences are indicated on the figure.

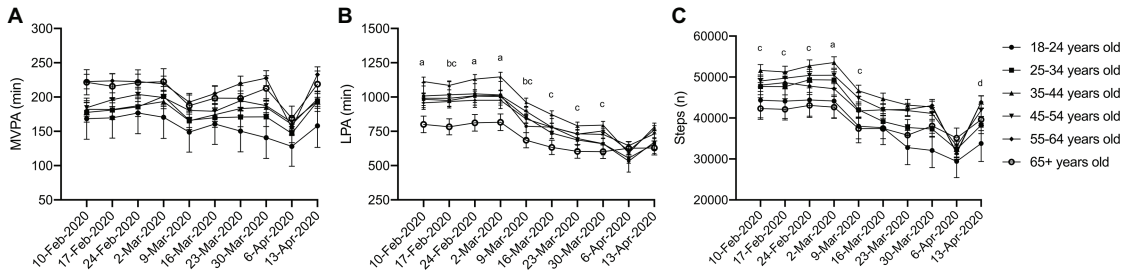

FIGURE 3 | Physical activity during physical distancing by age. **(A)** MVPA; **(B)** LPA; **(C)** Steps; (a) 35–44 year olds are significantly different from 55 to 64 and 65+ year olds; (b) 65+ year olds are significantly different from 45 to 54 year olds; (c) 65+ year olds are significantly different from 35 to 44 year olds; (d) 55–64 year olds are significantly different from 25 to 34 year olds. For clarity, only selected significant differences are indicated on the figure.

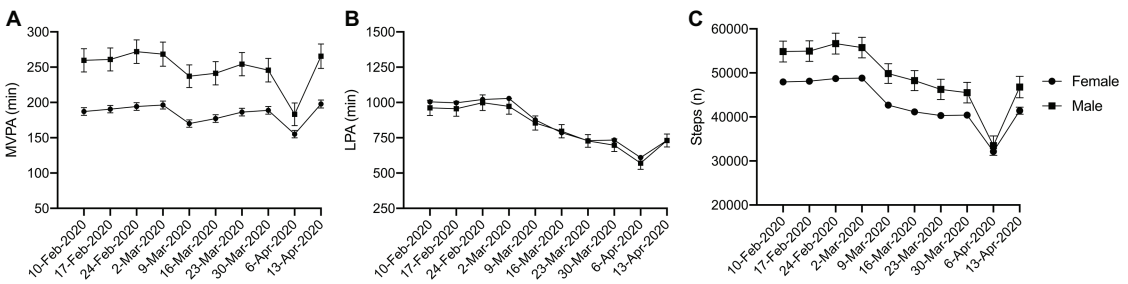

FIGURE 4 | Physical activity during physical distancing by gender. **(A)** MVPA; **(B)** LPA; **(C)** Steps; No interactions observed.

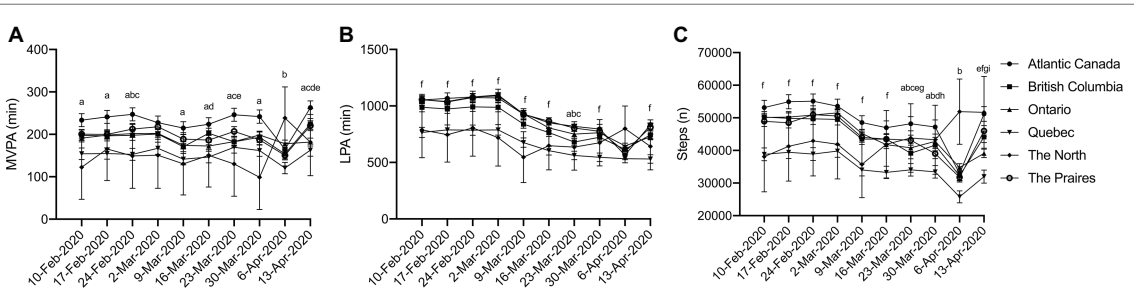

FIGURE 5 | Physical activity during physical distancing by region. **(A)** MVPA; **(B)** LPA; **(C)** Steps; (a) Quebec is significantly different from Atlantic; (b) Quebec is significantly different from Ontario; (c) Quebec is significantly different from The Prairies; (d) Quebec is significantly different from British Columbia; (e) Atlantic Canada is significantly different from Ontario; (f) Quebec is significantly different from Atlantic Canada, British Columbia, Ontario, and The Prairies; (g) Atlantic Canada is significantly different from British Columbia; and (h) Atlantic Canada is significantly different from The Prairies. For clarity, only selected significant differences are indicated on the figure.

DISCUSSION

The purpose of this study was to investigate changes in the physical activity of Canadians immediately prior to and 6 weeks following the implementation of physical distancing protocols in Canada. Results indicate all measures of physical activity (MVPA, LPA, and steps) demonstrated a significant decline following the declaration of a global pandemic on 11 March 2020. Following the initial decline, MVPA had returned to pre-pandemic levels by 6 weeks (week of 13 April 2020) following the implementation of physical distancing protocols. The declines observed in LPA and steps were maintained in the 6 weeks following implementation of physical distancing protocols. This suggests that app users were able to successfully adjust their behavior to maintain their MVPA levels, but incidental physical activity (LPA and steps) has experienced a significant and sustained decline as a result of physical distancing. While significant differences were observed between app users in different age categories and regions of Canada, patterns of response to the pandemic appeared uniform for age, gender, and region. Notably, less active app users experienced minimal disruption in recorded MVPA over the 10 weeks of observation.

Additional declines in MVPA, LPA, and steps were observed during the 9th week of the study (6–12 April 2020). However, these additional declines returned to activity levels similar to week 8 (30 March 2020) by week 10 (13 April 2020). We hypothesize that these additional declines in physical activity may be attributed to the national statutory holiday that occurred over the 10 to 12 April 2020 weekend. App users may have significantly changed their behavior during the long weekend, which not only includes physical activity, but wearing fitness trackers and how they interact with the app during this time.

The existing literature examining physical activity during the COVID-19 pandemic is limited. To the best of our knowledge this is the first scientific research study to examine device-recorded physical activity during the COVID-19 pandemic and physical distancing. Fitbit and Garmin previously reported on changes in physical activity among users between 2019 and 2020. Fitbit reported a 14% decline in step count as a result of the pandemic in Canada (22 March 2019 vs. 2020). In comparison, we found a 12.8% decline in steps, a 14.6% decline in LPA, and a 13.1% decline in MVPA in the current study before and during the first week of physical distancing (Week of 2 March vs. 11 March 2020). These declines align with changes in physical activity of other North American countries, with the United States and Mexico demonstrating a 12 and 13% decline in steps, respectively (Fitbit Staff, 2020).

Garmin suggests that people are exchanging their typical physical activity with activities that can be done at home with minimal equipment. Skiing and golf have been replaced with virtual cycling and indoor workouts to maintain and exceed physical activity levels of prior to the pandemic (Garmin, 2020). These findings are reflected in the current study in that app users' MVPA had returned to pre-pandemic levels by 6 weeks following the implementation of physical distancing. Similarly, Garmin also reported declines in step count of ~500 steps/day from 15 March compared to 30 March 2020, which is also reflected by the findings of the current study. Extending the Fitbit and Garmin reports, our results differentiate between step data and MVPA and demonstrate a rebound in MVPA that is not matched in LPA or steps.

Increased physical inactivity due to lost opportunities for incidental physical activity has been raised as a specific concern during physical distancing (British Association of Sport and Exercise Sciences, 2020). We observed this phenomenon in the current study when declines in LPA and step count were maintained in the 6 weeks of physical distancing while MVPA returned to pre-physical distancing levels over the same time period. This is both encouraging and concerning. It is encouraging in that physically active individuals were able to adapt and return to participation in MVPA 6 weeks after the start of physical distancing measures; however, incidental physical activity has likely been replaced with sedentary behavior. The suppression of LPA is concerning as higher levels of light-intensity and incidental physical activity have been independently positively associated with cardiorespiratory fitness (Ross and McGuire, 2011), and inversely associated with obesity (Fuzeki et al., 2017), blood glucose (Healy et al., 2007; Fuzeki et al., 2017), cardiometabolic risk biomarkers (Carson et al., 2013; Fuzeki et al., 2017), and all-cause mortality (Fuzeki et al., 2017; Loprinzi, 2017). This suggests that the observed declines in LPA of ~7 h per week may have significant implications for the health of Canadians.

Beyond the physical implications of declines in physical activity during the pandemic, potentially worsening mental health conditions are also a significant concern (e.g., Mammen and Faulkner, 2013). A review of the existing literature revealed 16–28% increases in anxiety and depression and an 8% increase in self-reported stress as a result of the COVID-19 pandemic (Rajkumar, 2020). Increased demand for mental health services during the pandemic and physical distancing may place further strain on limited mental health resources. Physical activity may reduce anxiety and depression and is recommended as a first line treatment for mild to moderate depression in Canada (Ravindran et al., 2016). Additionally, light-intensity exercise has been associated with increased well-being in older adults (Buman et al., 2010). The observed declines on physical activity in the current study may exacerbate the precarious mental health of Canadians during physical distancing.

Study Implications

An important implication of this study is the need to explore how to attenuate reductions in LPA in particular in response to future pandemics or a second wave of COVID-19 infection. This may include concerted social marketing efforts to promote the importance to health of LPA, interrupting extended bouts of sedentary behavior and in clarifying the safety of physical activity outdoors while physical distancing. Our findings demonstrate the necessity for public health measures that provide extra space for everyone to engage in incidental activity through walking or cycling for example. This could include temporary reallocation of roadway space and keeping expansive green spaces open. Our finding that patterns of change appeared independent of age, gender, and region suggests such initiatives may be appropriate for many Canadians.

Strengths and Limitations

Here, we used a large sample (>2000 participants) of device-measured physical activity data to reduce the bias associated with self-reported physical activity data. Self-reported physical activity overestimates the amount and intensity of physical activity of the respondent in question. Additionally, this study uses data from the PAC app, a continuously collecting physical activity tracking app. Consequently, we were able to document real-time changes in the physical activity of Canadians in response to the ongoing COVID-19 pandemic and physical distancing.

The PAC app collects data through linkages to physical activity tracking apps or other wearable physical activity monitors. These devices determine time spent in physical activity and intensity of activity using objective measures such heart rate and accelerometery. These devices reduce the bias associated with self-reported physical activity; however, each device uses its own proprietary algorithm to determine MVPA and LPA. Additionally, the use of these devices may have also changed as a result of physical distancing. For example, individuals who are now working from home may not carry their cellular phone around their homes, which would result in decreased steps and LPA recorded. Additionally, we observed a maintenance of MVPA in inactive Canadians during the 6 weeks of physical distancing. This maintenance might be explained by alterations in the way users interact with their fitness trackers and the PAC app. Motivated "active" individuals may adhere more to tracking their physical activity.

As described in the statistical analysis section of this manuscript, the data pull from the PAC app had significant amounts of missing data, and the missing data were not missing at random as individuals with fewer minutes of activity were less likely to have complete data sets. As a result, ~10% of app users had complete data and these users were more active than the whole cohort. Thus, the physical activity levels reported here are most likely above those of the average Canadian (Statistic Canada, 2019) and caution should be used extrapolating the data. While, the absolute values of activity may overestimate activity levels of Canadians, the trends of declining activity appear to reflect the whole cohort (data not shown). PAC app users also predominately identify as female (~75% of users in the whole cohort, ~90% of users with complete data). Therefore, generalization of the results for males in the current study is limited.

CONCLUSIONS

Significant and sustained declines in incidental physical activity (LPA and steps) were observed, while MVPA returned to pre-pandemic levels by 6 weeks of physical distancing. Attenuating the loss of incidental activity should be considered a public health priority in response to future pandemics or a second wave of COVID-19 infection, as declines in incidental activity may have significant long-term implications for both the physical and mental health of Canadians.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Behavioral Research Ethics Board University of British Columbia. Written informed consent for participation was not required for this study in accordance with national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

KD and GF conceived and designed the study, designed the methods, and extracted the data, oversaw the analysis, and interpretation of data, and drafted and revised the article. TC-B and LV contributed to the analysis plan and reviewed the manuscript. All authors contributed to the article and approved the submitted version.

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The remaining author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Validation of the Impact of Event Scale With Modifications for COVID-19 (IES-COVID19)

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Viral outbreaks can be experienced as disruptive and can be associated with trauma-related stress symptoms. In the current study, we adjusted the Dutch version of the Impact of Event Scale (IES) to assess traumatic stress symptoms related to the impact of the COVID-19 outbreak. The psychometric properties of this Impact of Event Scale with modifications for COVID-19 (IES-COVID19) were investigated by administering the IES-COVID19 to 380 university students who participated during the early stage of the COVID-19 outbreak, upon invitation *via* e-mail. Using confirmatory factor analysis, the factor structure of the IES-COVID19 was found to be similar to the original IES, indicating two latent factors: intrusion and avoidance, $\chi^2(85) = 147.51$, CFI = .92, TLI = .90, RMSEA = .044, SRMR = .049. Cronbach's alpha showed acceptable internal consistency of the total IES-COVID19, $\alpha = .75$. Pearson's correlations of the IES-COVID19 over time were also sufficient, demonstrating adequate test–retest reliability, $r = .62$. Significant correlations (ranging between .15 and .50) between the IES-COVID19 and symptoms of depression, anxiety, stress, stress-related rumination, as well as negative social interactions, demonstrate adequate convergent validity. Overall, the IES-COVID19 shows to be a valid and reliable measure that can be utilized to investigate trauma-related stress symptoms of intrusion and avoidance related to the short- and long-term impact of the COVID-19 outbreak.

Keywords: COVID-19, coronavirus, impact of event scale, trauma, intrusion, avoidance, confirmatory factor analysis

INTRODUCTION

There is a wide consensus that during times of pandemic not only physical health, but also mental health is affected. In particular, many people exhibit depressive, stress- and anxiety-related symptoms in response to viral outbreaks and quarantine measures. For instance, during the H1N1 influenza outbreak (swine flu), 15% of a general population sample reported to feel worried about contracting H1N1, and 6% experienced emotional distress (1). Similarly, during the severe acute respiratory syndrome (SARS) epidemic in 2003, health care workers, individuals diagnosed with SARS, and people exposed to SARS patients exhibited depressive as well as anxiety- and stress-related symptoms (2, 3). Among these stress symptoms, trauma-related stress symptoms were

found to be common in 10 to 36% of health care workers and diagnosed SARS patients (3–7). Notably, these trauma-related stress symptoms persisted over time and were still present 13 to 26 months after the outbreak (8). Similar findings have been reported during the Middle East Respiratory Syndrome (MERS) outbreak: 7.8% of healthcare workers who were involved in the treatment and diagnosis of MERS exhibited trauma-related stress symptoms (9).

To reduce transmission rates during viral outbreaks, physical distancing measures are taken, and people are encouraged to stay at home. Empirical evidence that focusses on the impact of quarantine measures and isolation during viral outbreaks demonstrates that these measures are in particular associated with negative psychological effects, including, depression, irritability, insomnia, confusion, and anger (3, 10). In addition, a large amount of evidence indicates that being quarantined is also associated with trauma-related stress symptoms (10). During the SARS outbreak, symptoms of trauma-related stress were observed in 28.9% of quarantined respondents (3). Moreover, being quarantined predicted trauma-related stress symptoms three years later (11). In the context of the H1N1 influenza outbreak (swine flu), one study showed that individuals who were quarantined reported trauma-related stress levels that were four times higher compared to those who were not quarantined (12).

Emerging findings on the COVID-19 outbreak suggest a similar psychological impact as in previous viral outbreaks [*e.g.*, (13, 14)]. Mertens and colleagues (2020) conducted an online study three days after the World Health Organization declared the coronavirus outbreak a pandemic (15). Respondents reported a wide range of concerns regarding the COVID-19 outbreak. Li and colleagues (2020) examined differences in negative and positive emotions before and after the declaration of the COVID-19 epidemic and found that anxiety, depression, and anger increased, while positive emotions and life satisfaction decreased (16). In addition to depressive symptoms, worrying and anxiety, evidence reveals that trauma-related stress symptoms were common during the initial stages of the COVID-19 outbreak (*e.g.*, (14)). A study from Li et al. (2020) shows that both the general public and health care staff might suffer from vicarious traumatization (17). Nonmedical health care workers reported more trauma-related stress compared to medical health care workers (18). Moreover, the presence of physical COVID-19 symptoms was found to be associated with higher trauma-related stress symptoms in health care workers (19). In a study on the psychological impact during COVID-19 experienced by psychiatric patients, Hao et al. (2020) found that more than one-third of psychiatric patients might fulfill the diagnostic criteria of posttraumatic stress disorder (PTSD) (20).

In conclusion, evidence on previous viral outbreaks as well as emerging findings on the current COVID-19 outbreak indicates that viral outbreaks and taken quarantine measures are commonly experienced as disruptive or traumatic. Trauma-related stress symptoms are an important aspect of the psychological impact of a viral outbreak. Moreover, in previous outbreaks these trauma-related stress symptoms persisted in the long run. Future research will reveal whether a similar long-term impact is found in the aftermath of the COVID-19 outbreak. Notably, Belgium, the country where this study was conducted, is severely affected by the COVID-19 outbreak. By the second half of June 2020, about 60,000 COVID-19 cases were confirmed, and 9,600 people died from COVID-19 in Belgium (21).

To measure traumatic stress symptoms in the context of viral outbreaks, the Impact of Event Scale has found to be valuable [IES; (22)]. The IES is a self-report scale assessing subjective distress related to a specific life event. The 15-item scale was developed to assess two dimensions that characterize responses to traumatic stressors: seven items to measure intrusions (intrusively experienced ideas, images, feelings, or bad dreams) and eight items to measure avoidance (self-reported avoidance of ideas, feelings or situations). For the Dutch version of the IES (23), a factor and cluster analysis confirmed the two dimensions (23, 24) and both subscales indicated high internal consistency (α = .93 for intrusion and α = .90 for avoidance; (24)). In addition, the Dutch IES shows adequate convergent validity with the highest correlations between the IES and the anxiety and depression subscales of the SCL-90 (24). An important advantage of the IES, in comparison with other self-report measures of psychological impact, is that the event can be specified. The current study aims to investigate whether the IES can be used to measure the psychological impact of the COVID-19 outbreak. We adjusted the Dutch translation of the IES and developed the Impact of Event Scale with modifications for COVID-19 (IES-COVID19). We examined the psychometric properties of the IES-COVID19 by administering it during the early stages of the COVID-19 outbreak in a sample of university students. Using confirmatory factor analysis, we tested whether a similar factor structure as in the IES emerged (24). In addition, internal consistency, test–retest reliability and convergent validity of the IES-COVID19 were evaluated.

METHODS

Participants

At the first timepoint (T1), a total of 380 students at KU Leuven took part in the study, 335 (88.16%) women and 45 (11.84%) men, after e-mail invitation *via* the university's Experiment Management System (EMS). Their average age was M = 19.44, SD = 1.40, *range* = 17–28. All 380 participants were invited *via* e-mail (using EMS) one month later to participate in the follow-up measurement. At Timepoint 2 (T2), 246 respondents took part (64.74% response rate), 221 (89.84%) women and 25 (10.16%) men. They averaged at an age of M = 19.51, SD = 1.31, *range* = 18–27. Data were sampled from two subgroups (A and B) of participants at each timepoint (T1: n_{AT1} = 198, n_{BT1} = 182; T2: n_{AT2} = 123, n_{BT2} = 123). Belonging to subgroup A or B was a consequence of both of the first authors having access (contact details) to students that were in different years of their education (third-year [group A] and first-year [group B] psychology academic bachelor students). The groups did not differ in terms of gender, p = .88; however, participants of group A

were on average 1.36 years older than participants of group B, t (378) = 10.79, p <.001. Nonetheless, the two samples were considered comparable, since both consisted of predominantly young, female university (psychology) students. Procedural elements were kept similar over groups, groups only differed in in the administration of specific questionnaires to test the convergent validity of the IES. Group A filled out the DASS-21, IES-COVID19, FS, and SSL, whereas group B filled out the DASS-21, IES-COVID19, and SRRS (see abbreviations in the *Measures* section). Timing of administration was identical, as both groups filled out the questionnaires in the same weeks.

Measures

The Impact of Event Scale With Modifications for COVID-19 (IES-COVID19)

The IES-COVID19 was developed based on the Dutch version of the Impact of Event Scale (Brom & Kleber, 1985). Items 1, 4, 5, 6, 10, 11, and 14 concern the Intrusion subscale. Items 2, 3, 7, 8, 9, 12, 13, and 15 are part of the Avoidance subscale. Every item is rated on a 4-point scale ranging from 'not at all'(0) over 'seldom'(1) and 'sometimes'(3) to 'often'(5). Higher scores indicate a higher psychological impact of the situation with regard to COVID-19. Subscale scores are calculated by summing the respective items and the total IES-COVID19 score is calculated by the sum of all of the 15 items. The instructions of the IES were adapted to specifically apply to 'the situation with regard to COVID-19'. The items were largely kept similar to the original 15-item IES. Only when references to the past were made in the original version (*e.g.*, reminder, memory, still, …), we changed the item to match present times (*e.g.* thoughts, thinking), as the COVID-19 pandemic was ongoing during data collection. The items and full instructions of the IES-COVID19 are included in **Appendix 1**.

The Depression Anxiety and Stress Scales (DASS-21)

To investigate symptoms of internalizing psychopathology, we used the Dutch version of the Depression, Anxiety and Stress Scales [DASS-21: (25); Dutch translation: (26)]. This self-report instrument assesses symptoms of depression, anxiety and stress. Every item is to be rated on a 4-point Likert scale, ranging from 'not at all or never applicable' (0) to 'definitely or very often applicable (3). Higher scores thus indicate higher rates of depression, anxiety, and stress. It has proven to be internally consistent, .85 ≤ Cronbach's α ≤ .91, test–retest reliable, .74 ≤ r ≤ .85, and shows adequate validity in a Dutch sample of first-year university students (N = 289) which is comparable to our sample (26).

Psychological Well-Being (PWB)

Psychological well-being was investigated using the Flourishing Scale [FS: (27); Dutch translation: (28)]. This self-report instrument consists of eight items to measure psychosocial prosperity and has shown to be related to the longer version of the psychological well-being scales that Ryff (1989) created (29). Each item is rated on a 7-point Likert scale, ranging from 'strongly disagree' (1) to 'strongly agree (7). Higher scores thus indicate higher psychological well-being. The FS is a brief measurement of psychological well-being that has proven to perform well, with high internal reliability, Cronbach's α = .86, and high temporal stability, r = .71 (27).

The Social Support List (SSL)

Perceived social support was assessed using the Social Support List-Interactions (SSL-I) & -Negative Interactions (SSL-N) (30). Both the SSL-I and the SSL-N are rated on a 4-point Likert scale, ranging from 'seldom or never' (1) to 'very often'. Since the SSL-I includes positively formulated items (*e.g.*, people support me, calm me, give me good advice, *etc.*), higher scores indicate more positive social interactions. However, the SSL-N includes negatively formulated items (*e.g.*, people blame me, treat me unfairly, don't keep their promises to me, *etc.*), so higher scores indicate more negative social interactions. These scales have shown good construct validity, high internal reliability, SSL-I:.90 ≤ Cronbach's α ≤.93; SSL-N:.69 ≤ Cronbach's α ≤.81, and test–retest stability, SSL-I: r = .77; SSL-N: r = .56 (30). Research has indicated that negative interactions (*e.g.* giving one disapproving comments, treating one unfairly), are not at the other end of the spectrum of positive interactions. They are seen as an independent domain of interpersonal functioning and are related to psychological non-well-being (31).

The Stress-Reactive Rumination Scale (SRRS)

The SRRS (32, 33) is a 25-item self-report measure that was developed to assess three cognitive tendencies in response to major life stressors: (1) the tendency to focus on negative attributions and inferences; (2) the tendency to focus on hopeless cognitions; (3) the tendency to focus on active coping strategies and problem solving solutions. Answers are given on an 11-point scale, ranging from 'never' (0), over 'half of the time' (5), to 'always' (10). Higher scores indicate a stronger tendency to focus on (1) negative attributions, (2) hopeless cognitions and (3) problem solving. The negative attributions subscale shows adequate internal validity (Cronbach's α = .89), test–retest reliability (r = .71) and convergent validity (correlations with depression and rumination scales). For this study, we instructed respondents to complete the SRRS with regard to the COVID-19 outbreak.

Procedure

The study was conducted online during the COVID-19 outbreak. Testing at T1 occurred between March 23 and March 27, 2020, within two weeks after the World Health Organization declared the COVID-19 outbreak a pandemic. Testing at T2 took place between April 22 and April 29, 2020. At both timepoints physical distancing measures were in force in Belgium, which meant that citizens were required to stay at home and avoid contact with people outside of their household, and only essential journeys were allowed. Participants were contacted *via* email to take part in the study. In the informed consent, participants were informed about the aims and procedure of the study, and they were told that they could stop their participation at any time without further consequences. After agreeing to the informed consent, they could start completing the questionnaires. Respondents were instructed to do this in a quiet space with

no distractions and to respond to all questions as honestly as possible. Group A filled out the DASS, IES-COVID19, FS, and SSL, whereas group B filled out the DASS, IES-COVID19 and SRRS. After participation, all participants were given contact details of the research team, professional help instances, and they were thanked for their effort and time. Participants either received course credit or an online voucher as reimbursement for their participation. The study was conducted in accordance with ethical guidelines and approved by the Social and Societal Ethics Committee of the KU Leuven (G-2018 10 1357 and G-2019 09 1744).

Analyses

Data were analyzed using JASP (Version 0.12.2) and SPPS (version 26). First, we calculated means and standard deviations for each item of the IES-COVID19. In line with previous research (22, 24, 34, 35), endorsement scores were calculated for each item as well, defined as the percentage of responses larger than zero. Second, the hypothesized factor structure of the IES-COVID19 was tested using confirmatory factor analysis (CFA) (24), using Maximum Likelihood estimation. To compare the fit of different models, we inspected the chi-square fit index. Since the latter is very sensitive to sample size, we also included the Comparative Fit Index (CFI), the Tucker-Lewis index (TLI), the Root Mean Square Error of Approximation (RMSEA) and the Standardized Root Mean Square Residual (SRMR) (36). Values of .90 or higher for the CFI and TFI, and values lower than 0.06 for RMSEA and lower than 0.08 for SRMR were used as the cut-offs for a good fit between the hypothesized model and the collected data (36, 37). Model 1 emanated from one factor, containing all 15 items. Model 2 consisted of two correlated factors, with—in line with previous CFA on the IES (24) —items 1, 4, 5, 6, 10, 11, and 14 loading on the first factor (Intrusion) and items 2, 3, 7, 8, 9, 12, 13, and 15 loading on the second factor (Avoidance). Modification indices were used to adapt this model and explore possible better fits to the data, for instance by allowing error covariance between certain items. For the final model, we calculated the average variance extracted for each factor. All factor analyses were run on the total sample (N = 380). Third, Cronbach's alphas and construct reliability were computed to test the internal consistency of the IES-COVID19 and its subscales. Fourth, test–retest reliability (between T1 and T2) was investigated using Pearson's correlations. Finally, convergent validity of the IES-COVID19 was assessed by calculating Pearson's correlations between the IES-COVID19 and the DASS-21, PWB, SSL and SRRS.

RESULTS

Endorsement, Means, Standard Deviations

In **Table 1**, the percentage endorsement, defined as the percentage of responses on an item larger than zero is presented. Means and standard deviations are displayed for each item and for each subscale.

TABLE 1 | Means and Standard Deviations per Item and per Subscale, Percentage Endorsement and Percentage Responses for each Scale Rating point per Item.

Item	*M*	*SD*	*% end*	*% 0*	*% 1*	*% 3*	*% 5*
1	2.37	1.69	86.80	13.20	31.80	35.00	20.00
2	2.34	1.75	85.50	14.50	33.20	30.30	22.10
3	2.22	1.88	75.80	24.20	25.80	26.80	23.20
4	1.11	1.74	39.50	60.50	16.60	10.30	12.60
5	1.98	1.84	74.20	25.80	32.40	21.60	20.30
6	0.78	1.55	27.90	72.10	12.10	6.60	9.20
7	1.35	1.85	46.80	53.20	17.90	13.70	15.30
8	2.24	1.87	77.40	22.60	27.40	26.60	23.40
9	1.17	1.80	41.10	58.90	17.60	8.90	14.50
10	1.16	1.75	44.20	55.80	21.60	9.20	13.40
11	1.93	1.83	72.90	27.10	31.80	21.80	19.20
12	1.32	1.88	47.70	52.60	22.60	7.10	17.60
13	2.08	1.96	70.00	30.00	25.30	20.30	24.50
14	1.89	2.03	60.80	39.20	21.10	15.50	24.20
15	1.29	1.77	48.70	51.30	22.10	12.90	13.70
Intrusion	11.22	7.15					
Avoidance	13.03	7.54					

The abbreviation % end indicates percentage endorsement, defined as the percentage of responses on an item larger than zero. The abbreviations %0, %1, %3, %5 respectively indicate the percentage of responses on an item being 0, 1, 3, or 5.
All results are calculated using the baseline sample (T1).

Confirmatory Factor Analysis

Confirmatory factor analyses were performed using Maximum Likelihood estimation. In **Table 2**, the fit indices are presented for all models. The significance of the chi-square indices for all models can be attributed to our large sample size rather than a bad fit of these models to the data. This is evidenced by the values of the other fit indices (CFI, TLI, RMSEA, SRMR), which point in the direction of an adequate and increasingly better fit of the following models to the data.

Model 1 included one general latent factor on which all 15 items loaded. Fit indices showed that the fit of Model 1 to the data was not sufficient yet. Especially the CFI and TLI indices of fit were below the cut-off score of .90 and the RMSEA index was above .06. We included two latent factors in Model 2, which corresponds to the original structure of the IES (22). Differences between chi-square statistics indicate that Model 2 fits the data significantly better than Model 1, $\Delta\chi^2(1, N = 380) = 8.00$, $p < .001$. A two-factor solution is thus preferred above a one-factor structure for this dataset. However, the CFI, TLI, and RMSEA indices of Model 2 did not meet the criteria for an adequate fit yet.

Subsequently, Model 2 was further adapted in order to obtain a better fit to the data by implementing modifications following the indices of the highest values[1]. Those modification indices indicated that allowing error covariance between some of the items may result in a better fit of the model to the data. Allowing similar items to covary means that the variance which is not

[1]Notably, the modification indices suggested to include item 14 in both factors. However, we decided to refrain from this modification because the loading of item 14 changed to negative on the factor it was initially predicted to load on positively (Factor 1—Intrusion) after including the item in Factor 2 (Avoidance). This negative loading on Factor 1 is in terms of its content not compatible with the interpretation of this factor.

TABLE 2 | Fit indices for Confirmatory Factor Models of the IES-COVID19.

Model	χ^2	df	p	CFI	TLI	RMSEA	SRMR
Model 1	244.80	90	<.001	.80	.76	.067	.061
Model 2	236.80	89	<.001	.81	.77	.066	.060
Model 2a	206.96	88	<.001	.84	.81	.060	.057
Model 2b	180.31	87	<.001	.88	.85	.053	.053
Model 2c	166.33	86	<.001	.89	.87	.050	.051
Model 2d	147.51	85	<.001	.92	.90	.044	.049

Comparative Fit Index (CFI), the Tucker–Lewis index (TLI), the Root Mean Square Error of Approximation (RMSEA) and the Standardized Root Mean Square Residual (SRMR). Model 1: one-factor model. Model 2: two-factor model. Model 2a: Model 2 plus allowing for error covariance between items 3 and 13. Model 2b: Model 2a plus allowing for error covariance between items 4 and 6. Model 2c: Model 2b plus allowing for error covariance between items 13 and 14. Model 2d: Model 2c plus allowing for error covariance between items 10 and 3.

All results are calculated using the baseline sample (T1).

explained by the factors may covary because of the similarity between those items. In Model 2a, we allowed a covariance between items 3 and 13, since both items concerned attempts to not think about the situation concerning COVID-19. After implementing this modification, it became clear that Model 2a fits our data significantly better than Model 2, $\Delta\chi^2$ (1, N = 380) = 29.84, p <.001. Nonetheless, the fit of Model 2a was still insufficient (CFI and TLI <.90). Therefore, Model 2b was tested on top of Model 2a, by allowing items 4 and 6 to covary, as both items related to the impact of COVID-19 on sleeping. Comparing chi-square indices revealed that Model 2b fits the data significantly better than Model 2a did, $\Delta\chi^2$ (1, N = 380) = 26.65, p <.001. However, the fit indices of Model 2b still showed an inadequate fit to the data (CFI and TLI <.90). Consequently, we built on Model 2b, by including a covariance between items 13 and 14 in Model 2c. Again, the decision for allowing error covariance between these items was theoretically justified, as the items concerned intrusive thoughts and consequent coping processes with these thoughts. Model 2c showed to fit our dataset significantly better than Model 2b, $\Delta\chi^2$(1, N = 380) = 13.98, p < .001, however not sufficient yet to pass our predetermined cut-off criteria (TLI <.90). Hence, we adjusted Model 2c according to the highest modification index again, which resulted in the inclusion of an inter-item covariance between item 10 and item 3 in Model 2d. Items 10 and 3 also both included thoughts and their associated coping strategies. Model 2d passed all cut-off criteria (CFI ≥ .90, TLI ≥ .90, RMSEA < .06, SRMR < .08) and fits the data significantly better than the previously tested Model 2c did, $\Delta\chi^2$ (1, N = 380) = 18.82, p < .001. The average variance extracted (AVE) for each of the factors in the final Model 2d surpassed the threshold of .50 (38), being .67 for Factor 1 (Intrusion) and .57 for Factor 2 (Avoidance). The factor loadings obtained in Model 2d are displayed in **Table 3**.

TABLE 3 | Factor Loadings in Model 2d.

Subscale and item	Factor Loading
Intrusion	
1	0.62
4	0.82
5	0.84
6	0.59
10	0.86
11	0.80
14	1.11
Avoidance	
2	0.18
3	1.02
7	0.75
8	0.32
9	0.87
12	0.85
13	0.96
15	0.61

All results are calculated using the baseline sample (T1).

Internal Consistency

Cronbach's alphas were computed to examine the internal consistency of the total scale and subscales. The Cronbach's alphas for the intrusion subscale, α = .67, the avoidance subscale, α = .59, as well as for the total IES-COVID19, α = .75, indicated an acceptable internal consistency (39). In addition, the construct reliability (CR) for the intrusion subscale, .93, for the avoidance subscale, .90, and for the total scale, .87, indicated also an adequate internal consistency (38).

Test–Retest Reliability

Pearson's correlations were calculated to investigate test–retest reliability for the total IES-COVID19 and its subscales. The test–retest reliability of the total IES-COVID19, r = .62, p <.001, the intrusion subscale, r = .47, p <.001, and the avoidance subscale, r = .54, p <.001 were moderate, indicating sufficient reliability over time (40).

Convergent Validity

Pearson's correlations between the total IES-COVID19, the intrusion subscale, the avoidance subscale and our concepts of interest were calculated. Results are presented in **Table 4**. The total IES-COVID19 scores as well as both subscales were significantly positively related to depression, anxiety, stress (as measured with the DASS-21), and stress-reactive rumination (as measured with the SRRS). This shows that individuals who experience a higher psychological impact by the COVID-19 outbreak exhibit other psychological symptoms as well, like depression, stress and anxiety, and they have a higher tendency to ruminate about it. Furthermore, the total IES-COVID19 score and the avoidance scale were positively associated with negative social interactions (as measured by the SSLN), indicating that people who experienced social contact in a more negative way and felt less supported by others, also experienced more

TABLE 4 | Pearson's Correlations Between the Total IES-COVID19, Subscales, and Other Scales.

Scale	IES-COVID19	INT	AVO
PWB	−.11	−.07	−.11
DEP	.27**	.19**	.29**
ANX	.31**	.26**	.28**
STR	.34**	.32**	.28**
SSLI	.14	.12	.11
SSLN	.17*	.13	.15*
SRRS	.50**	.46**	.45**

PWB, psychological well-being; DEP, depressive symptoms; ANX, anxiety symptoms; STR, stress symptoms; SSLI, social support list: positive interactions; SSLN, social support list: negative interactions; SRRS, stress-reactive rumination.
*$p < .05$,
**$p < .001$.

psychological impact of COVID-19. However, IES-COVID19 scores did not relate to positive social interactions. Finally, scores on the IES-COVID19 and scores for psychological well-being were not related, suggesting two different constructs.

DISCUSSION

The goal of the current study was to investigate whether the Impact of Event Scale [IES; (22, 23)] is a valid measure of traumatic stress symptoms related to the outbreak of COVID-19. We adapted the IES to COVID-19 (IES-COVID19) and administered it in a sample of 380 university students during the COVID-19 outbreak in Belgium. Psychometric properties of the IES-COVID19 were investigated in terms of factor structure, internal consistency, test–retest reliability and convergent validity.

The results of the confirmatory factor analysis provide support for a two-factor structure in our data, containing the original subscales of intrusion and avoidance as described by Horowitz et al. (22) and later replicated in the Dutch version by van der Ploeg et al. (24). Minor modifications to the two-factor model were implemented according to the highest modification indices in order to ensure a better fit to the data, namely, inter-item correlations between items 3–13, 4–6, 1–14, and 3–10 were allowed. Our final model (Model 2d) fits the data significantly better than a unifactorial model or a bifactorial model without modifications and passes the predetermined cut-off criteria (CFI ≥ .90, TLI ≥ .90, RMSEA <.06, SRMR <.08) (36, 37). For completeness and consistency purposes, we utilized the subscales as well as the total IES-COVID19 scale in our further psychometric analyses.

The internal consistency of the total IES-COVID19 was adequate, demonstrating that the items cohesively measure trauma-related stress symptoms. The internal consistency of the subscales was acceptable as well (as measured by construct reliability). In addition, the test–retest reliability over a one-month period was good, rendering a similar rank order of individuals with regard to their trauma-related stress symptom severity over time. The average total scores on the IES-COVID19 were also compared between both timepoints, showing that respondents reported a higher impact of COVID-19 in March 2020, $M = 24.84$, $SD = 13.02$, compared to April 2020, $M = 22.02$, $SD = 14.28$, $t(245) = 3.57$, $p < .001$. This is line with previous research of Sloan (1988) who demonstrated that changes in reactions to traumatic events can be reliably measured using the IES (41). Wang et al. (2020) found that the IES-R is more sensitive to change during the COVID-19 outbreak as compared to the DASS-21 (14). Moreover, the magnitude of the standard deviation at both timepoints (*SD range* = 13.02–14.82) shows that there are large inter-individual differences in how the COVID-19 outbreak affects experienced traumatic stress symptoms. Accordingly, we suggest that the IES-COVID19 would be a useful instrument to assess not only broad population trends but also intra-individual fluctuations in traumatic stress symptoms over time. Since the impact of pandemic outbreaks and quarantine measures can be long-lasting (11), it is important to follow up on symptomatology over time, in particular for those individuals that were under extremely stressful circumstances during COVID-19, like health care workers or family members of people who contracted the disease. Horowitz and colleagues (22) indicated a 75% chance of developing posttraumatic stress disorder (PTSD), when scores on the IES are 27 or higher (22). They suggested that this score on the IES might represent the best cut-off for the probability of a PTSD diagnosis, with the advice of consulting a mental health professional when scores are 35 or above. Accordingly, the IES-COVID19 could be used preventively as an instrument to screen individuals at-risk for developing PTSD.

Furthermore, and in line with our expectations, total IES-COVID19 and subscale scores were significantly correlated with symptoms of depression, anxiety, stress, and stress-related rumination. The relations between the IES-COVID19 and scales that are developed to measure related psychological symptomatology support adequate convergent validity of the IES-COVID19. No relation between the IES-COVID19 and general psychological well-being, as measured with the Flourishing Scale [FS: (27); Dutch translation: (28)], was found, suggesting differences in underlying concepts between both measures. Finally, significant correlations between perceived negative social interactions and the total IES-COVID19 scores as well as the avoidance scores show that individuals who do not feel sufficiently supported by their social network experience more trauma-related stress symptoms. This points to the importance of social support as a possible protective factor for mental health in pandemic outbreaks (10).

Several other questionnaires have been developed to measure psychological reactions in the context of the COVID-19 outbreak, for instance the Fear of COVID-19 Scale [FCV-19S: (42)] and the COVID Stress Scales [CSS: (43)]. Notably, the FCV-19S and CSS focus on broader anxiety- and stress-related symptoms, whereas the focus of the IES-COVID19 is more specifically on trauma-related symptoms[2]. Moreover, an advantage of the IES-COVID19 is that it closely resembles the IES, which is a wide-spread and popular measure of the psychological impact of traumatic events and specifically viral outbreaks and of which the psychometric properties have been evaluated extensively. The FCV-19S has the advantage that it has been translated and validated in different languages [*e.g.*, (44–47)]. Similarly, it is recommended to validate the current modification of the IES to COVID-19 in other languages and countries to allow for cross-country comparisons. In addition, it

[2]The CSS contains a subscale measuring traumatic stress.

would be interesting to compare the IES-COVID19 with other questionnaires on psychological reactions to COVID-19 in future research.

A possible limitation of the study might be the homogeneity of our sample, which consisted mostly of young female students. Nonetheless, total average scores on the IES-COVID19 were between $M = 22.02$ (April) and $M = 24.84$ (March), indicating a significant impact of COVID-19, even in a considerably healthy population (22). In line with Li et al. (2020), traumatization as a result from pandemic outbreaks might not only occur in health care workers and infected individuals, but also in the general population and in a vicarious way. Nevertheless, it seems important to evaluate the IES-COVID19 in other groups, such as high-risk and vulnerable populations (*e.g.*, health care workers, COVID-19 patients and relatives).

In conclusion, our results indicate that the IES-COVID19, an adaptation of the widely used IES, is a valid measure of traumatic stress symptoms (avoidance and intrusions) related to the COVID-19 outbreak. We see several possibilities for the further use of the IES-COVID19, for instance, to examine the long-term impact of COVID-19 and as a prognostic marker or screening instrument of individuals at risk of developing chronic complaints and PTSD.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by The Social and Societal Ethics Committee of the KU Leuven (G-2018 10 1357 and G-2019 09 1744). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

Conceptualization: SS, LV, DH. Formal analysis: EB, LV, SS. Methodology: LV, EB, SS. Supervision: DH. Writing—original draft: LV, SS. Writing—review and editing: LV, SS, EB, DH.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2020.00738/full#supplementary-material

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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2019 Novel Coronavirus Disease, Crisis, and Isolation

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The highly contagious 2019 novel coronavirus disease (COVID-19) outbreak has not only impacted health systems, economies, and governments, it has also rapidly grown into a global health crisis, which is now threatening the lives of millions of people globally. While, on one hand, medical institutions are critically attempting to find a cure, on the other hand, governments have introduced striking measures and policies to curtail the rapid spread of the disease. Although COVID-19 has achieved pandemic status and is predominantly viewed as a biomedical issue, it is argued that it should also be treated as a psychological crisis. This paper also reviews the literature to examine and comment on the detrimental effects of isolation, which has been enforced as one of the primary preventative measures to manage the spread of COVID-19. This paper further outlines key recommendations that should be addressed across different levels to buffer against the known adverse effects of isolation, which is especially relevant for the current COVID-19 situation, where a large proportion of the global population is isolated, confined, and/or quarantined.

Keywords: 2019 novel coronavirus disease, coronavirus, crisis, isolation, psychology, health, wellbeing, recommendations

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INTRODUCTION

Epidemiological research suggests that the outbreak of 2019 novel coronavirus disease, or COVID-19, has rapidly spread from a seafood and wet animal market in Wuhan (China) in December 2019 to over 216 countries worldwide in June 2020, with 7,127,753 confirmed cases and 407,159 deaths (World Health Organization, 2020a,b). The severity of the emerging COVID-19 infection and its associated zoonotic viral pathogenesis bring with them significant human costs, which includes, but are not limited to, physical, economical, mental, organizational, social, and cultural wellbeing. Although some level of psychological distress is normal and expected during times of crises, dynamic adaptation to extraordinary, prolonged, and/or uncertain levels of deleterious crisis becomes vital, especially if it causes significant disruptions and endangers global populace. This is particularly relevant now when in addition to extraordinary medical trials to find a cure for COVID-19, the world is also simultaneously witnessing a period of global crises with the enforcement of striking public health measures and policies that are likely to reorient human behavior, choices, and lifestyle for some time to come. Effective and efficient management of crises, therefore, becomes crucially important because of the impact and substantial costs to humanity when they are not resolved. The nature, scope, and impact of crises should not be limited to retrospective academic scholarship but should be proactively, systematically, and concurrently studied by the broader community.

CRISIS: DEFINITION

The word "crisis" generally refers to a time of intense difficulty or adversity. Although a number of synonymous terms (such as catastrophe, emergency, disaster, threat, and danger) may be found in the extant literature, a scholarly definition of crisis still remains elusive. Arriving at a comprehensive understanding or consensus on a definition of crisis is not only a part of sound academic approach, but also paves the way for scientific investigation to be undertaken with the aim of explaining, predicting, and managing crisis successfully. This is especially true for COVID-19, where accurate and timely understanding of the virus, its manifestation and transmission to humans, and the crisis it engenders is of paramount importance.

WHO defines crises as a situation that is perceived as difficult, which implies the possibility of an insidious process that cannot be defined in time (World Health Organization, 2020c). Seeger et al. (1998) characterize crisis as a specific, unexpected, and nonroutine event that creates uncertainty and threat. Similarly, James and Wooten (2010) define crisis as a rare, significant, and public situation that creates highly undesirable outcomes. Although there is a consensus that crisis represents a turning point which interferes with routine business operations (Spillan and Hough, 2003), there has been some divergences in its conceptualization, where some authors argue that crisis situation can be extreme and abnormal (Pearson and Clair, 1998), while some others posit that crisis manifests as a result of a long period of incubation that bluntly occurs through the influence of a precipitating event (Roux-Dufort, 2009). For the purpose of this paper, crisis is defined as an occurrence of a solitary or series of apparent or surreptitious incident(s) or event(s) that causes an initial shock that impedes normal functioning, immediately accompanied by a state of real and/or perceived urgency, threat, and helplessness, which has the potential to cause significant disruptions and endanger individuals, communities, and/or humanity, in real-time or sometime in the near future. In proposing this definition, it is argued that crisis may eventuate as a result of one solitary blunt incident or a series of causative precipitative factors that align in a certain manner in a given time period to cause major disruptions or a combination of both with one following the other in quick succession. It is important to clarify that crisis may originate in any one domain and quickly escalate out of control and infect other domains. This is especially true for COVID-19 pandemic that emerged primarily as an epidemiological issue but has rapidly grown into a global economic and public health crisis.

While on one hand, most international bodies and institutions have ramped up measures to conduct epidemiological studies and medical trials, on the other hand, major governments and organizations have introduced new policies and legislations to curtail the spread of COVID-19 (e.g., Australian Government Department of Health, 2020; Centers for Disease Control and Prevention, 2020; World Health Organization, 2020d). The ultimate challenge in such an endeavor is to simultaneously implement a plan of action that would yield immediate and intended outcomes in the short-term while carefully balancing and managing the consequent results of such measures in the long-term. In other words, strategies and procedures must be planned, developed, and executed in a way that helps exterminate the present crisis while simultaneously averting any potential negative outcomes that may eventuate as a result of those actions in the future. Although all of the proposed guidelines and measures are intended to stop the rapid spread of COVID-19 in the short-term, the long-term health consequences of some of these measures are not known. One such measure, isolation, has been strongly recommended and legally enforced, not only just for individuals who have contracted the virus or have been in contact with a confirmed case, but also for general public who have been advised to stay indoors (Australian Medical Association, 2020; Elsworthy and Willis, 2020). Intuitively, it may appear that these measures would have the intended impact and desired outcome, but the efficacy and manner in which this would take place has been brought into question (Rodgers, 2020). This may be crucially true for isolation, which could appear to have positive short-term benefits, but also have deleterious health consequences for individuals in the long-term, especially those who have not tested positive for COVID-19 but find themselves isolated or restricted.

ISOLATION AND HEALTH CONSEQUENCES

Humans are social beings. And therefore, it is reasonable to argue that our need for being social is crucial for our health and wellbeing, and that any form of isolation that challenges this can be disruptive. Although the concept of isolation has received considerable attention in the literature, a comprehensive definition still remains elusive. This is further convoluted by the fact that a number of other concepts are often used interchangeably with isolation, which include loneliness, solitude, quarantine, and confinement. Walker and Avant (2011) argue that it is essential to identify distinguishing characteristics of isolation to successfully delineate it from other related concepts. So far, researchers have identified three aspects of human isolation: sensory deprivation, confinement, and social isolation (Rasmussen, 2008; Sells, 2008). Most studies maintain that these aspects of isolation, when experienced by themselves or in a combination, can cause significant decrements in adaptation and sustenance (Haythorn, 2008). Furthermore, the existing literature on isolation lacks contextual manifestation. For instance, it would be reasonable to argue that isolation due to solitary confinement in prison would be very different to isolation during space exploration or polar expedition or quarantine during a pandemic. Similarly, ontological understanding of isolation is also contingent on the subsequent epistemological viewpoint. For instance, isolation is viewed differently in the social sciences or humanities than it is in other fields of study, such as chemistry or cyber security. Providing a comprehensive coverage of how isolation has been characterized in the literature or differentiating between the various types of isolation and other related concepts is beyond the scope of this paper. However, for the purpose of this

paper, a thymological view has been adopted, and isolation has been defined as a real or perceived state, where an individual experiences separation from their usual sense of being and feels limited in internal and/or external space or movement and interpersonal connections, which results in detrimental psychophysiological alterations and decrements in adaptation and performance. In light of this definition and the current circumstances that surround COVID-19 pandemic, this perspective considers the different but related concepts of loneliness, solitude, quarantine, and confinement to fall under the broader rubric of isolation.

Recent research indicates that isolation can not only be a social problem, but it can also pose serious challenges for the public health system (Klinenberg, 2016; Snell, 2017). Isolation and lack of social interaction have been consistently linked with a range of risk factors for poor health, undesirable health outcomes, increased morbidity, and early mortality (e.g., Knox and Uvnas-Moberg, 1998; Cornwell and Waite, 2009; Shankar et al., 2011; Coyle and Dugan, 2012; Luo et al., 2012; Barger, 2013; Pantell et al., 2013; Steptoe et al., 2013; Barger et al., 2014; Kreibig et al., 2014; Shevlin et al., 2014; Tsai et al., 2014; Holt-Lunstad et al., 2015; Miyawaki, 2015; Na and Hample, 2016; Valtorta et al., 2016; Chang et al., 2017; Courtin and Knapp, 2017; Rico-Uribe et al., 2018).

Similarly, numerous epidemiological, experimental, clinical, and longitudinal studies on isolation have indicated that it has profoundly detrimental effect on the psychological and physical health of individuals. Isolation has been found to cause impairment in optimal functioning in mood, cognitive performance, stress hormones, and neurological activity (Golden et al., 2009; Schneider et al., 2010; Cacioppo et al., 2015; Friedler et al., 2015). Studies examining executive functioning and working memory in socially excluded participants have reported reduced brain activity and inferior cognitive performance (Sauer et al., 1999; Reed et al., 2001; Campbell et al., 2006). Furthermore, neuroscientific studies on the effects of long-term isolation have shown that individuals may experience a range of degenerative symptoms, including neurocognitive and immune modulatory alterations, fatigue, misaligned circadian rhythm, sleep disorders, and altered stress hormone levels (e.g., Jacubowski et al., 2015; Pagel and Choukèr, 2016). Neurobiological studies have indicated that isolation may cause atrophy in certain brain areas, such as the hippocampus and the prefrontal cortex (Duman and Monteggia, 2006; Liston et al., 2009) and decrease of brain-derived neurotrophic factors (Barrientos et al., 2003; Gong et al., 2017), which are responsible for neurogenesis and plasticity. Similarly, Schneider et al. (2010) found that isolated individuals reported decreased electrocortical activity when they were subjected to long-term confinement.

Psychosociological studies have linked isolation to impaired self-regulation of hedonistic processes (Baumeister et al., 2005) and increased perception of loneliness (van Baarsen et al., 2009). It has also been found that feelings of loneliness are strong predictors for reduced cognitive performance (Tilvis et al., 2004; Wilson et al., 2007) and fragmented sleep (Cacioppo et al., 2002; Kurina et al., 2011). Numerous studies have repeatedly demonstrated that lonely individuals are more likely to worry about being evaluated negatively and feel more threatened in social situations (Cacioppo et al., 2006), experience heightened accessibility of negative social information (Cacioppo and Hawkley, 2009), and report higher sensitivity to the presence of pain (Yamada and Decety, 2009). Similarly, it has been found that loneliness is strongly associated with markers of threat surveillance (Mendes et al., 2002). This is in line with imaging studies that have linked loneliness to greater activation of visual cortex in response to negative social images (Cacioppo et al., 2009) and eye tracking research that has shown that lonely individuals are more likely to spend a greater proportion of their time fixating on socially threatening stimuli in a social scene (Bangee et al., 2014).

It is evident that isolation causes significant neurophysiological and psychosocial disruptions, which can have serious implications for the health and wellbeing of individuals. Considering the severe biopsychosocial outcomes, it would be reasonable to state that isolation has the potential to seriously and negatively influence individuals' cognitive capabilities and decision-making and problem-solving abilities, along with deterioration in interpersonal relationships and overall quality of life. This may be particularly true for the current COVID-19 situation, which has already witnessed discrepancies in how individuals have behaved around the world – while some individuals have chosen to ignore critical health recommendations and advice (Bhanot, 2020; Pollock et al., 2020), others have indulged in stocking up on essential supplies (Boulet and Kodikara, 2020; Lufkin, 2020) – both presenting challenge, panic, and uncertainty in the society.

This present perspective seeks to encourage critical discourse analysis and practices in this domain, especially to inform research and policy. More specifically, this paper is intended to serve as a caution that in addition to the ongoing medical and economic crises, we are also in the midst of a palpable psychological crisis, which if unchecked, can further burden the already enervated state of reality we find ourselves in. In light of the proposed definition of crisis, it is argued that the current COVID-19 pandemic presents significant and unprecedented risk of a *global isolation crisis*, which will present substantial mental, social, economic, and public health challenges. It is, therefore, imperative to acknowledge and address global isolation due to COVID-19 as a (psychological) health crisis. This is particularly significant for, but is not limited to, majority of those individuals who have not tested positive for COVID-19 but have been subjected to isolation. For a large proportion of these individuals, the indefinite period of isolation coupled with the uncertainty of financial, medical, and social wellbeing can instigate real and/or perceived crisis. It should also be noted that the present perspective is not intended to criticize the lockdown measures that have been implemented globally and shown to be effective in containing the spread of the virus. Rather, it is hoped that this perspective will also highlight that the interim solution of isolation may potentially proliferate other vulnerabilities and hence warrants further investigation and analysis.

DISCUSSION AND RECOMMENDATIONS

Given the deleterious effects of isolation and the serious consequences they may have on the health and wellbeing of individuals, it is argued that it must be treated as a crisis and that a collaborative, concerted, and committed effort must be made to buffer against the known adverse effects of isolation. These measures must be developed and implemented across various levels of the society to ensure that we are prepared for arduous and uncertain times. This is especially relevant for the current COVID-19 situation, where a large proportion of the global population is isolated and quarantined.

Considering the limitations found in the extant literature reviewed, this paper addresses a number of shortcomings and proposes practical and workable solutions to address isolation crisis. It is evident that the conceptualization of isolation in the literature has largely been unsystematic and unidimensional. Although previous research has identified a number of indicators of isolation, a comprehensive and multidimensional understanding of this construct still remains elusive. Moreover, researchers in this domain have primarily focused on obtaining and interpreting quantifiable aspects of isolation, such as frequency and duration of isolation, and as such have largely disregarded the qualitative contexts where isolation manifests. Similarly, the vast majority of research on isolation has been conducted on Western population, particularly the US and UK, and as such does not represent the lifestyle, socioeconomic circumstances, and cultural diversity of the global population. Also, a large proportion of the research examining health risks associated with isolation has primarily focused on the elderly population. The academic and research community should, therefore, carefully examine, characterize, and define isolation and its correlates, both at micro- and macro-levels. This also includes, but is not limited to, examining other related concepts, such as loneliness, solitude, quarantine, and confinement. Furthermore, ethnographic, phenomenological, cross-cultural, and longitudinal studies must be conducted to understand how isolation affects the psychophysiology of individuals across the lifespan, especially in different contexts, such as voluntary and non-voluntary isolation, and short-term and long-term isolation. Future research must also focus on understanding the chronology of effects during initial period of incubation along with its manifestations along different time intervals (i.e., short-term, medium- to long-term, and long-term) so that appropriate measures could be suitably developed.

Equipped with this knowledge, health professionals and counselors should develop tailored programs and interventions to assist high-risk individuals. For instance, community engagement programs may be developed to assist children in orphanages or elderly people in aged-care facilities to engage in regular physical activity and maintain adequate dietary and nutritional intake during periods of isolation and confinement, especially in times of crisis such as COVID-19. Also, a routine check-in program may be introduced at the local or community level, where allied health professionals connect with residents to ascertain their level of functioning and provide them with appropriate care and resources. This is especially relevant for the current COVID-19 pandemic, where most people now find themselves isolated for an indefinite period of time, which is likely to present psychophysiological challenges. Also, efficient use of technology (such as telehealth or ehealth sessions), social media (such as Facebook or Twitter), and collaborative platforms (such as Skype or Zoom) in this scenario may greatly alleviate logistical, health, or communication concerns, especially considering the physical distancing rule that has been implemented to curtail the spread of COVID-19. Furthermore, novel and innovative ways of encouraging social interaction and inclusivity must be developed and promoted so that individuals are not only able to optimally function and reap the social and health benefits of interpersonalism, but also converge in solidarity during times of crisis such as COVID-19.

Additionally, organizations and governments across the world must collaborate to develop multidimensional indices of isolation, which also factor the influence of other related variables, such as age, gender, multimorbidity, and lack of social integration. Also, crisis modeling systems and interventions to forecast and detect impairment due to isolation must be developed as essential precautionary measures. Furthermore, merging national and international data from previous crises along with current data, a real-time and dynamic database must be maintained that provides accurate and timely information on the state of crisis and best practices for management and mitigation. This database should also contain historical information on the physiological effects of isolation on the human body and its reaction to periods of isolation and confinement. Preparatory and educational measures and policies must be developed *apriori* so that individuals are equipped to take necessary steps to assuage the known adverse effects of isolation and crisis. This would not only help mitigate adverse effects for the individuals, but also alleviate tremendous burden that would otherwise strain the public health system during times of crisis.

Finally, in an attempt to develop preventative infection control measures and health policies, we must also acknowledge that COVID-19 affects women, men, and children differently. This pandemic is likely to worsen the existing vulnerabilities of certain groups of people who are already at a disadvantage. This may include, but is not limited to, individuals who have faced gender inequality or been subjected to domestic or intimate partner violence; marginalized groups such as people with disabilities and people of color; and those who are homeless, refugees, or in extreme poverty. This makes COVID-19 a major human rights issue where these groups of people are at a disproportionately higher probability of being adversely affected. And therefore, it is critical that measures that are intended to resolve the COVID-19 conundrum must also mindfully intersect with basic and universal human rights, especially for those who have been isolated, marginalized, alienated, or disempowered.

CONCLUSION

In a span of few months, COVID-19 pandemic has emerged as a major biomedical threat to global economy and public health systems. Given its transmissibility, it is imperative that strict infection control and safety measures are adopted across the globe. Considering the timeframe required to develop effective vaccine, isolation has been asserted as a fundamental measure to limit the contagion. But prolonged, indefinite, and uncertain periods of isolation may bring with it adverse psychophysiological effects. In this paper, it is argued that emerging global psychological distress and isolation due to COVID-19 should also be treated as a crisis. Appropriate precautionary and mitigatory measures must be developed and introduced at various levels in the society, which would not only aid efforts at individual and community levels, but also help reduce burden on the already encumbered public health systems.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

The author confirms being the sole contributor of this work and has approved it for publication.

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Conflict of Interest: The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Psychosocial Support for Healthcare Workers During the COVID-19 Pandemic

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The novel corona virus disease COVID-19 was first diagnosed in humans in Wuhan, China in December 2019. Since then it had become a global pandemic. Such a pandemic leads to short- and long-term mental health burden for healthcare workers. Recent surveys suggest that rates of psychological stress, depression, anxiety, and insomnia and will be high for this group. Numerous organizations have since released guidance on how both healthcare workers and the general public can manage the mental health burden. However, these recommendations focus on specific healthcare workers (e.g., nurses or psychologists), are often not evidence-based, and typically do not situate guidance within a phased model that recognizes countries are at different stages of the COVID-19 pandemic. In this perspective paper we propose a phased model of mental health burden and responses. Building on work by the Intensive Care Society and the Royal College of Psychiatrists in the United Kingdom, we present a model that demonstrates how both staff and organizations might respond to the likely stressors that might occur at preparation-, pre-, initial and core-, and longer-term-phases of the pandemic. Staff within countries at different stages of the COVID-19 pandemic will be able to use this model. We suggest practical tips for both healthcare workers and organizations and embed this within up-to-date scientific literature. The phased model of mental health burden and responses can be a helpful guide for both staff and organizations operating at different stages of the pandemic.

Keywords: COVID-19, Corona virus, psychosocial support, interventions, healthcare, staff

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INTRODUCTION

This paper aims to collate some of the current guidance on maintaining mental health during the COVID-19 pandemic, with a particular focus on frontline healthcare workers. It situates these recommendations within a phased model of mental health burden and responses, which builds off the work by the Intensive Care Society (2020) and the Royal College of Psychiatrists (Williams et al., 2020). We suggest this model demonstrates how both staff and organizations might respond to the likely stressors that might occur at preparation-, pre-, initial and core-, and longer-term-phases of the pandemic. These recommendations are situated within relevant psychological literature, and derived from the clinical experiences of two of the authors, GL and BD-W. This text is primarily aimed at frontline staff and managers working in healthcare settings.

First, we describe sources of mental health burden for staff. Then we briefly highlight experiences of Chinese staff and interventions implemented there, before moving on to list a range of possible psychosocial interventions and underscore some key principles that can be derived from these. Finally, we present the phased model of mental health burden and responses.

BACKGROUND

The novel corona virus disease COVID-19 was first diagnosed in humans in Wuhan, China in December 2019 (World Health Organization [WHO], 2020a). The disease is found in individuals infected by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The coronavirus can be transmitted between people via droplets, typically in coughs and sneezes. This can occur directly between people or indirectly by touching one's mouth, nose or eyes. SARS-CoV-2 has spread rapidly across the globe and in March, 2020 the World Health organization (WHO) classified the outbreak a pandemic (World Health Organization [WHO], 2020b). As of July 29, 2020, there were 16,341,920 recorded cases and 650,805 fatalities globally (World Health Organization [WHO], 2020c).

Such a pandemic leads to short- and long-term mental health burden for healthcare workers. Emerging, current literature suggests that psychological distress is a very real outcome for staff providing health care amidst the COVID-19 pandemic. A study published March 23, 2020, surveyed 1257 healthcare workers in 34 hospitals in China (Lai et al., 2020). It found that rates of psychological stress were high: 50.4% had symptoms of depression, 44.6% for anxiety, 34% for insomnia, and 71.5% for general psychological distress[1]. Nurses, female staff, staff in Wuhan, and staff working directly with patients were more likely to have "severe" scores on these outcomes.

These findings are not unique to COVID-19. Studies into the SARS outbreak in 2003 reported psychological symptoms in 89% of workers in high-risk situations (Lai et al., 2020). This is all the more understandable given one in five SARS infection cases were healthcare workers (Chan-Yeung, 2004). Long-term psychological distress can result from the psychological stress experienced during such a pandemic (Lai et al., 2020). It is likely that the impact of stress associated with managing and providing care in uncertain and ever-changing circumstances may negatively impact on the immune system, weakening staff members' ability to fight off the virus.

SOURCES OF MENTAL HEALTH BURDEN FOR STAFF

Currently the world is responding to an unprecedented pandemic and medical crisis that has not been seen for 100 years. Those working on the frontline are therefore exposed to a variety of sources of mental health burden which we outline below:

- Risk of contamination of the virus; compliance with biosecurity measures including constant vigilance, equipment use and isolation practices; tensions between patients and staff; and the stigmatization of healthcare workers coming into contact with patients with COVID-19 (International Federation of Red Cross and Red Crescent Societies, 2020).
- Abnormal mourning for the death of a loved one, home quarantine and social isolation, disruptions to work routines, sensitivity to and obsession with cleanliness and hygiene, the closure of public and private institutions, rumors about the disease, and the loss of social capital (Javadi et al., 2020).
- Uncertainty. This leads to stress and anxiety (Shanafelt et al., 2020). Stress is higher where staff have high work demands (heavy workload, time pressure, periods of intense concentration) but low work control (low levels of autonomy and decision-making input). Motivation and performance are lower when stressors are perceived as hindrances. Examples of hindrances include: unclear objectives, conflicting requests, red tape, organizational politics, and various other work-related hassles (Bolino, 2020).
- Weakened immune system due to high levels of stress (Segerstrom and Miller, 2004).
- Staff inquiries, physical exhaustion, sleep disruption, and fear and emotional disturbances (Li et al., 2020).
- Staff not knowing they can go home if they are ill or can work from home where appropriate (Beckman et al., 2020).
- Feeling vulnerable, loss of control, concerns about health of self and others, changes in working patterns/routine, feelings of personal danger, being isolated, lacking necessary supplies to conduct their work (Lai et al., 2020).
- Redeployment of the clinical workforce will be challenging. Clinicians are expected to work within unfamiliar territory, often with new teams/people, new processes, clinical procedures and equipment. Additionally clinicians are being released from their pre-registration studies early to contribute and work within frontline services (Royal College of Nursing, 2020).
- Implicit and explicit racism toward staff of Chinese origin (The Guardian, 2020).
- Abuse from detained patients including verbal insults intended to hurt staff members to "share the pain" of isolation from families (personal communication with an advanced nurse practitioner, United Kingdom).
- Pre-existing mental health vulnerability including previous trauma and mental ill health (Mental Health Foundation, 2020).

Having identified some of the sources of mental health burden in staff, this document describes principles that should underpin how hospitals and healthcare organizations can implement psychosocial interventions and organizational practices to mitigate these.

[1]Depression (defined as a total score of ≥5 in the Patient Health Questionnaire-9); anxiety (defined as a total score of ≥5 in the Generalized Anxiety Disorder-7); insomnia (defined as a total score of ≥8 in the Insomnia Severity Index); stress related symptoms (defined as a total score of ≥9 in the Impact of Events Scale-Revised).

EXPERIENCES FROM CHINA

Some of the hospitals in China that were most affected by COVID-19 implemented a three-pronged approach to care for the mental health needs of staff:

1. Psychological intervention medical team to develop online courses to manage common psychological problems.
2. Psychological assistance hotline team to offer guidance and supervision to callers to help solve psychological problems.
3. Individual and group psychological interventions, including activities to release stress (Chen et al., 2020).

However, staff were hesitant to engage in these. Interviews with staff suggested that this reticence was due to a lack of immediate concern about being infected and feeling they did not need psychological support. They stated they needed more rest and personal protective supplies, and that they wanted mental health training or mental health staff to assist them when interacting with difficult or aggressive patients.

Revised interventions were implemented. Hospitals provided space for staff to rest and isolate themselves from families; staff were provided food and daily living supplies. New staff were trained in how to interact with difficult or aggressive patients; security teams were engaged if necessary. Detailed rules on appropriate use of personal protective supplies were written. Hospitals also established leisure activities; gave training to staff on how to relax properly; and counselors were embedded into the workplace to listen to staff and provide necessary help (Chen et al., 2020).

HOW CAN STAFF AND ORGANIZATIONS RESPOND TO DIFFERENT PHASES OF THE COVID-19 PANDEMIC?

The Intensive Care Society (United Kingdom) offers several helpful ways of thinking about maintaining staff mental health before, during and after the COVID-19 pandemic (Intensive Care Society, 2020). Hospitals should think about where their organization is in relation to phases of the pandemic, be cognizant of the issues and impacts these will likely have for them and take note of the recommended approaches to these phases.

We have expanded on this guidance by incorporating mental health expertise to provide further context to their recommendations, practical tips for organizations and for individual staff. Subtle changes have been made to the phases outlined by the intensive care society as we have added in a preparation phase and combined the initial and core phases and the end and long-term phases acknowledging also that although these phases are linear, the overall process is cyclical and not rigid or fixed. We have added a preparation phase as different organizations and countries are encountering this pandemic at varying points; however, many international healthcare providers may well have passed this point now.

Our aim is to offer guidance providing practical mental health support and advice to a range of frontline staff and organizations internationally who are working on the front line of this global pandemic. The guidance is written alert to the concern that services may face a 2nd wave or future pandemic. In **Figure 1** we provide a flow chart that gives an overview of the phased advice and practical tips. More detail for each phase will be described within text.

Preparation Phase

Individual Responses and Building Resilience

We have identified the need within the preparation phase for self-reflection, knowing your own needs and strengths and sharing them with someone you can trust to plan and prepare. There is a need to have a personal understanding of our triggers for stress as well as personal coping strategies for managing distress. As the team develops and membership evolves, time should be taken to discuss wellbeing and self-care routinely in the short-term and alongside supervision in the long-term. Be prepared to "Share":

- **S**ee it?
- **H**ear it?
- **A**re you feeling it?
- **R**eport it and let someone know.
- **E**mbrace your needs and be a model for others to share.

Organizational Response

Organizationally, leaders are required to understand the needs of their workforce and establish if any members of the team may be more vulnerable than others to mental health difficulties including:

- Those with existing needs or current mental health difficulties.
- Those who have caring responsibilities in their home lives.
- Those who may have recently survived a stress or trauma experience.

Identification in the preparation phase will not identify everyone who might experience challenges to their mental wellbeing during the pandemic. However, it will enable teams to identify those most vulnerable so that plans can be put in place to support them. Buddy systems where peer support can be provided should be considered, as should a common compassionate mantra of "It's ok not to be ok" due to the stigma often associated with mental health difficulties (Highfield et al., 2020; Stuart, 2016).

Resilience and wellbeing plans for staff should be encouraged. These should recognize the stressors that can present day to day in healthcare but particularly how this is magnified in such instances as this. These plans, written by team leaders, should describe triggers for stress, how one presently copes, early signs of distress (change to baseline), how they or team members can help. Wellbeing plans could include a parachute analogy, where leaders develop a plan like the weaving of a parachute that is there to soften and protect people in events of crisis such as this, instead of waiting until it is too late, therefore adopting a proactive rather than reactive approach. Support staff to make new mental

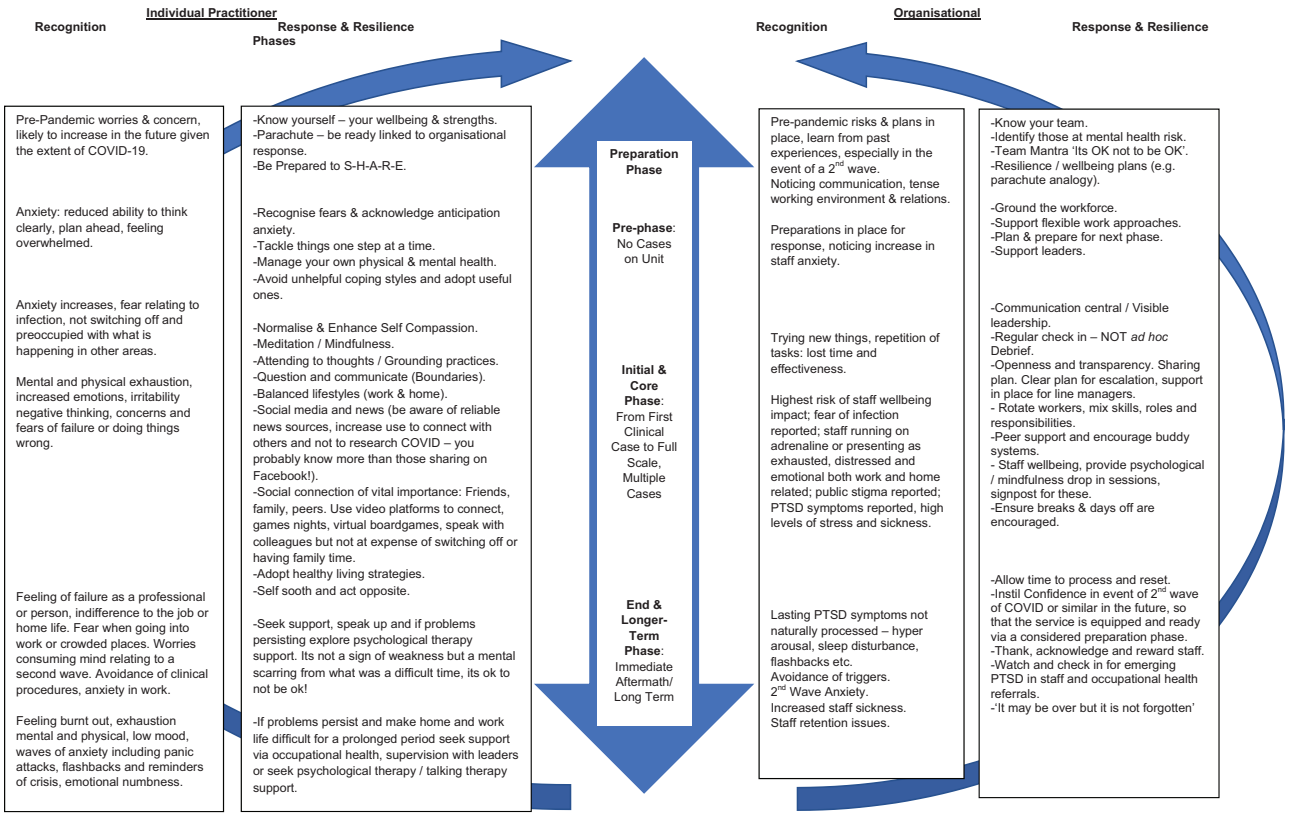

FIGURE 1 | Phased model of advice for recognising and responding to mental health burdens during the COVID-19 pandemic.

health disclosures as the outbreak may bring these to the fore (Mental Health Foundation, 2020).

Pre-phase

Individual Responses and Building Resilience

We advise that there is a need for people to recognize that fears and anxieties are justified and it is natural for these to be present in the face of threat as these fears enable us to identify risk and keep safe (World Health Organization [WHO], 2020b). Sometimes the anticipation of stressful events can be worse than when the actual event occurs. During the actual event we might neglect our emotional needs by focusing solely on our current tasks. During the pre-phase we have lots of time to think about what may occur, how it may feel, worst case scenarios, and what the job will be like in the initial and core phase.

Instead we suggest that whilst organizational preparations are made, individuals should tackle one task at a time, trying not to become preoccupied with future threats that cannot yet be addressed. The whole picture can be overwhelming (Williams et al., 2020). Instead we advise that your focus should be on making sure you are managing your own mental well-being. This is as important as your physical health is for tackling challenges that may present. A worldwide pandemic is an unprecedented scenario – identify and use strategies and positive coping techniques that you have used previously that have worked for you. However, avoid unhelpful coping such as smoking or drinking alcohol.

Organizational Response

At this pre-stage, team grounding is important. Grounding involves noting the emotional and cognitive information being shared in a group, acknowledging this and using it to structure an agenda for discussion. This is important because thoughts and emotions can become amplified within a group setting and fear and anxiety can migrate across team members (Smith and Mackie, 2015; Weisbuch and Ambady, 2008). Therefore, in the same way that we ask a client to ground themselves to the present when their distress exceeds their window of tolerance, the team leader may need to offer a greater sense of present moment awareness. A number of techniques are applicable with groups. For instance, ask the group to clap their hands at the same time or stamp their feet. Hold regular team meetings (making use of virtual tools where necessary) (International Federation of Red Cross and Red Crescent Societies, 2020).

One might also offer realistic reassurance – encourage team openness via adoption of the mantra "its ok not to be ok." Consider what communication will look like for each team whilst remaining aware of the team's current needs. Ensure you think about protected characteristics of staff i.e., do measures affect all staff equally? (Mental Health Foundation, 2020). Offer flexible working routines for staff personally affected by the virus e.g.,

illness or death in the family, childcare duties (World Health Organization [WHO], 2020b). Ensure that managers are also considerate of their own individual needs and they are themselves not immune to the mental wellbeing impact such events have due to the high levels of stress they will also be enduring. Part of this is sharing stories with other managers and team leaders (Mental Health Foundation, 2020). Unlike the individual response, the organizational response will require longer term planning in order to respond effectively to worst case scenarios, i.e., access to beds, equipment including PPE, and resources redistribution.

Initial and Core Phases

Individual Responses and Building Resilience

This phase has been identified as the highest psychological risk phase (Highfield et al., 2020). In **Figure 1** we provide some practical ideas which in this phase are going to be of paramount importance.

- *Enhance Self Compassion* – We can in times of high stress and emotional extremes often become critical of ourselves or our performance. Be compassionate. How would you speak to your friend if they were feeling this way? What advice would you give? How would you hold yourself or hold them? Now speak to yourself in the same way . . . say the same things. Use a mantra: "it is fine to feel like this" (Irons and Beaumont, 2017). Identify activities that help you self-sooth that you can still engage within the comfort of your own home. The tasks you never got around to completing, the film you've been wanting to watch, etc.
- *Mindfulness* – Mindfulness is the practice of being in the present moment, on purpose, taking a non-judgmental stance and is underpinned by mediation practices (Kabat-Zinn, 2013). Mindfulness practices to manage our stress and emotion are becoming increasingly popular practice. A variety of Apps including Headspace can be purchased for mobile devices, and providers such as YouTube include narrative examples of mindfulness.
- *Grounding* – It is important to take stock of what is going on around you and ground back to what is happening in that moment. Grounding techniques can be used to help people stabilize in the face of trauma, stress, and dissociation (Foureur et al., 2013). Some useful techniques include placing both feet into the ground and stomping, clapping hands, or looking around the environment to name and describe three objects you can see or three sounds you can hear, hence using the senses to assist in grounding.
- STOP, GROUND, BREATH is another strategy in which we encourage you to use your breath to as a grounding technique such as, breath in through the nose and out of the mouth . . . breath in (2 s), hold two and breath out completely (take three breaths).
- *Balance home and work* – Try to distinguish the two by reducing time spent watching the news, focusing on things away from COVID-19. Taking a break at home is important as work will be dominated by the pandemic.
- *Social Media* – Use credible sources, keep in touch with friends and family but choose what to read and engage in. "Sandra" on Facebook probably knows much less than you, so do not let her posts further impact on your emotions.
- *Social Connection* – Connect with friends, family, peers. Recent surveys of the United Kingdom general public found this to be one of the most helpful coping mechanisms (Holmes et al., 2020). Use video to see faces. Engage in virtual games nights and board games. Social connectedness with people experiencing the same difficulties is important. Use buddy systems, check in on each other but balance this with family and no-work downtime (Williams et al., 2020).
- *Adopt healthy living strategies* – These will reduce your emotional vulnerability and make you more able to manage you own stress and emotions (1) Take care of physical health and treat physical illness, (2) balance eating; low mood often results in reduced appetite or comfort eating which in the short term might feel helpful but longer term make you feel worse, (3) avoid mood altering drugs (including alcohol), (4) sleep well; we all require rest especially in times of stress and high anxiety which alone can be exhausting, (5) engage in exercise; physical fitness and a release of pressures are essential, and (6) build mastery by finding activities that provide you with a sense of accomplishment (Linehan, 2014).
- *Routine* – Maintain a routine as much as possible. Write a list of the things you would like to do around the house that can now be achieved in your out of work time but balance this with relaxation time.
- *Act Opposite* – Don't watch too much news, programs, and films related to the current challenges or sad themes; act opposite and watch comedic, upbeat or enlightening programs and films. Don't listen to music that makes you sad or upset; listen to upbeat songs. Don't withdraw and isolate from those you love; use this as a chance to reconnect and learn new things about people (Linehan, 2014).

Organizational Response

During this stage, communication is going to be essential. Provide timely, accurate and evidence-based information on the virus and the hospital's response, including worse case scenarios (International Federation of Red Cross and Red Crescent Societies, 2020; Mental Health Foundation, 2020; World Health Organization [WHO], 2020b). Ensure present, visible and easily recognized leadership is present. Be a role model for how you would expect staff to behave (personal health and wellbeing, appropriate use of personal protective equipment) (World Health Organization [WHO], 2020b). Ensure regular communications are provided, with the opportunity for regular check in and discussions. Frame/describe the hospital's response to COVID-19 as a challenge from which staff can all grow and develop; do not describe it as a hindrance (Bolino, 2020). Give staff autonomy and input into decision-making where possible (Bolino, 2020). Remove bureaucratic hindrances to flexible working, such as blocks on virtual meetings or remote working (Bolino, 2020).

Do not perform psychological debrief as this is not advised during traumatic events and can make things worse (National Institute for Health and Care Excellence, 2018). Engage the workforce in peer support and buddying practices and within this

consider partnering experienced people up with those who may be less experienced or new (International Federation of Red Cross and Red Crescent Societies, 2020; World Health Organization [WHO], 2020b). Adopt a mantra and compassionate response to staff in that "its ok not to be ok" and allow for opportunity for people to discuss their own needs, concerns and feelings. Signpost to psychological first aiders and drop-in sessions for staff support, you might even assign a single member of staff as the representative on this (International Federation of Red Cross and Red Crescent Societies, 2020; Mental Health Foundation, 2020). Ensure, positively monitor, and encourage work breaks (World Health Organization [WHO], 2020b). Mindfulness practices within the workplace can also prove beneficial, with programs of mindfulness-based stress reduction provided to support health care professionals, producing positive results (Irving et al., 2009).

End and Longer-Term Phase

Individual Response and Building Resilience

Once the COVID-19 pandemic has passed things are unlikely to return to normal. You will be likely reflecting on what has occurred and your responses to this. Make sure you stay connected with colleagues and that you share your experiences. Feeling distressed after your experience is normal and understandable. This is all the more likely if you have been moved into a new role or redeployed into a new working environment where routines, rules and colleagues are unfamiliar. The Adaptive Information Processing model (AIP) proposes that new information taken into the brain through our senses is assimilated into existing memory networks. This allows us to make sense of this information when we recall this information in the future. It is important to give yourself time to process experiences into your existing cognitive structures (memory networks).

The latest guidance for the assessment and treatment of trauma proposes "watchful waiting" rather than psychological debriefing (National Institute for Health and Care Excellence, 2018). This is because many individuals exposed to trauma do not develop post-traumatic stress disorder (PTSD). Most people recover from the early experience of traumatic stress symptoms without formal intervention (Grey, 2009). However, a minority can develop symptoms and it important to recognize symptoms. The Diagnostic and Statistical Manual of Mental Disorders version 5 (DSM-V) refers to pre-, peri-, and post-factors that influence the risk of PTSD (including prior trauma, prior health needs, inappropriate coping strategies, and negative appraisal), and is a good source to consult (American Psychiatric Association, 2013). As such you should continue to use the strategies you have found work for you. Observe and notice changes in sleep, feeling unreal or feeling disconnected, re-experiencing things that have happened. Be aware if there are things you are avoiding in case they trigger negative emotions. Report any of these as you may need further support to your supervisors or supportive friends and family.

Organizational Response

Allow and expect that time is afforded for all in the team to process their experiences and reset. The crisis might be over in terms of immediate threat but the after-effects psychologically on the workforce may not instill confidence of readiness and lessons learnt if fears of a second wave are prevalent but ensure in the background the organization is ready for such an occurrence. Look to thank, acknowledge, and reward the workforce. Reflect on the lessons learnt using a known model of reflection, such as Description, Feelings, Evaluation, Analysis, Conclusion, Action plan (Gibbs, 1988). Take a watchful waiting approach and check in for any emerging symptoms of PTSD in staff, making sure appropriate referrals are made. Adopt a stance of "It may be over but it is not forgotten." Continue regular communications with staff following shifts to check in and see if anyone requires further support. The UK National Institute for Health and Care Excellence (2018) guidelines on the treatment and management of PTSD suggest looking out for the following signs:

- Hyper arousal;
- Sleep disturbance;
- Flashbacks or re-experiencing;
- Avoidance of triggers.

If staff present with any of these offer them direction to support services or simply propose a talk in protected time.

CONCLUSION

There is plenty that hospitals and healthcare providers can do to help healthcare staff manage mental health burden. Early experiences from China and more recently in Europe suggest that healthcare staff will likely experience negative mental health outcomes due to the pandemic and their employment. This paper is a guide to managing the mental health burden of the clinical workforce in an attempt to support their mental wellbeing and organizational responses. The phased model of mental health burden and responses can be a helpful guide for both staff and organizations operating at different stages of the COVID-19 pandemic. Organizations and individuals implementing this model in whole or in part should also consider undertaking a suitably powered evaluation of both staff and organizational outcomes. This would help to develop a body of evidence that supports embedding the model in routine practice or making signposting alterations.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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Exploring Children's Social and Emotional Representations of the COVID-19 Pandemic

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COVID-19, a new emerging infectious disease (EID), has spread throughout the world, including Europe. Spain, in particular, has witnessed a significant outbreak of the pandemic. All classes have been canceled, and the government has declared a state of emergency, ordering the lockdown and confinement of the entire population. All children in the country have been confined to their homes since March 13 and are not allowed to leave at any time. This population is thus facing the harshest restrictions. Given the vulnerable situation of children, the aim of this research is to understand how they represent and emotionally cope with the COVID-19 crisis. A free association exercise elicited by the word "coronavirus" was completed by 228 children (age range: 3–12 years) from the North of Spain. To analyze the content, we employed the Reinert method with Iramuteq software for lexical analysis. The results revealed that children represent the COVID-19 as an enemy that is being fought by the doctors. Children are afraid and worried about catching the virus, but mainly because they think they can infect their grandparents, and this makes them feel guilty. Moreover, the lockdown situation has produced conflicting emotions in the children. On the one hand, they are scared, nervous, lonely, sad, bored, and angry, but they also feel safe, calm, and happy with their families. These results indicate the need for governments to also consider children in their management of the current situation by placing greater emphasis on social and inclusive policies to help alleviate the possible effects that they may suffer as a consequence of the pandemic and the lockdown. In short, there is a need to address the psychological, educational, social, health, and well-being needs of children.

Keywords: COVID-19, children, emotions, pandemic, social representation

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INTRODUCTION

Children represent only a small percentage of COVID-19 cases (Hamzelou, 2020; Pavone et al., 2020), and the majority of infected children might appear asymptomatic (Cai et al., 2020) or present mild clinical manifestations (Jiao et al., 2020). It might therefore be tempting to assume that, in comparison with adults, children are less vulnerable to this pandemic (Pavone et al., 2020). However, from the beginning of the pandemic, health authorities and politicians have repeatedly pointed out that because of this mild symptomatology, children may play a significant role in spreading the infection. Consequently, in most countries of the world, schools have been closed (United Nations Educational, Scientific and Cultural Organization, 2020) with children confined to their homes. Nevertheless, each country has imposed its own specific rules for children in the

lockdown; while in some countries they are allowed to leave their homes to exercise, play sports, or take walks with their parents, in other countries these activities are prohibited (Garcia, 2020).

Spain is currently one of the European countries most affected by COVID-19. Cases began to multiply exponentially and uncontrollably in early March. In view of this situation, all the schools in the country were closed (Sánchez, 2020a), with the Spanish prime minister declaring a state of emergency on 14th March 2020, ordering a mandatory lockdown for all citizens (Royal Decree 462/2020, 2020). In the same speech, the prime minister stated that the rules of this lockdown were very drastic, possibly the most stringent in Europe and even the world (Merino, 2020; Sánchez, 2020b).

In that speech, there was not a single mention of children, even though the rules of the lockdown are particularly harsh for them. Children were forbidden to leave their homes, with Spain along with Italy, being the only European countries where children were not allowed to go out at all (Granda, 2020; Grechyna, 2020). On the 18th of March, however, the government clarified a detail of this law, which permitted single parents (specifically those unable to leave their children in the care of another adult) to leave their homes accompanied by children to purchase groceries and essential items. Further, children were not allowed to use the communal spaces within their buildings, such as a shared terrace or garden (Royal Decree 465/2020, 2020). In Spain, this absolute lockdown for the children lasted 6 weeks, and then, from April 26, they were allowed to go outside, but only for 1 h a day.

Pediatricians, psychologists, and educators have warned of the serious threats that this confinement may pose to children from both a physical and emotional perspective (Grechyna, 2020; Jiloha, 2020; Léon, 2020; The Spanish Children's Rights Coalition, 2020), stressing that it is essential that children understand what is happening in order to mitigate the damage that this situation may cause them (Dalton et al., 2020; Wang et al., 2020). However, no research has yet been conducted to explore the ways in which children integrate this coronavirus outbreak into their everyday thinking and how they are coping with the psychosocial impact of the crisis.

During the 1980s and 1990s, a considerable body of research focused on children's understanding of illness (Myant and Williams, 2005). Most of this research was based on Piaget's theory of development, essentially demonstrating that children have different perceptions of the disease depending on their age and stage of development (Bibace and Walsh, 1980; Banks, 1990; Gillis, 1990; Hergenrather and Rabinowitz, 1991; Carson et al., 1992; Simeonsson et al., 1993; Kury and Rodrique, 1995; Moss-Morris and Paterson, 1995).

However, these cognitive studies, even in their most modern versions (Vacik et al., 2001; Koopman et al., 2004; Myant and Williams, 2005; Piko and Bak, 2006), have failed to address how children understand specific diseases from a common sense standpoint or the ways in which they deal with illnesses on an emotional level. In contrast, the present study is theoretically framed within the Social Representations Theory (SRT; Moscovici, 1961, 1984) because this theory provides a framework for embracing the symbolic meaning that is assigned to diseases in everyday thinking (Joffe, 2003).

Although relatively little work has been conducted with children from the perspective of social representations (Galli and Nigro, 1987; Galli and Fasanelli, 1995; Cagnin et al., 2004; Goodwin et al., 2004), SRT offers an innovative point of view since the function of social representations is to make familiar the things that are unknown or unfamiliar to us (such as the new COVID-19 pandemic; Galli and Nigro, 1987). Thus, a key concern of this theory relates to how knowledge about a new risky phenomenon is transformed from scientific discourse into the common understanding of lay people (Joffe, 2003). Consequently, extensive research has been carried out with regard to specific emerging infectious diseases (EIDs) within this framework (Joffe and Haarhoff, 2002; Joffe and Bettega, 2003; Joffe and Lee, 2004; Washer, 2006; Idoiaga et al., 2017a,b). However, this work has always been conducted from the perspective of adults.

In recent years, social representation research on several EIDs (Wagner-Egger et al., 2011; Idoiaga et al., 2017a), including the COVID-19 pandemic (Eiguren et al., 2020; Idoiaga et al., 2020 a,b[1,2]), has revealed that recurring emotional patterns can be observed when it comes to dealing with pandemics. First, EIDs are usually represented in terms of heroes, victims, and villains (Wagner-Egger et al., 2011). The heroes are typically the scientific and medical experts who work to beat the disease, while villains are the media and governments (Washer, 2010). The victims are represented as the infected people, particularly those who are defenseless to face the epidemic (Idoiaga et al., 2017b).

However, the representation of risk is not homogeneous throughout society. The SRT also states that in these moments of crisis specific shared ideas emerge among different groups, and also, of course, among children (Wagner and Hayes, 2005; Washer, 2006). Social representations are important in these contexts because they are constructed based on the particular experiences that each group is living through during the pandemic and the information they receive both from the media and through social interactions (Moscovici and Duveen, 2000).

Moreover, research in the field of social representations (Smith and Joffe, 2013) and EIDs highlights the role played by the emotional context in symbolic thought and its relevance for making a topic recognizable and understandable (Höijer, 2010). In fact, the work carried out so far has revealed that in modern societies there are recurring emotional patterns that emerge in response to the threat of EIDs, with fear being very prominent, along with anger and emotional fatigue (Joffe, 2011; Sherlaw and Raude, 2013; Idoiaga et al., 2017a,b). In the case of children, it has been warned that the lockdown imposed in response to COVID-19 could generate feelings of fear, worry, sadness, or stress (Jiao et al., 2020; Jiloha, 2020; Wang et al., 2020) and that understanding children's reactions and emotions is essential to properly address their emotional needs (Jiao et al., 2020; Jiloha, 2020).

[1]Idoiaga, N., Berasategi, N., Eiguren, A., and Dosil, M. (2020a). Education as an intervention strategy against COVID-19: social representations and emotions. (Under review).

[2]Idoiaga, N., Berasategi, N., and Ozamiz, N. (2020b). Coping with COVID-19: social representations and emotions. (Under review).

Given these considerations, it is of critical importance to identify how children understand this health crisis in order to develop strategies and tools that, by taking into account their concerns, will ultimately help them to overcome these unprecedented circumstances. Thus, the main goal of this article is to study how children understand or represent the COVID-19, while observing their emotional response to the coronavirus pandemic in Spain.

DESIGN

Sample

A total of 250 children participated in this study between 30th March and 13th April 2020. The sample was recruited in the Basque Country region located in Northern Spain. Of the sample, 52.21% were girls and 47.79% were boys. The mean age of the participants was 7.14 years (SD = 2.57) with an age range of 3–12 years.

As additional information on participating families and with regard to the economic status of the families, most of them (85.7%) have a medium economic status, the rest 8.9% have a low economic status, and the remaining 5.4% have a high economic status. Moreover, most of the parents have a university education 71.2% or a bachelor's degree 23.2%. And, only 2.8% have a secondary education and the 2.8% have a primary education.

Besides, with regard to children care, most of the parents, 46% said that they shared the childcare tasks, 32.4% said that it is the mother who takes care of the children, 18.0% said that it is the father, and 3.2% said that other people take care of their children. Finally, 36.6% of the families had no outside space (such as a balcony, terrace, or garden) in their homes.

Data Collection Method

Due to the confinement situation, we decided to access the children through their parents. Questionnaires were sent to all schools in the Basque Country region and the schools were asked to forward these questionnaires to the families. In that email, a document was sent explaining how the study should be carried out and a link to do so. In the explanatory document, it was specified to the parents that this was a free association exercise for their children and that they, the parents, would take the role of interviewers. To carry out the exercise, they had to ask to their children two specific questions: (1) These days we are talking a lot about the coronavirus. When you hear the word coronavirus, what comes to mind, or what do you think? (2) How are you feeling these days because of the coronavirus? The parents were then encouraged to transcribe the exact responses given by their children. The document gave two practical examples of how the exercise should be done and how it should not be done (specifying that no suggestions should be made or that the children's words should not be paraphrased).

All children participated on a voluntary basis, received information about the procedure of the investigation, and their parents gave their consent before participating in the study. This research has obtained the approval of the Ethics Committee of the UPV/EHU [M10/2020/055].

Data Analysis Method

The Reinert method using Iramuteq software for lexical analysis (Reinert, 1983, 1990) was employed to analyze the corpus of text. This method has frequently been used for the study of social representations (Lahlou, 2001; Klein and Licata, 2003; Kalampalikis, 2005), confirming that the results obtained agree with those of other methods used in this field of research (Lahlou, 1996). Iramuteq software eliminates problems of reliability and validity in text analysis (Reinert, 1996; Klein and Licata, 2003). Using this method, which follows a descending hierarchical analysis format, the analyst obtains a series of classes and statistical cues in the form of typical words and typical text segments (see Idoiaga et al., 2017a). Specifically, the software identifies the words and text segments with the highest Chi-square values, that is, those words and text segments that best identify each class or idea that the participants have repeatedly mentioned. Once these "classes" have been identified, they are associated with "passive" variables (independent variables). In the present case, the passive variable was the age range, that is, young children (3–5 years), middle-aged children (6–9 years), or old children (10–12 years).

In accord with previous research using the Reinert method (Camargo and Bousfield, 2009), the raw data were entered into the Iramuteq software, and the most significant items of vocabulary in each class were selected on the basis of three criteria: (1) an expected value of the word greater than 3; (2) proof of association of the Chi-square, tested against the class [$\chi^2 \geq 3.89$ (p = 0.05); df = 1]; and (3) the word appears mainly in that class, with a frequency of 50% or more.

Reinert method operations are statistical, transparent, and reproducible until the final stage of interpretation, where the analyst assigns a label to each specific vocabulary set that the software had identified as a lexical world on the basis of co-occurrences and distribution patterns (Schonhardt-Bailey, 2013). Finally, as a complementary analysis, Iramuteq also conducts a lexical similarity analysis. This analysis presents in a graphical format the structure of a corpus, distinguishing between the shared parts and the specificities of coded variables. This allows the link between the different forms in the text segments to emerge. That is, this analysis allows to identifying the words' co-occurrences, providing information on the words connectivity, and thus helping to identify the structure of a text corpus content. It also allows to identify the shared parts and specificities according to the descriptive variables identified in the analysis (Marchand and Ratinaud, 2012).

RESULTS

The full corpus contained 12,892 words, of which 1,515 were unique words. Specifically, the descending hierarchical analysis divided the corpus into 211 segments and five classes. The results of this analysis can be observed in **Figure 1**.

The analysis identified the main ideas held by children regarding COVID-19, elicited through the free association procedure. Each issue or idea is represented by a set of typical words and text segments, which is referred to as a class. First, the results revealed two main branches or themes (composed of different classes), which are referred to as main clusters

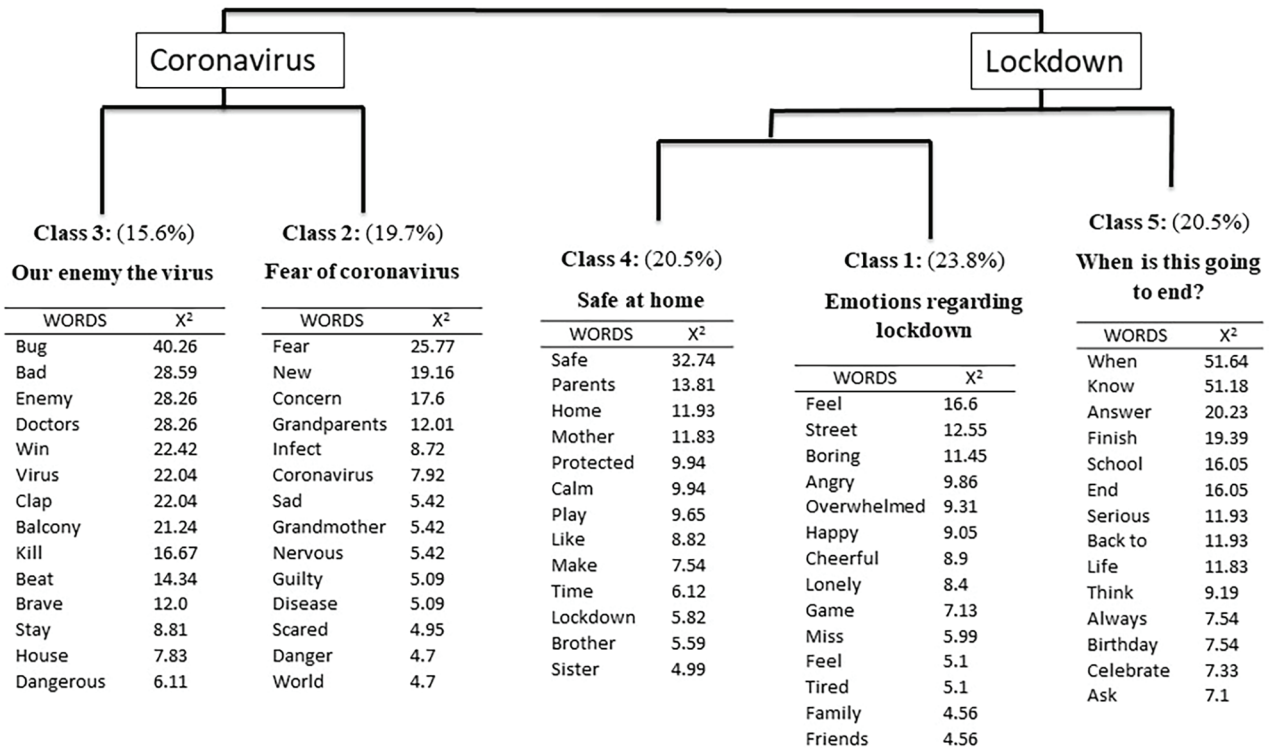

FIGURE 1 | The hierarchical clustering dendrogram of the free association exercise, showing the most frequent words and the words with the greatest association $\chi^2(1)$, $p < 0.00$.

and labeled as "coronavirus" and "lockdown". The first main cluster is composed of Classes 3 (Our enemy the virus) and 2 (Fear of coronavirus). The second main cluster is composed of Classes 4 (safe at home), 1 (emotions regarding lockdown), and 5 (when is this going to end?).

Following the hierarchical clustering dendrogram, within the first main cluster describing the coronavirus, the first class to emerge was Class 3, with a weight of 15.6%, which has been labeled as "Our enemy the virus". Within this class, it can be observed how children describe the COVID-19 with words such as bug, bad, or enemy but they also mention words such as doctors, win, brave, balcony, or clap, praising the work of the doctors to tackle the virus and stressing that what they must do is to stay at home, as can be seen in the characteristic text segments: "It's a virus but we don't really know what it is. We have to stay home and beat it because it's bad and it's a bug or something that gets into our tummy. In the street the doctors, who are heroes and brave, are going to beat it and that's why we go out every afternoon to the balcony to clap for them" (X^2 = 157.75, boy, 4 years); "It's a bad bug, but we're going to beat it and the doctors are going to kill it! And get it out of here now!" (X^2 = 153.59, boy, 5 years); and "It travels by plane and has come here and will not leave. That's why we have to beat it and to beat it we have to help the doctors and stay home and that's it, and then everything will be fine" (X^2 = 145.03, girl, 5 years). This class was mainly elicited by young children (2–5 years; $p < 0.02$).

Within the same "coronavirus" main cluster, the second class emerges, labeled as "Fear of coronavirus" with a weight of 19.7%. This class describes the emotions of fear, concern, sadness, nervousness, or fright created by this health crisis. However, children are more afraid of infecting their grandparents than themselves, even mentioning that they would feel guilty if that happened. The most significant text discourses are: "It's a virus but since it's new we're all a little scared and they talk about it on the radio, on television and everywhere else. It doesn't hurt children but we can infect our grandparents and that scares me and that's why we can't go to their house" (X^2 = 148.60, girl, 6 years); "Older people say they are afraid but then they go out and buy bread four times a day! I don't care about those people! I am worried and afraid that something will happen to my grandmother! That's why I don't go to her house because if she gets sick I will feel guilty" (X^2 = 115.88, girl, 12 years); and "The coronavirus is a virus that makes you feel a little afraid but not for yourself, for older people (X^2 = 98.60, boy, 10 years). This class was mainly elicited by middle-aged children (6–9 years; $p < 0.01$) and old children (10–12 years; $p < 0.05$).

In the second main cluster, classes related to the lockdown situation emerged, including the fourth class (20.5%), which has been labeled as "safe at home." With words such as safe, protected, calm, home, parents, or mother, children describe how they feel safe and protected at home and are happy with their family, as revealed in the most characteristic segments: "The virus can't

get into my house so I am safe here and I don't want to go out. Besides, I am happy to play with my family a lot" (X^2 = 84.83, boy, 7 years) and "I am happy and calm because I like to be with my father and mother and we do many things that I like, and at home we are safe" (X^2 = 67.64, girl, 5 years).

Within the same main cluster, the first class emerges, labeled as "emotions regarding lockdown" (23.8%). In this class, it is emphasized that children have conflicting emotions during these times. On the one hand, they say they are bored, angry, overwhelmed, tired, and even lonely because they have to stay at home without being able to go out. On the other hand, they also say that they are happy and cheerful being with their family, as can be seen in the characteristic text segments: "Bored because I have to do a lot of homework, sad, and a little lonely because I don't see my friends or my dog. But also happy because at home we spend more time with my father, mother, and sister and because we clap our hands at the window" (X^2 = 140.07, boy, 10 years); "I am happy and cheerful but sometimes I get angry because I want to go out and see my friends. It's a virus that makes me feel angry because it's a pain in the ass and I can't decide about anything" (X^2 = 94.36, girl, 8 years); and "I feel happy when I play with my family. Sometimes I get angry and sometimes I get bored too. If I get angry, I yell and then my mother gets angry" (X^2 = 74.20, girl, 4 years).

Finally, the fifth class emerges, labeled as "When is it going to end?" (20.5%). Children are very explicit about wanting to know when they will be able to return to school and to their normal life. In addition, many of them are also worried about whether they will still be in confinement on significant dates, for example, on their birthdays. The following are some of the most significant text segments of this class: "I have doubts because I don't know when this boring confinement is going to end. I want to go back to school and play with my friends" (X^2 = 144.85, boy, 12 years); and "I want to know when I will go back to school. April 17th is my birthday, I will be 11 and I will have to be at home, and I don't like it." (X^2 = 84.18, girl, 10 years). This class was mainly elicited by the oldest children (10–12 years; $p < 0.001$).

Given the wide range of emotions that emerged in the different classes, and in order to analyze these in more depth, we decided to create a Tgen with all the words reflecting emotions and a sub-corpus with these and the associated text segments. This sub-corpus was subjected to a lexical similarity analysis (see **Figure 2**).

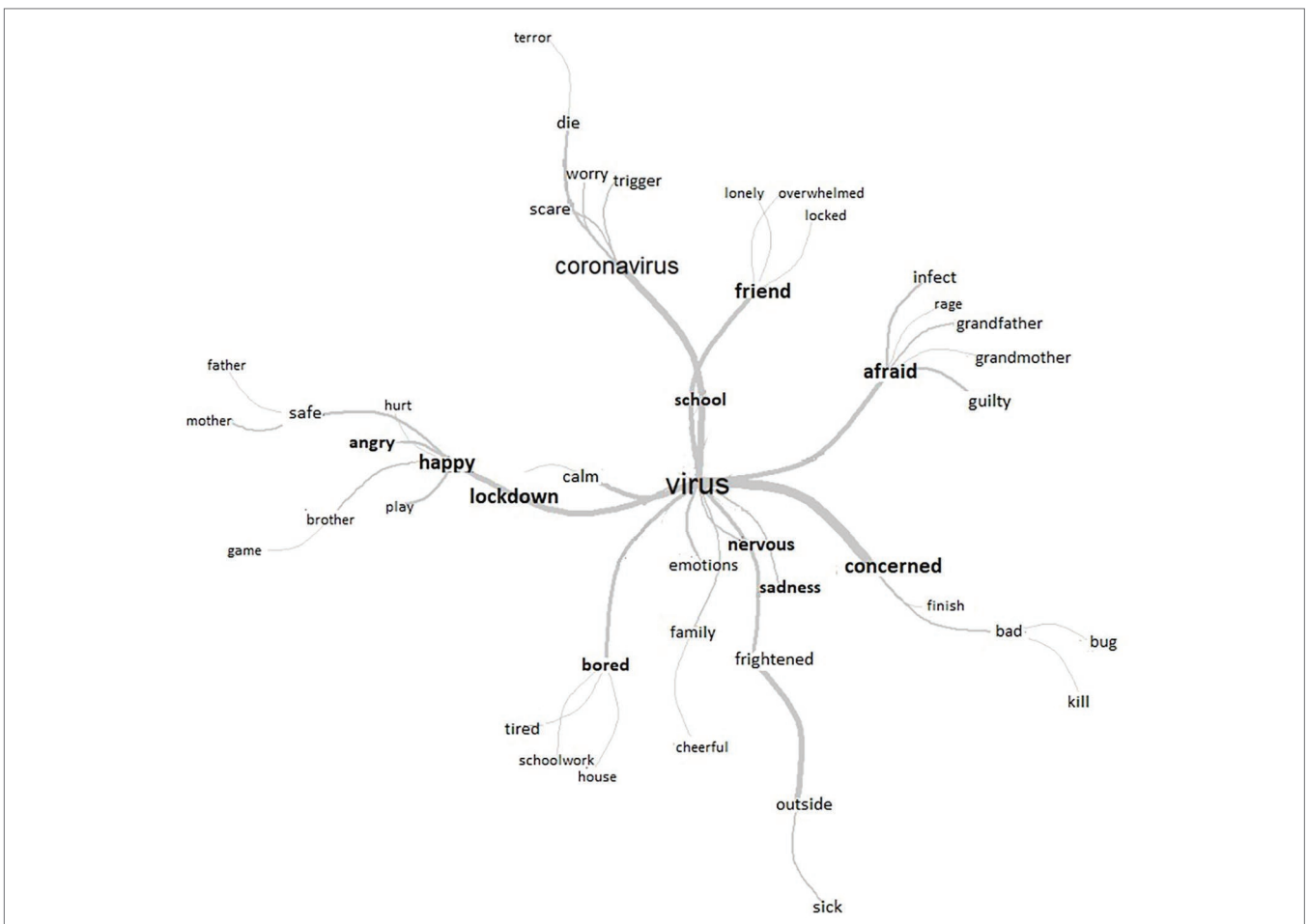

FIGURE 2 | Results of the lexical similarity analysis produced by the sub-corpus of emotions.

The similarity analysis is interesting to observe the words interconnection as well as the level of relation between them, which rate of co-occurrences between them may be stronger or weaker (Chi-squared test). Based on this analysis, it can be seen more clearly that the coronavirus evokes feelings of fright – and even terror and fear – in the children. This fear is mainly associated with the possibility of infecting their grandparents, along with feelings of guilt. Infants are also concerned about whether the doctors will manage to kill the bad bug (the COVID-19). Moreover, the children are also nervous, sad, and afraid of having to leave their house and are worried about falling ill outside. Therefore, they feel happy, cheerful, calm, and safe at home with their family. However, at the same time, being at home also bores and tires them, particularly when it comes to schoolwork. Finally, this lockdown situation also makes them feel angry.

DISCUSSION

The findings of this research offer important clues for identifying how children integrate COVID-19 into their everyday thinking. From the voices of the children, the issues that have arisen can be classified into two categories: the coronavirus itself, and the lockdown that has been implemented to control the spread of the virus.

First, coronavirus is represented not only as an enemy, but also as something that could be contagious. Specially from the youngest children's standpoint, the virus is viewed as something that is very bad and they represent it as a serious bug that is clearly their enemy. In the research carried out so far on COVID-19, and in other work on previous EIDs, other populations (adults and young people) also showed representations of enemies, but interestingly, this enemy or villain was never the disease itself, but the media, the government, or even the citizens who were perceived as behaving in an uncivilized way (Idoiaga et al., 2020b[2]). However, there is agreement regarding the heroes – which are the doctors and healthcare professionals – and also the victims, who are the people most vulnerable to infection (Wagner-Egger et al., 2011; Idoiaga et al., 2020b[2]).

Moreover, older children (the ones from 6 to 12 years) are quite concerned because they know that COVID-19 is highly contagious. In fact, these children expressed their fear, concern, sadness, nervousness, and fright when they were asked about coronavirus. However, they understand the situation well, and most of them are more worried about infecting their grandparents than being infected themselves. However, some of them have expressed that they would feel guilty if someone close to them became infected. This emotion of guilt should be particularly taken into account since in China these feelings have been found to be intrinsically linked to post-traumatic stress (Vidal, 2020). Therefore, it is of vital importance to make it clear to children that they will in no way be blamed if someone close to them becomes infected.

Second, and in relation to the lockdown, we observed the emergence of a sense of security on account of being made to stay at home. They express the idea that for them their house is a safe place and they feel protected at home. However, it should be borne in mind that along with this sense of security, children also express fear of going outside. It is true that at the time at which this research was conducted, children were not allowed to leave their homes under any circumstances. Even so, the street should not be represented as something dangerous or scary because this could have undesirable consequences when the children are eventually permitted to go outside, turning those initial exits into the outside world into traumatic events (Pakpour and Griffiths, 2020).

Returning to the confinement situation, the counter-emotions expressed by the children are remarkable. On the one hand, they are bored, angry, overwhelmed, tired, and even lonely because they have to stay at home without being able to go out. Previous research conducted in China also found that similar negative emotions arise in children regarding the coronavirus lockdown (Jiao et al., 2020; Wang et al., 2020). However, loneliness is a new and striking feeling to emerge in our study. In research with other age groups on COVID-19, loneliness was only aroused in the case of older people (aged over 60; Eiguren et al., 2020). Loneliness is an exceedingly painful experience that is the sum of an unfulfilled need for intimacy and social relationships that are felt to be insufficient or not entirely satisfactory (Berger and Poirie, 1995). Therefore, the emergence of this feeling indicates that peer interaction is extremely important to children (Howes, 2020). That is, they need contact with others such as friends and classmates, and the fact that they feel lonely indicates that they are not receiving the opportunity for such interaction, or at least, not to the extent that is required.

Given the importance of relationships in this growth stage, different strategies must be developed for children to cope with these feelings of loneliness until they have the opportunity to become re-acquainted with friends and classmates. For example, it would be useful to promote socialization strategies from within schools. In other words, in "real life" educational institutions are much more than places, where academic skills are developed; indeed, in terms of socialization in children, the school environment is the space par excellence (Wentzel and Looney, 2007). Therefore, in this situation, emphasis should also continue to be placed on promoting active relationships, with schools playing a primary role in the development and well-being of children.

Further, the children also report feeling happy and cheerful being at home with their family, because now they have more options to spend time and play with their parents, brothers, and sisters. This indicates the great work that families are doing to create safe and pleasant spaces, even in adverse situations like this, particularly in nurturing resilience in children exposed to epidemics (Jiao et al., 2020). Resilience is an attribute that helps children to manage everything from minor disappointments to major life traumas (Goldstein and Brooks, 2005). Amid the current COVID-19 crisis, research from China suggests that resilience should be nurtured by public health programs implemented by healthcare professionals, schools, and families in order to help children to overcome conditions of distress, and prospectively provide them with emotional and psychological support (Pettoello-Mantovani et al., 2019; Dalton et al., 2020; Jiao et al., 2020)

Further, given the results of our lexical similarity analysis, it is worth noting that we again observed the appearance of the emotions of fear, nervousness, sadness, happiness, calmness, boredom, and anger. Some of these emotions, particularly those linked to fear, sadness, worry, or nervousness, have already been identified in other studies (Jiloha, 2020), but new emotions have also emerged here. In particular, emotions of anger and boredom need to be considered as they have been noted as risk factors for mental health during lockdown (Brooks et al., 2020) and have already appeared in previous lockdown experiences during the SARS epidemic (Cava et al., 2005). In addition, the fact that these emotions are represented in relation to schoolwork should be analyzed more carefully, since it might need to be considered whether this work is an additional source of conflict for families, as certain pedagogues point out (Tonucci, 2020).

Finally, there appears to be one particular question that repeatedly comes to the minds of the children, especially to the oldest ones, that is, when is this situation going to finish? It is clear that this question cannot be answered by anyone at this time, but this call for answers also makes it obvious that children need to be considered in communications regarding COVID-19. In fact, several academics have argued that communication about the epidemic in both family and institutional networks is essential for mitigating its effects and is also one of the best tools for fostering resilience (Dalton et al., 2020; Jiloha, 2020; Weaver and Wiener, 2020).

It is worth noting that this research also has some limits that should be mentioned. First of all, the main limitation refers to the way in which data were collected, that is through parents. Although this choice was due to lockdown circumstances, the presence of parents may have altered some responses, especially those of younger children. Secondly, the sample of this research includes a range of children of very varied ages, from 3 to 12 years. And although the results have pointed to some differences among the responses of children from different ages, their understandings for an epidemic disease and for their own cognitions and feelings probably will vary quite differently.

In short, we are experiencing an unprecedented and rapidly changing situation. Understanding the emotional patterns linked to the current pandemic from the voice of those that are most vulnerable i.e., children, and identifying how they cognitively represent and emotionally face this new situation could help to lay bare the strategies that could be developed in order to help them deal with the crisis from a psychological, emotional, and social sphere. To begin with, this research has shown that, contrary to popular belief, children are not impervious to COVID-19. They are experiencing this health crisis and its consequences first-hand, and they are feeling the considerable effects of these unprecedented circumstances at different levels – not only emotionally, but also in physical and social terms. Special attention must also be paid to the emotions of fear, worry, guilt, loneliness, boredom, and anger, with an emphasis on strengthening resilience and offering psychological support to parents and children, a point that has already been emphasized by a number of scholars during this crisis (Coyne et al., 2020). In this regard, it will be essential for governments and local authorities to develop social and inclusive policies that address the psychological, social, health, and well-being needs of children, which could help to mitigate the possible effects that they could suffer as a consequence of this crisis.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to their containing information that could compromise the privacy of research participants.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics Committee of the UPV/EHU was obtained [M10/2020/055]. Written informed consent to participate in this study was provided by the participants' legal guardian/ next of kin.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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The Little Professor and the Virus: Scaffolding Children's Meaning Making During the COVID-19 Emergency

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From the very first years of life, children try to make sense and meaning out of the different stimuli they receive from their physical and social caregiving environment. Eric Berne used to refer to this precocious intuition of the surrounding world as a Martian thinking, "the naivest possible frame of mind for observing Earthly happenings" (1). This way of thinking is typical of the psychological Child Ego state called the "Little Professor", which harbors strategies that the child possesses for solving problems: intuition and prelogical thinking (2). So, with the "little professor" we can refer to the intuitive and creative—rather than logical—thought process that builds on the explorative attitude of young children and on their sensitivity to the surrounding environment (3). Of course, this meaning-making process is far from being a conclusive viewpoint on reality and it is critically affected by direct and indirect messages received from the adult caregivers, especially the parents.

As the coronavirus disease of the 2019 (Covid-19) is rapidly spreading worldwide, it's reasonable to assume that even the children's "Little Professor" is trying to develop a naïve theory of what is happening in the external world by incorporating different information sources. These may include the verbal messages (e.g., information, explanations) and the emotional expressions of their parents as well as delivered by the media and other adults. Notably, even when language comprehension is not fully developed, children are highly sensitive to the prosodic elements of human communications, including adults' gesture and voice tone (4). For this reason, the parental scaffolding of meaning-making processes is crucial to help children cope with such unexpected and frightening events, disentangling unclear messages and making order within the large amount of potentially confusing information they receive about the Covid-19 epidemic (5). Indeed, children are now surrounded by adults wearing masks, talking to each other about the infection and they can perceive alarm and distress by looking and listening to them. They are supposed to change their habits: to respect strict hygiene standards and to remain at home with a dramatic reduction of physical social exchanges with peers. Additionally, they may have faced for the first time the loss of a significant person in their family. At the present moment, it is not easy for most parents to find verified and reliable information on the nature of this coronavirus as well as on the healthcare risks for themselves and their children (6). Scientists themselves are trying to understand the nature of the virus and they do not have conclusive estimations on the health-related risk as well as on the time course of the emergency (7).

This uncertainty—together with the lack of a specific and effective treatment for the Covid-19—can further feed the fears and the sense of vulnerability of citizens—both adults and children. In this context, whereas the healthcare policies adopted by different countries could help to contain and mitigate the infection spread, for most families they also represent severe restrictions to social relationships and habits (8). Previous research on the well-being of parents and children during and after healthcare emergencies suggest that both can develop post-traumatic stress symptoms (9). Increased prevalence of post-traumatic stress symptoms was reported in survivals of the SARS epidemic (10) and preliminary evidence of similar psychological effects are also emerging for the Covid-19 emergency (11). Notably, the stress perceived by parents may widely affect parenting behaviors (12) and the quality of parent-child interaction (13, 14). Neuroscientific (15) and epigenetic (16) evidence suggests that these stress-related parenting effects may have profound intergenerational consequences for children's emotional and cognitive development (17–19). Thus, it is not surprising that the psychological consequences of Covid-19 emergency have been identified as the "second tsunami" of this unprecedented pandemic (20).

In sum, scaffolding children's meaning-making process during the present pandemic is crucial to help them cope with the emergency situation and to avoid the overwhelming and traumatic effects of misleading or partial cognitive appraisal and emotional over-reactions. It is possible to identify different ways in order to create a safe environment in which parents and other adult caregivers (e.g., teachers, educators) can help young children to deal with the COVID-19 emergency. In this article, we would like to highlight four ways through which adults can guide their children through the meaning-making process: self-regulation, careful listening, simple talking, and playing and practicing together (**Figure 1**).

First, parents should be in touch with their emotions and they are warranted to recognize, express, and regulate them in an adaptive way. Despite school-aged children may have a greater understanding of the verbal content of adults' communications, infants are already sensitive to non-verbal cues such as looking, pointing, vocal tone, and other adults' emotional and social expressions (21, 22). Even during preschool age, children could perceive the adults' emotional state and they could respond consistently (23). Nonetheless, as especially young infants during the first two years of life may have only a partial access to the meaning of adults' communications, their "Little professor"—who is constantly in search of coherent meanings—may be especially vulnerable to misinterpretations and pragmatic errors (24). In this context, infants may use the emotional expression of the caregivers to interpret the safety of ambiguous conditions (i.e., meaning-making) and to adopt consequent problem solving actions (e.g., coping strategies). The social referencing literature has largely provided examples of this by means of the so-called visual cliff experiment. In the visual cliff, infants move on a glass-covered table divided into a shallow side under which a checkered pattern is placed right beneath the glass and a deep side under which a similar pattern is placed some distance below the glass, creating an apparent drop (25, 26). When mothers posed a happy expression, almost all infants crossed the cliff, whereas none of the infants who observed mothers' fearful expression crossed, suggesting that at least from 12-month age infants resolve ambiguous conditions by integrating the parents' emotional expressions in their implicit meaning-making (27). For this reason, caregivers should validate their own feelings of anxiety, fear, and worries and they should not neglect them dismissively. After all, it is in the reciprocal and mutual exchange of affective states that happen within the parent-child relationship, that children can develop appropriate and successful emotional regulation strategies and resilience to stress (28). Parents who are able to be in deep touch with their affective inner world, validating not only their positive emotional states but even depressive and anxious ones, can provide regulatory support and help their children deal with similar feelings, co-constructing with them instruments capable of adaptive emotional regulation (5). In other words, parents who let themselves express their real emotions will also grant the same permission to their young children. Reassuring children about the perceived alarm and risk for health can be successful only if it

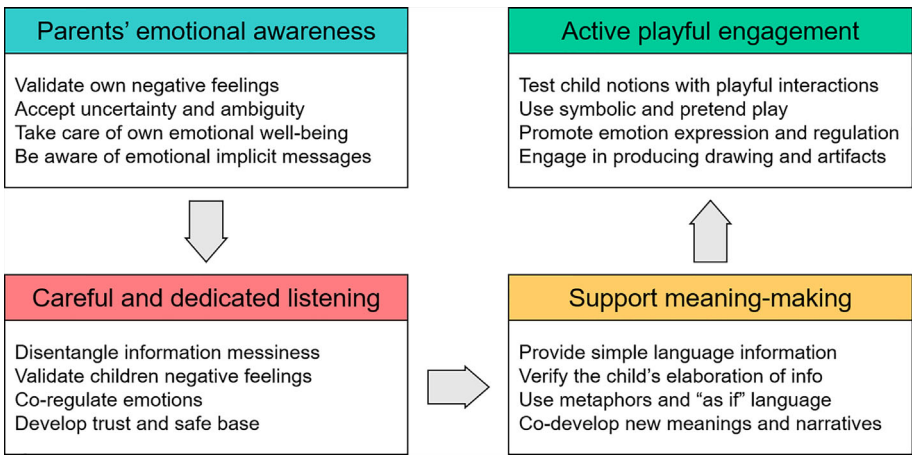

FIGURE 1 | Schematic overview of parental actions aimed at supporting children's meaning-making during the Covid-19 emergency.

happens within a relationship characterized by genuine and open sharing of affective states.

Second, adults that do not neglect their own emotions can also promote a careful listening of children's affective messages and communications. By supporting their child's spontaneous emotional expression, adults can detect how the "Little Professor" in their child is trying to develop a coherent meaning of the situation. Indeed, previous research suggests that family-based narrative approaches provide a structured opportunity to elicit parents' and children's meaning-making, assemble divergent storylines into a shared family narrative, and thereby enhance members' skills to cope with stressful and traumatic events developing hope and trust in family support (29). Careful and open listening by parents can allow children to freely express their feelings of fear and worries about the emergency within a relationship in which they may feel safe and protected (30). It should be highlighted that this personal creative and intuitive way of meaning making which is typical of the "little professor" is often limited in options (31). It provides emotional containment and protective survival strategies that require further scaffolding and permissions from parents to allow the emergence of more functional and adaptive coping strategies to face challenging life conditions. Additionally, far from hinder this intuitive thinking, adults can engage in a careful listening of children emotional world and they can understand which are the elements contributing to the emergent meaning-making process that they are developing (32). This is a crucial step for parents to provide further explanations to children and to promote a positive dialogue about the affective states and the cognitive representations arising from the lived experience of the Covid-19 emergency. Moreover, it should be important to note that this particular attitude to careful listening is warranted to continue across time as new information and knowledge can arrive to the children in different moments, thus requiring continuous interactive rearrangement and mutual refinement of the meaning-making process.

Third, when adults' self-regulation is in place and careful listening is available for children, caregivers can now provide active contributions to the meaning-making process by using simple language. Avoiding complex concepts and explaining the emergency-related issues with age-appropriate words is crucial to clean up the messy ensemble of information to which the children are exposed (33). For example, receiving communications expressed in simple language can help the children to understand the Covid-19 symptoms, the risk factors and the appropriate behaviors needed to deal with the emergency. As the "Little Professor" use intuitive and analogic forms of representations, the use of metaphors, drawings and "as if" language can facilitate the integration of information by the child, stimulate curiosity and avoid the emergence of "monsters" or the persistence of scaring images in the meaning mindset of the child. Moreover, mother and fathers are encouraged to talk with their child together, as a way to communicate that the family as a system is coherent and to reinforce the strength of the messages. From this perspective, observing children's spontaneous and subjective creations may allow the adults to monitor the meaning-making process that is unwinding within their inner world.

Fourth, the active engagement of parents during recreative activities can further scaffold children's meaning-making during the Covid-19 emergency. Indeed, recreational activities represent the best secure setting in which parents and their children can share meanings about the actual emergency (34). During these moments, caregivers can enhance children's intuitive and creative thinking, offering them coherent explanations about what is happening and directly co-constructing meanings and representations. As previously mentioned, the precocious experiences of parental holding and emotional regulation are key to make meanings about the physical, social, and psychological world the child is living in. For example, drawing and playing together allow parents and children to co-create a shared symbolic and analogic language through which a sensitive emotional education process is warranted to enhance children's capacity to perceive, label, and differentiate among their own emotional feelings and affective states (35). By playing and practicing together, parents and children develop a shared grammar of meanings that will contribute to create a safe environment for psychological, emotional, and cognitive explorations later in life (36). In this crucial process, caregivers act like a mirror that may reflect and disentangle their child's affective states. The current Italian context provides a clear example of this co-creation, which is the shared drawing of rainbows with the claim "Everything will be all right". This symbolic creation highlights the importance to develop a common symbolism within the family that can also be shared on-line with peers, contributing to support hope and resilience for the future (37, 38).

In sum, in times of such an unprecedented global healthcare emergency, adults have the responsibility to take care and partner with children in producing integrated, coherent, and adequate meaning-making on the pandemic (39). In fact, young children create internal representations of their experiences of "being-with" the adult caregivers who support them to make sense about the surrounding environment (40). The cognitive and emotional appraisal of subjective experiences by the "Little Professor" allow the development of adaptive reactions to the situation and peculiar and subjective survival strategies. For this reason, by helping the present generation of children in dealing with the Covid-19 emergency, we hope adults can successfully contribute in nurturing a new generation of human beings that will share enhanced resiliency when faced with future unexpected and stressful events.

AUTHOR CONTRIBUTIONS

LP and EB conceived this work. EB, SL, and RB contributed to the drafting of the final version of the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Treating Psychological Trauma in the Midst of COVID-19: The Role of Smartphone Apps

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With the COVID-19 pandemic confronting health systems worldwide, medical practitioners are treating a myriad of physical symptoms that have, sadly, killed many thousands of people. There are signs that the public is also experiencing psychological trauma as they attempt to navigate their way through the COVID-19 restrictions impinging on many aspects of society. With unprecedented demand for health professionals' time, people who are unable to access face-to-face assistance are turning to smartphone apps to help them deal with symptoms of trauma. However, the evidence for smartphone apps to treat trauma is limited, and clinicians need to be aware of the limitations and unresolved issues involved in using mental health apps.

Keywords: smartphone apps, COVID-19, trauma, PTSD, mHealth, anxiety, Internet, mental health

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INTRODUCTION

Although many medical and allied health professionals are conducting telehealth sessions with patients and clients during the COVID-19 pandemic, the increased level of demand means that some people may not be able to access services in an adequate timeframe (1). In response, increasing numbers of sufferers are turning to digitized, automated options such as mobile applications (apps) (2). For people with symptoms of acute stress disorder, which if present for longer than a month is reclassified as posttraumatic stress disorder (PTSD) (3), mental health apps are potentially one way to access treatment and lessen the burden on primary health care.

It is no surprise that individuals are turning to digital options—over 5.2 billion people worldwide own a smartphone (4). When the COVID-19 situation rapidly worsened, downloads of mental health apps accelerated (2, 5). For example, the apps *Calm* and *Headspace* ranked two and three for worldwide revenue achieved in March 2020 for health and fitness apps in the Google Play store, achieving sales worth over US$1,149,000 and US$838,000, respectively (6). Around the world, there is other evidence that both authorities and people are turning to apps and other digital options in large numbers to cope with the trauma of COVID-19: in Australia (7), China (8), India (9), New Zealand (10), U.K. (11), U.S. (5), and others. However, we do not yet have accurate data on how many people are experiencing symptoms of PTSD as a result of COVID-19, nor how many are relying on smartphone apps to cope with these symptoms.

THE EVIDENCE FOR TREATING SYMPTOMS OF TRAUMA WITH AN APP

Best practice involves initially treating symptoms of trauma with specially administered psychological therapy, such as trauma-focused cognitive-behavioral therapy (CBT), eye movement desensitization and reprocessing (EMDR), cognitive processing therapy, narrative exposure therapy, or prolonged exposure therapy (12). If there is no or little improvement in symptoms

as a result of these treatments, clinicians may explore pharmacological options, either as an adjunct to therapy or as a front line treatment if psychotherapy has been ineffective (13). If psychotropic medication is prescribed for PTSD, it will usually initially be an antidepressant, and mostly it will be a selective serotonin reuptake inhibitor (SSRI) or serotonin-norepinephrine reuptake inhibitor (SNRI) (12). However, the evidence for efficacy of pharmacological treatments of PTSD is less than that for psychological treatments (13), so further treatment options would be welcomed, especially with the anticipated worldwide surge in trauma-related presentations that may arise during and after the COVID-19 situation with both health workers and the general public (14–17).

The description of "antidepressant" for a class of drug is confusing because many antidepressants not only treat depression, but also anxiety (18). When pharmacological treatment is prescribed for anxiety or depression in the form of an antidepressant, it is has been done so for a medication that has been approved by government regulators in that country that have identified the medication as safe and efficacious. A *digital antidepressant*, therefore, can be thought of as any app, website or other digital tool that is specifically designed to treat symptoms of anxiety or depression. If this digital tool is a form of non-pharmaceutical medication, there is a need for these digital tools to have research behind them. Government regulators would not allow a pharmaceutical antidepressant to become available without research of efficacy, and using the term "digital antidepressant" is a reminder of how important it is to consider apps that claim to treat anxiety and depression symptoms as things that need to have research for their efficacy as well. The idea that a health professional could "prescribe" a mental health app (19) is attractive at this time because of the difficulties accessing face-to-face treatment, whether by telehealth or in-person. Medical practitioners are concerned about the welfare of their patients, and if their patients cannot access "human" help, they may seek out other options in the form of digital technology. However, clinicians should be aware of the evidence for mental health apps, and understand that a digital antidepressant may not produce the desired clinical outcomes.

Similarly, the above mentioned evidence-based psychotherapies for treating symptoms of trauma require the specialized skills of highly trained practitioners. To be effective, such practitioners have to be experts in recognizing the signs and symptoms of trauma, adapting their psychotherapy in response to changes in client presentation, and acting appropriately if their client's condition deteriorates, especially in response to a risk of self-harm or suicide. If a general practitioner or other health professional does not have such specialized training in the area of psychologically treating symptoms of trauma, they may have the mistaken belief that a mechanized version of psychotherapy is possible in an app without being aware that evidence may not exist for the app's effectiveness in treating trauma presentations.

Evidence for the efficacy and effectiveness of mental health apps is limited (20, 21). The research suffers from methodological deterrents (e.g., quality randomized controlled trials [RCTs] can be expensive and take years to run which is an impediment for the profit-driven app sector), heterogeneity across studies, no published replication studies to speak of, and a lack of independence (i.e., studies completed by researchers who have not had any association with the app) (22, 23). This last point is important and is illustrated through a comparison with chemical antidepressants.

The early evidence base for chemical antidepressants, which was largely established by pharmaceutical companies who developed these medications, showed far higher effect sizes and greater levels of statistical significance than more recent studies (24). The later studies have included a much greater proportion of independent trials by researchers who have no association with the medications being tested. Their results have demonstrated significantly less efficacious and effective outcomes (24). Using the Cochrane Bias Tool, it has been estimated that 82% of all previous published studies on antidepressant medications are at moderate or high risk of bias due to the involvement of pharmaceutical companies (24).

If the efficacy of mental health apps is to be free of the limitations affecting many drug trials, unbiased research is required while their development is still relatively young. In a recent review of the two major app stores, only 1% of apps that claimed to offer a therapeutic treatment for anxiety and depression had independent research to back-up claims of efficacy (25). That is, research that was conducted by individuals, institutions or organizations who were not involved in the development of the app, and who would not stand to gain financially or otherwise from it. This is not to discourage research by app developers—quite the contrary. More app developers also need to conduct research on their product because a huge proportion of publicly available apps have no research support whatsoever (22, 23). While much of the research conducted by those who have an association with the app may be of acceptable quality, it is important that independent research in this area is increased to further legitimize the evidence base and minimize concerns regarding bias.

There is less evidence for apps specifically treating symptoms of trauma. The principal research on this front has come from the U.S. Department of Veterans' Affairs (VA), developers of *PTSD Coach* (26) and a suite of other apps, most of which are specifically aimed at veterans or their families. At time of writing, no published evidence could be found for the efficacy or effectiveness of any individual app specifically designed to treat symptoms of trauma, other than those produced by VA (27, 28). This is despite hundreds of publicly available apps purporting to do this (28, 29), and the availability of a standardized framework for developing PTSD-focused apps that stipulates the importance of demonstrated efficacy (30). Without a more diverse evidence base, it is unknown to what extent people benefit when they attempt to manage trauma by using apps. Worse still, we do not know how much damage is being caused by misinformed and poorly developed apps.

GOVERNMENT REGULATION

Examples of potential harm from an app include breaches of privacy, misuse of personal data, providing inappropriate advice (31), and poor app functionality leading to possible app failure at a critical emotional point for the user. It has also been

TABLE 1 | Website resources for clinicians that provide reviews and further information on mental health apps for symptoms of trauma.

Resource	Summary
American Psychiatric Association's App Evaluation Model (https://www.psychiatry.org/psychiatrists/practice/mental-health-apps/app-evaluation-model)	U.S.-based framework for clinicians and researchers on how to conduct their own evaluation of apps
Anxiety and Depression Association of America (https://adaa.org/finding-help/mobile-apps)	U.S.-based non-government, non-profit organization providing reviews of mental health apps by volunteers with recognized mental health qualifications who do not have any association with the apps being rated
Beacon (https://beacon.anu.edu.au/)	Australian university website providing research summaries of digital health resources, including mental health apps
Head To Health (https://headtohealth.gov.au/)	Australian government website providing information regarding digital mental health resources, including apps
Health Navigator (https://www.healthnavigator.org.nz/)	New Zealand government-supported website, with input from professional health-related bodies, providing information regarding digital health and medical resources, including mental health apps
mHabitat (https://wearemhabitat.com/)	U.K. government-supported website, with the involvement of various departments of the National Health Service, dedicated to developing partnerships with developers of digital health solutions, including mental health apps
MindApps (https://mindapps.dk)	A mental health app review website by The Centre for Telepsychiatry, Psychiatry in the Region of Southern Denmark. It includes reviews by therapists, academics, and consumers
NHS Apps Library (https://www.nhs.uk/apps-library/)	Coordinated by the U.K.'s National Health Service, this tool allows users to search for all types of health apps, including mental health apps, with summaries about what the app does, links to the app's website, and links to the App Store and/or Google Play for download.
The Organization for the Review of Care and Health Apps (ORCHA) (https://www.orcha.co.uk/who-we-help/health-and-care/)	Private organization based in the U.K. offering a number of tech-related health services, including reviews, accreditation, curation and prescription services for health and mental health apps
Reachout.com (https://au.reachout.com/tools-and-apps)	Australian non-government organization providing expert and consumer reviews on mental health apps
PsyberGuide (https://psyberguide.org/)	U.S. non-government organization providing expert reviews on mental health apps

found that for over 20% of publicly available apps claiming to treat symptoms of PTSD, their app store descriptions did not contain any specific PTSD evidence-based content (28). This is where government intervention is urgently required, but many governments are struggling to develop suitable regulations around mental health apps (32). Authorities such as the U.S. Food and Drug Administration are focused on removing apps that may cause harm (33). A recent report by the Australian Commission on Safety and Quality in Health Care (34) attempts to encompass a wider regulatory view of digital mental health resources founded on a "model of care" with "best available evidence and best practice" (p. 20).

However, these new standards in digital mental health care, which include mental health apps, are yet to be implemented. In the meantime, medical practitioners who are expecting an influx of trauma-related presentations in the wake of COVID-19, must use caution in directing patients toward apps to assist in managing symptoms of trauma.

DISCUSSION

There is uncertainty about the effectiveness of many mental health apps (i.e., their ability to deliver beneficial treatments in a real world setting) and the most appropriate methods of examining this (35). The COVID-19 crisis brings to the fore the need for a centralized database of information for use by medical professionals, governments, therapists, researchers, and consumers (36). Clearly, there is a need to move beyond reliance on app store ratings and reviews, which may be inaccurate, ill-informed, or fake (37), to the requirement for app researchers to provide accessible and timely research evidence. While the time demands of the gold standard RCT can be an impediment to research, other methodologies that do not sacrifice scientific rigor and integrity can potentially be conducted on apps in a more timely manner (38). These include scalable single-case designs involving practicing clinicians working with researchers (36). In such a model, clinicians could contribute their findings to a centralized database that may continually be updated with results that occur from individuals using their app in real-world settings. The single-case methodology has the added advantage of being able to provide potentially more information on the characteristics of the individual than might otherwise be identified in larger RCT designs. This may in-turn lead to more informed hypotheses about how individual characteristics may impact on the effectiveness of a mental health app.

Other than the need for further research on efficacy and effectiveness, future development of apps for treating symptoms of trauma (and indeed for all apps treating mental illness generally) needs to take into account a number of factors, and there are many existing development blueprints that app developers can refer to (39–41). Building a mental health app on the foundations of an evidence-based framework is vital

(42). There are several evidence-based frameworks that inform PTSD psychological treatments (as mentioned above), and it would seem plausible that such treatment interventions could be incorporated into an app. There needs to be expert input from qualified clinicians and/or researchers into the development of a mental health app—many apps claiming to treat symptoms of mental illness do not have such input (25, 43, 44). Given that the development of mobile mental health apps is still in its infancy, we are still not certain about the mechanisms of action of such apps, and therefore the level of importance of characteristics such as app design and usability is still being investigated. However, it would seem plausible to assume that a mental health app has to be easy to use, engaging, and aesthetically pleasing to be efficacious and effective (41), and therefore having the input from experienced app designers would seem to be a necessity. This is only a brief summary of necessary aspects of a successful mental health app, but even here it can be seen that many different aspects of development need to be considered before an app is able to make claims that it can successfully treat symptoms of trauma, or of any other mental illness.

Another concerning feature of around 40% of mental health apps is that they lack a publicly accessible privacy policy (45). Given the sensitive nature of people's mental health information, app developers need to pay more attention to this. One reason why app developers have been able to get away with this for so long is that there is no government regulation about the need for privacy policies for digital mental health resources. If government authorities can broaden and strengthen their oversight of this sector, protecting people's privacy will be as necessary a factor as ensuring that mental health apps do no harm to their users.

There are websites that clinicians (and consumers) can access for reviews and further information about choosing mental health apps, listed in **Table 1**. The rationale for providing the information in **Table 1** is so that clinicians can become more informed about recommending appropriate apps for their patients and clients. We did not recommend specific apps, as that is not the purpose of this paper. Although lacking information on how to measure effectiveness, these websites are nevertheless useful resources for clinicians who need assistance identifying potentially suitable apps. While the current evidence base is lacking, it is hoped the COVID-19 crisis is a potential catalyst for ensuring that mental health apps have demonstrated effectiveness for treating specified mental health disorders, including PTSD-related trauma, into the future.

DATA AVAILABILITY STATEMENT

All datasets analyzed in this study are included in the article/supplementary material.

AUTHOR CONTRIBUTIONS

JM wrote the manuscript drafts. DD and WB provided proofreading and editing. All authors read and approved the final submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Videoconferencing Psychotherapy for Panic Disorder and Agoraphobia: Outcome and Treatment Processes From a Non-randomized Non-inferiority Trial

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Background: In the context of the COVID-19 pandemic, legislations are being modified around the world to allow patients to receive mental health services through telehealth. Unfortunately, there are no large clinical trial available to reliably document the efficacy of delivering videoconferencing psychotherapy (VCP) for people with panic disorder and agoraphobia (PDA) and whether basic psychotherapeutic processes are altered.

Methods: This 2-arm intent-to-treat non-inferiority study reports on a clinical trial on VCP and documents how therapeutic working alliance and motivation toward psychotherapy are associated to treatment outcome. We hypothesized that VCP would not be inferior to standard face-to-face (FF) cognitive behavior therapy for PDA. No specific hypothesis was stated to address working alliance and treatment mechanisms. VCP was compared to a gold-standard psychotherapy treatment for PDA, which was delivered either in person or in videoconference, with a strict tolerance criterion of about 2 points on the primary outcome measure. Seventy one adult patients were recruited. Measures of working alliance were collected after the first, fifth, and last session. Motivation toward therapy at pre-treatment and working alliance after the fifth therapy session were used as predictors of treatment outcome and compared with change in dysfunctional beliefs toward bodily sensations.

Results: Panic disorder, agoraphobia, fear of sensations and depressed mood all showed significant improvements and large effect-sizes from pre to post-treatment. Gains were maintained at follow-up. No significant differences were found between VCP and FF, and effect sizes were trivial for three of the four outcome measures. Non-inferiority tests confirmed that VCP was no less effective than FF therapy on the primary outcome measure and two of the three secondary outcome measures. Working alliance was very strong in VCP and did not statistically differ from FF. Working alliance and motivation did not predict treatment outcome, which was significantly predicted by the

reduction in dysfunctional beliefs. The strength of the therapeutic bond was correlated with change in dysfunctional beliefs.

Conclusion: Mental health professionals can use VCP to provide services to patients with PDA. Building and maintaining a sound working alliance should not be a source concern. Practical recommendations are formulated.

ISRCTN Trial Registration Number: ISRCTN76456442.

Keywords: telepsychotherapy, telehealth, videoconference psychotherapy, panic disorder and agoraphobia, working alliance, self-efficacy, treatment outcome, treatment processes

INTRODUCTION

Telemedicine and telepsychotherapy have long been considered solutions to provide health services to people living in rural areas, but legislations are now being modified around the world to allow people to receive services from home due to measures implemented to face the COVID-19 pandemic. However, many people are sensitive to these measures, including some anxious patients and those fearful of physical distancing and confinement. In this context, there is a need for accessible empirical evidences about the efficacy and predictors of outcome of telehealth for each specific mental disorder.

People suffering from PDA are vulnerable in a pandemic crisis, such as the one associated with COVID-19. By definition (American Psychiatric Association [APA], 2013), people with PDA experience recurrent unexpected and spontaneous panic attacks, worry about recurring attacks, and fear of physical symptoms, such as chest pain, heart palpitations, shortness of breath, dizziness, or abdominal distress. PDA is accompanied with significant anxiety about being in places or situations in which it would be difficult to escape or receive assistance if panic attacks were to occur (American Psychiatric Association [APA], 2013), including being confined. The lifetime prevalence of PDA is estimated at 4–6% of the adult population. PDA is chronic, associated with very significant emotional distress, significant fear of body sensations and frequent medical visits (Barsky et al., 1999; Teismann et al., 2018; Chang et al., 2019). The psychological processes at the core of PDA rest on the dysfunctional association between body sensations (interoceptive cues) experienced during panic arousal and perceived threat, which is maintain by avoidance of stimuli or places that elicit feared body sensations or potential panic attacks (Clark, 1986; Barlow, 1988; Taylor et al., 2007). Preliminary reports have suggested that COVID-19 may have an impact on panic disorder (Bhatia et al., 2020; Qiu et al., 2020). People with PDA, or at risk of developing PDA, may be more sensitive to the apprehension of suffering from harmful diseases, experiencing symptoms associated with COVID-19 (e.g., shortness of breath, dizziness), wearing facial masks that may induce the feeling that breathing is difficult, being restricted in mobility because of rules for confinement and physical distancing, having panic attacks induced by the increase in arousal caused by adapting to this situation or by co-morbid anxiety disorders, etc. As an effective treatment for PDA, CBT involves strategies targeting dysfunctional beliefs and avoidance behaviors (Sánchez-Meca et al., 2010). The key treatment mechanism of CBT for PDA is considered to be reappraisal of interoceptive sensations, and to some extent increase in self-efficacy (Clark, 1986; Barlow, 1988; Bouchard et al., 2007; Smits et al., 2012; Gallagher et al., 2013).

Videoconferencing psychotherapy (VCP) is one of the various telehealth modalities that can improve access to mental health professionals trained in evidence-based strategies such as cognitive-behavior therapy (CBT) or with other specialized expertise (Nelson and Duncan, 2015; Liu et al., 2020). The efficacy of CBT is well established in the treatment of anxiety disorders when delivered face-to-face, when compared to no treatment or to a placebo (Hofmann et al., 2012; Carpenter et al., 2018), and is recommended as the gold-standard form of psychotherapy for PDA in clinical guidelines (e.g., Katzman et al., 2014). Several outcome studies have been conducted on VCP, but systematic reviews on anxiety disorders have always concluded that more rigorous research is needed (Rees and Maclaine, 2015; Berryhill et al., 2019).

The most recent systematic review (Berryhill et al., 2019) demonstrated that studies on VCP for panic disorder and agoraphobia (PDA) are scarce. Only three studies have been published so far (Bouchard et al., 2000, 2004; Cowain, 2001; Lindner et al., 2014) and are of moderate methodological quality. One additional study has been published, only in French, not indexed in major databases, and before the entire study was completed (Allard et al., 2007). The largest outcome study on PDA (Bouchard et al., 2004) reported in reviews and meta-analyses (Rees and Maclaine, 2015; Berryhill et al., 2019) was conducted with 21 participants, and showed that CBT delivered by videoconference was effective.

If mental health professionals are to conduct VCP for PDA, it is urgent to share knowledge that demonstrate its efficacy based on larger samples that includes follow-up data. It is also essential to better understand the processes involved in telepsychotherapy, such as the role of working alliance and motivation toward therapy.

Indeed, working alliance is an important part of any psychotherapy and involves three factors: agreement on in-sessions tasks, agreement on treatment goals, and the development of a mutual therapeutic bond (Bordin, 1979; Horvath and Greenberg, 1989). In a systematic review on VCP, Backhaus et al. (2012) found that only 16 out of 47 studies examined the patient-provider relationship in therapy, and 14 out of 16 concluded that patients and providers perceived a strong working alliance. However, a more recent review

using different criteria (Norwood et al., 2018) highlighted the need for more studies, including for PDA, and considered that the working alliance was slightly lower in VCP than in FF therapy. Psychotherapists may be apprehensive toward using videoconferencing for fear of disrupting the working alliance (Rees and Stone, 2005; Richardson et al., 2009; Connolly et al., 2020). Two remaining key questions are how the three factors that contribute to working alliance could be affected by VCP and how, in turn, alliance influences treatment mechanisms and outcome.

Another important process that can affect therapy is patients' motivation. Motivation influences how patients engage in therapeutic work, integrate learning, change their behavior (Deci and Ryan, 2000), and can influence treatment outcome (Orlinsky et al., 1994). Ryan and Deci (2008) proposed that, when individuals are more autonomously engaged in a therapeutic undertaking, they are more likely to integrate learning and to change their behavior, resulting in more positive outcomes. However, to the authors' knowledge, no study has examined if motivation toward psychotherapy differs when offered in VCP versus face-to-face.

The aims of this paper are to disseminate results on a non-inferiority trial of VCP at post-treatment and follow-up and document factors associated with treatment outcome for PDA. The main hypothesis of the first aim was that VCP would not be inferior to standard face-to-face CBT for PDA according to the primary measure of outcome (severity of PDA). Similar hypotheses were formulated for the three broader measures of generalization (agoraphobic avoidance, fear of sensations and depressed mood). Non-inferiority was defined by a strict and small margin of tolerance for non-inferiority. The second aim was to document the impact of VCP on alliance and how alliance and motivation influenced treatment outcome. No *a priori* hypothesis was stated. First, we compared measures of alliance at the beginning of the treatment, after the first third of the treatment, and the end of the treatment. Second, we assessed and compared the contribution of alliance, motivation, and cognitive changes in dysfunctional beliefs toward body sensations to the primary measure of treatment outcome.

MATERIALS AND METHODS

Procures to Meet Standards in Ethics and Research

The project was approved by the research ethics boards of the lead university and all hospitals involved and was conducted following the ethical standards of the Canadian Tri-Council policy statement for ethical conduct for research involving humans and the Declaration of Helsinki. No monetary compensation was provided. All patients were fully informed of the nature of the study and provided free written consent.

This article was written following CONSORT (Consolidated Standards of Reporting Trials) guidelines for trials assessing non-pharmacological treatments and for non-equivalence trials. There was no modification to the trial's methods once the study started. Modifications from the grant proposal application were done to respect the budget, ensure feasibility and take into account requests from the ethics committees. Patients and therapists were aware (not blind) of the assigned treatments and study objectives due to the explicit nature of the treatment provided (VCP or FF). The clinical trial was designed as a within-between trial (i.e., pre/post/f-up comparing VCP to FF) without random assignment of participants to the treatment modalities. Random assignment in VCP studies has mixed pros and cons that must be considered. If a study is to replicate the factual and subjective effects due to patients being in a remote location isolated from their therapist, randomly assigning patients to meet online a therapist that is nearby in an adjacent room of the clinic is not an ecologically valid option. This is especially relevant for CBT of PDA, as patients feel reassured by the presence of the therapist during exposure. To use a randomly controlled design, the alternative is to allocate participants to both conditions and, for those in the FF treatment modality, to either have the participants or the therapists commute to the FF therapy site. This solution entails enormous research costs and challenging funding issues. In addition to reducing the representativeness of the study, this solution also significantly increases the risk of drop-out, as experienced by Mitchell et al. (2008) in their study, with a drop-our rate of 40% during therapy. Finally, because remote rural communities are less populated, this approach precludes the recruitment of a large sample. For this study, in order to maximize generalization of results to patients who are unable to receive psychotherapy in FF, participants from a rural (Maniwaki) and an urban (Montréal) distant sites were all allocated to VCP and patients in the local urban site (Gatineau) were all allocated to FF. As per the grant proposal, the study was stopped when funding was exhausted.

Conducting non-inferiority trials is associated with important methodological requirements that must be explicitly stated and justified (Powers and Fleming, 2013; Mauri and D'Agostino, 2017), such as the choice of the reference treatment (to ensure the experimental treatment is not compared with a barely effective one), the selection of the non-inferiority margin, the statistical approach, and the use of an intent-to-treat approach that does no impede the effectiveness of the reference treatment. In the current study, the reference treatment was a gold standard for PDA that has shown its efficacy and superiority over placebo and several other alternatives (Hofmann et al., 2012; Carpenter et al., 2018), and that has been successfully used before by our research group in its traditional FF format (Bouchard et al., 1996). Non-inferiority was defined by a small margin of tolerance operationalized as a Cohen *D* of 0.20, which represents a difference in change between the two conditions of no more than 2 points on the primary outcome measure. The same criterion was applied to the secondary outcome measures. The statistical approach was to document treatment outcome based on repeated-measures ANOVAs, focus on the effect sizes of both conditions' outcome and the Condition by Time interactions, and interpret the differences in effectiveness based on non-inferiority analyses. Structural equation modeling of latent growth curve model was not use because it requires very large sample size as well as numerous measurement points, and to allow for consistency with the non-inferiority testing approach described

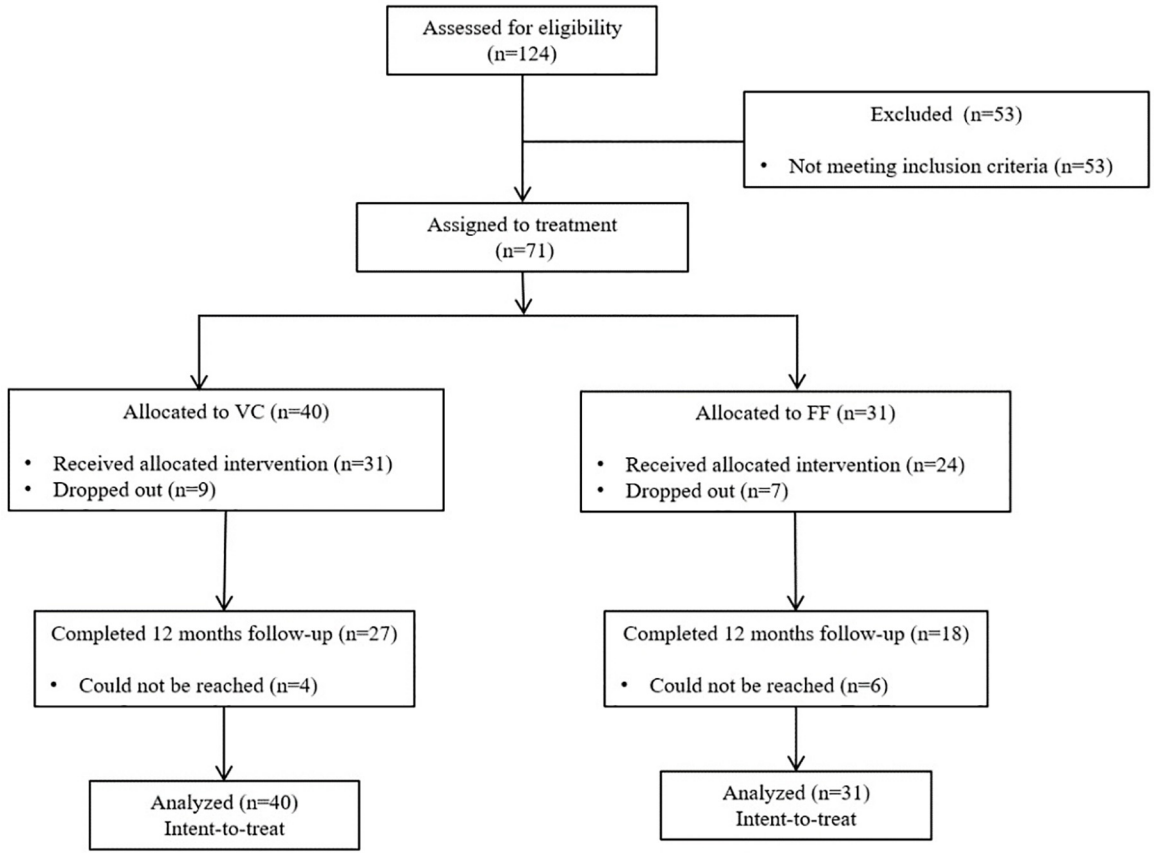

FIGURE 1 | CONSORT flowchart of the progress of participants through the phases of the trial.

above. The trial was analyzed with intent-to-treat design because it is the most conservative approach.

Sample

Upon contact following publicity and medical references, each participant received the Structured Clinical Interview for DSM-IV (SCID; First et al., 1997) to ascertain eligibility (presence of PDA and other mental disorders). The intake interview was realized face-to-face. The exclusion criteria were: (1) primary diagnosis other than PDA (American Psychiatric Association [APA], 2013); (2) duration of illness of less than 6 months; (3) diagnosis of bipolar disorder, schizophrenia or psychotic disorder, organic mental disorder, intellectual disability, substance use disorder, or severe personality disorders; (4) below 18 or above 65 years of age; (5) currently receiving a psychological treatment (i.e., no concurrent psychotherapy allowed); (6) presence of a medical condition precluding participation in the treatment for methodological or clinical reasons (e.g., cardiovascular disease, Meuniere syndrome, asthma, history of seizures, uncontrolled hypoglycemia, pheochromocytoma, hyper- or hypothyroidism, and brain or lung tumors); (7) if taking antidepressants, using them for less than 6 months or, if taking benzodiazepines, using them for less than 3 months. People on medication who corresponded to the selection criteria were included only if they agreed not to change their medication or to increase its dosage during the study. The vast majority of candidate excluded at the recruitment stage (see **Figure 1** for the CONSORT flow chart) were not eligible because PDA was not their principal diagnosis.

The sample size and power were established *a priori* based on results from a previous and separate study (Bouchard et al., 2004) and 124 participants were initially recruited (**Figure 1**). After intake, the sample consisted of 71 adults who met the selection criteria. Participants from the remote sites were all allocated to VCP ($n = 40$) and patients from the local site all received face-to-face (FF) treatment ($n = 31$). A chi-square analysis was conducted in order to identify differences in dropout rates between VCP and FF and the result was not significant [$\chi^2(1) = 0.06$, ns].

Treatment

Treatment consisted of 12 weekly 60-min sessions of CBT and was delivered according to a standardized treatment manual (Clark and Salkovskis, 1987; Barlow and Cerny, 1998; Bouchard et al., 2004; Allard et al., 2007). The treatment was provided without delay, as soon as a participant was deemed eligible for the study. The 12-session written treatment manual was based on target objectives that must all be addressed in a fixed sequence of five modules within a predetermined number of sessions.

This allowed some clinical flexibility in treatment pace while protecting fidelity of the delivery of a reproductible validated clinical intervention. The target objectives of the treatment were: building rapport and developing a case formulation (module 1, session 1), sharing a common understanding of information on PDA and the role of appraisal and avoidance of physical sensations (module 1, session 2), conducting cognitive restructuring focused on the core dysfunctional beliefs of PDA as revealed by the case formulation (module 2, sessions 3 and 4), engaging in interoceptive exposure (e.g., hyperventilating, spinning, breathing through a straw) of stimuli and avoidance behaviors identified as relevant in the case formulation (module 3, sessions 5–8), planning and reviewing agoraphobic exposure exercises to be conducted between sessions (module 4, sessions 9–11), and wrapping-up the treatment with relapse prevention (module 5, session 12). The three psychotherapists who conducted all CBT sessions were two female graduate students in clinical psychology and a male psychologist, with previous experience in CBT and trained for the use of VCP. They were weekly supervised by the first author. Treatment integrity (Moncher and Prinz, 1991) was ensured by blind ratings of a subset of video recordings of therapy sessions for adherence to the treatment manual (Allard et al., 2007). Thirty items rated on a 0–3 scale measured therapist's attitude, general skills, delivery of cognitive restructuring techniques, delivery of exposure, and management of homework assignment. The analysis revealed no difference between the two conditions on the respect of treatment integrity [$t(1,10) = 1.161$, ns]. No adverse effects were reported.

Equipment and Locations

Two remote cities (Maniwaki and Montreal) were linked at 384 kbps with a local site (Gatineau) with Tandberg 2000 videoconference systems set up in psychologists' offices. Participants in the VCP condition were all located in the remote sites, treated by therapists located at the local site, and never met their therapist face-to-face. The height of the 32-inch video monitor and the distance between the monitor and the chair were positioned to replicate a face-to-face psychotherapy context. Patient and therapist could see each other from the head to the hips. Therapists in VCP were encouraged to keep the picture-in-picture function activated so they could see their own video image and ensure that they remained visible to their patients. All therapy sessions were video recorded using the videoconference equipment (i.e., using only the camera in the FF condition and turning the monitor off) to assess adherence to the treatment protocol. If documents needed to be shared, email or fax was used.

Measures

The outcome variables were assessed after the intake diagnostic interview: at pre-treatment, at post-treatment, and at a 12-month follow-up. The duration of the follow-up was set as for 12 months because it is considered as a reasonably long in CBT and by granting agencies [in comparison, in their meta-analysis Carpenter et al. (2018) reported a mean follow-up duration of 5.5 months]. All instruments have been validated and extensively used to assess PDA (see Bouchard et al., 1997 for a review and details of psychometric properties and information). Higher scores represent more severe symptoms. The primary outcome was a measure addressing the severity of PDA globally and was complemented with three secondary outcome measures addressing more broadly the impact of the treatment (agoraphobic avoidance, fear of body sensations, and depressed mood). Additional measures were administered to document predictors of treatment outcome that may be influenced by VCP. They included two variables considered as common factors in all psychotherapies (working alliance and motivation) and two measures specific to CBT of PDA (change in dysfunctional beliefs toward body sensations and in perceived self-efficacy). To maintain an adequate ratio of participants per predictor variables, only change in dysfunctional beliefs toward body sensations were analyzed in the regression analyses reported in the article. The role of perceived self-efficacy was explored in the Online **Supplementary Material** only. The two measures of working alliance were administered after sessions 1, 5, and 12. All three measurement points were compared to find differences between VCP and FF. To reduce the risks of social desirability biases on measures of working alliance, participants were assured their therapist would not have access to their results; once completed, patients sealed the questionnaires in an envelope and mailed the envelope to the provincial board of psychologists. The envelopes were only returned to the researchers when treatments for all participants were completed. Only ratings of working alliance obtained at session 5 were used in the analyses of the predictors of outcome, as recommended to provide a fair assessment of alliance unbiased by treatment success (Ardito and Rabellino, 2011; Buchholz and Abramowitz, 2020).

Panic and Agoraphobia Scale (PAS; Bandelow, 1995)

The PAS was selected as the primary outcome measure because it assesses the global severity of PDA. This self-report has 13 items, rated on a 0 to 4 rating scale measuring: (1) panic attacks (frequency, severity, duration); (2) avoidance; (3) apprehension; (4) impairment in familial and professional relationships; and (5) worries about health. The average score reported for a clinical sample of people with PDA was 24.7 ($SD = 9.8$) and Cronbach's alpha was 0.88. The PAS is a sensitive and well validated global outcome measure.

Mobility Inventory When Alone (MI; Chambless et al., 1985)

This measure of agoraphobia uses 27 items to rate how frequently a person avoids various situations when not accompanied by someone else. Agoraphobic avoidance is a very important feature of PDA and was selected as one of the three secondary measures of the generalization of treatment outcome. The average clinical score reported by the authors was 3.22 ($SD = 1.01$), and an average score of 1.5 ($SD = 0.45$) has been reported for a community sample. The MI-Alone has a Cronbach's alpha between 0.94 and 0.96.

The Body Sensations Questionnaire (BSQ; Chambless et al., 1984)

The BSQ measures the fear of 17 different body sensations and was used as a secondary outcome measure. In the validation study, the average score of the clinical sample was 3.05 (*SD* = 0.85), and an average score of 1.8 (*SD* = 0.59) had been reported in a community sample. The BSQ has a Cronbach's alpha of 0.87.

Beck Depression Inventory (BDI; Beck et al., 1996)

The BDI is a well known 21-item self-report measure of symptoms of depression. As a measure of depressed mood, it is used in several CBT trials to document treatment effects that are broader than core PDA features. The BDI has a Cronbach's alpha of 0.92. Scores below 10 are in the normal range and scores above 20 are associated with probable or mild depression.

The Agoraphobic Cognitions Questionnaire (ACQ; Chambless et al., 1984)

The Agoraphobic Cognitions Questionnaire (ACQ; Chambless et al., 1984) is a well validated measure of the core psychological change processes involved in the CBT of PDA (Clark, 1986). It was administered as a measure of treatment process specific to the CBT of PDA. It consists of 14 items measuring dysfunctional beliefs related to possible catastrophic consequences of having a panic attack. The average score was 2.42 (*SD* = 0.64) in the clinical validation sample, and 1.6 (*SD* = 0.47) in a community sample. The Cronbach alpha is 0.80.

Working Alliance Inventory (WAI; Horvath and Greenberg, 1989)

Patients completed the self-rated version of the WAI. This widely used questionnaire measures working alliance with three subscales (agreement on goals, agreement on tasks, and the therapeutic bond). The long 36-item version offers an excellent general measure of working alliance, but it is recommended to analyze the shorter 12-item version if one wants to measure the three first-order unique aspects of the alliance that are the Goal, Task and Bond subscales (Tracey and Kokotovic, 1989). The Cronbach's alpha are 0.90, 0.90, and 0.92 for the Goal, Task, and Bond subscales, respectively.

California Psychotherapy Alliance Scale (CALPAS; Marmar et al., 1986)

The CALPAS is another self-rated measure of alliance. This 24-item instrument was also administered to provide a different and complementary perspective on the working alliance (Bachelor and Salamé, 2000; Buchholz and Abramowitz, 2020).

The Client Motivation for Therapy Scale (Pelletier et al., 1997)

The CMOTS was used to provide a global measure patient's motivation. The 24 items assess assessing intrinsic motivation for therapy, the four forms of extrinsic motivation (integrated, identified, introjected, and external regulation) for therapy, and amotivation for therapy. These factors were derived from Deci and Ryan (2000)'s theory of the self-determination and motivation. This questionnaire was administered at the pre-treatment and the alphas for internal consistency vary between 0.70 and 0.92). The total score was calculated as recommended by the authors and used in this study.

RESULTS

Data were analyzed using IBM SPSS 25. **Table 1** presents the descriptive variables for VCP and FF conditions. Chi-square analyses and Student's *t*-tests did not reveal pre-existing differences between the two conditions on these variables. Note that there was no statistically significant difference when comparing participants from the different recruitment sites on all of these variables or on outcome variables at pre-treatment.

Repeated measures ANOVAs were performed to document treatment efficacy, and non-inferiority was tested using Wellek (2010) procedures and tables using a strict margin of tolerance for non-inferiority of 0.20 at the significance level of 0.05. All assumptions were respected for the analyses. Mauchly's test for sphericity was significant and the Greenhouse–Geisser correction was applied. However, the correction was small and yielded the exact same *F* values as when uncorrected.

Table 2 presents results for the PAS, MI, BSQ, and BDI. The ANOVAs revealed significant Time effects for each measure and no significant difference for the Condition and the Condition × Time interactions. Contrasts for Pre to Post Time effects were all significant and very large [for PAS [$F(1,69) = 79.98$, $p = 0.000$, $\eta_p^2 = 0.52$), for MI [$F(1,69) = 43.97$, $p = 0.000$, $\eta_p^2 = 0.39$], for BSQ [$F(1,69) = 52.68$, $p = 0.000$, $\eta_p^2 = 0.43$], and for BDI [$F(1,69) = 13.99$, $p = 0.000$, $\eta_p^2 = 0.17$]. Contrasts for Pre to Post by Condition interaction were all non-significant and trivial for all measures, except for the fear of body sensations which was very small [for PAS ($F(1,69) = 0.2$, $p = 0.63$, $\eta_p^2 = 0.003$), for MI ($F(1,69) = 0.08$, $p = 0.78$, $\eta_p^2 = 0.001$), for BSQ ($F(1,69) = 1.65$, $p = 0.2$, $\eta_p^2 = 0.023$), and for BDI ($F(1,69) = 0.098$, $p = 0.76$, $\eta_p^2 = 0.001$)]. Gains were all maintained at the 12-mo follow-up. All posttreatment to follow-up contrasts were non-significant [for PAS ($F(1,69) = 1.97$, $p = 0.17$, $\eta_p^2 = 0.028$), for MI ($F(1,69) = 0.02$, $p = 0.87$, $\eta_p^2 = 0.000$), for BSQ ($F(1,69) = 3.32$, $p = 0.07$, $\eta_p^2 = 0.046$), and for BDI ($F(1,69) = 0.007$, $p = 0.93$, $\eta_p^2 = 0.000$)]. Applying Bonferroni corrections with a significance level set at 0.01. did not change the interpretation of the results.

The analyses were repeated for gender (17% were males) and for presence of none versus at least one comorbid disorder (46% did not report a comorbid disorder) to document the potential impact of these variables. Some impact of gender was found to be statistically significant on three outcome variables, but gender did not significantly influence the impact of VCP on treatment outcome on any variable. For the PAS, the Time X Gender interaction was significant [$F(2,134) = 5.1$, $p < 0.01$, $\eta_p^2 = 0.07$], suggesting that males benefited more from CBT than females. For the MI, the main effect of Gender was significant [$F(1,67) = 10.25$, $p = 0.002$, $\eta_p^2 = 0.13$], suggesting more severe avoidance in females overall. A similar gender difference was found on the BSQ [$F(1,67) = 10.1$, $p = 0.002$, $\eta_p^2 = 0.13$]. The impact of Comorbidity

TABLE 1 | Descriptive statistics of the sample of participants with panic disorder with agoraphobia who received cognitive behavior therapy.

	VCP (*n* = 40)	FF (*n* = 31)	Statistical test
Age, mean (*SD*)	34.90 (10.45)	36.90 (11.60)	$t(69) = 0.76$, ns
Female	34 (85%)	25 (81%)	$\chi^2(1) = 0.24$, ns
Presence of at least one comorbid disorder*	19(47%)	19(61%)	$\chi^2(1) = 1.34$ ns
Canadian	37 (93%)	31 (100%)	$\chi^2(1) = 2.43$, ns
Education			$\chi^2(3) = 7.54$, ns
High school (incomplete)	9 (22%)	0 (0%)	
High school completed	10 (25%)	8 (29%)	
College	11 (27%)	7 (29%)	
University	10 (25%)	11(42%)	
Single	20 (50%)	12 (38%)	$\chi^2(1) = 0.89$, ns
Income			$\chi^2(2) = 2.69$, ns
Low	14 (35%)	5 (20%)	
Average	18 (45%)	11 (44%)	
High	8 (20%)	9 (36%)	
Motivation toward therapy	13.27 (3.77)	12.3 (4.65)	$t(67) = 0.96$, ns

*VCP, videoconference psychotherapy; FF, face-to-face; SD, standard deviation. *Comorbid disorders identified among the sample were: specific phobia (n = 12), generalized anxiety disorder (n = 12), major depressive disorder (n = 9), social anxiety disorder (n = 5), hypochondriasis (n = 3), adjustment disorder (n = 1), obsessive-compulsive disorder (n = 1), insomnia (n = 1), and posttraumatic stress disorder (n = 1).*

TABLE 2 | Efficacy of delivering psychotherapy in videoconference or in face-to-face to patients with panic disorder and agoraphobia (with intent-to-treat at post-treatment and follow-up), *N* = 71.

Variable	Condition	Pre		Post		Follow-up		Outcome analysis - ANOVA				Non-inferiority analysis (Tolerance ε = 0.20)	
		M	*SD*	*M*	*SD*	*M*	*SD*	Time df (2,138)	Condition df (1,69)	Interaction df (2,138)		Pre/post interaction	Pre/F-up interaction
										F	Eta squ.	*T*	*T*
PAS	VCP	26.88	9.89	16.43	10.50	15.30	10.82	68.18***	1.52	0.30	0.004	−0.45*	−0.65*
	FF	23.48	8.78	14.06	8.95	13.48	9.72						
MI	VCP	2.89	0.85	2.31	0.88	2.22	0.90	37.31***	1.40	0.449	0.006	0.27*	−0.51*
	FF	2.64	0.99	2.00	0.90	2.07	1.00						
BSQ	VCP	3.08	0.78	2.43	0.78	2.29	0.74	52.35***	0.09	1.10	0.016	1.3	0.72
	FF	3.17	0.78	2.26	0.94	2.29	0.98						
BDI	VCP	12.75	9.31	9.05	7.73	8.70	7.53	11.05***	0.14	0.07	0.001	0.31*	0.01*
	FF	12.41	8.91	8.03	6.93	8.29	7.98						

*M, mean; SD, standard deviation; VCP, videoconference psychotherapy; FF, face-to-face; df, degrees of freedom; PAS, Panic and Agoraphobia Scale; MI, Mobility Inventory when Alone; BSQ, Body Sensations Questionnaire; BDI, Beck Depression Inventory. *p < 0.05, **p < 0.01, and ***p < 0.001. Results for the contrasts are reported in the text.*

was not statistically significant for any outcome measure. In sum, the treatment was effective, and no difference was found between VCP and FF. **Figure 2** illustrates the pattern of results with 95% confidence intervals.

The non-inferiority tests revealed that VCP was statistically no less effective than FF on the primary outcome variable (see **Table 2**), and two of the three secondary outcome measures (agoraphobia and depressed mood). However, the non-inferiority test did not reach statistical significance for the fear of body sensations.

Repeated measures ANOVAs were also conducted for the measures of working alliance (see **Table 3** for the results with patients as treated). A significant Time effect was found with each measure, while no Condition or Time × Condition effects were statistically significant. The quality of working alliance improved during treatment in both conditions and according to both measures. In all comparisons, the alliance was strong but lower in VCP compared to FF, with differences that were not significant and associated with very small effect sizes (partial eta-squared ranged between 0.03 and 0.06). The analyses were repeated with gender and presence of at least one comorbid disorder to document the potential impact of these variables. None of those analyses revealed a statistically significant effect of gender or of presence of comorbidity. Despite the lack of significant main effect for Condition in all ANOVAs, *a posteriori* contrasts were performed to scrutinize the impact of VCP on working alliance. The effect sizes of contrasts comparing VCP and FF were between trivial and small at Session 1 (partial

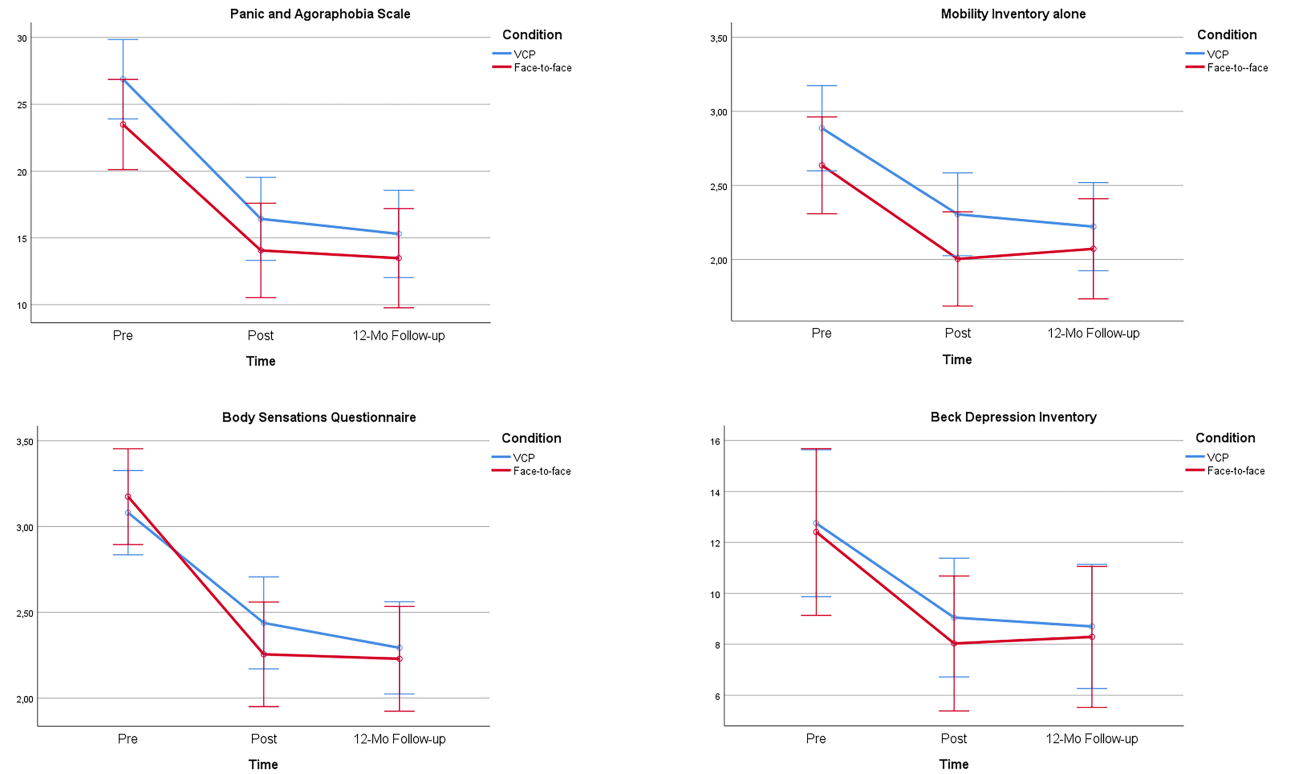

FIGURE 2 | Illustration of 95% confidence intervals for the efficacy of delivering cognitive-behavior therapy to patients with panic disorder and agoraphobia in videoconference psychotherapy (VCP) or in face-to-face.

TABLE 3 | Strength of the working alliance over the course of psychotherapy delivered in videoconference and in face-to-face and how it relates to treatment outcome for adults with panic disorder with agoraphobia, *N* = 53.

Variable	Condition	Session 1		Session 5		Session 12		ANOVAs			
		M	*SD*	*M*	*SD*	*M*	*SD*	Time df (2,102)	Condition df (1,51) *F*	Interaction df (2,102)	
								F		*F*	η_p^2
WAI-Task	VC	23.94	3.61	25.65	2.70	25.48	3.19	11.39***	1.79	0.39	0.007
	FF	24.68	2.44	26.14	1.70	26.68	1.70				
WAI-Bond	VC	22.16	4.85	24.48	3.53	25.29	3.02	8.09**	2.68	1.88	0.04
	FF	24.64	2.50	24.64	4.85	26.35	2.17				
WAI-Goal	VC	24.84	3.14	26.16	1.71	26.77	1.94	6.99**	3.11	3.19	0.06
	FF	26.52	2.27	26.95	1.43	26.86	1.59				
CALPAS	VC	148.90	14.43	153.60	11.69	155.50	10.51	6.00**	2.48	1.31	0.03
	FF	155.59	9.59	156.41	8.91	158.41	7.08				

Regression for predictors of residualized improvement on the PAS

	std Beta	*t*	*sig. p*	*Simple corr.*	*Partial corr.*	*Semi-partial corr.*	
WAI-Task at session 5	−0.04	−0.19	0.85	−0.15	−0.03	−0.03	
WAI-Bond at session 5	−0.21	−1.43	0.16	−0.25	−0.20	−0.2	Statistics for the regression equation
WAI-Goal at session 5	−0.13	−0.69	0.5	−0.17	−0.1	−0.1	$F(5,53) = 0.82$, *ns*
CALPAS at session 5	0.09	0.48	0.63	−0.08	0.07	0.07	$R^2 = 0.08$
Pre-treatment motivation	−0.08	−0.52	0.61	−0.08	−0.08	−0.07	*Adjusted* $R^2 = -0.17$

M, mean; SD, standard deviation; VCP, Videoconference Psychotherapy; FF, face-to-face; df, degrees of freedom; WAI, Working Alliance Inventory; CALPAS, California Psychotherapy Alliance Scales; PAS, Panic and Agoraphobia Scale.

eta-squared of 0.000 for WAI-Task, 0.04 for WAI-Bond, 0.02 for WAI-Goal, and 0.03 for CALPAS), trivial at Session 5 (partial eta-squared of 0.004 for WAI-Task, 0.000 for WAI-Bond, 0.01 for WAI-Goal, and 0.01 for CALPAS), and between trivial and small at Session 12 (partial eta-squared of 0.05 for WAI-Task, 0.04 for WAI-Bond, 0.00 for WAI-Goal, and 0.01 for CALPAS). Further analyses reported in the on-line supplement explored the possibility that a strong working alliance in VCP was obtained because therapists put more efforts than in FF (see Online **Supplementary Material**). This alternative explanation was not confirmed. The online supplement also reports results of the repeated measures ANOVAs performed with imputed values for missing data on working alliance. These additional analyses did not change the statistical significance of any of the findings pertaining to working alliance.

Motivation toward therapy was high and self-determined in participants in the VCP (Mean = 13.26, *SD* = 3.77) and the FF (Mean = 12.30, *SD* = 4.65) conditions. The difference in motivation across conditions at pre-treatment was not significant [$t(67) = 0.96$, $p = 0.34$; $\eta_p^2 = 0.01$].

Finally, two regression analyses were performed to identify the predictors of treatment efficacy based on the PAS. The first multiple regression looked at the predictors of outcome with the working alliance (WAI-Task, WAI-Bond, WAI-Goal, CALPAS total score) measured after the fifth therapy session and motivation measured at pre-treatment. Change in pre to post treatment outcome was measured using residualized change score. A second regression was performed to assess the relative role of working alliance and motivation compared to the predictor of change assumed by the CBT model to be the core treatment mechanism, change in dysfunctional beliefs. Residualized change in dysfunctional beliefs were added in the second step of a hierarchical regression, after controlling for the other predictors and residualized change on BDI. Depressed mood was included in the analysis to be more conservative and reduce the percentage of variance left to explained at the second step of the hierarchy (i.e., the impact of change in beliefs was higher when not controlling for the depressed mood). Note that scores on the ACQ significantly decreased following therapy [$F(2,138) = 41.23$, $p < 0.001$; Mean for VCP at pre-treatment = 2.28 (*SD* = 0.59); Mean for VCP at post-treatment = 1.84 (*SD* = 0.47); Mean for VCP at follow-up = 1.75 (*SD* = 0.45); Mean for FF at pre-treatment = 2.48 (*SD* = 0.64); Mean for FF at post-treatment = 1.90 (*SD* = 0.66); Mean for FF at follow-up = 1.88 (*SD* = 0.72)]. The Condition main effect was not significant [$F(1,69) = 1.23$, $p = 0.27$]. The Time by Condition was not significant [$F(2,138) = 0.047$, $p = 0.63$, $\eta_p^2 = 0.007$].

The first regression equation was not significant (see **Table 3**). Result suggested that strength of the working alliance and motivation did not significantly predict treatment outcome. Robustness of our result was assessed by testing *a posteriori* additional regression models. Including the treatment condition in the regression did not change the results. Performing the regression with ratings of the working alliance after the first session, instead of the fifth one, did not change the significance of the regression equation or the predictors, except for agreement on the tasks ($t = -2.26$, $p < 0.05$, semi-partial correlation = −0.29). Using measures of working alliance collected at the last therapy session did not change the significance of the first regression equation or the predictors.

The second regression tested the relative contribution of working alliance, motivation, and the changes in dysfunctional beliefs. After controlling for working alliance (three subscales of the WAI, CALPAS), motivation and change in depressed mood, the addition of residualized change scores on the ACQ lead to a significant regression model [$F(7,52) = 3.89$, $p < 0.002$, $R^2 = 0.37$, *adjusted* $R^2 = 0.28$; *F change* $(1,45) = 7.54$, $p = 0.009$]. All parameters that were non-significant in the previous regression remained non-significant, change in BDI was significant (std Beta = 0.36, $t = 2.45$, $p = 0.014$, semi-partial correlation = 0.30) but, most importantly, change in dysfunctional beliefs was significant (std Beta = 0.37, $t = 2.75$, $p = 0.009$, semi-partial correlation = 0.32). Of note, the correlation between the bond subscale of the WAI at session five was significantly correlated with change in dysfunctional beliefs ($r = -0.29$, $p < 0.025$), which was not the case for the other measures of alliance and motivation. The online supplement reports results with imputed values for missing data and for self-efficacy. Analyses with imputed values did not change the interpretation of the results, and the role of self-efficacy was found to be statistically significant.

DISCUSSION

This study provides important information to guide the delivery of mental health services via teleconference technologies during and after the COVID-19 crisis. Results found no evidence of CBT for PDA being significantly less effective when delivered in VCP compare to FF on all outcome measures. The treatment was effective at post-treatment and gains were maintained at follow-up based on measures of panic disorder, agoraphobia, fear of sensations and depressive mood. Confirming the main hypothesis of the first aim of the study, the non-inferiority analysis demonstrated that VCP was significantly non-inferior to FF therapy for the primary outcome measure of PDA. Two of the secondary hypotheses were also confirmed, showing significant non-inferiority for agoraphobic avoidance and depressed mood. However, one of the secondary hypotheses was not supported for the measure of fear of physical sensations. There was no significant difference in treatment outcome on the fear of sensations, but study lacked sufficient power to reach the significance level of non-inferiority with a strict tolerance criterion. The experimental design retained for the study reflects the situation of patients who are unable to meet the therapist to receive face-to-face care and could not feel reassured by her or his physical proximity during therapy sessions. A gender difference in treatment response, regardless of the treatment modality, was observed. This is likely to be related to the small number of males in the study, which is consistent with the gender distribution of PDA, and the impact of a few strong male responders in each condition.

The second significant finding is that CBT can be conducted in VCP with an excellent working alliance. The use of

instruments measuring working alliance from two different theoretical perspectives provides an interesting perspective. The CALPAS has been used less frequently in studies on CBT (Buchholz and Abramowitz, 2020) and provides information that complements the WAI, such as patient working capacity, patient commitment and therapists understanding and involvement. This is reassuring for mental health professionals who may worry that using technology to remotely deliver psychotherapy may pose significant threat to the working alliance and the therapeutic relationship (e.g., Rees and Stone, 2005). Motivation at pre-treatment was also not a source of concern. Working alliance, when measured globally with the CALPAS and at the specific component level with the subscales of the WAI, was not a significant predictor of outcome, which is consistent with other studies on CBT for PDA (see Buchholz and Abramowitz, 2020 for a more elaborated discussion). Consistent with the CBT model, the key factor associated with treatment outcome was change in dysfunctional beliefs. Change in beliefs was correlated with the possibility to build a strong bond with the therapist at session 5, even when therapy was delivered remotely. This is clinical meaningful, as it supports the notion that: (a) a strong alliance can be built in VCP, including the development of a strong therapeutic bond, (b) a strong bond is necessary in CBT to engage in the key behavioral techniques that lead to cognitive change, which (c) is the key factor leading to improvement and treatment success.

Our results confirm with a larger sample and methodological improvements the efficacy of delivering CBT in VCP for PDA (Bouchard et al., 2000, 2004; Cowain, 2001; Allard et al., 2007; Lindner et al., 2014). In addition, they contribute to the growing body of evidence that using videoconference does not significantly compromise the quality of the three factors of working alliance, or the alliance measured globally (Bouchard et al., 2004; Allard et al., 2007; Germain et al., 2010; Backhaus et al., 2012). Motivation before initiating therapy was slightly higher in VCP participants, but this was not significant and did not influence treatment outcome. Our study used a global motivation score, and it would be worthwhile to examine the role of individual motivation subtypes in future studies. When considering whether or not using VCP, some professionals and patients may have experienced low levels of telepresence in their professional or social use of videoconference. In VCP, telepresence refers to the impression of really being *in* therapy with the provider, rather than being in a physically different location (Bouchard et al., 2011). The feeling of telepresence in VCP could have an impact on the quality of working alliance, especially on the bond between patient and therapist, and may indirectly influence treatment outcome. Telepresence (Draper et al., 1998) is expected to differ when comparing psychotherapy to common applications of videoconference, such as business meetings, classes and social events. An experimental study (Bouchard et al., 2011) showed that videoconference exchanges involving emotions, akin to those observed in psychotherapy, compared to more neutral ones, led to stronger telepresence. More research on the role of telepresence and working alliance on psychotherapy processes is required. However, in the meantime, some tentative suggestions can be formulated to build and manage a working alliance using e-mental health delivery methods during the COVID-19 pandemic. First, therapists must focus more on the general felling of telepresence occurring during the session than on small communication glitches that can occur during VCP. Second, it is important to be aware and address explicitly breaks in acceptance of the technology settings (Haddouk et al., 2018; situations when patients become frustrated toward the use of VCP). Third, therapist may want to look directly at the camera to establish direct eye contact with their patient, instead of looking at the eyes of the patient on the video monitor. Fourth, therapist may need to use more non-verbal cues (e.g., nodding or thumbs up) and allow longer pauses between verbal exchanges with their patient to reduce the risks of talking over each other. Finally, therapists can explore the literature on ways to communicate empathy in computer-mediated interactions (Grondin et al., 2019). More research is also required to extend our results to other mental disorders, including those for which building and maintaining a strong working alliance is more challenging than for anxiety disorders (e.g., addictions, personality disorders).

The study has limitations that must be acknowledged. First, participants were not randomly assigned to both conditions, for practical reasons that allowed to replicate situations where patients are remote and isolated from their therapist. Conducting exposure to interoceptive cues in a context where the patient is far away from the therapist is an important asset for the generalization of the current study to the situation imposed by the COVID-19 and public health rules related to physical distancing and confinement. Actually, most past VCP studies did not conduct randomized control trials (Berryhill et al., 2019). The 12-month follow-up must be interpreted in the context of an intent-to-treat analysis where some patients could not be reached to collect information. Finally, participants were aware they would receive VCP when they volunteered for the study. Volunteers for the study may thus have had a more positive attitude toward VCP than the general population. However, in situations where telemedicine is a viable solution, or the only solution, the impact of attitude toward technology may be less important than actually having access to services.

In the light of our results, three clinical issues deserve comments regarding the application VCP for PDA in the context of COVID-19: (a) fear of the disease, (b) confinement, and (c) deconfinement, physical distancing and other public health measures. Dysfunctional thoughts and beliefs about diseases, health conditions or treatments, can be addressed effectively in VCP by cognitive restructuring techniques and exposure to interoceptive cues. In the current study, all CBT interventions were based on an individualized case conceptualization. In the context of COVID-19, it would be important to consider exploring with patients if the virus, the disease, the potential treatments (including intubation), the potential vaccines, information from the Internet and peers, or the rules imposed by public health services, contribute to PDA (e.g., Bhatia et al., 2020). Cognitive restructuring and exposure should be adapted accordingly. Some patients may avoid going to hospitals and clinics to receive relevant physical care or exams by fear of contracting the virus. Therapists

must also pay attention to subtle avoidance behaviors that may be hidden under good intentions (e.g., staying home may be recommended as a preventive measure, but it may also be a justification for not wearing a facial mask and venture outside). Confinement imposed by public health authorities, or self-imposed by house bound PDA patients, can be a sound justification for opting for VCP. The current study shows that it is an excellent solution and illustrates that interoceptive exposure is feasible in VCP, including hyperventilation, breathing through a straw, doing aerobic exercises, spinning, Valsalva maneuver, etc. (Clark and Salkovskis, 1987; Barlow and Cerny, 1998). The therapeutic bond was excellent in the current study when these exposure exercises were introduced, and it remained high until the end of a treatment that relied heavily on exposure. However, at some point, VCP must encourage patients with agoraphobia to actively leave the comfort of locations where they feel safe and reassured. With smartphones and other communications devices, VCP sessions can even be conducted when patients are exposing themselves in feared locations. Whenever possible, exposure to agoraphobic situations must be targeted and addressed. When not possible, therapists must use alternative strategies (e.g., imaginal exposure, videos, virtual reality) or postpone exposure. However, technology must not become a way to foster avoidance in anxious patients. Finally, measures imposed by public health authorities to cope with COVID-19 are much more diverse than confinement and each of them may impact the clinical management of PDA. For example, wearing facial masks may induce sensations feared by PDA patients (e.g., difficulty breathing). Long lines and queue to access stores and services can be feared and avoided by people with PDA. Physical distancing and other deconfinement rules may limit the techniques the therapist could apply in the office (e.g., hyperventilating is very likely to have a different impact on the spread of respiratory droplets compared to talking 2-m away from each other), and coping with the changes imposed by public health and safety may increase the daily arousal that facilitate the onset of panic attacks in people with PDA. Finally, therapists and patients may want to consider an option that has not yet been explored in clinical trials, which is alternating between VCP and FF every few sessions.

To conclude, additional general practical guidelines for use of VCP are summarized. To start with, not all telehealth services need to use videoconference. Telephone, web-based treatments and other options are worth considering given each patient's and therapist's contexts. When it comes to VCP, the selection of the software to use for VCP must be considered carefully. In addition to practical and ergonomic issues, their use must respect the rules and regulations implemented by the regulatory bodies of each country, province, or state. Even in open markets (e.g., European Union, Canada - United States - Mexico Agreement), there are constraints and limitations to the use of titles such as psychotherapist or psychologist, rights to practice psychotherapy, and established best practices to protect confidentiality. Psychotherapy and behavioral change are not limited to the VCP session; for patients it is a process that requires personal engagement, emotional processing, time, perspective taking, and between sessions exercises. For therapists, it also implies using the right software. Some software needs a password to confirm the identity of the patient and restrict access on the users' computer, offers robust encryption of the therapy session and uses servers that protect confidentiality. In terms of psychotherapeutic context, it remains important at the start to define and agree with patients on the psychotherapeutic frame. For example, setting rules for appropriate physical space on both ends (e.g., privacy, not being disturb while in session), interpersonal interactions (e.g., no emergency calls outside office hours, keep VCP interactions similar to face-to-face), management of distractors (e.g., no email alerts during session), communication strategies (e.g., use of non-verbal interactions to signal approval instead of speaking over each other, connect a few minutes before the session to replicate the experience of settling down in the waiting room), and a contingency management plan if the sessions fails abruptly (e.g., rescheduling versus calling back on the telephone or without video feed). For health care agencies and regulatory board, results of this study should encourage them to guide and inform their mental health professionals on the relevance and potential of VCP. The publication of telehealth guidelines, consent form examples and which software to recommend should be among their list of key priorities during and after the COVID-19 crisis.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Comité d'Éthique de la Recherche (CÉR) de l'Université du Québec en Outaouais (UQO). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

SB had full access to all the data in the study and took responsibility for the integrity of the data and the accuracy of the data analysis. All of the authors of this article provided a significant intellectual contribution to this study, including its conception, the acquisition and analysis of data, drafting the article or providing critically important review. SB was the lead researcher, conceptualized the study and its design, wrote the grant application, supervised the study, conducted the analyses, and finalized the article. MA contributed to the conceptualization of the study, was involved in data collection and her doctoral thesis is based on analyses of a subset of the data. GR contributed to the study design and the coordination of the study. SD contributed to the coordination of the study and complementary analyses. TG contributed to the design and the analysis of the material in the online supplement. CL contributed to the final

analyses and wrote the first draft of the article. IG-D, PR, and L-GC contributed to the conceptualization of the study and the original research grant. AM contributed to the conceptualization of the study, the original research grant, and the supervision of the study. GC contributed to the final analyses and critical work on the final versions of the article. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

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Conflict of Interest: SB is the president of and owns equity in Cliniques et Développement In Virtuo, a university spin-off that uses virtual reality as part of its clinical services and distributes virtual environments. The terms of this arrangement have been reviewed and approved by the Université du Québec en Outaouais in accordance with its conflict of interest policies. GR is VP of Corporate affairs and owns equity in In Virtuo.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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COVID-19 Outbreak and Physical Activity in the Italian Population: A Cross-Sectional Analysis of the Underlying Psychosocial Mechanisms

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Italy is one of the first European epicenters of the COVID-19 pandemic. In attempts to hinder the spread of the novel coronavirus disease, Italian government hardened protective measures, from quarantine to lockdown, impacting millions of lives dramatically. Amongst the enacted restrictions, all non-essential activities were prohibited as well as all outdoor activities banned. However, at the first spur of the outbreak, for about a dozen of days, physical and sports activities were permitted, while maintaining social distancing. In this timeframe, by administering measures coming from self-determination theory and theory of planned behavior and anxiety state, in an integrated approach, we investigated the prevalence of these activities by testing, via a Structural Equation Model, the influence of such psychosocial variables on the intention to preserve physical fitness during the healthcare emergency. Through an adequate fit of the hypothesized model and a multi-group analysis, we compared the most COVID-19 hit Italian region – Lombardy – to the rest of Italy, finding that anxiety was significantly higher in the Lombardy region than the rest of the country. In addition, anxiety negatively influenced the intention to do physical activity. Giving the potential deleterious effects of physical inactivity due to personal restrictions, these data may increase preparedness of public health measures and attractiveness of recommendations, including on the beneficial effects of exercise, under circumstances of social distancing to control an outbreak of a novel infectious disease.

Keywords: social distance, integrated theoretical model, confinement, pandemic, home-based exercise

Abbreviations: AVE, average variance extracted; BREQ, behavioral regulation in exercise questionnaire; CFI, comparative fit index; COVID-19, coronavirus disease; MG-CFA, multi-group confirmatory factor analysis; PBC, perceived behavioral control; RAI, relative autonomy index; RMSEA, Root mean square error of approximation; S-Bχ^2, satorra-bentler correction of chi-square and standard errors; SDT, self-determination theory; SEM, structural equation modeling; SRMR, standardized root mean square residual; STAI, state-trait anxiety inventory; TLI, trucker-levis index; TPB, theory of planned behavior; ΔCFI, difference in CFI; χ^2, chi-square.

INTRODUCTION

Since December 2019, when a new coronavirus (SARS-CoV-2) was originally revealed by an ophthalmologist in Wuhan (Hubei province, China), a related severe acute respiratory syndrome – namely COVID-19 – has been spreading at a pandemic rate, putting global health systems under unprecedent pressure. Italy, as the first Western country tremendously hit by this disease outbreak, has become the iconic resilient outpost under international policymakers' attention. In fact, as we write, Italy is suffering one of the deadliest impacts of coronavirus (Anderson et al., 2020). In particular, Lombardy, a region of northern Italy – the most densely populated one – has been coping with a completely different epidemiological scenario, in terms of a greater number of confirmed cases and victims, as compared to the remainder of the nation. When initial clusters were identified, restrictive actions to curb isolated upsurges of infection were taken by the health region system of Lombardy, thereafter, were extended to all northern Italy and to the entire country.

From February 21, when the first Italian COVID-19 case was diagnosed in southern Lombardy, to March 22, when Italian's government restrictions to contain the pandemic were extended, prohibiting all non-essential business activities and banning all movements of people nationwide, the country faced an unchartered scenario, from several standpoints, along with the psychosocial ones (Bao et al., 2020). Amongst these crisis byproducts, social distancing is one of the necessary measures enabled by health authorities to nullify virus contagion due to interhuman contacts. Social distancing represents *per se* a psycho-social problem, potentially increasing mental health problems, such as depression and anxiety (Huremović, 2019), and leading to sleep and circadian disruption (Altena et al., 2020). Furthermore, quarantine and lockdown policies, not only disrupt human relationships but also foresee a revolution of one's habits and lifestyles, including the possibility to remain physically active during a forced isolation. On a side, it is very likely that prolonged staying home ("quarantine") might be associated with: (a) sedentary behaviors (sitting, watching tv, smart-devices activities; (b) reduced physical activity bearing low energy expenditure; and, (c) engaging in avoidance activities that, consequently, lead to an increased risk for and potential worsening of chronic health conditions (Gutin et al., 2005). On the other hand, the need to maintain regular physical activity levels is still urgent in the current COVID-19 emergency (Chen et al., 2020), even when asymptomatic SARS-CoV-2 infection has been ascertained (Joy, 2020). In fact, physical activity is capable of triggering an immune-modulatory response which is an essential forefront, on a standard basis (Codella et al., 2015), and especially under circumstances of obliged sedentariness (Codella, 2020). An enormous number of both cross-sectional and longitudinal studies have indicated that regular physical exercise exerts diversified anti-inflammatory actions (Pedersen and Saltin, 2015), offering protection against all-cause mortality (WHO, 2015). In a murine study (Lowder et al., 2005), moderate endurance exercise (30 min/day) protected mice from death due to influenza. In older adults, 10 months of moderate endurance training improved influenza vaccination responses (Woods et al., 2009) and regular exercise, in general, covers a broad spectrum of mental health benefits, from boosting mental wellness by enhancing mood states (Yeung, 1996; Berger and Motl, 2008) to reducing levels of anxiety and perceived stress (Herring et al., 2010; Codella et al., 2017). In addition, exercise and sleep have a complex and reciprocal interaction, which is explained by multiple psycho-physiological pathways, and it has been largely demonstrated that chronic moderate-intensity exercise is able to promote humans' sleep (Chennaoui et al., 2015), On the contrary, social isolation and confinement are known to have negative effects on immunity, for instance by elevating glucocorticoids like cortisol (Cacioppo et al., 2015) and inhibiting T-cells action (Cole et al., 2015) which are vital effector lymphocytes in protecting vulnerable areas like upper respiratory tracts and lungs (Nieman, 1994).

The set of policies enacted in Italy in the time frame between March 11 (Government of Italy, 2020a), when the first official lockdown was put in place, and March 22 (Government of Italy, 2020b), when all opportunities of physical activity were abrogated, allowed people to perform a certain amount of physical activity like walking dogs, outdoor individual fitness activities (jogging, running, biking). That timespan is of particular interest as it depicted a mixture of states, motives, and modified behaviors which undoubtedly affected personal physical activity, in terms of prevalence (quantity, frequency), modality, and expectations to perform exercise and sports regardless of the pandemic period.

The present study, conducted through March 17–22, aimed at surveying Italian population on its physical activity behavior and how this latter was modeled by psychosocial variables during the emergency contingencies and measures taken for COVID-19 outbreak. As endpoint, these data might help developing targeted empirical evidence in order to strength public health policies and guidance concerning the containment of the pandemic.

In order to evaluate our aims we adopt a multi-theory, integrated approach to identify the psychological determinants of the physical activity behavior (Hagger and Chatzisarantis, 2014; Galli et al., 2018). The integrated approach encompasses multiple constructs representing key determinants and the associated processes. The integration maximizes the comprehensiveness of explanation of outcomes, assists in addressing shortcomings of single theories, and provides means to represent different processes that determine behavior (Hagger, 2009). In particular, we applied an integrated model that draws its hypotheses from two main theories of motivated action: the self-determination theory (SDT; Deci and Ryan, 1985; Ryan and Deci, 2000) and the theory of planned behavior (TPB; Ajzen, 1985). Specifically, the SDT aims to identify the contextual and environmental factors that can increase or decrease individual motivation. Central to the theory is the distinction between two main types of motivation: intrinsic and extrinsic (Ryan and Deci, 2000). Intrinsic motivation pertains to engagement in a specific activity for the pleasure and satisfaction. In contrast, extrinsic motivation refers to activities that are performed to obtain separable outcomes (Ryan et al., 2009). These motives vary along a continuum: at the lowest end there is the amotivation (when an individual does not motivate at all), and the intrinsic motivation

is at the highest end (Reifsteck et al., 2016). SDT includes different types of regulations determining extrinsic motivation, each with unique characteristics: external (i.e., motivated by rewards or punishments), introjected (i.e., motivated by feeling of guilty) identified (i.e., there are important goals related to the activity) and integrated (i.e., the activity is part of who you are). SDT has been applied especially to health behaviors both in the physical activity contexts (Gutin et al., 2005; Reifsteck et al., 2016).

The TPB is a specific version of the more generalized integrated behavioral model of reasoned action approach (Fishbein, 1980). Central to this theory is the idea that the performance of one behavior is determined by behavioral intention. In turn, behavioral intention is determined by three belief-based social cognition behaviors: attitudes (favorable – unfavorable evaluations of the behavior), subjective norms (social pressure to perform the behavior) and perceived behavioral control (PBC – the beliefs people hold about resources they have to enact the behavior, and their capacity to overcome behavior related barriers). A large number of researches studied the relationships between TPB constructs and physical activity (Hagger et al., 2002; Armitage, 2005; Young et al., 2014). Results of these studies showed people are more likely to intend to engage physical activity behavior if they are positively disposed toward it (attitudes), if they perceive social pressure to do so (subjective norms), and if they believe they will be successful (PBC).

Finally, we also considered in our model state anxiety construct to evaluate how the anxious state, referred to the quarantine period, could influence the behavior inclined to physical activity through the social-cognitive predictors. In fact, state anxiety represents a cognitive process of response to stress (Spielberger, 1966). In this sense, some studies showed that state anxiety correlates negatively with activity participation (Ussher et al., 2007; Ma et al., 2008).

With these theoretical perspectives in mind, we expected that the hypothesized integrated theoretical model would fit with the full sample of the study. In terms of specific hypotheses (**Figure 1**), as suggested by previous literature researches (Hagger et al., 2006, 2007; Hagger and Chatzisarantis, 2009), we expected that autonomous motivation would predict positively the TPB variables (attitudes, subjective norms, PBC, and intention – $H1_a$, 1_b, 1_c, 1_d); moreover, we expected that attitudes, subjective norms and PBC would positively predict the intention to do physical activity during the quarantine period ($H2_a$, 2_b, 2_c); in turns, we expected that the higher intention would be related with a higher probability to enact the behavior (H4). Finally, we hypothesized that the state anxiety would predict negatively the behavior toward physical activity, through the mediation of the TPB constructs ($H3_a$, 3_b, 3_c, 3_d). Furthermore, given the specific impact that the virus had on the Lombardy region, a specific aim of this study was to evaluate specific differences between Lombardy inhabitants sample and the rest of the Italian population sample within the integrated model key variables.

MATERIALS AND METHODS

Procedure and Participants

Data were collected via an online survey written in Italian language and administered between the 17th March 2020 to the 22nd March 2020. Participants were recruited using online advertisements. All participants were informed regards the general purpose of the study and their rights to anonymity. Researchers provided to collect written informed consent before participating in the study. The time needed to complete the survey took approximately 10 min. Collected data were coded and processed anonymously. The Department of Psychology of Development and Socialization Processes Ethical Committee of University "La Sapienza" approved the study.

Measures

Behavior-specific version of study measures were developed specifically for the target behavior, according to the case or

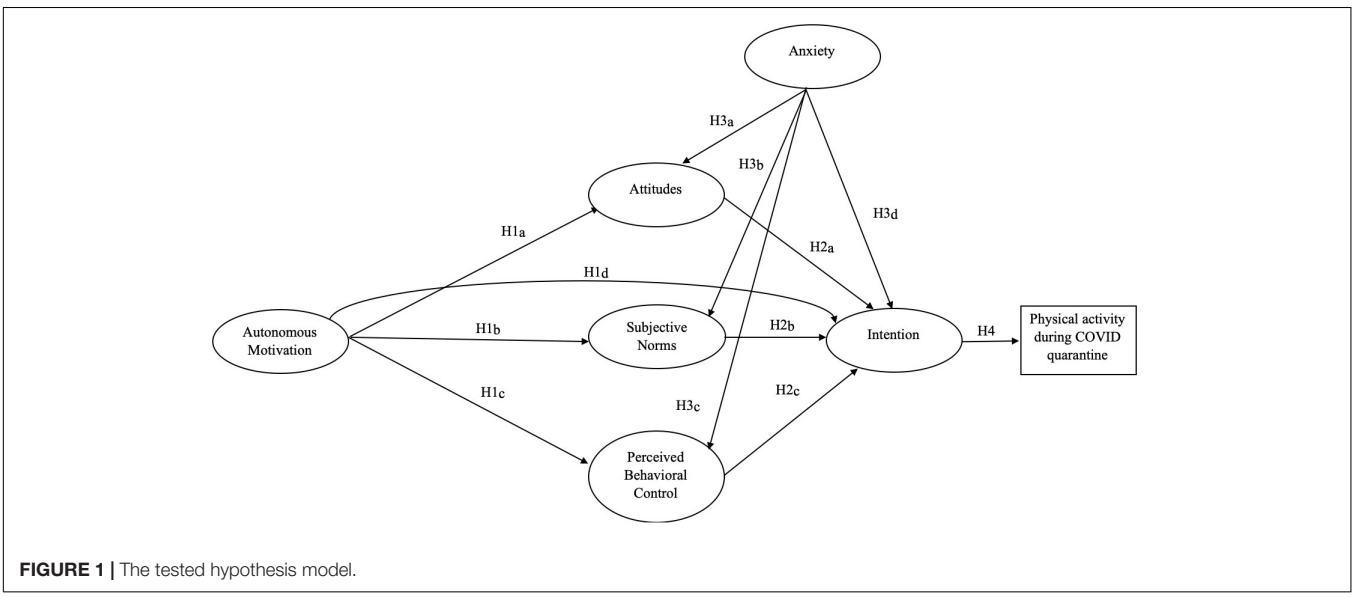

FIGURE 1 | The tested hypothesis model.

specifically developed from the component theories of the adopted integrated model based on previous studies (e.g., Girelli et al., 2016; Hamilton et al., 2017; Galli et al., 2018). Italian version of the measures was translated from the English version by two English-Italian bilinguals using standardized back translation procedures (Hambleton and Patsula, 1998).

Autonomous Motivation

The relative degree of autonomous motivation was measured using a short form of the Behavioral Regulation in Exercise Questionnaire version 3 (BREQ-3; Markland and Tobin, 2004). Participants were asked to answer on a 5-point Likert type scale (0 = "*not true for me*" and 4 = "*very true for me*"). In order to maximize the parsimony of the model in our study the relative autonomy index (RAI; Ryan and Connell, 1989) was calculated. RAI is a single score derived from the subscales that gives an index of the degree to which respondents feel self-determined. Higher, positive scores indicate greater relative autonomy; lower, negative scores indicate more controlled regulation.

Theory of Planned Behavior Constructs

Measures of attitudes, subjective norms, PBC, and intention from the TPB were measured using a scale developed by the authors, following the recommendations of Ajzen (1991) for TPB construct development and based on measures used in previous studies (Chirico et al., 2015; Galli et al., 2018).

In particular, each item for *attitudes* construct was introduced by "I think doing physical activity in this quarantine period is. . .," comprised three items with responses provided on 7-points semantic differential scales with the bipolar adjectives "*wrong- right*," "*disadvantageous- advantageous*," "*useless- useful*."

Subjective Norms were measured using three items by asking participants what extent meaningful others e.g., "would like me to do physical activity in this quarantine period" with responses provided on a 7-point Likert type scales (1 = "*strongly disagree*" and 7 = "*strongly agree*"). Item scores were aggregated into a single score, for which higher values indicated greater normative social pressure toward the behavior.

PBC was measured using three items (e.g., "I'm confident I can exercise in this quarantine period") with responses provided on 7-point Likert-type scales (e.g., 1 = "*no control*" and 7 = "*high control*"). Item scores were aggregated into a single score, for which higher values indicated greater perceived confidence toward the behavior.

Finally, *intention* was measured using four items (e.g., "I intend to do physical activity during this quarantine period") by asking respondents to indicate on a 7-point Likert type scale (1 = "*strongly disagree*" and 7 = "*strongly agree*"). Item scores were aggregated into a single score, for which higher values indicated greater intention toward the behavior.

Anxiety was measured using the six-item short form of the State-Trait Anxiety Inventory (STAI; Marteau and Bekker, 1992). Participants were asked to answer on a 6 –point Likert scale (1 = "*never*" and 7 = "*always*"; e.g., "I feel worried").

Self-reported behavior was measured considering the frequency in terms of weekly hours spending on physical activity during the quarantine period. In order to evaluate the past behavior, we asked participants to report the same physical activity measure (i.e., the weekly hours spending on physical activity) during the 2 months before the quarantine period.

Data Analysis

Statistical analyses were performed using the R language v. 3.6.3 (R Development Core Team, 2017) and the RStudio environment v. 1.2.5033 (Rstudio Team, 2019), employing a statistical significance at $\alpha = 0.05$. Descriptive analyses were used to describe the sample characteristics (i.e., sociodemographic).

Relationships among the constructs were tested using structural equation modeling (SEM) through the "lavaan" package v. 0.6-5 (Rosseel, 2012). The SEM is a multivariate method that combine different analytical procedure (factor analysis and multiple regression analysis) and allow to study and assess the relationships between latent and measured variables (i.e., measurement model) and between latent variables (i.e., structural model; Gana and Broc, 2019) taking in account, at the same time, for the measurement errors. One of the assumptions to conduct SEM is the multivariate normality distribution of the data, therefore the "MVN" package v. 5.8 (Korkmaz et al., 2014) was used to assess this condition through Mardia's multivariate normality test (Mardia, 1970). The reliability of the SEM measurement model was tested using Cronbach's alpha (α; Cronbach, 1951) and McDonald's hierarchical omega (ωh; McDonald, 2013). Reliability was considered "excellent" for values of Cronbach's $\alpha \geq 0.90$, "good" for α between 0.90 and 0.80 and "acceptable" for α between 0.80 and 0.70 (Kline, 2013). The same thresholds values were applied for ωh (Zinbarg et al., 2005, 2006). The validity of the SEM measurement model was assessed using standardized factor loadings (i.e., measurement model coefficients), and average variance extracted (AVE). Validity was considered acceptable considering the statistical significance of the standardized factor loadings and a minimum threshold AVE value of 0.50 (Hair et al., 2010). Reliability and validity indices were calculated employing the "semTools" package v. 0.5-2 (Jorgensen et al., 2019). The indices used to assess the SEM measurement model and structural model were the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR). Literature regards model fit indices reports a "good fit" for CFI and TLI >0.95, RMSEA <0.06, and SRMR <0.08 (Hu and Bentler, 1999). However, "acceptable fit" can be reported as long as CFI and TLI ≥ 0.90, RMSEA ≤ 0.08, and SRMR ≤ 1.00 (Gana and Broc, 2019). Due to the large sample size, the Chi-square (χ^2) test and its associated significance was reported but not considered to assess the model fit (Schermelleh-Engel et al., 2003). A multi-group SEM was conducted to assess the same model in two groups, based on the region of provenance. The first group comprised people living in Lombardy, the most COVID-19 impacted region of Italy and the Italian epicenter of the disease (n = 1,280; "Lombardy sample"), while the second group was represented by participants from the rest of the Italian country (n = 1,118; "Other regions sample"). Differences across models were evaluated comparing SEM regression coefficients through z-score tests (Clogg et al., 1995; Paternoster et al., 1998). Differences between coefficients

were reported as significant for $p < 0.05$, employing two-tailed hypothesis. In order to perform a multi-group analysis, the SEM measurement model was previously tested for measurement and structural invariance, using multi-group confirmatory factor analysis (MG-CFA; Gana and Broc, 2019). The criteria used to assess invariance was the difference in CFI (ΔCFI) between nested models, with a threshold value of ΔCFI <0.01 (Cheung and Rensvold, 2002; Gana and Broc, 2019). Finally, we performed a series of t-test to further investigate the mean differences on key variables (i.e., intention, attitudes, subjective norms, PBC, autonomous motivation, anxiety, self-reported behavior) across the two groups. We employed Yuen's test (Yuen, 1974) for normality and equality of variances issues, Welch's *t*-test (Welch, 1947) only in the case of inequality of variances and Student's *t*-tests in the event of normality and equality of variances across groups. All these tests are available in the R language and in the "WRS2" package v. 1.0.0 (Mair and Wilcox, 2019).

We assessed the power to test parameters effects (Wolf et al., 2013; Lee, 2015) employing a "proactive" Monte Carlo analyses (Marcoulides and Saunders, 2006; Marcoulides and Chin, 2013; Wolf et al., 2013) using the "simsem" package v. 0.5-15 (Pornprasertmanit et al., 2020) fixing observed variables' standardized loadings, direct regressive paths across latent variables and correlation between attitudes, subjective norms and PBC (respectively, standardized loadings = 0.50; β = 0.40; $r = 0.40$). Moreover, we conducted an analysis to detect model misspecification in terms of RMSEA (MacCallum et al., 1996) through a *post-hoc* analysis employing the "semPower" package v. 1.0.0 (Moshagen and Erdfelder, 2016). The power level was considerate adequate if ≥0.80 (Cohen, 1992).

RESULTS

Participants

Participants who responded to our survey were 2,398 in total. The demographic and descriptive characteristics and descriptive statistics of the sample and subgroups are shown in **Table 1**.

Data Check Assumption

Analysis of univariate normality and descriptive statistics of items are presented in **Table 2**. Only attitudes items present normality issues (skewness and kurtosis > |1.96|). Regards multivariate normality distribution of the data, Mardia's coefficient was statistically significant ($p < 0.05$). Accordingly, the SEM estimator employed was a robust version of maximum-likelihood, using Satorra–Bentler correction of chi-square and standard errors [S-Bχ^2; (Satorra and Bentler, 2001)] and robust versions of CFI, TLI and RMSEA fit indices.

Power Analysis

Results regards the "proactive" Monte Carlo analysis ($N = 1{,}118$; 10,000 replications) exhibited an adequate average power to detect non-zero parameters ($M = 0.98$). Also, the power to detect model misspecification in terms of the RMSEA was considerate as adequate (≥0.99) with a sample of 1,118 participants.

Measurement Model

Findings regarding the reliability and validity of the measurement model are shown in **Table 2**. Regarding reliability, the PBC and the autonomous motivation were acceptable ($0.7 \leq \alpha < 0.8$), the attitudes and the anxiety were "good" ($0.8 \leq \alpha < 0.9$) and the subjective norms and the intention were excellent ($0.9 \leq \alpha$). The ω_h values reported a difference of the reliability interpretation only for the autonomous motivation ($\alpha = 0.74$; $\omega_h = 0.89$), probably due to its multidimensionality and unequal factor loadings (see Zinbarg et al., 2005). Relative to validity, all items loaded on their respective latent variable in a significant way ($p < 0.001$). All constructs showed an AVE above 0.50, except for anxiety (AVE = 0.45), nevertheless, given the ω_h value above 0.70, the validity of anxiety was considered adequate (Fornell and Larcker, 1981). The measurement model showed good fit indices [S-B$\chi^2_{(260)} = 1734.104$, $p < 0.001$; Robust CFI = 0.961; Robust TLI = 0.955; Robust RMSEA = 0.053; SRMR = 0.047].

The Structural Equation Model

The total sample model exhibited a good fit, according to the fit indices' values [S-B$\chi^2_{(284)} = 2030.860$, $p < 0.001$; Robust CFI = 0.956; Robust TLI = 0.950; Robust RMSEA = 0.055;

TABLE 1 | Characteristics of the samples.

	Total	Other regions	Lombardy
Age			
M	31.84	34.10	29.86
SD	12.55	11.92	12.76
Sex (%)			
M	42.4	47	38.4
F	57.6	53	61.6
Educational (%)			
No	0.2	0.1	0.2
Primary school	0.1	0.2	0
LM school	10.4	4.2	15.8
High school	32.7	32.6	32.7
Degree or more	56.7	62.9	51.3
House dimension (%)			
≤50 m^2	9.2	9.6	8.9
50–90 m^2	42.2	41.7	42.7
≥90 m^2	48.6	48.7	48.4
Outdoor spaces (%)			
Balcony	41.5	38.2	44.4
Terrace	14.2	16	12.7
Garden	35.6	35.9	35.3
No	8.7	9.9	7.7
Numbers cohabiting (%)			
1	14.1	16.2	11.8
2	24.8	23.8	25
3	29.1	29.3	28
4	26.7	25	27.3
5	5.3	3.9	6.3
>5	0	1.7	1.6

M, Mean; SD, Standard Deviation; M, male; F, female; LM, lower middle.

TABLE 2 | Descriptive statistics, reliability, and validity indices of the measurement model.

Constructs	Items	Descriptive statistics				Standardized factor loadings (all $p < 0.001$)		Validity and reliability measures		
		M	SD	SK	KT	COEFF	SE	α	ω_h	AVE
SN	SN_1	4.04	2.05	−0.03	−1.15	0.86	0.01	0.93	0.93	0.81
	SN_2	4.56	1.94	−0.33	−0.99	0.91	0.01			
	SN_3	4.42	2.00	−0.25	−1.08	0.94	0.01			
PBC	PBC_1	4.80	1.85	−0.53	−0.71	0.80	0.01	0.77	0.76	0.53
	PBC_2	5.76	1.79	−1.41	0.89	0.55	0.02			
	PBC_3	5.80	1.69	−1.43	1.10	0.81	0.01			
IN	IN_1	5.79	1.86	−1.45	0.80	0.97	0.00	0.98	0.98	0.94
	IN_2	5.67	1.93	−1.33	0.43	0.97	0.00			
	IN_3	5.71	1.88	−1.37	0.59	0.98	0.00			
	IN_4	5.74	1.88	−1.40	0.67	0.96	0.00			
ATT	ATT_1	6.07	1.56	−1.98	3.05	0.90	0.01	0.89	0.89	0.73
	ATT_2	5.95	1.59	−1.82	2.51	0.85	0.01			
	ATT_3	6.16	1.43	−2.17	4.28	0.80	0.02			
ANX	ANX_1	3.18	1.20	0.05	−0.70	0.87	0.01	0.81	0.81	0.45
	ANX_2	3.04	1.10	0.31	−0.05	0.67	0.02			
	ANX_3	2.64	1.10	0.60	0.31	0.48	0.02			
	ANX_4	3.48	1.20	−0.08	−0.65	0.85	0.01			
	ANX_5	3.55	1.26	−0.15	−0.60	0.66	0.01			
	ANX_6	2.85	1.28	0.52	−0.23	0.37	0.02			
RAI	AMO	−1.25	2.99	−3.11	11.57	0.37	0.03	0.74	0.89	0.72
	EXT	−2.12	2.55	−1.41	1.52	0.20	0.02			
	INTR	4.64	3.11	0.38	−0.61	0.40	0.01			
	IDEN	20.44	4.86	−1.55	1.91	0.84	0.01			
	INTE	24.80	11.68	−0.71	−0.82	0.89	0.01			
	INTRI	34.94	12.37	−0.83	−0.04	0.87	0.01			

M, Mean; SD, Standard Deviation; SK, Skewness; KT, Kurtosis; COEFF, coefficients; SE, Standard Error; α, Cronbach's alpha; ωh, Hierarchical omega; AVE, Average Variance Extracted; SN, Subjective Norms; PBC, Personal Behavior Control; INT, Intention; ATT, Attitudes; ANX, Anxiety; RAI, Relative Autonomy Index; AMO, Amotivation; EXT, External; INTR, Introjected; IDEN, Identified; INTE, Integrated; INTRI, Intrinsic.

SRMR = 0.049]. **Figure 2** reports the structural model and standardized path coefficients. Regarding the relationship across autonomous motivation and TPB variables, findings report that autonomous motivation was a significant positive predictor of TPB variables; the same positive and significant effect has been founded for attitudes, subjective norms and PBC on behavioral intention. Moreover, anxiety negatively affected subjective norms and PBC, with a marginally significant effect on attitudes, meanwhile it had a positive effect on intention. Analysis of indirect effects of the total sample model (see **Supplementary Appendix B – Table B1**), exhibited a positive effect of the autonomous motivation on intention through attitudes, subjective norms and PBC. Conversely, anxiety significantly and negatively predicted intention through subjective norms and PBC, with also a marginally significant effect through attitudes. Lastly, to control the effect of past behavior on all the variables, a further analysis that included the physical activity behavior before quarantine period was conducted (Hagger et al., 2015). The inclusion of past behavior did not lead to a decrease of the model fit, according to the fit indices' values [S-B$\chi^2_{(304)}$ = 2012.846, $p < 0.001$; Robust CFI = 0.958; Robust TLI = 0.952; Robust RMSEA = 0.052; SRMR = 0.048]. Findings showed positive and significant relationships between past physical activity behavior and autonomous motivation (β = 0.526, $p < 0.001$), intention (β = 0.038, $p < 0.01$) and physical activity during quarantine period (β = 0.439, $p < 0.001$), meanwhile a negative and significant relationship arose with anxiety (β = −0.09, $p < 0.001$).

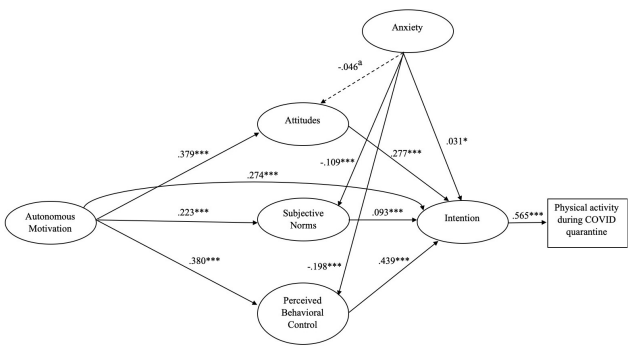

FIGURE 2 | The total sample model. Results of the structural equation model for the proposed integrated theoretical model related to the total sample. Dashed lines indicate paths that were not statistically significant ($p > 0.05$). ***$p < 0.001$; *$p < 0.05$; a $p = 0.05$.

In addition, the inclusion of past behavior in the model led to a significant reduction of the intention effect on physical activity during quarantine period ($z = -8.164$, $p < 0.001$; $\beta_{past} = 0.415$ vs. $\beta_{no_past} = 0.565$) and to an increase of the variance explained by the model for the physical activity during quarantine period (from $R^2 = 0.319$ to $R^2 = 0.488$). For a full overview for the differences of all the effects of past behavior on all the variables, see in **Supplementary Appendix B – Tables B1, B2**.

Measurement Invariance

In order to perform a multi-group analysis, a preliminary assumption is to verify the invariance of the model assessing both the measurement and the structural invariance.

The MG-CFA five steps procedure was adopted in order to assess the measurement invariance and three further stages tested the structural invariance. The first step demands a separated CFA for each subgroup to investigate the goodness of fit for each different model. Values of the fit indices measurement model for each subgroup showed satisfactory fits [Lombardy model: S-B$\chi^2_{(260)}$ = 918.398, $p < 0.001$; Robust CFI = 0.969; Robust TLI = 0.964; Robust RMSEA = 0.048; SRMR = 0.045; Rest of Italy: S-B$\chi^2_{(260)}$ = 1066.354, $p < 0.001$; Robust CFI = 0.952; Robust TLI = 0.945; Robust RMSEA = 0.058; SRMR = 0.056].

The second step requires to test a configural invariance model and to assess the fit indices. Also, this model reported a "good fit" (see **Supplementary Appendix A – Table A1**). From the third step onwards, various constraints were gradually added and the ΔCFI threshold was applied, to evaluate each subsequent model with the previous one. As reported in **Supplementary Appendix A – Table A1**, all nested models exhibited a ΔCFI <0.01, indicating that the multi-group SEM could be applied.

Multi-Group SEM

The multi-group model reported a good fit [S-B$\chi^2_{(608)}$ = 2326.813, $p < 0.001$; Robust CFI = 0.958; Robust TLI = 0.952; Robust RMSEA = 0.052; SRMR = 0.048]. **Figure 3** reports the multi-group structural model and standardized path coefficients. Regarding differences between Lombardy sample and other region sample, Lombardy group exhibited a larger effect of PBC on intention ($z = 3.397$, $p < 0.001$; $\beta_{Lom} = 0.525$ vs. $\beta_{Oth} = 0.349$), along with the indirect effect of autonomous motivation on intention through the effect of PBC ($z = 3.389$, $p < 0.001$; $\beta_{Lom} = 0.216$ vs. $\beta_{Oth} = 0.118$), while the people from other regions reported a greater effect of autonomous motivation on intention ($z = -3.363$, $p < 0.001$; $\beta_{Lom} = 0.214$ vs. $\beta_{Oth} = 0.339$). Furthermore, anxiety was a positive and significant predictor of intention only for Lombardy inhabitants ($\beta_{Lom} = 0.042$, $p < 0.05$; $\beta_{Oth} = 0.020$, $p = 0.363$). Mediation analysis of subjective norms and PBC for the relationship between anxiety and intention reported partial mediation effects for Lombardy sample and total mediation effects in the other regions group, while attitudes acted on intention via only direct effect for all subgroups (**Supplementary Appendix B – Table B1**).

As performed for the total sample model, the effect of past behavior on all the variables was tested also in the multi-group analysis.

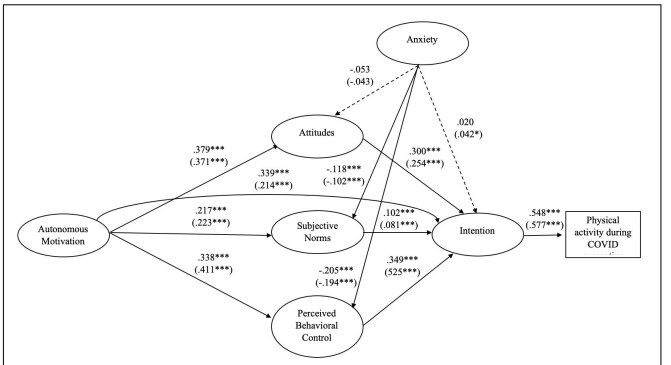

FIGURE 3 | The multi-group model. Results of the structural equation model for the proposed integrated theoretical model related to the comparison between Lombardy sample and the other regions sample. Standardized path coefficients for Lombardy sample are reported in parentheses. Dashed lines indicate paths that were not statistically significant ($p > 0.05$). ***$p < 0.001$; *$p < 0.05$.

The inclusion of past behavior did not lead to a decrease of the model fit for both groups according to the fit indices' values [Lombardy sample: S-B$\chi^2_{(304)}$ = 1097.008, $p < 0.001$; Robust CFI = 0.965; Robust TLI = 0.960; Robust RMSEA = 0.048; SRMR = 0.045; Other regions sample: S-B$\chi^2_{(304)}$ = 1226.507, $p < 0.001$; Robust CFI = 0.950; Robust TLI = 0.942; Robust RMSEA = 0.057; SRMR = 0.056]. Results regarding both Lombardy sample and other regions sample exhibited a positive and significant effect of past behavior on autonomous motivation ($\beta_{Lom} = 0.540$, $p < 0.001$) and current physical activity ($\beta_{Lom} = 0.415$, $p < 0.001$), and a negatively significant effect on anxiety ($\beta_{Lom} = -0.069$, $p < 0.05$). Furthermore, only in the other regions sample the past behavior showed a positive and significant effect on intention ($\beta_{Oth} = 0.048$, $p < 0.05$).

Moreover, in both groups, when controlling for past behavior, the effect of intention on physical activity behavior during quarantine period decreased (Lombardy sample: $z = -5.686$, $p < 0.001$; $\beta_{past} = 0.437$ vs. $\beta_{no_past} = 0.577$; Other regions sample: $z = -5.770$, $p < 0.001$; $\beta_{past} = 0.388$ vs. $\beta_{no_past} = 0.548$), leading also to an increase of the variance explained on actual behavior (Lombardy sample: from $R^2 = 0.333$ to $R^2 = 0.484$; Other regions sample: from $R^2 = 0.301$ to $R^2 = 0.491$).

Furthermore, considering the differences between the two sub-samples on the relationships between all the variables, results showed the same differences that were present in the models without controlling for past behavior. More specifically, differences regard the relationships between autonomous motivation and intention, PBC and intention and the indirect effect of autonomous motivation on intention though PBC. For a full overview for the differences of all the effects of past behavior on all the variables in both groups and between them, see the **Supplementary Appendix B – Tables B1, B3–B5**.

Means Comparison of Key Variables

In order to understand differences emerged in the multi-group analysis, a comparison of the two subgroups on all the key variables of the study has been performed.

The **Table 3** reports all descriptive statistics regarding key variables across subgroups. Analysis of univariate normality reported non-normality only for attitudes in both subgroups. Levene's test for homogeneity of variance across groups indicated unequal variances for intention, attitudes and autonomous motivation. Accordingly, Yuen's test was used for the comparison for attitudes, the Welch's *t*-test was employed for intention and autonomous motivation comparisons across groups meanwhile Student's *T*-Tests were used for other variables. Results showed that the anxiety score was significantly higher in people living in Lombardy region (M = 18.96, SD = 5.21) compared to people living in other regions [M = 18.47, SD = 5.09; $t_{(2396)}$ = 2.33, p < 0.05]. Autonomous motivation [$t_{(2365.8)}$ = 4.35, $p < 0.001$], intention [$t_{(2382.5)}$ = 3.29, $p < 0.01$], attitudes [$t_{(1376.59)}$ = 3.61, $p < 0.001$], subjective norms [$t_{(2396)}$ = 2.21, $p < 0.05$], and physical activity behavior [$t_{(2396)}$ = 2.18, $p < 0.05$] were significantly higher in the other regions sample than Lombardy one. PBC mean differences across groups was not significant [$t_{(2396)}$ = 0.938, $p = 0.35$].

DISCUSSION

The Italian Government implemented extraordinary measures to limit viral transmission of the COVID-19 since the 8th March 2020. These actions included, firstly, the restriction of people movement. Gradually, Italian Government decreed stricter measures in order to minimize the virus transmission until reaching 22nd March 2020, date on which a total lockdown of all the commercial and recreational activities, including sports ones, was ordered, thus, obliging people to radically change their lifestyles also in terms of physical activity. Possible consequences of widespread outbreaks of infectious diseases, such as COVID-19, and the harsh measures adopted to prevent these infections are associated with psychological distress and symptoms of mental illness (Hawryluck et al., 2004; Anderson et al., 2020; Bao et al., 2020).

The main aim of our study was to evaluate the role of different psychosocial predictors of physical activity, during the unique context of pandemic diffusion of COVID-19. In light of this, we tested an integrated theoretical model in Italian population in order to understand the psychosocial constructs underpinning the physical activity behavior.

In line with our purpose, we firstly tested an integrated behavioral model linking autonomous motivation, attitudes, subjective norms, PBC and anxiety, with the intention to do physical activity during quarantine, and in turns, the relationship between the intention and the behavior itself. The hypothesized model showed a good fit with our data.

Considering the full sample of the Italian population, a first tested hypothesis was the link between autonomous motivation and TPB variables. Our results showed that, during the lockdown for COVID-19, individuals whose motivation to enact physical activity is self-determined (autonomous motivation), have positive attitudes toward the physical activity ($H1_a$; attitudes), they feel supported by their "important others" ($H1_b$; subjective norms), and, since their motivation is self-determined, they feel the possibility to do physical activity under their perceived control ($H1_c$; PBC). Conversely, people who are not motivated, or whose motivation is external would have, accordingly, worst attitudes, would feel less supported and lower PBC. Our tested hypotheses are in line with literature dealing with the integration of SDT and TPB suggesting that motivation to engage in health-related behaviors for self-determined or external reasons (e.g., sense of guilty, medical condition, physicians suggestions) predisposes individuals to form beliefs congruent with these motives (Hagger and Chatzisarantis, 2009), and that self-determined motivation can be supported or thwarted by environmental contingencies (Reeve et al., 1999; Hagger and Chatzisarantis, 2007).

Our results, therefore, showed that autonomous motivation has both a direct and significant effect on intention ($H1_d$) and via the mediation of TPB predictors (see **Supplementary Appendix B – Table B1** for indirect effects). Although the indirect effect of autonomous motivation on intention and health-related behaviors has been frequently reported by scholars, the direct effect of the autonomous motivation on intention and health-related behaviors suggests more impulsive and less deliberative processes by which self-determined motives predict intention formation and enactment (Chatzisarantis et al., 2003; Hagger et al., 2005, 2006). To speculate, the intention to enact physical activity can be considered a highly self-determined and

TABLE 3 | Descriptive statistics of key variables across sub-samples.

	Lombardy sample				Other regions sample				
	M	SD	SK	KT	M	SD	SK	KT	t
Autonomous Motivation	79.01	29.90	−0.77	−0.29	84.27	29.23	−1.15	0.60	4.35***
Attitudes	5.96	1.46	−1.70	2.29	6.17	1.28	−2.02	3.96	3.61***
Subjective Norms	4.26	1.89	−0.19	−1.02	4.43	1.84	−0.24	−0.94	2.21*
PBC	5.43	1.44	−0.99	0.35	5.48	1.51	−1.06	0.41	0.94
Intention	5.61	1.89	−1.29	0.36	5.86	1.78	−1.57	1.21	3.29**
State anxiety	18.96	5.21	0.10	−0.23	18.47	5.09	0.13	−0.23	2.33*
PA during COVID quarantine	2.61	2.15	0.28	−1.27	2.8	2.16	0.19	−1.33	2.18*

*M, Mean; SD, Standard Deviation; SK, Skewness; KT, Kurtosis; PA, Physical Activity; t, t-test. ***p < 0.001; **p < 0.01; *p < 0.05.*

low deliberative process, especially during the Italian lockdown policy where all sport facilities (e.g., gyms, sport fields) are closed.

Furthermore, moving forward to the second set of tested hypotheses, behavioral intention has been significantly predicted by attitudes ($H2_a$), subjective norms ($H2_b$), and PBC ($H2_c$). In fact, different reviews and meta-analyses of literature provided robust evidence for these relationships (Sheeran and Taylor, 1999; Armitage and Conner, 2001; Sheeran et al., 2001; Hagger et al., 2002; Trafimow et al., 2002; Rivis and Sheeran, 2003; Schulze and Whittmann, 2003; McEachan et al., 2011).

Specifically, in the meta-analysis of McEachan et al. (2011), authors reported as attitudes and PBC were the strongest predictors of behavioral intention. In a similar fashion, our results indicate that PBC and attitudes influenced the intention to enact physical activity during COVID-19 pandemic with stronger effects compared to the subjective norms. Following the recommendation of other scholars (Ma et al., 2008), we implemented a measure of anxiety in order to understand its role within the hypothesized model. As expected, our data showed that anxiety had a significant negative effect on all the TPB predictors of intention, and a small unexpected positive direct effect on intention. This last effect could seem not supporting our hypothesis, since we tested the role of anxiety as inhibitor of physical activity, as suggested by other scholars dealing with this issue (Ma et al., 2008).

Currently, the literature is not consistent about the role of anxiety. In fact, different studies show that regular physical activity brings benefit to individuals with mental disease, such as depressive and anxiety symptoms (Martinsen et al., 1989; Petruzzello et al., 1991; Peluso and Guerra de Andrade, 2005).

On the other hand, part of literature focuses on the role of negative influence of the anxiety on the physical activity behavior (e.g., Ma et al., 2008; DeWolfe et al., 2020). However, following the latter theoretical perspective, we tested attitudes, subjective norms and PBC as mediators in the relationship between anxiety and intention (H4; Ma et al., 2008). Findings exhibited the role of mediator of all the tested variables, showing a significant negative effect of anxiety on the proximal predictors of the intention. To explore more deeply the unexpected positive role of anxiety on intention, we also tested a single direct effect of anxiety on intention without any mediating path. The relationship between these two variables resulted in a not significant effect ($\beta = 0.013$, $p = 0.329$), partially in line with our hypothesis. It is likely that the reason for the negligible positive effect of anxiety on intention is due to the large number of participants, as p-value is influenced by sample size (Kalinowski and Fidler, 2010).

A secondary aim was to apply the hypothesized model comparing participants living in the most heavily affected area in the northern of Italy (Lombardy; Percudani et al., 2020) with the rest of Italian country, within a multi-group approach. Noteworthy, it is important to underline the different number of people hospitalized for COVID-19 of the sub samples. Indeed, for each subgroup we calculated the trend of the ratio between the number of people hospitalized and the respective residence population. Considering the survey administration period (from 17th March to 22nd March), Lombardy region had the highest prevalence rate than the rest of Italy, starting with nearly 69 hospitalized per 100,000 people (other Italian regions around 12 per 100,000) and ending with approximately 94 per 100.000 (other Italian regions almost 21 per 100,000; Italian National Institute for Statistics (ISTAT), 2019; Presidency of the Council of Ministers - Italian Civil Protection Department, 2020).

Interestingly, some results are worth mentioning.

For instance, participants living in Lombardy experience a greater impact of their PBC on the intention to do physical activity, along with the indirect effect of autonomous motivation on intention through the effect of PBC, and a lower direct effect of autonomous motivation on the intention. To speculate, while in the other Italian regions a self-determined motive to do physical activity act as a direct and immediate proxy for the action, in an emergency context such as Lombardy autonomous motivation fosters a more reflexive and deliberative decision. In other words, these data suggest that people living in Lombardy region, even if highly self-motivated, could work out or train only after feeling themselves able to enact that behavior, thus, their motivation *per se* could not be enough.

Furthermore, anxiety is a small positive and significant predictor of intention only for Lombardy group, but this effect, as already stated for the model with all participants, hides an indirect pathway of the anxiety trough the TPB predictors of intention, in both groups.

For a better understanding of Lombardy region situation, differences between Lombardy inhabitants and the participants from other regions have been evaluated also trough t-test analysis. Results from this comparison showed a distinct situation for the individuals living in Lombardy. Firstly, people from Lombardy were living that peculiar healthcare situation, considering contagion ratios that could have a crucial impact on their mental state (Blakey et al., 2015; Percudani et al., 2020), resulted with a significant higher level of anxiety than the individuals living in other regions. Conversely, autonomous motivation to do physical activity, attitudes, subjective norms, intention, and the time spent in doing physical activity during quarantine were lower in Lombardy group than the inhabitants from other regions. These results depict a noteworthy situation in Lombardy and should be taken into account by National policies and other scholars, for specific studies focus on the mental health of people living in the hardest hit places by COVID-19, around the world.

Such peculiar epidemic contexts provide particular tool for psychosocial analysis.

In a recent review on psychological impact of quarantine, Brooks et al. (2020) reported that experiencing epidemic outbreaks can induce post-traumatic states such as stress, depression and/or confusion, among others. The authors suggested as stressor factors longer quarantine duration, infection fears, frustration, boredom, financial loss, inadequate information and supplies, stigma (Brooks et al., 2020). The sources of anxiety for quarantined and socially confined areas are obvious. On the contrary, it is not likewise expected that state anxiety would affect everyone in the same way. Here, we found that anxiety plays a major role and negatively predicts physical activity through the mediation of TPB variables, especially in

Lombardy region. Undoubtedly, when it comes to exploring effects of quarantine periods on mental health and psychological well-being, practice of physical activity ought to be taken into consideration. We conducted this survey across a definite interval of the Italian outbreak of COVID-19, during which sports and outdoor physical activities were partially permitted, provided that 1-meter distance could be maintained as a safety interpersonal measure. All other sports events and competitions were postponed or canceled. Therefore, under these worryingly turbulent circumstances, the beneficial effects of exercise could have been continuously exploited. Not only maintaining recommended levels of physical activity (WHO, 2015) offers a broad immune-metabolic protection for the majority of the population, but also sedentary behaviors, associated with forced lockdown, might exacerbate the vulnerability to SARS-CoV-2. Moreover, regular exercise increases the antioxidant defense system and the immune response against microbial antigens (Zheng et al., 2015). Altogether, this body of evidence sustains the need of remaining physically active, to a legitimate extent, even at home owing to quarantine.

To our knowledge, our study is the first quantitative research showing the psychosocial mechanisms involved in the practice of physical activity, both in the Italian country and in a specific sample population extraordinarily hit by the COVID-19 pandemic, such as the northern Italian region of Lombardy.

These strengths notwithstanding, the present research has a few inherent limitations. In first place, the administration of a web-survey sets out the caveat concerning the accessibility to internet connection and the possibility to participate to the survey (Couper, 2000).

A second limit refers to the use of RAI. Indeed, the employment of this index could be controversial (Chemolli and Gagné, 2014). Although the several limits linked to the use of RAI, we used this aggregate score to guarantee a parsimonious model.

Thirdly, we evaluated two self-reported measures of physical activity behavior, a first considering a 2-month time-period (i.e., before the quarantine) and a second evaluating a short and actual time-point (i.e., during quarantine). For this reason, as future directions, a longitudinal study, might assess the hereby investigated measures during a specific time point ("post"), i.e., once the Italian government imposed stricter regulations (March 22), banning by law all people mobility nationwide.

CONCLUSION

In the future, behavioral insights are warranted to guide public health policies throughout prolonged periods of isolation. In the case of highly contagious diseases, if inter-human contact must be avoided, on the other hand maintaining a physically active lifestyle while taking precautions appears a simple hygienic measure from both psychological and metabolic perspectives.

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found here: https://osf.io/wscmr/.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Department of Psychology of Development and Socialization Processes Ethical Committee of University "La Sapienza" approved the study. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

All authors were responsible for drafting the manuscript and revising it critically for valuable intellectual content, and approved the version to be published.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.02100/full#supplementary-material

TABLE A1 | Invariance analysis.

TABLE B1 | Indirect effects and mediation analysis for total sample, Lombardy sample and other regions sample models including and excluding past behavior.

TABLE B2 | Effects of past behavior on total sample model.

TABLE B3 | Effects of past behavior on Lombardy sample model.

TABLE B4 | Effects of past behavior on other regions sample model.

TABLE B5 | Comparisons regards the effects of past behavior across sub-samples.

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Mitigating the Impact of the Novel Coronavirus Pandemic on Neuroscience and Music Research Protocols in Clinical Populations

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The COVID-19 disease and the systemic responses to it has impacted lives, routines and procedures at an unprecedented level. While medical care and emergency response present immediate needs, the implications of this pandemic will likely be far-reaching. Most practices that the clinical research within neuroscience and music field rely on, take place in hospitals or closely connected clinical settings which have been hit hard by the contamination. So too have its preventive and treatment measures. This means that clinical research protocols may have been altered, postponed or put in complete jeopardy. In this context, we would like to present and discuss the problems arising under the current crisis. We do so by critically approaching an online discussion facilitated by an expert panel in the field of music and neuroscience. This effort is hoped to provide an efficient basis to orient ourselves as we begin to map the needs and elements in this field of research as we further propose ideas and solutions on how to overcome, or at least ease the problems and questions we encounter or will encounter, with foresight. Among others, we hope to answer questions on technical or social problems that can be expected, possible solutions and preparatory steps to take in order to improve or ease research implementation, ethical implications and funding considerations. Finally, we further hope to facilitate the process of creating new protocols in order to minimize the impact of this crisis on essential research which may have the potential to relieve health systems.

Keywords: COVID-19, music and neuroscience, music therapy, music and neuroscience research protocols, research crisis response

INTRODUCTION

The novel coronavirus disease (COVID-19) and the consequent systemic responses have impacted lives, systems and procedures at an unprecedented level. While medical care and emergency responses are the need of the hour, the implications of this pandemic are more far-reaching having direct consequences on health sciences and research. Neuroscience and music research,

and specially studies of music therapy, often take place in hospitals and health services. However, daily practices at these institutions have been reorganized to provide treatments for patients diagnosed with COVID-19, as well as to prevent the spread of the disease among professionals and patients with other conditions. As a result, relevant to music and neuroscience clinical research protocols have been subsequently temporarily suspended, put in jeopardy, or have been altered.

In this context, we would like to present and then address the problems – related to methodological, technical, and potential psychosocial ramifications – that music and neuroscience researchers in clinical settings may be facing. We do so by consolidating the insights gleaned from an international online forum attended by clinicians and researchers in the field of music and neuroscience. It is hoped that this effort will provide ideas, answers to questions, and possible solutions to problems in the ongoing or anticipated impact of COVID-19 on active research protocols, thereby improving research implementation, ethical implications and subsequent funding considerations. We further hope to facilitate the process of creating new protocols in order to minimize the impact of this crisis on essential research which may have the potential to relieve health systems.

THE DISCUSSION CONTEXT

The pandemic crisis has brought a myriad of new challenges to research practices in the international research community. It has also seemingly fostered the potential for a pioneering of new insights, beckoning professionals to examine how they can interact and solve problems in their respective scientific fields in novel ways. Many such insights were addressed during an online interaction held on April 15th, 2020. The forum, employing the Webex platform, provided the opportunity for a discussion of these issues and potential solutions related to active music and neuroscience clinical research protocols during the COVID-19 crisis period. Live polls were also conducted through the Webex platform, where participants could choose to answer questions posed by the organizers through an interactive platform. The discussion panel was comprised of five clinicians and researchers in this specific field joining from Finland, the United States, Spain and the United Arab Emirates. The discussion was attended by 392 participants from 41 different countries (for a breakdown on participants' demographics please see **Table 1**). There was a mix of academics, researchers and students of all levels. Among those who responded to the polls (60.15%) 35% were actively involved in music and neuroscience research. Similarly, the polls reported that 29% were planning to research in the area, and another 43% were contemplating researching in the areas of neuroscience and music. Each of the panelists presented their viewpoints, while sharing their own distinct crisis reality each through a unique lens. The themes that emerged were explored, categorized and expanded on by the authors who were also the panelists. Six major themes were revealed following an informal analysis of the discourse after the end of the teleconference. These were based on the panel discussion, and the questions posed from the participants, as well as the live survey-polls.

TABLE 1 | Breakdown of participants' demographics.

Argentina	1	Latvia	1
Brazil	1	Malaysia	1
Canada	16	Mexico	2
China	1	Myammar	1
Colombia	2	Netherlands	3
Cyprus	2	Nigeria	1
Denmark	2	Poland	1
Ecuador	1	Portugal	4
Egypt	1	Qatar	1
Estonia	3	Russia	1
Finland	4	Singapore	1
France	5	South Africa	4
Georgia	1	Spain	13
Germany	4	Sri Lanka	1
Greece	19	Switzerland	3
Hong-Kong	2	Taiwan	1
Hungary	2	Turkey	2
India	17	United Arab Emirates	87
Ireland	1	United Kingdom	16
Italy	8	United States	76
Jordan	1	Unknown	78

THE DISCUSSION THEMES

The six themes presented below, roughly outline the COVID-19 crisis research situation, while also bringing to the forefront some crucial points to consider for future planning.

Factors Directly Affecting Protocols

Changed Timelines

Governmental policies facing the COVID-19 pandemic led to the cessation of many professional activities in the majority of countries, either because "essential activities" were the only ones permitted to take place, or because restrictions interfered with the usual and customary development of these activities. In the field of music, music therapy and neuroscience research, these governmental policies have a direct effect on data collection. Researchers in this field may continue designing studies, analyzing data and/or preparing their manuscripts, however, some on-going and about-to-start studies were forced to stop their protocols as either researchers or participants are unable to get to the lab, hospital or health service clinic. This is a critical issue particularly for clinical trials which follow specific, pre-set protocols. Researchers are faced with difficult choices and fast decisions on questions such as "can the music intervention be altered so that it can be implemented through remote communication" and "how does stopping and restarting the intervention later affect the design of the study."

Technological Challenges in Adapting to Changes

Music-based interventions are complex as they have several interacting components (Craig et al., 2008). Adaptation of intervention protocols require a theoretical understanding of how these components contribute to the treatment success;

which components are essential; and how possible modifications to remotely implement the intervention would affect the participants and the study outcomes. Further collaborations and interaction with other fields such as engineering/information technology are needed to effectively adapt interventions for their virtual or remote implementation. Apart from the technical challenges, new ways of delivery also posit several ethical challenges, such as ensuring the safe and secure collection, and storage of clinical data, as well as data potentially gathered at participants' homes (Stanberry, 2006; Kaplan and Litewka, 2008). Moreover, implementation of adapted interventions requires piloting and testing procedure feasibility, processes that take time and can delay a rapid response to this situation. For on-going studies, adapting an intervention protocol would force researchers to analyze the data of those participants who received the intervention in an adapted form, separately from those who participated under normal clinical conditions.

Loss of Control Over Confounding Variables

Prolonged breaks in interventions and treatments if the study is interrupted and restarted later may have direct consequences on research quality. One of the main challenges when restarting a protocol will be to ensure that the conditions related to the setting, professionals and procedures remain as similar as possible to the conditions set before the crisis. However, it is uncertain how hospitals and health services are going to operate in the future. Researchers will have to analyse these contexts and control their changes to avoid potential confounding variables.

Confounds can also occur due to the nature of the populations that are usually involved in neuroscience and music studies. Research in music, music therapy and neuroscience often involve vulnerable populations. These populations are inevitably prone to being affected by isolation, and the lack of activity and rehabilitative treatments during this period, as well as by the predicted future economic crisis. There may be long-term negative physical, cognitive and psychosocial consequences in these vulnerable populations, which will force researchers to redefine music-based interventions and protocols in the future. Researchers may be asked to address new needs that may arise, consequently changing how protocols for treatment are instituted and measured.

Factors Directly Affecting the Sample

While the domain of neuroscience and music promotes exploratory studies on brain development (for example Papatzikis, 2017; Putkinen et al., 2019; for a review see Tervaniemi et al., 2018), quite a lot of research in the field is rehabilitative in nature (Särkämö et al., 2016; Cheever et al., 2018). The rehabilitative studies in the field include recovery from stroke and brain injury as well as other neurological and neurodegenerative disorders. Additionally, the specific field deals with neurodiverse research population paradigms focusing on autism, ADHD and pre-term infants (Loewy et al., 2013).

One apparent element of the discussion was that populations with high vulnerability to the disease cannot physically participate in active research at the moment, due to possible coronavirus exposure, while having even more difficulty safely socializing or traveling to attend research sessions if needed. It was also noted that especially research focusing on music group interventions can no longer be conducted in many places around the world due to the restrictions on mobility and allowed size of any type of group gathering. Tragically, in ongoing clinical trials and longitudinal studies, it can also be anticipated that there will be participants who dropout of studies because of COVID-19, either directly because of illness or death or indirectly because of changes in life situation. While further recruitment might be feasible later on, at the very epicenter of the pandemic, it is quite difficult to proceed with it at present. If the pandemic and the state of emergency continue for long, it may also negatively affect the general willingness and motivation of people, especially the high risk groups most affected, to participate in research as subjects, as it may be seen as unsafe or abortive.

In parallel, it was noted that the sample recruitment difficulty will most definitely affect the context of music and neuroeducation, too – a closely related field with challenges similar to those met in music rehabilitation. Its importance is intrinsic in those studies which aim at revealing brain bases for the development of music skills, and which also explore the existence of transfer skills influenced by music activities. These studies recruit participants from newborns until adolescence mostly in longitudinal paradigms, and they face similar constrains and uncertainties in the current situation.

Factors Due to the Setting

Music, music therapy and neuroscience research most frequently occurs in clinical settings. With some hospitals placing restrictions on "non-essential" services, research for many has come to a grinding halt. For example, neonatal intensive care units (NICUs) are a common setting in which to conduct music, music therapy and neuroscience research on infants. In adult neurological and neurodegenerative disorders, such as stroke and dementia, much research takes place in the context of rehabilitation units and care homes. In the COVID-19 pandemic, these facilities are now among the most isolated units as their clinical populations are highly vulnerable and at high risk for contagion, and are therefore out of bounds when it comes to participating in music intervention research. The cruel irony is that especially in this situation, music could actually be a most valuable tool for many to cope with the stress, loneliness, and social exclusion caused by the quarantine-like isolation measures imposed by COVID-19 management. With the ICUs being filled up and overloaded, there is no longer the time or patience to do music research, even though music-based intervention might improve not only patients but also professionals' well-being.

Regarding the methodological side, music and neuroscience research typically utilizes neuroimaging equipment and facilities, such as electro- or magnetoencephalography (EEG/MEG) and magnetic resonance imaging (MRI). This equipment is often located within the hospital setting. Therefore, physical access to these facilities by researchers is now not only limited by more stringent hospital safety policies but also because in most affected countries available resources are devoted to patients diagnosed with COVID-19. Also, performing the measurements entails being in close physical proximity with the participant (e.g., when

attaching EEG electrodes or the MRI head coil) which is not possible due to the need to keep the minimum physical distance, typically specified as 2 meters in the COVID-19 guidelines.While remote or online data collection, for example with e-forms or through various video chat apps, is an option in many fields of research, it is unfortunately not possible in applied neuroscience.

Interfering Research Variables

Like all experimental research, research in music, music therapy, and neuroscience is carefully structured to ensure the reliability, integrity, and stability of findings. This includes controlling for various intervening factors pertaining to individual variability, stimuli characteristics, music delivery and environmental context (Hunt, 2015) which may affect the results and their interpretation and generalizability. With ongoing research, these factors have been controlled and planned in advance, especially in pre-post design models, where the pre-assessment provides a baseline and any changes (outcomes) are then considered attributable to the effects of the music intervention or activity.

In ongoing clinical trials or other longitudinal studies, the COVID-19 situation, and the mobility and social restrictions posed by it, do not only affect the protocol and sample characteristics (see above) but can also have a broader personal and social impact, which introduces a number of factors that can potentially interfere or bias the longitudinal results of the outcome measures, such as questionnaires on mood and quality of life and cognitive tests measuring attention and memory. For example, the pervasive fear of contracting the COVID-19 virus can increase anxiety. Being socially isolated from friends and family and facing uncertainty about the future can cause stress, rumination, and depression. Restriction from usual participation in social activities and hobbies (including group musical hobbies, such as singing in a choir or playing in a band) induces social deprivation or impoverishes one's personal environment and lifestyle, which has broad psychological effects on the individual.

Moreover, the economic crisis expected as a consequence of this pandemic will stress the role of social determinants on health, which should be taken into account as interfering variables. In studies comparing intervention and control groups, all of these factors of course affect both groups and thus balance out, but the problem is that they can be so pervasive and strong that they mask out any potential intervention effects. Understanding that the mental state of the population may have changed, baseline assessments may no longer be indicative of current circumstances. Therefore, even if research could go forward, it is at the risk of contamination from confounding variables.

Resources

With focus on the immediate health and economic outcomes of the pandemic, the shift for hospitalists and most health care providers is now seemingly on managing and coping with the pandemic, rather than on resource-building, *per se*. There may be a lack of empathy from governing bodies for research at this time, because the decision-makers may not see the value of research in the face of more pressing immediate matters. As a result, funding is likely to be – and is already being – redirected toward research dealing directly or indirectly with COVID and its public health outcomes.

Over a longer period, the economic crises that may be imminent could lead to a general reduction on the level of science funding, which, in turn, may affect prioritization of where the reduced funding is allocated. In the ensuing funding competition, smaller, more niched areas of research, including music neuroscience, may take the heaviest tolls. In the meantime, considerations arise for any data collection delays as research timelines are severely affected. This situation would force researchers to negotiate with institutions, decision-makers and funding agencies for new timelines and extended access to protocol resources.

The funders and policy-makers need to be convinced regarding the special relevance for this research during this time, and how instituting and advocating for music as a meaningful and most of all easy, accessible tool to implement in the clinical settings, is necessary. Now more than ever, people need the kind of support provided by music since it can alleviate the impact of isolation and address its cognitive, emotional (Ramirez et al., 2015) and social consequences. Those who may be more vulnerable to isolation such as children with neurodevelopmental disorders and older adults with neurodegenerative disorders are apt to suffer the most, and therefore might benefit the most from such research (Grau-Sánchez et al., 2020).

On another note, some clinical trials, more particularly those involving a longer intervention period, may benefit from resources and treatment adaptation. Maintaining subject treatment strategies may afford subjects and researchers achievable, sustainable status when adaption to a web-based forum can be accomplished. Notably, any intervention that is altered in any way needs to be accounted for and ultimately identified in the data collection process and approved by the IRB (Internal Review Board). For example, the findings of music therapy forums involving groups that sing – addressing the impact of community on outcomes such as aphasia, mood and quality of life – may offer some surprises in the data analyses when outcomes are finally calculated.

One might suspect that a pandemic involving social distancing might reinforce isolation for older adults, an adaption of our usual and customary protocols might reflect that web-based groups may afford subjects the comfort of being alone in their homes, or rooms, while at the same providing for time together with others, personal and professional carers, in the context of a screen. Where there are re-routings of this sort, however, there can be surprises in the data. There are spaces for alteration.

Finally, bringing the reality of the COVID 19 pandemic into our research thinking may call upon us as a global community of music, music therapy and neuroscience researchers to expand our domains and cohorts types, directing our protocols to address novel or under-researched topics, such as the impact of music on pulmonary function. Recent music-based protocols for children and adults with chronic respiratory diseases, for example, show promise (Canga et al., 2015; Loewy et al., 2020) despite the scarcity of clinical trials on the topic. Since breath control is reliant on a brainstem neuronal network that can be strengthened with predictability and rhythmic reinforcement, perhaps landing

ourselves in projects involving music and pulmonary function might gain traction and align opportunities for innovative funding support.

Response to Limitations

Several studies point out that researchers are at high risk of suffering anxiety and depression (Levecque et al., 2017; Evans et al., 2018; Duffy et al., 2019). The pandemic forces us to stop most research projects, and this has a subsequent negative impact on productivity. This is particularly relevant for young scientists that are pursuing their Ph.D. studies or are on a path leading toward a tenure-track position. On the other hand, quite a few researchers in the music, music therapy and neuroscience field are still going forward resiliently. Along with the rest of the world, they seem to have embraced technology and cell-phone based modes of communication, as they have transitioned feasible interventions from in-person to online modes of delivery.

Luckily, music is a mode of communication with some aspects that can be easily transferred to the virtual domain. For example, gamification of interventions and home-based interventions administered through apps (Benveniste et al., 2008; Benveniste, 2010; Boulay et al., 2015; Bégel et al., 2018; Ramirez et al., 2020) are currently being used with more acceptance and may be a viable solution for certain kinds of interventions moving forward. Nevertheless, while during the pandemic this approach has certainly involved a learning curve for many, with collaboration and some effort it has proved to be a valuable tool. This kind of adaptation or modification may not only help maintain research momentum but can provide much needed relief during this difficult period.

THE WAY FORWARD

As research continues for some in its adapted state, and/or when it resumes for others, we will need to be mindful and sensitive. We need to have an understanding of how time and temporary cessation, as well as limited mobility and social restrictions have affected our projects. At the same time, we need to discover mechanisms for accurate analysis and best reporting of these disruptions, as well as markers that will inevitably determine when to begin research, and/or resume and adhere to the original and/or alter the interventions and data collection in our projects. Do we perhaps need to be more cautious in these times than the general health and safety guidelines dictate, especially when we deal with vulnerable populations and at-risk groups? Which research takes priority within labs when measurement times get bottlenecked? These are some critical questions to answer, and the only way to overcome these issues is through communication within the scientific community, and with our clinical partners as well. This occurs, most surely, with patience.

During the COVID-19 lockdown, the time some researchers "lose" in data collection is time that fortunately can be used for in-depth literature review catch-up, for data analysis, reading and writing. As mentioned, for some the research continues in a temporarily altered format. For many others this period, while being in many ways stressful and demanding, has also been a welcome opportunity to catch up on those secondary research tasks, such as analyzing old data and finishing up old manuscripts, for which time under usual circumstances, may be difficult to find. Overall, this exceptional period can give us a moment to become creative and adjust current projects, or to slow down and reflect, and in all cases, to consolidate and understand nuances that may have perhaps been otherwise missed.

As music researchers, we can study closely what pandemics do to people, how they have reacted, what kind of problems they have faced, what resilience they have shown, and what role music and its related technological, biological and psychological extensions might play in this situation. During the COVID-19 crisis, news images and videos from Italy, Spain and elsewhere featured people quarantined to their homes playing music and singing together from their open windows and balconies to help cope with the emotional distress and social isolation; a testament to the emotional and social power of music.

Importantly, in these times, new music intervention projects and also new target groups requiring support can be identified. One such group are the frontline workers and medical staff who face unparalleled stress and burn out from shouldering staggering responsibility. In New York city, for example, the trend for virtual "music rooms" for staff is a tradition renewed from 9 to 11, which showed the impact of music therapy on another kind of trauma (Loewy and Frisch-Hara, 2002). The treatment of trauma is a growing discipline, and is beginning to be embraced in the music neuroscience world. Pandemics are fertile ground for the continuance of such important work (Porges and Rossetti, 2018). Another important group to turn our research efforts upon are the elderly isolated in their homes, for whom online music interventions could be explored as tools to lift mood, soothe anxiety, and provide social contact.

Moving forward with hope rests on an assumption that there will always be support for improving the human condition. As researchers working in this exceptional situation, we need to be patient and open in our views and also perhaps a bit more permissive when it comes to meeting our own deadlines and achieving goals. For instance, we may have to make addendums for reporting confounding variables in the pursuit of our research objectives as we think of new ways to implement our research. We also need to understand that people react differently to crisis. We have to respect this and take it into account when working together. On the other hand, it is important to keep pressing forward, to be proactive, and make the necessary comprises when needed, rather than to bury our heads in the sand and simply wait for things to change or get better.

Finally, now more than ever, it is important to come together as a community, to interact, learn from each other, and identify new research avenues where music could be used to combat among others the emotional and social burden caused by COVID-19. An instance of this coming together is the Musicovid network (which can be accessed at https://www.aesthetics.mpg.de/forschung/abteilung-musik/musicovid-an-international-research-network.html) that compiles and makes available to the public

domain research conducted in this area. This is an exemplary model of community convergence, research communication and support, showcasing an effective way forward. Taking care of ourselves and of the people we work with is and should be paramount in these difficult and extraordinary times we live in, hence a must for our research community, too.

DATA AVAILABILITY STATEMENT

All datasets presented in this study are included in the article/supplementary material.

AUTHOR CONTRIBUTIONS

EP and FZ drafted the main body of the manuscript. TS, JG-S, RR, MT, and JL contributed parts and commented on the manuscript. EP, FZ, and JL edited and proofread the manuscript. All authors approved the final submission.

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Social Stigma: The Hidden Threat of COVID-19

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COVID-19 infection has been recognized as a pandemic by the World Health Organization. Efforts to prevent the spread of the disease are threatened by the appearance of disease-associated social stigma in society. In Egypt, a small wave of stigma directed at different groups started to appear. Here we report the features of COVID-19-associated stigma in Egypt and suggest recommendations to overcome this stigma before it grows and have physical and psychological impacts on society.

Keywords: COVID-19, pandemic, spread, Egypt, social stigma

INTRODUCTION

On the 11th of March 2020, the WHO declared the novel coronavirus disease (COVID-19) as a global pandemic (1). The disease rapidly spread through the world, affecting millions of people, with a mortality of about 5.7% (2). Since there is no approved vaccine or treatment for COVID-19, efforts to fight the disease focused on prevention of spread. These efforts included political decisions to apply social distancing from one side and public health education to increase awareness of the individuals about the disease and how to protect themselves on the other side (3).

However, the unprecedented situation of the current pandemic, where news spread instantly through media, could be associated with panic buying (4), fears, stereotyping, and the appearance of stigma directed at different groups in society. A survey was conducted on the general public in China to better understand the psychological impact, anxiety, depression, and stress during the initial stage of the COVID-19 outbreak. The authors found that 53.8% of respondents rated the psychological impact of the outbreak as moderate or severe; 16.5% reported moderate to severe depressive symptoms; 28.8% reported moderate to severe anxiety symptoms; and 8.1% reported moderate to severe stress levels (5). Four weeks in the peak of the COVID-19 pandemic, 34.8% of respondents reported stigma or discrimination by people from other countries (6). Furthermore, vulnerable groups like psychiatric patients are at higher risk of adverse mental health and faced more stigma during the COVID-19 pandemic (7). Healthcare workers also suffered from burnout and faced tremendous stress (8, 9) and potential stigma.

Here we report the current COVID-19 situation in Egypt, some features of the social stigma that emerged with the spread of COVID-19, and present our recommendations which can help limit this wave especially in Egypt.

COVID-19 IN EGYPT

During the first week of March 2020, the Egyptian Ministry of Health and Population (MOHP) announced the first case of an Egyptian citizen infected with SARS-COV-2. Since then, a growing number of cases have been reported to reach about 64,000 cases and more than 2,700 deaths by the end of June (10). Although MOHP used different means of communication to educate the public about the disease, we reported a significantly lower level of knowledge among older, lower-income, less educated people

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and rural residents in our recently published survey about the knowledge, perceptions, and attitude of Egyptians toward COVID-19 (11). Most participants believed in the danger of the diseases, and about one quarter of them thought that infection is associated with stigma (11). Taken together, we think that although a certain degree of knowledge has been gained by some categories in the society, this has been associated with growth of rational and irrational fears toward the disease, its risk, and potential sources of infection.

COVID-19-ASSOCIATED STIGMA

During outbreaks or pandemics, human fear arises from the anxiety about a disease of an unknown cause and possible fatal outcome, especially when infection control techniques such as quarantine and isolation are applied to protect the community (12, 13). In the past, stigma has been associated with different infectious diseases (4) and resulted in discrimination against these patient groups, which caused negative consequences both on the individuals and society (14). These features, which have also been reported during the COVID-19 pandemic in different studies, may result in stigmatization of the potentially infected that flourishes with dramatic stories in media and through the internet (5, 6).

During the current COVID-19 pandemic, several features of stigma have been reported worldwide mainly toward individuals from Asian descent, those with recent travel history, and healthcare professionals (15, 16).

There are several reports of xenophobia in Europe, USA, and many countries around the world directed mainly toward Asian foreigners (17–20). A single incident for discrimination against a person with apparently Asian features has been reported in Egypt. It was interesting that this incident was faced with rejection from society, including governmental officials (15).

The main religions in Egypt are Islam, followed by Christianity. Both religions have funeral rites that call for the burial of the body. Reports about locals refusing to bury the body of dead persons from COVID-19 have been published in Egypt as it might be a source of infection (21, 22). Similar reports have been published in Indonesia as well (17). The WHO declared that there is no evidence of possible spread of infection from dead bodies and released a guide on the safe management of a dead body from COVID-19 (23). Those incidents sounded the alarm for the wave of stigma, where the call for interference from the parties concerned is required.

Another dangerous feature of stigma is the one against healthcare professionals. In our study about the prevalence of burnout during the COVID-19 pandemic, more than one third of Egyptian doctors participating were found to suffer from burnout (data not published). Since healthcare workers come in the frontline among groups susceptible to infection, fears from communication with them have been reported in several forms in Egypt as well as other countries. For example, incidents have been reported where taxi drivers refused to drive medical doctors, restaurants refused to deliver food to hospitals, and residents refused to have healthcare professionals as neighbors (24–27). More than three quarters of Egyptian physicians participating in the aforementioned study about COVID-19-associated burnout believed that there is a stigma against health professionals and linked harassment by patients' families with different dimensions of burnout. A document by WHO about mental health and psychosocial considerations during the COVID-19 outbreak has pointed out to this type of stigma and provided recommendations to deal with it (28). Collectively, these individual incidents point to a potential hidden threat, which may be reflected in the form of underreporting of cases, fear to seek medical care, and a negative effect on the mental and emotional health of stigmatized groups (16).

DISCUSSION AND RECOMMENDATIONS

Studies have shown that during serious disease outbreaks, when the general public requires immediate information, a subgroup of the population that is at potentially greater risk of experiencing fear, stigmatization, and discrimination will need special attention from public health professionals (29, 30). Several measures to deal with the mental and psychological stress and stigma during the COVID-19 response have been published by WHO, Centers for Disease Control and Prevention (CDC), and United Nations International Children's Fund (UNICEF) (16, 28, 31). Among these measures, we would like to highlight the following recommendations, which we think are best relevant to the situation in Egypt. It should be noted that these recommendations should be executed through collaboration between the government, international health organizations, private media sector, nongovernmental organizations (NGOs), and social influencers.

1. For media platforms: These platforms should try to increase awareness without increasing fear. They should also warn from negative behaviors and support stigmatized groups. Wording to describe patients or infected persons should be chosen properly. Accurate data and information should be carefully selected. Healthcare workers should be supported, and their work should be appreciated. It is also important to amplify positive and hopeful stories of people who recovered from the disease (16, 28, 31). Such news will limit the feeling that the disease is fatal and will increase the level of empathy with patients.
2. For individuals: We recommend that individuals should minimize exposure to news about COVID-19 (28). Prolonged exposure is associated with exaggerated fear and negative reactions. Moreover, social media and other communication methods can be a source of misinformation, which may increase the level of stress (11, 16, 28).
3. For healthcare workers: Avoidance by some members in the community can be disappointing. Getting support from family, colleagues, and managers can help healthcare workers overcome these feelings. Providing emotional support to affected people during different stages of isolation/treatment can help them overcome the psychological impact of stigma if present and give a positive example to the society (28). Professional psychological support should be

available to all stigmatized individuals and groups, including healthcare workers.

4. Social influencers: Including religious leaders, should have a role through communicating messages that can help reduce stigma and support stigmatized groups (31). Such role can be very valuable if the persons and message were carefully chosen. Interestingly, the Grand Sheikh of Al-Azhar, a prestigious Sunni Islam title in Egypt, recently gave a speech warning against stigma associated with COVID-19 (32).
5. Workplace: Harassment and stigmatization at work can have a substantial adverse impact on physical and mental health, which may be reflected in the form of reduced productivity and increased staff turnover (33). Employers should follow general measures for creating a healthy workplace (33). The economic factor should be taken into consideration while dealing with COVID-19 patients. Psychological and financial support should be available for patients, and transparent policies about these issues should be communicated in advance. Staff education and speaking out against negative behaviors can help to avoid these behaviors in the future (16). The government should request employers to prevent and curb discrimination against confirmed or suspected cases of COVID-19 within the business (34).

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

AA conceptualized the idea and started the manuscript writing. MA then added his input and revised the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Study Protocol for the COVID-19 Pandemic Adjustment Survey (CPAS): A Longitudinal Study of Australian Parents of a Child 0–18 Years

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Background: The COVID-19 pandemic presents significant risks to the mental health and wellbeing of Australian families. Employment and economic uncertainty, chronic stress, anxiety, and social isolation are likely to have negative impacts on parent mental health, couple and family relationships, as well as child health and development.

Objective: This study aims to: (1) provide timely information on the mental health impacts of the emerging COVID-19 crisis in a close to representative sample of Australian parents and children (0–18 years), (2) identify adults and families most at risk of poor mental health outcomes, and (3) identify factors to target through clinical and public health intervention to reduce risk. Specifically, this study will investigate the extent to which the COVID-19 pandemic is associated with increased risk for parents' mental health, lower well-being, loneliness, and alcohol use; parent-parent and parent-child relationships (both verbal and physical); and child and adolescent mental health problems.

Methods: The study aims to recruit a close to representative sample of at least 2,000 adults aged 18 years and over living in Australia who are parents of a child 0–4 years (early childhood, N = 400), 5–12 years (primary school N = 800), and 13–18 years (secondary school, N = 800). The design will be a longitudinal cohort study using an online recruitment methodology. Participants will be invited to complete an online baseline self-report survey (20 min) followed by a series of shorter online surveys (10 min) scheduled every 2 weeks for the duration of the COVID-19 pandemic (i.e., estimated to be 14 surveys over 6 months).

Results: The study will employ post stratification weights to address differences between the final sample and the national population in geographic communities across Australia. Associations will be analyzed using multilevel modeling with time-variant and time-invariant predictors of change in trajectory over the testing period.

Conclusions: This study will provide timely information on the mental health impacts of the COVID-19 crisis on parents and children in Australia; identify communities, parents, families, and children most at risk of poor outcomes; and identify potential factors to address in clinical and public health interventions to reduce risk.

Keywords: COVID-19 pandemic, mental health, parenting, mother, father, child mental health, couple conflict, family functioning

INTRODUCTION

The World Health Organization declared COVID-19 a pandemic on the 11th of March 2020. Consistent with government responses around the world, the Australian federal and state governments introduced an increasingly strict regime of social distancing/isolation measures to slow the rate of infection (1). These measures may present significant risks to the population, over and above the health threat associated with COVID-19 (2, 3). Findings from a cross-sectional study of 2,077 participants recruited in 22 countries in late March and early April 2020 indicated that adult mental health symptoms at that time were elevated compared to historical norms, with participants' concern about the COVID-19 pandemic and loss of employment associated with higher levels of mental health problems (4). It is as yet unknown what the full impact of the pandemic will be on Australian families.

The COVID-19 pandemic represents an unprecedented confluence of risk in Australia and globally in this century, including: (1) a high level of uncertainty in regard to the parameters, time frames, and outcomes of the pandemic; (2) high rates of unemployment or underemployment, and housing and economic uncertainty; (3) threat to, or reduction of protective factors, such as social and community connection, physical activity, access to greenspace, and other co-curricular activities; and restricted access to clinical, community, family, and other supports and services; (4) increased pressure on parents to supervise and/or home-school children while juggling working from home; and (5) risk associated with being 'locked in' with family members in close quarters. It is unknown what effect the combination of these risks may have on the population of parents. However, each of these factors have an evidence-base demonstrating potential risks to adult and child mental health and wellbeing (5–16). There is evidence showing increased risks of mental health problems, drug and alcohol use, and family violence during and after crisis events and disasters (5–7, 17). Job loss, employment uncertainty, and difficulties in juggling work and family roles are associated with increases in parent mental health problems, couple conflict, and child mental health problems (8–16). Finally, there is evidence that quarantine is associated with a range of negative psychological outcomes including post-traumatic stress symptoms, confusion, and anger (3).

It is important to understand the experiences and consequences of the COVID-19 pandemic for all Australian families in order to plan for appropriate intervention and support, both during and after the pandemic period. However, the pandemic is likely to have a disproportionate effect on vulnerable parents and families. There is an urgent need to understand the impact for families with pre-existing risk factors to ensure that any public health interventions are appropriately tailored to these subgroups (2). Mental health problems are highly prevalent, affecting approximately one in five adults in Australia (18). It will be important to understand how adults with a pre-existing mental health problem or other personal vulnerabilities, such as difficulties in managing relationships and emotions (i.e., attachment insecurity and difficulties regulating emotions), respond to the COVID-19 pandemic. In addition, approximately one in seven children and adolescents experience a mental health or neurodevelopmental disorder, such as attention-deficit/hyperactivity disorder or autism spectrum disorder, equating to about 560,000 young people in Australia (19). In Australia and other nations, child mental health problems are clustered in places of disadvantage (20). To88 date, there is limited evidence as to how place-based epidemic management affects disadvantaged communities. This study represents an important opportunity to understand how Australian communities and families affected by such conditions adjust to a global pandemic. Further, adults with chronic physical health conditions (such as diabetes, cardiovascular disease, and autoimmune conditions) are also at increased risk of negative outcomes *via* the potential for (1) more serious illness outcomes (21), (2) exacerbation of their health condition(s) caused by psychosocial stress and depression (22–24); and increased risk of infection in context of immune system impairment (25) or immunosuppressive treatments (26).

This study will investigate the impact of COVID-19 on the health and wellbeing of parents, children, and families. Specifically, the study will examine:

1. The extent to which the developing COVID-19 pandemic over time is increasing risk for:

   a. Parent mental health problems, poor wellbeing, loneliness, and alcohol use;
   b. Parent-parent (verbal and physical conflict) and parent-child relationship problems;
   c. Child and adolescent mental health problems.
2. Whether some families and communities have a higher risk of experiencing these problems over time compared to other families, including:
   a. Families with a member with a pre-existing mental health problems, attachment insecurity, and/or recent stressful life events;
   b. Families living with or supporting those with a physical health condition or disability;
   c. Families experiencing financial strain, crisis-associated job loss, and/or on low incomes or government benefits.
3. Whether there are modifiable factors that moderate families' experience of risk over time, that could be targeted to strengthen families during and after the crisis, including:
   a. Individual: promoting emotion-regulation, sleep quality, physical activity, and healthy screen-use;
   b. Couple: promoting supportive relationships and constructive management of conflict; Familial: promoting nurturant parenting and positive familial communication.

METHODS

Design

This is a longitudinal cohort study of Australian parents of a child aged 0–18 years. The study comprises two sets of online surveys scheduled on a regular basis for the duration of the COVID-19 pandemic. The surveys include:

1. A repeated baseline survey (20 min) scheduled at baseline and at 3-month intervals and
2. A brief longitudinal survey (10 min) scheduled every 2 weeks.

The time frame of the study will extend across the duration of the social distancing measures implemented by the Australian federal and state governments to manage the COVID-19 pandemic in Australia. The federal government released a statement estimating that the likely time frame will be a period of six months from March 2020 to September 2020 (27). The regularity and time-frame of the longitudinal surveys will be reviewed every 2–3 months to ensure that benefits of regular follow-up are weighed against potential for participant burden and fatigue.

Eligibility

Participants will be eligible to participate if they are an Australian resident, 18 years or over, and are a parent of a child aged 0–18 years. Survey information and advertisements will be written in English, so it is expected that people with adequate English fluency will complete the survey.

Recruitment

Parents will be recruited *via* paid and unpaid social media advertisements. A range of methods will be used to target specific groups to increase the representativeness of the sample (e.g., targeting *via* postcodes and demographic factors). The style and wording of advertisements is important in determining recruitment success. Consistent with prior research, this study will employ advertisements that: (1) refer to research; include the Deakin University affiliation, refer to the incentive (as detailed below), and are written in engaging yet plain language (28).

Participants will primarily be recruited *via* the social media platform, Facebook, given demonstrated success in recruiting hard-to-reach populations on this platform (29, 30). A project 'business' Facebook page will be established to maintain contact with participants, affiliate organizations, and the wider public. The page will be monitored regularly by project staff and any content/comments deemed inappropriate or offensive will be promptly removed. Both paid and unpaid recruitment strategies on Facebook will be used in the current study. Unpaid strategies will include making contact with established interest groups, parenting groups, and organizations on Facebook *via* the project Facebook page and/or Deakin University email (i.e., where email addresses are provided), and requesting that these sites endorse our project by posting the project advertisement so that it is visible to their group members. Paid strategies will involve using Facebook's systems to target recruitment to specific sub-populations *via* demographic variables (e.g., parents of children 0–18 years; fathers, remote/regional postcodes, and parents speaking a language other than English), posting paid advertisements on all available platforms, including Facebook and Instagram. We will also use other social media platforms (e.g., Reddit, Twitter, Instagram, and WhatsApp) following the same protocols to post both paid and unpaid advertisements as per our current use of Facebook.

Expected Sample Size

The study aims to recruit a minimum of 2,000 parents of a child 0–4 years (early childhood, N = 400), 5–12 years (primary, N = 800), or 13–18 years (secondary, N = 800).

Procedures

Baseline Survey

The advertisements used for recruitment will contain a web hyperlink which will direct participants to an initial Qualtrics survey website. The landing page for the survey will contain a brief description of the purpose of the research. On the next page, participants will be asked two eligibility questions, checking that they are a parent of a child 0–18 years and that they currently live in Australia. If participants are not eligible to participate, they will be directed out of the survey with an explanation of the eligibility criteria. Eligible participants will then be presented with a Plain Language Statement and Online Consent form available for download as a PDF document. On this page, participants will be asked to check a box that confirms that they have read the Plain Language Statement, which they understand its contents, and consent to participate in the

study. Participants will then be asked to provide contact information with details of their first name, phone number, and email address. A brief explanation will be provided that this information will assist the research team in contacting the participants for the follow-up survey, sending reminders, and contacting winners of the monthly prize draw. On completion of the baseline survey, participants will be automatically allocated a unique ID number, which will be embedded in their subsequent surveys to identify them and link their data.

An invitation (and web link) will be included at the end of the Qualtrics baseline survey inviting the potential participant to 'friend' the CPAS page on Facebook. This is intended as a strategy to maximize participant retention rates and promote participant connectedness to the study. Facebook allows a stable means of communication where participants can be contacted for future time points of the study regardless of changes in contact details. This request would be a means of keeping the study in the minds of participants as study updates and news would appear on the participant's own Facebook 'News Feed.' Only one email request would be sent with no follow-ups, even if the request is declined or ignored. No changes would be made to the previously approved Facebook privacy settings.

Fortnightly Longitudinal Survey

Participants will be re-contacted every 2 weeks after completion of the baseline survey *via* an automated email invitation. Participants will be recruited on a rolling basis to maximize reach and sample size. Regardless of whether a participant responds in a given week, participants will remain on the active list and will continue to receive survey invites and reminders. All emails to participants will contain an opt-out link with two options: to opt-out from the survey or to opt-out of the study entirely.

Participant Reminders

Participants who open the baseline survey, consent to participate, and who have provided their contact details but did not complete the full version of the online baseline survey will be sent an email reminder about completing the survey 24 hours later. Participants will be sent an email reminder 24 hours after each fortnightly longitudinal survey is sent. If participants have not completed a survey or made contact with the study team over a period of three consecutive surveys, the team will use a range of methods to attempt to re-engage participants in the study. This may include sending an additional follow-up email, sending an SMS reminder and/or calling the participant on their mobile phone number, or contacting the participant *via* Facebook (refer to section *Facebook Tracing*, below). We will limit all contacts to a maximum of 1 direct contact (i.e., involving communication from the participant) within a week, *via* email, SMS, or voicemail message. In order to understand reasons for participant drop out, we will ask participants two brief questions when making contact *via* phone, a question asking about the participants' reasons for not completing follow-up surveys ("Day to day life is very busy"; "Want to complete but forget or never get around to it"; "Change in your circumstances—decrease in job hours/loss job; increase in job hours, gained employment, started studying, stopped studying, change in caregiving responsibilities"; "Lost interest in the survey"; "Other") and a question assessing participants' level of functioning ("Compared to when you first completed the survey in April – this was around the beginning to middle of the most restrictive period in Australia – would you say you are going about the same, better, or worse right now? ").

Facebook Tracing

For participants whom we are not able to contact (no email response or a return to sender email; and no evidence that we reached the correct participant's phone—i.e., no identifying voicemail message or the number was disconnected), we propose attempting contact *via* Facebook. Facebook searches will be conducted to generate evidence from which to identify participants. Only publicly available information will be viewed based on information publicly visible on users' profiles, "Liked Pages," "Groups," or "Check-ins" to verify the location of the participant, compared to their last known residential address. If the study team has strong evidence to link a Facebook user with the identity of a previous participant, participants will be contacted through Facebook Messenger.

Remuneration for Participation

Research has shown benefits associated with the use of incentives in social media recruitment *via* Facebook (28, 31). Participants will be entered into a prize draw for 1 of 10 AU $50 online gift vouchers if they have completed at least one survey for every month of the survey. We have estimated vouchers based on a study of six months' duration (6 prize draws, 10 vouchers offered at each draw, a total of 60 vouchers).

Consent

Consent will be obtained at baseline. Participants will also complete separate (optional) consent to be contacted for future research participation. Participants will be informed that they are under no obligation to participate and advised that they are free to withdraw at any time without consequences.

Data Management

Study data will be managed using Qualtrics, hosted at Deakin University (32). Data will be downloaded from the Qualtrics server on a weekly basis and stored on servers maintained by Deakin University.

Measures

Table 1 provides an outline of study measures. Where possible, measures will be harmonized with the Longitudinal Study of Australian Children (LSAC), a population representative sample of Australian families. LSAC includes two cohorts of children and families recruited in 2005 and followed biennially on an ongoing basis (altogether, N = 10,000 at baseline) (52).

Demographic and COVID-19 Variables

Identifiable Information (First Baseline Survey Only)

First name, email address, mobile number, and postcode.

Demographics (Baseline Survey Only)

About adult: Age, gender, country of birth, Aboriginal and Torres Strait Islander status, language other than English spoken at home, education, relationship status, whether living with partner, and number of children in the household. Demographics prior to COVID-19: employment, study, household income, source of income, and shortage of money. Items about housing: type of dwelling, owned or rented, number of bedroom, number of people living in house, satisfaction with quality of housing, and access to private outdoor space at current home.

About partner: Gender; partner's relationship to child, employment, and education.

About child: Age, gender, and education setting.

COVID-19 Factors (Baseline and Fortnightly Survey)

Items adapted from the CoRonavIruS Health Impact Survey (CRISIS) V0.1 (33).

Household: COVID-19 diagnosis, test result, or symptoms.

About adult: Participant or family members affected by COVID-19 (fallen ill, hospitalized, self-quarantine, and passed away), financial problems or housing and food insecurity related to COVID-19, working from home, frequency and type of contact with work colleagues, impact on family life, food/medical shortages, use of media, feelings and attitudes about COVID-19, impact of COVID-19 on family life (short-answer question, "How has COVID-19 affected your family life?"), coping strategies (short-answer question, "What strategies are helping you to stay calm in the current situation?"), frequency of use of news sources (newspapers, television, social media, radio, rated on 6-point scale from 'not at all' to 'multiple times per day'), appraisals of COVID-19 as a serious health risk, and whether likely to catch COVID-19 (both rated on a 7-point scale from 'strongly disagree' to 'strongly agree').

About child: Presence of a daily routine at home, time outside home (going to stores, parks, etc.), child's relationship quality with their friends (rated on 5-point scale from 'a lot worse' to 'a lot better'). Whether school classes are running on campus, school attendance on campus or online. For children home-schooling: whether child home with parent while they work, child's internet/computer access at home, whether they have assignments to complete from home, amount of school work completed each day, and parents rating of how well they are managing child's home learning (4-point scale from 'very poorly' to 'very well').

Adult Outcomes

Wellbeing (Baseline and Fortnightly Survey)

Personal Wellbeing Index (34) (seven items). seven domains: standard of living, personal health, achieving in life, personal relationships, personal safety, community-connectedness, and future security. Example item: "How satisfied are you with … your standard of living?" Rated on a 11-point scale from 'no satisfaction at all' to 'completely satisfied'.

Personality (Baseline Survey Only)

Introvert/extrovert (one item, designed for the current study) "Do you consider yourself an introvert?" rated on a 7-point scale from 'introvert' to 'extrovert.'

Mental Health (Baseline and Fortnightly Survey)

Depression and Anxiety Scale (DASS) 21-item version (35). Three subscales: depression, stress, and anxiety (seven items each). Example item: "I found it hard to wind down." Rated on a 4-point scale from 'did not apply to me at all' to 'applied to me very much, or most of the time.'

Mental or Physical Health Diagnosis (Baseline and One Fortnightly Survey Only)

One item (baseline): "Have you ever had a professional diagnose or treat you for a mental or physical health condition? What was the condition?" One item (presented at one fortnightly survey): Have you ever been treated or diagnosed for any of the following chronic physical conditions by a health professional? Ulcerative Colitis, Crohn's disease, endometriosis, cardiovascular disease (e.g., coronary heart disease, stroke, and heart failure); hypertension (clinically high blood pressure), type 1 diabetes, type 2 diabetes, and other.

Emotion Regulation (Baseline Survey Only)

Difficulties in Emotion Regulation Scale-16 Item Version (36) (16 items). Five subscales: strategies, non-acceptance, impulse control, goals, and clarity. Example item: "I have difficulty making sense out of my feelings." Rated on a 5-point scale from 'almost never' to 'almost always.'

Positive Effect (Baseline Survey Only)

Positive Affect Subscale from the positive and negative effect schedule short form (37) (five items). Example item: "Thinking about yourself in the past 4 weeks, about how often did you feel … alert?" Rated on a 5-point scale from 'very slightly or not at all' to 'extremely.'

Physical Health (Baseline and Fortnightly Survey)

Physical activity (one item) from the Longitudinal Study of Australian Children (LSAC). Item: "About how many days each week do you do at least 30 min of moderate or vigorous physical activity (like walking briskly, riding a bike, gardening, tennis, swimming, running, etc)?" Rated from 1 to 7 days.

Sleep (one item) from LSAC. Item: "During the past month, how would you rate your sleep quality overall?" Rated on a 4-point scale from 'very good' to 'very bad.'

Substance Use (Baseline and Fortnightly Survey)

Alcohol consumption (one item) from LSAC. Item: "How often do you have a drink containing alcohol?" Rated on a 7-point scale from 'never' to 'every day.'

Cigarette smoking (one item) from LSAC. Item: "How often do you smoke cigarettes?" Rated on a 3-point scale from 'do not smoke at all' to 'at least once a day.'

Adult Attachment (Baseline Survey Only)

Experiences in Close Relationships Scale–Relationship Structures (ECR-RS) (38) (nine items). Two subscales: attachment anxiety

TABLE 1 | Overview of measures included in the COVID-19 Pandemic Adjustment Survey (CPAS).

Construct	Measure (items)	Baseline/ fortnightly
Demographics	Family demographics and socio-economic questions	Baseline
COVID-19	COVID-19 factors (adapted from the CoRonavIruS Health Impact Survey (CRISIS) V0.1. (33)	Baseline-fortnightly
Parent factors		
Well-being	Personal well-being index adult (34) (seven items)	Baseline-fortnightly
Personality	Introvert/extrovert	Baseline
Mental health	Depression and anxiety scale (DASS) 21-item version (35)	Baseline-fortnightly
	Mental or physical health diagnosis	Baseline
Emotion regulation	Difficulties in emotion regulation scale-16 item version (36)	Baseline
Positive affect	Positive and negative affect schedule short form (37) (five items)	Baseline
Physical health	Physical activity (1 item) from the Longitudinal Study of Australian Children (LSAC)[a]; sleep (one item) from LSAC	Baseline-fortnightly
Substance use	Alcohol consumption (1 item) from LSAC; cigarette smoking (one item) from LSAC	Baseline-fortnightly
Adult attachment	Experiences in close relationships scale–relationship structures (ECR-RS) (38) (nine items)	Baseline
Resilience	Brief resilience scale (BRS) (39) (six items)	Baseline
Loneliness	UCLA loneliness scale (40) (six items)	Baseline-fortnightly
Utopian thinking	Utopian thinking (one item)	Baseline
Family functioning		
Family expressiveness	Adapted short-form of the self-expressiveness in the family questionnaire (41) (11 items)	Baseline-fortnightly
Stressful life events	Stressful life events over the past 12 months (42) (nine items)	Baseline
Couple conflict	Argumentative relationship scale used in LSAC (43) (five items)	Fortnightly
Relationship quality	Perceived relationships quality component (PRQC) questionnaire (44) (baseline survey, six items; fortnightly survey, one item only).	Baseline
Social support	Social support (1 item) from LSAC; social provisions scale (one item) (45); secure base characteristics scale (one item) (46)	Baseline-fortnightly
Neighbourhood disadvantage	Postcodes used to derive the Socio-Economic Indexes for Areas (SEIFA) advantage and disadvantage (47)	Baseline
Parenting	Interpersonal mindfulness in parenting (IEM-P) (48) (three items); Emotion-focussed parenting (three items); parenting irritability from LSAC (49) (five items)	Baseline-fortnightly
Child outcomes		
Physical health	Global child health	Baseline-fortnightly
Child diagnosis	Professional diagnosis or treatment	Baseline
Mental health	The short mood and feelings questionnaire (SMFQ) (50) (13 items); modified brief spence children's anxiety scale (51) (four selected items); SNAP-IV 26-item parent rating scale, opposition/defiance (four selected items). Irritability (one item) and loneliness (one item) adapted from the CoRonavIruS Health Impact Survey (CRISIS) [28]	Baseline-fortnightly
Mood	Child mood (eight items) (fortnightly survey only)	
Physical health	Physical activity (one item) adapted from LSAC; sleep pattern and regularity (two item) from LSAC	Baseline-fortnightly
Screen-time	Screen time (two items) from LSAC	Baseline-fortnightly
Intervention		
Interest in online interventions	Likelihood of using an online intervention (one item)	Baseline-fortnightly
Type online intervention	Likelihood of using self-guided or therapist assisted online mental health intervention (two items)	Baseline-fortnightly

The Longitudinal Study of Australian Children (LSAC) is a population-representative government-funded study comprising of two cohorts of children and their families recruited in 2005 and followed biennially (together, N = 10,000).

and attachment avoidance. Example item: "It helps to turn to people in times of need." Rated on a 7-point scale from 'strongly disagree' to 'strongly agree.'

Resilience (Baseline Survey Only)
Brief resilience scale (BRS) (39) (six items). Example item: "I tend to bounce back quickly after hard times." Rated on a 5-point scale from 'strongly disagree' to 'strongly agree.'

Loneliness (Baseline and Fortnightly Survey)
UCLA loneliness scale (40) (six items). Example item: "I lack companionship." Rated on a 4-point scale from 'never' to 'always.'

Utopian Thinking (Baseline and Fortnightly Survey)
Utopian thinking (one item). Item: "I often think about what an ideal society might look like." Rated on a 7-point scale from 'strongly disagree' to 'strongly agree.'

Family, Couple, and Parenting Outcomes

Family Expressiveness (baseline and fortnightly survey)
Adapted short-form of the Self-Expressiveness in the Family Questionnaire (41) (11 items were selected according to a consensus of three independent expert ratings evaluating item relevance in relation to the COVID-19 pandemic). Two subscales: positive and negative expressiveness. Example item: "Showing contempt for another's actions." Rated on a 9-point scale from 'not at all frequently in my family' to 'very frequently in my family.'

Stressful Life Events (Baseline Survey Only)
Stressful life events over the past 12 months (42) (eight items). Example items: "In the last year, have any of the following happened to you (or your partner)? You became pregnant or had a baby; You moved house." Items rated Yes/No.

Couple Conflict (Baseline and Fortnightly Survey)
Argumentative Relationship Scale used in LSAC (43) (five items). Example item: "How often do you and your partner disagree about basic household issues?" Rated on a 5-point scale from 'never' to 'always.'

Relationship Quality (Baseline and Fortnightly Survey)
Perceived Relationships Quality Component (PRQC) *Questionnaire* (44) (six items measured in baseline survey and one item in fortnightly survey). Example item (and item in fortnightly survey): "How satisfied are you with your relationship?" Rated on a 7-point scale from 'not at all' to 'extremely.'.

Social Support (Baseline and Fortnightly Survey)
Social support (one item) from LSAC. Item: "Overall how do you feel about the amount of support or help you get from family or friends living elsewhere?" Rated on a 4-point scale from 'I get enough help' to 'I don't get any help at all' and 'I don't need any help.'

Social Provisions Scale (45) (one item selected). Item: "When I am feeling stressed about a new or unknown situation, I can rely on my partner to comfort me." Rated on a 7-point scale from 'strongly disagree' to 'strongly agree.'

Secure Base Characteristics Scale (46) (one item selected). Item: "My partner encourages me to draw on my skills and abilities to deal with challenges". Rated on a 7-point scale from 'strongly disagree' to 'strongly agree.'

Neighborhood Disadvantage (Baseline Survey Only)
Postcodes used to derive neighborhood disadvantage according to the Socio-Economic Indexes for Areas (SEIFA) advantage and disadvantage (47).

Parenting (Baseline and Fortnightly Survey)
Interpersonal Mindfulness in Parenting (IEM-P) (48) (three items). Example item: "When I'm upset with my child, I notice how I am feeling before I take action." Rated on a 5-point scale from 'almost never' to 'almost always.'

Emotion-Focused Parenting (three items). Example item: "When my child experiences strong emotions (sad, angry, scared), I connect with them and provide comfort and support." Rated on a 5-point scale from 'almost never' to 'almost always.'

Parenting Irritability (five items) from LSAC. Example item: "In the past 6 months, how often would you say … I have raised my voice with or shouted at this child." Rated on a 10-point scale from 'not at all' to 'all the time.'

Child Outcomes

Physical Health (Baseline and Fortnightly Survey)
Global child health from LSAC. Item: "In general, is your child's current health…" Rated on a 5-point scale from 'excellent' to 'poor.'

Child Diagnosis (Baseline Survey Only)
Professional diagnosis or treatment (one item). Item: "Has your child ever been diagnosed or treated for any of the following by a health professional?" Response options (rated Yes/No): ADHD; autism, Asperger's, other autism spectrum; oppositional defiant or conduct disorder; speech or language disorder; head injury, epilepsy, seizure (s), febrile convulsions; disability; and other (free text).

Mental Health (Baseline and Fortnightly Survey)
The Short Mood and Feelings Questionnaire (SMFQ) (50) (13 items). One scale: Depression. Example item: "Your child felt miserable or unhappy." Rated on a 3-point scale from 'not true' to 'true.'

Modified Brief Spence Children's Anxiety Scale (51) (four selected items). One scale: Anxiety. Example item: "My child worries about things." Rated on a 4-point scale from 'never' to 'always'.

Swanson, Nolan, and Pelham –IV Questionnaire (SNAP-IV) (53) *Parent Rating Scale*, *Opposition/Defiance Subscale* (four selected items). Example item: "Often actively defies or refuses adult requests or rules" Rated on a 4-point scale from 'not at all' to 'very much.'

Loneliness (one item) adapted from the CoRonavIruS Health Impact Survey (CRISIS) (33). Item: "During the past 2 weeks, how lonely has your child been?"

Irritability (one item) adapted from the CoRonavIruS Health Impact Survey (CRISIS) (33) Item: "During the past 2 weeks, how irritable or easily angered has your child been?"

Child mood (eight items) (fortnightly survey only). Item: "Please indicate below how your child is feeling: happy, sad, content, bored, excited, anxious, alert, tired." Rated on a 11-point scale from 'not at all' to 'very much.'

Physical Health (Baseline and Fortnightly Survey)

Physical activity (one item) adapted from LSAC. Item: "About how many days each week does your child do at least 30 min of moderate or vigorous physical activity (like walking briskly, riding a bike, swimming, running, etc)?" Rated from 1 to 7 days.

Sleep pattern (one item) from LSAC. Item: "How much is your child's sleeping pattern or habits a problem for you?" Rated on a 4-point scale from 'not a problem at all' to 'a large problem.'

Sleep regularity (one item) from LSAC. Item: "Does the study child go to bed at regular times?" Rated on a 5-point scale from 'never' to 'always.'

Screen-Time (Baseline and Fortnightly Survey)

Screen time (two items) adapted from LSAC. "About how many hours on a typical weekday does your child watch TV or videos at home not for educational purposes? (e.g., YouTube, Instagram, TikTok, streaming services such as Netflix)." Rated on a sliding scale from 1 to 24 hours.

Intervention Willingness (Baseline and Fortnightly Survey)

Online intervention (three items). Items: "The COVID-19 pandemic and the associated measures to increase social distancing have caused many people to feel stressed and worried. How likely would you be to use an online or smartphone intervention for the following reasons: Mental health support for yourself, mental health support for your child, and parenting support." Rated on a 5-point scale from 'not at all' to 'extremely likely.'

Mental health intervention (two items). Items: "Should you experience a mental health difficulty in the future, how likely are you to use a … Self-guided internet- or smartphone-app based treatment program? Therapist-assisted internet- or smartphone-app based treatment program?" Rated on a 5-point scale from 'extremely likely' to 'extremely unlikely.'

Analysis Approach

Quantitative Data

Data Preparation

Data will be prepared in Stata version 16 (54). Missing data will be addressed using either full information maximum likelihood estimation or multiple imputation by chained equations, depending on the analysis. Both methods rely on the untestable assumption that missingness is ignorable. Sensitivity analyses (e.g., in the form of selection models or pattern mixture models) will be conducted to evaluate impact of violation of this assumption on modeled results (55).

Data Analysis

Analyses will be conducted in Stata version 16, or where relevant, in Mplus version 8 (56). The planned approach for testing Aims 1–3 is outlined below. Where relevant, all associations will be investigated in unadjusted analyses, and then in adjusted analyses, the latter controlling for the baseline effects of factors known to be associated with adult socio-emotional adjustment (gender, age, health, family demographic factors). Decisions about the inclusion of specific covariates in each model will be made using directed acyclic graphs (DAGs) (57). Associations will be analyzed using multilevel modeling in either a latent variable or mixed effects framework to: (i) account for the clustered nature of time points within individuals while (ii) also modeling between-individual differences in rate of change over time. In these models, we will regress an outcome (e.g., mental health) on to 'time,' any moderator variables of interest, and background covariates. We anticipate 'time' being treated as a continuous predictor in all models (with the baseline time-point coded as 0 and then numbered consecutively), but we will also consider treating 'time' as a categorical variable with discrete categories of time demarcated by important events that may occur during the pandemic window. The influence of potential moderators on the relationship between these associations will be investigated by including interaction terms (e.g., moderator x time).

Population Weighting

We will use post-stratification weights, generated through a raking approach (58) to compensate for differences between the final sample and the national population across geographic community clusters, parent age, gender, educational attainment, and country of birth (Australia/New Zealand versus other). We will ensure that strata sample sizes are large enough to not unduly influence the overall results.

Power Calculation

Power is demonstrated for our key analyses involving within person relationships during the longitudinal study. Given the clustered nature of the study of time points nested within participants, the Effective Sample Size (ESS) for the study is given by $ESS = nm/(1+(m-1)\rho)$ (59), where n = number of participants aiming to be recruited, m = number of data points per cluster, and ρ = the within cluster correlation. Based on a 6-month window of data collection and fortnightly assessments (estimated 14 assessments), the smallest sample of 400 participants (parents of a child 0–4 years) has an ESS = 746 assuming a conservative within cluster correlation of $\rho = .5$. Using Monte Carlo simulation (10,000 draws) in Mplus 8, an ESS = 746 would provide 98.2% power to detect a true effect of interest (e.g., time related change in parent mental health problems) of even small magnitude ($\beta = .14$, representing just ~2% extra variance accounted for in the outcome above a base level of ~10% by other variables in the model; at $\alpha = .05$, two-tailed). Thus, the study is well powered for even small true effects of interest. Note that even if participants only complete two of the assessments (ESS = 533), this would still provide 92.7% power to detect the above-mentioned effect for our smallest age stratified group (parents of a child 0–4 years). Additionally, for

any between person relationships (e.g., differences between families), even the minimum sample size of 400 would provide 84.8% power to detect effects of the above-mentioned size. Thus, the study is well powered.

Qualitative Analysis

Qualitative data will be analyzed using thematic analyses to determine the common themes that arise from the participant answers to the two short-answer questions posed regarding parent's coping strategies and impact of COVID-19 on family life (60), Thematic analysis is a method of analyzing qualitative data that is focused on identifying, examining, and recording major patterns or themes in the data.

Research Study Administration

Ethics Statement

The current study has been approved by the Deakin University Human Ethics Advisory Group (Project number: HEAG-H 52_2020).

Ethical Issues

We use brief screening measures to assess adult and child functioning. These measures are routinely used in population-level, large scale, longitudinal surveys, but are not designed to collect clinical information, thus the scales cannot be used to diagnose physical or mental health conditions. Participants will be provided with a Plain Language Statement that outlines the key constructs assessed in the study, reminds participants they can withdraw at any time, and provides information on where participants can seek help if any of the questions do cause them discomfort or distress. It will be possible for participants to skip any of the questions/items in the survey, and to facilitate this, none of the special case assessment items on the online survey form will be coded as a 'forced' answer. In the event that a participant expresses significant risk to themselves or others (e.g., suicidal ideation) in free-text comments, such as in the qualitative data, the lead investigator (EW), a registered clinical psychologist, will contact the participant to offer information on support services and referral options.

Dissemination of Outcomes

Results will be disseminated in peer reviewed journals, *via* the media, online, and at academic conferences. A plain language summary of results from the study will be made available to participants upon request. Participants are advised of the process to request a plain language summary of the results in the Plain Language Statement.

Future Research and Data Sharing

Participants are invited to provide optional consent to be contacted for future research, such as further follow-up beyond 6 months. This process would involve a new ethics application. Participants will also be invited to consent to their de-identified information being stored on public repositories for the purposes of data sharing. If consent is provided, participant data will be stored securely. All information about the study (including publication preprints, data access, and analytic code) will be available at https://osf.io/78g5t/.

Project Closure

At the conclusion of the study, recruitment materials, the project landing page, and online survey materials will be deactivated or removed. All data will remain securely stored on Deakin University servers. Information collected in this research project involves children who are under 18 years old, thus data will be kept until the youngest child turns 33 years of age.

Recruitment Progress

The study was launched on the 8th of April, 2020. As at the 26th of April, 2,375 eligible participants had completed the baseline survey.

Discussion

The COVID-19 pandemic presents significant risks to the mental health and wellbeing of Australian families. This project seeks to investigate the manifold impacts of the pandemic, including the impacts for families in regards to job loss, employment conditions, home-schooling, and unprecedented lifestyle changes associated with social distancing measures. Chronic stress and social isolation have potential risks for adult mental health, couple and family relationships, and children's health and development (8–13). The novel contribution of the current study will be the repeated measures design, which will facilitate the tracking of changes in mental health over time in relation to the developing situation around the world.

This project is designed to provide timely information to government and communities on the mental health effects of the emerging COVID-19 crisis on Australian parents and children. This information can then be used to inform the development of assessment and screening tools to identify those parents, families, and children who may be most at risk. Furthermore, the findings of this research can guide health practitioners and policy makers regarding the factors that should be the focus of clinical and public health interventions to reduce risks of adult mental health, family breakdown, and child maladjustment when faced with such health crises in the future. Finally, the findings from this study can be used to develop practical information and advice for families in how to deal with such crises and create positive family environments to buffer against mental health problems, family dysfunction, and child maladjustment.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Deakin University Human Ethics Advisory Group (project number: HEAG-H 52_2020). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

All authors contributed to the conceptualization of the study, drafting of the study protocol, and selection of survey items/measures. EW drafted the manuscript, and together with TB, developed all study materials, including the online Qualtrics survey and the study adverts. EW, GK, JAM, LO, GY, CG, AM-W, ES, SE, MF-T, RC, DH, GM, JF, ST, AW, JT, TB, JL, PE, MS, and CO wrote or revised sections of the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Health Anxiety and Mental Health Outcome During COVID-19 Lockdown in Italy: The Mediating and Moderating Roles of Psychological Flexibility

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The COVID-19 emergency has severely affected the Italian population. During a pandemic, those with high health anxiety are at risk of adverse mental health outcomes, including peritraumatic distress and mood disturbance. No prior research has explored the role of psychological flexibility in protecting people at high risk of poorer mental health impacts due to health anxiety during a pandemic. Psychological flexibility is the cornerstone of psychological health and resiliency. According to acceptance and commitment therapy (ACT), it involves behaving consistently with one's chosen values even in the presence of emotional and mental discomfort. This study examined the mediating and moderating roles of psychological flexibility in the link between trait health anxiety and three mental health outcomes: COVID-19 peritraumatic distress, anxiety, and depression. We hypothesized that higher psychological flexibility would decrease the negative impacts of trait health anxiety on mental health outcomes. During the mandatory national lockdown (M = 35.70 days, SD = 8.41), 944 Italian adults (75.5% female, M = 38.86 years, SD = 13.20) completed an online survey consisting of standardized measures of psychological flexibility, trait health anxiety, COVID-19 distress, anxiety, and depression. Results indicated that psychological flexibility did not moderate the link between trait health anxiety and mental health outcomes. Rather, greater psychological flexibility mediated decreases in the adverse effects of trait health anxiety on COVID-19 distress, anxiety, and depression. In particular, two psychological flexibility processes, observing unhelpful thoughts rather than taking them literally (defusion) and values-based action (committed action), mediated decreases in the negative effects of trait health anxiety on all mental health outcomes. In contrast, the psychological flexibility process acceptance, which involves openness to inner discomfort, mediated increases in negative mental health outcomes. Overall, the combination of these processes mitigated the detrimental impacts of trait health anxiety on mental health during the emergency mandatory COVID-19 nationwide lockdown. Consistent with the ACT conceptualization of psychological flexibility, findings

suggest embracing (rather than avoiding) inner discomfort and observing associated unhelpful thoughts, while also engaging in values-based action, increases resilience during adversity. Evidenced-based large-scale online public health interventions that target psychological flexibility in those experiencing health anxiety in the context of a pandemic are urgently needed. Many empirically-based ACT interventions are suited for this purpose.

Keywords: health anxiety, COVID-19, pandemic, depression, anxiety, psychological flexibility, quarantine

INTRODUCTION

The coronavirus disease 2019 (COVID-19) outbreak caused by SARS-CoV-2 has severely affected the Italian population which was subjected to extreme and unprecedented social distancing measures for almost 2 months (Remuzzi and Remuzzi, 2020). In order to contain the spread of COVID-19, the Italian government on March 9 implemented a national lockdown in which movements outside one's city were forbidden and all Italians were required to stay home and refrain from any social contact with friends and relatives outside their household (Lazzerini and Putoto, 2020). Schools and universities and all "non-essential" industries and retail stores had to remain closed until May 4, and traveling was only permitted for work (where work from home was not possible), health care, or other basic necessities (e.g., obtaining groceries) (Government of Italy, 2020). Mandatory quarantine was required to reduce the exponential spread of the virus and to alleviate the pressure on the healthcare system. However, the pandemic itself and prolonged home confinement may negatively impact mental health, due to fear of contracting the disease, large-scale social isolation, and the saturation of news and social media with negative COVID-19 information (Asmundson and Taylor, 2020b; Brooks et al., 2020; Garfin et al., 2020). During the mandatory lockdown, Italy registered over 28,884 deaths due to COVID-19 (Italian Ministry of Health, 2020).

Investigation of the impacts of the pandemic on mental health has been identified as a high research priority (Holmes et al., 2020). Preliminary data suggest that elevated anxiety and depressive symptoms and sleep impairment are very common (Rajkumar, 2020; Xiao et al., 2020a,b). Two of the first studies conducted during the Chinese national lockdown indicated that 35% experienced mild to severe COVID-19 peritraumatic distress (N = 52,730; Qiu et al., 2020), 54% rated the psychological impact of the outbreak as moderate to severe, 16.5% endorsed moderate to severe depressive symptoms, and 28.8% moderate to severe anxiety symptoms (N = 1,210; Wang et al., 2020). Another study conducted on an Italian sample of 18,147 indicated that 37% of participants experienced post-traumatic stress, while 21–23% reported high anxiety, perceived stress, insomnia, and adjustment disorders (Rossi et al., 2020). In view of these data on the adverse effects of the COVID-19 pandemic on mental health, the purpose of the present study was to explore the role of psychological flexibility in protecting people at high risk of poorer mental health impacts due to elevated health anxiety during the COVID-19 pandemic and lockdown.

Health Anxiety During a Pandemic

Given the extremely high COVID-19 infection rate and relatively high mortality, individuals with higher health anxiety are at increased risk for elevated peritraumatic stress, anxiety, and depression (Taylor, 2019; Ahorsu et al., 2020; Asmundson and Taylor, 2020a,b; Rossi et al., 2020; Wang et al., 2020). Health anxiety has been measured as state and trait, with the latter being conceptualized as a relatively stable dispositional individual difference (Taylor, 2019). It is defined as excessive awareness of one's bodily sensations, such as those related to viral infections (e.g., fever, coughing and aching muscles), and the persistent propensity to attribute them to a sign of a severe medical condition (Salkovskis et al., 2002; Asmundson et al., 2010; Asmundson and Taylor, 2020b).

Consistent with cognitive behavior therapy theory, health anxiety symptoms occur on a continuum, from mild to severe, and contribute to hypochondriasis and other somatic and illness anxiety disorders (Fava et al., 2000; Salkovskis et al., 2002; Sirri et al., 2008; Asmundson et al., 2010; Taylor, 2019). During a pandemic people typically receive a great amount of information about the virus from the media, which is likely to intensify health anxiety in those who are vulnerable to such symptoms (Asmundson et al., 2010; Sirri et al., 2015; Garfin et al., 2020; Gao et al., 2020). In particular, people who had high trait health anxiety before the COVID-19 pandemic are likely to be at increased risk for adverse mental health outcomes, as their tendency to misinterpret bodily sensations (e.g., coughing) could evoke a profound fear of having contracted the virus (Wheaton et al., 2012; Taylor, 2019; Asmundson and Taylor, 2020a,b; Li et al., 2020; Rajkumar, 2020).

While there is some evidence of an association between higher health anxiety and greater negative mental health outcomes during a pandemic (Wheaton et al., 2012; Blakey and Abramowitz, 2017), no published study has examined the mediating or moderating roles of protective psychological factors in this relationship. Therefore, the purpose of the present study was to explore the mediating and moderating effects of psychological flexibility on the adverse impacts of health anxiety on mental health outcomes during a pandemic lockdown.

Psychological Flexibility

Psychological flexibility is the cornerstone of psychological health and is positively related to resiliency (Kashdan and Rottenberg, 2010). A psychological flexibility model underpins one of the most promising contemporary variants of cognitive behavior therapy, Acceptance and Commitment Therapy

(ACT; Hayes et al., 2012). According to the ACT model, psychological flexibility involves behaving consistently with one's chosen values even in the presence of unwanted intrusive internal experiences such as emotional discomfort or self-critical thinking. ACT uses six interrelated core processes to increase psychological flexibility: (1) acceptance: openness to experience, (2) cognitive defusion: observing thoughts rather than taking them literally, (3) present moment awareness (mindfulness): open and responsive awareness of the present, (4) self-as-context: flexible self-awareness and perspective taking, (5) values: freely chosen personally meaningful life directions, (6) committed action: values-guided effective action.

ACT is as an empirically supported treatment for a range of mental health problems (see reviews, Hayes et al., 2006; Powers et al., 2009; Ruiz, 2010; Swain et al., 2013; A-tjak et al., 2015; Spijkerman et al., 2016). ACT has also been effective in the context of community disasters. For example, an ACT-based self-help program effectively reduced psychological distress among war refugees (Tol et al., 2020). In a randomized controlled trial, ACT intervention participants with severe health anxiety evidenced a greater reduction in symptoms compared to the control group, and these intervention effects were mediated by psychological flexibility (Eilenberg et al., 2016, 2017). In addition, lower psychological flexibility has been found to predict trauma and mental health problems in the context of natural disasters, school shootings, and violent crimes (e.g., Gold et al., 2007; Kumpula et al., 2011; Marshall and Brockman, 2016). Nevertheless, few studies have examined the mediating and moderating roles of each of the six core psychological flexibility processes on mental health outcomes, particularly during a pandemic (Rolffs et al., 2018; Makriyianis et al., 2019; Rogge et al., 2019; Stabbe et al., 2019; Lin et al., 2020).

Nature of the Role of Psychological Flexibility in the Link Between Health Anxiety and Mental Health During a Pandemic Lockdown

As a protective factor, psychological flexibility may influence the link between health anxiety and mental health via mediating or moderating mechanisms. We found no published theoretical or empirical data on either the mediating or moderating role of psychological flexibility in the link between health anxiety and mental health outcomes in general, or in the context of a pandemic. However, in the broader literature psychological flexibility has been examined as both a mediator and a moderator (Masuda et al., 2011; Fischer et al., 2016; Novaes et al., 2018; Makriyianis et al., 2019; Ramaci et al., 2019; Pakenham et al., 2020). Studies that have examined psychological flexibility as a mediator have in the main tested models where the independent variable is typically a stable personality characteristic or a risk factor related to a personality trait (e.g., self-concealment, Masuda et al., 2011; early maladaptive schemas, Fischer et al., 2016; adverse childhood experiences, Makriyianis et al., 2019), and the dependent variable is a mental health outcome, most frequently depression or anxiety. In the only published study that has examined both the mediating and moderating roles of psychological flexibility with respect to a personality characteristic (e.g., early maladaptive schemas; Fischer et al., 2016), the mediation model was stronger than the moderation model.

Alternatively, studies that have examined psychological flexibility as a moderator have mostly tested models where the independent variable is a contextual risk factor rather than a personality characteristic, including work stressors (Ramaci et al., 2019), job demands (Novaes et al., 2018), and COVID-19 risk factors (Pakenham et al., 2020). Regarding the latter, psychological flexibility mitigated the adverse effects of COVID-19 pandemic and lockdown risk factors on mental health via a moderation pathway.

The present study examined the role of psychological flexibility, including its six processes, as mediators and moderators of the effects of health anxiety on the mental health outcomes of COVID-19 peritraumatic distress, anxiety, and depression. In this study the independent variable in the mediation model is trait health anxiety, which is closely related to personality pathology dimensions (e.g., neuroticism) (Taylor, 2019; Skjernov et al., 2020). Furthermore, given the research findings showing that trait anxiety is associated with maladaptive avoidance (Fava et al., 2000) and impaired cognitive flexibility and prefrontal control (Eysenck et al., 2007; Bishop, 2009; Park and Moghaddam, 2017; Wilson et al., 2018), we reasoned that trait health anxiety in the context of a pandemic is likely to diminish psychological flexibility, which in turn accounts for the adverse effects of health anxiety on mental health outcomes.

Given that psychological flexibility has been shown to mediate and moderate the effects of personality characteristics and contextual risk factors on mental health respectively, we predicted that psychological flexibility would emerge as a mediator rather than a moderator in the link between trait health anxiety and mental health. Specifically, we hypothesized that higher global psychological flexibility would reduce the negative impacts of trait health anxiety on mental health outcomes via a mediation rather than a moderation mechanism. We did not make specific predictions about the effects of each of the six psychological flexibility processes on the link between trait health anxiety and mental health because they are contextually sensitive, and in the context of a pandemic and lockdown it is unclear how each of these may function. However, we expected the overall impact of the six processes would result in global psychological flexibility reducing the adverse effects of trait health anxiety on mental health.

MATERIALS AND METHODS

Participants and Recruitment Procedure

A total of 944 respondents completed an online survey during the Italian mandatory lockdown. Inclusion criteria were living in Italy and being at least 18 years of age. Exclusion criteria were living outside of Italy during lockdown and being under 18 years of age. Participants were recruited through social media (e.g., Facebook, WhatsApp, etc.) and a snowballing procedure whereby participants were asked to invite friends in similar circumstances

to participate in the study. The survey was advertised as research designed to examine the psychological impacts of the COVID-19 pandemic. Recruitment information stated that participation was voluntary, anonymous, and that withdrawal from the study was possible at any time. The survey was developed with the Qualtrics software and took approximately 15–20 min to complete. Participants clicked the link in the advertisement and, after providing active online informed consent, completed the survey. Participants were required to complete an item before proceeding to the next item. Due to the online survey methodology and recruitment primary by social network, it was not possible to calculate a response rate. The study was approved by the University of Bologna ethics committee.

Measures

Demographics

Participants indicated their age (date of birth), gender (female vs. male), education (elementary school, middle school, high school diploma, bachelor's degree, master's degree, specialization, or PhD), marital status (single, married/in domestic partnership, widowed, separated/divorced), employment (employed, unemployed, student, retired) and ethnicity (Italian: yes/no or specify). To gauge socio-economic status, participants were asked to indicate whether they were below, average, or above the mean income of the population.

COVID-19 Lockdown Variables

The following information was obtained on participants' lockdown experiences: number of days in lockdown, number of people in the household, living alone during lockdown, perception of available personal space (i.e., "Is the size of your home enough to guarantee your personal space, despite the mandatory lockdown, such as number of rooms in relation to the people you live with?" rated on a 5-point Likert scale from 1 = *not at all* to 5 = *very much*), lost work or in redundancy fund because of lockdown, COVID-19 infection in self and other people (family members, close others, roommates, or friends), severity of COVID-19 symptoms (rated on a 5-point Likert scale from 1 = *not at all serious* to 5 = *very serious*), hospitalization of significant others (family members, close others, roommates, or friends), and death of loved ones due to COVID-19.

Trait Health Anxiety

The trait version of the Short Health Anxiety Inventory (SHAI; Salkovskis et al., 2002), a self-report questionnaire composed of 18 items, was used to assess trait health anxiety. Each item presents a specific health anxiety symptom, such as worry about health, awareness of bodily sensations or changes, and feared consequences of having an illness. Participants rated the frequency of their anxiety symptom during the last 6 months on a 4-point scale (0 = "I do not worry about my health," 1 = "I occasionally worry about my health," 2 = "I spend much of my time worrying about my health," and 3 = "I spend most of my time worrying about my health"). Items are summed, with higher scores indicating higher trait health anxiety (range 0–54). A cut-off score of 18 has been commonly used to indicate a moderate level of trait health anxiety, while a score of 27 indicates a higher probability of meeting *DSM-IV* criteria for hypochondriasis (Alberts et al., 2013). For the purpose of this study, the SHAI scale was translated into Italian by a bilingual translator and two authors of this report. The SHAI has shown sound psychometric properties including good reliability and validity in clinical and non-clinical populations (Salkovskis et al., 2002; Abramowitz et al., 2007; Alberts et al., 2013). Because the SHAI has not been validated in Italian, we ran a confirmatory factor analysis (CFA) with the robust maximum likelihood estimator (MLR; Muthén and Muthén, 1998–2018). Fit indices of the CFA of the Italian SHAI were satisfactory for the original one-factor model: χ^2 (129) = 409.117, $p < 0.001$; CFI = 0.925; TLI = 0.911; RMSEA = 0.048; RMSEA CI = [0.043, 0.053]; SRMR = 0.043 (factor loadings are reported in **Supplementary Table A**). The Italian SHAI demonstrated good internal consistency ($\alpha = 0.84$) in the current sample.

Psychological Flexibility

We used the psychological flexibility dimension of The Multidimensional Psychological Flexibility Inventory (MPFI; Rolffs et al., 2018) to assess psychological flexibility and its constituent six core processes: Acceptance (e.g., "I tried to make peace with my negative thoughts and feelings rather than resisting them" and "I opened myself to all of my feelings, the good and the bad"), Present Moment Awareness (e.g., "I was in tune with my thoughts and feelings from moment to moment" and "I strived to remain mindful and aware of my own thoughts and emotions"), Self-as-context (e.g., "Even when I felt hurt or upset, I tried to maintain a broader perspective" and "When something painful happened, I tried to take a balanced view of the situation"), Defusion (e.g., "I was able to step back and notice negative thoughts and feelings without reacting to them" and "When I was scared or afraid, I was able to gently experience those feelings, allowing them to pass"), Values (e.g., "I was very in-touch with what is important to me and my life" and "My deeper values consistently gave direction to my life"), and Committed Action (e.g., "Even when I stumbled in my efforts, I didn't quit working toward what is important" and "I didn't let my own fears and doubts get in the way of taking action toward my goals"). Participants rated the extent to which they agreed with each item on a 6-point Likert scale ranging from 1 (*never true*) to 6 (*always true*). Scores are averaged and higher scores indicate higher flexibility on the global psychological flexibility score and on the six psychological flexibility processes. The Italian version of this scale is currently under validation by some authors of this report. The MPFI has demonstrated good reliability and validity in clinical and non-clinical samples (Lin et al., 2020; Rogge et al., 2019; Stabbe et al., 2019). In the derivation study, the Cronbach's alpha for the global psychological flexibility scale was 0.91 and the alpha in the present study was 0.94. Individual subscales also had high alphas in the original investigation (ranging from 0.89 to 0.93) and the range in the present study was 0.85–0.94. Because the MPFI has not yet been validated in Italian, we ran a CFA with the robust maximum likelihood estimator (MLR; Muthén and Muthén, 1998–2018) on the psychological flexibility dimension of the instrument. Fit indices for the original six-factor model were satisfactory: $\chi^2(397) = 1542.769$,

$p < 0.001$; CFI = 0.937; TLI = 0.931; RMSEA = 0.055; RMSEA CI = [0.052, 0.058]; SRMR = 0.084 (factor loadings are reported in **Supplementary Table B**).

COVID-19 Peritraumatic Distress

The COVID-19 Peritraumatic Distress Index (CPDI; Qiu et al., 2020) is a self-report questionnaire composed of 24 items that assess COVID-19 peritraumatic distress symptoms. The measure was developed to evaluate COVID-19 distress in China. The English version was made available by the authors of the measure and was translated into Italian by a bilingual translator and two authors of this report. Items examine the frequency of anxiety, depression, specific phobias, cognitive change, avoidance, compulsive behavior, physical symptoms, and loss of social functioning in the past week (e.g., "I can't stop myself from imagining myself or my family being infected and feel terrified and anxious about it," "I feel empty and helpless no matter what I do," and "During this COVID-19 period, I often feel dizzy or have back pain and chest distress"). Items are rated on a 5-point Likert scale ranging from 0 (*never*) to 4 (*most of the time*). Scores are summed (total score range 0–100) with higher scores indicating higher COVID-19 peritraumatic distress. Chinese normative data revealed the following ranges for the total score: 28–51 mild to moderate distress and ≥ 52 severe distress. The CPDI demonstrated satisfactory reliability and content validity in the derivation study (Qiu et al., 2020). Because the CPDI has not been validated in Italian, we ran a CFA with the robust maximum likelihood estimator (MLR; Muthén and Muthén, 1998–2018). Fit indices of the CFA of the Italian CPDI were adequate for a one-factor model: $\chi^2(276) = 6{,}307.124$, $p < 0.001$; CFI = 0.914; TLI = 0.900; RMSEA = 0.048; RMSEA CI = [0.044, 0.052]; SRMR = 0.047. However, five items did not comply with the item loading criteria ≥ 0.32 and were eliminated (items 5, 8, 9, 10, and 11). A second CFA was conducted on the remaining 19 items leading to a one-factor solution with satisfactory fit: $\chi^2(146) = 487.400$, $p < 0.001$; CFI = 0.933; TLI = 0.922; RMSEA = 0.050; RMSEA CI = [0.045, 0.055]; SRMR = 0.040 (factor loadings are reported in **Supplementary Table C**). The Cronbach's alpha for the final Italian CPDI was 0.90 in this sample.

Anxiety

The General Anxiety Disorder Scale (GAD-7; Spitzer et al., 2006) is a widely used self-report questionnaire measuring general anxiety symptoms over the past 2 weeks. It is composed of 7 items (e.g., "Not being able to stop or control worrying") evaluated on a 4-point Likert scale, ranging from 0 (*not at all*) to 3 (*nearly every day*). Scores are summed with higher scores indicating higher anxiety symptoms. We used the Italian version of the GAD-7 developed by the MAPI Research Institute (Kroenke and Spitzer, 2010). This measure has good psychometric properties (Löwe et al., 2008; Plummer et al., 2016). The Cronbach's alpha in this sample was 0.90. Normative data show the following ranges for the total score: minimal (0–4), mild (5–9), moderate (10–14), and severe (15–21) anxiety symptoms (Spitzer et al., 2006).

Depression

The Patient Health Questionnaire (PHQ-9; Spitzer et al., 1999) is a widely used self-report measure of depressive symptomatology over the past 2 weeks. It is composed of 9 items (e.g., "Feeling down, depressed, or hopeless") evaluated on a 4-point Likert scale, from 0 (*not at all*) to 3 (*nearly every day*). Scores are summed with higher scores indicating higher depression, ranging from minimal (0–4), mild (5–9), moderate (10–14), moderately severe (15–19), to severe (20–27) levels of depressive symptoms. We used the Italian validated version of the PHQ-9 (Mazzotti et al., 2003). This measure has demonstrated sound psychometric properties (Manea et al., 2012). Cronbach's alpha in this sample was 0.87.

Data Analysis

All analyses were performed in IBM SPSS 24 using the Process macro v.3.4. Regression diagnostics were conducted according to the recommendations of Darlington and Hayes (2017). Outliers were identified using *t*-residual distributions. Pearson's and Spearman's correlations were conducted between trait health anxiety, psychological flexibility and its six processes, all mental health outcomes, and potential confounding variables (i.e., gender and age), which we later controlled for in mediation and moderation analyses. We also reported descriptive data on levels of trait health anxiety, anxiety, and depression relative to norms. For the Italian modified CPDI, we calculated the mean and *SD* for the total sample. Participants who scored one *SD* above the mean were deemed to fall in the mild to moderate range of clinically significant COVID-19 distress and those who scored two *SDs* above the mean were regarded as falling in the severe range of clinically significant COVID-19 distress. To test the mediational role of psychological flexibility (M) in the link between trait health anxiety and all mental health outcomes, three simple mediational analyses were performed with Process Model 4 (Hayes, 2018), one for each dependent variable (i.e., COVID-19 peritraumatic distress, anxiety, and depression). Process Model 4 enables testing of the direct and indirect effects with a single mediator or multiple mediators in parallel (Hayes, 2018). Indirect effects were analyzed by computing bias-corrected 99% confidence intervals (CIs) with 10,000 random bootstrap samples: statistical significance of the indirect effects was established when zero was not included in the lower and upper levels of the CIs (Hayes, 2018). To test the moderating role of psychological flexibility (W) in the link between trait health anxiety and mental health outcomes, three simple moderation analyses were performed with Process Model 1 (Hayes, 2018), one for each dependent variable. Process Model 1 enables testing the conditional effect (i.e., the effect of one variable on another, conditioned on a third or interaction) by estimating the effect of X on Y at a certain point (or points) along the moderator, and testing whether this effect is significant. Statistical significance of simple moderations was established when the 99% CIs for the interaction (trait health anxiety × moderator) did not include zero (Hayes, 2018). Finally, models in which psychological flexibility emerged as a significant mediator or

moderator were further examined using the six psychological flexibility processes, instead of the global psychological flexibility score. Given the primary hypothesis regarding the mediating and moderating effects of global psychological flexibility was tested across three mental health outcomes, more stringent significance levels of $p < 0.01$ and 99% CIs were used for these analyses to control for Type I error. The subsequent mediation or moderation analyses conducted on the six psychological flexibility processes were more exploratory in nature and thus, the conventional significance levels of $p < 0.05$ and 95% CIs were retained.

RESULTS

Sample Characteristics

Three cases were identified as outliers. Exclusion of the outliers did not change the results of the primary analyses, hence, analyses are reported using the full sample. The sample was composed of 944 Italian adults, 75.3% female, aged 18–81 (M = 38.8, SD = 13.2). Almost all participants (98.4%) were of Italian nationality. Thirteen participants were of German (n = 2), Romanian (n = 2), Swiss (n = 2), Albanian (n = 1), Argentina (n = 1), Ecuadorian (n = 1), Lebanese (n = 1), Palestinian (n = 1), Slovenian (n = 1), and Ukrainian (n = 1) nationality. Regarding highest level of education, approximately half of the sample (48.1%) had a bachelor's degree, 26.4% completed high school, and 22.1% postgraduate courses. Almost half (46%) of the sample were either married or living with a partner, while 54% were single, widowed, or divorced. Regarding socioeconomic status, 81.3% endorsed the middle socioeconomic band, 10.6% average, and 8.2% wealthier than the average. Most (66.4%) participants were employed, 11.2% were students, and 9.6% unemployed.

Table 1 summarizes the COVID-19 context of the sample. Participants spent on average 35.70 days in lockdown (SD = 8.41) and lived with a mean of 2.55 cohabitants (SD = 1.21), while 23.3% lived alone during lockdown. A total of 24.3% of participants lost work or were put on a redundancy fund because of the mandatory lockdown. A total of 178 participants (18.9%) reported having been infected by COVID-19 with an average symptom severity of 1.80 (SD = 0.90, range 1–5). A quarter of the sample (25.5%) reported having significant others (family members, close others, roommates, or friends) infected by COVID-19, 20.6% of them were hospitalized, and 16.7% died due to COVID-19.

Regarding descriptive data on trait health anxiety, 33.8% of the sample reported moderate symptomatology, while 8.1% reached severe levels associated with a higher probability of meeting *DSM-IV* criteria for hypochondriasis. Considering the mental health outcomes, 10.3% of participants reported mild to moderate COVID-19 peritraumatic distress (1 *SD* above the mean), while 5.2% had severe levels of symptomatology (2 *SDs* above the mean). With respect to anxiety, 11.5 and 6.6% of the sample reported moderate and severe levels of symptomatology, respectively. A total of 14.6% of participants experienced moderate levels of depressive symptomatology, while 8.8% fell in the severe depression range.

TABLE 1 | Descriptive data on demographics and COVID-19 lockdown variables.

Variable	% (*n*)	*M* (*SD*)	Range
Demographics			
Age years		38.86 (13.20)	18.87–81.03
Gender: female	73.5 (694)		
Currently working	66.4 (627)		
Currently studying	11.2 (106)		
Currently unemployed	9.6 (90)		
Retired	5.3 (50)		
COVID-19 lockdown variables			
Days in lockdown		35.70 (8.41)	10–90
Number of cohabitants		2.55 (1.21)	1–6
Living alone	23.3 (220)		
Perception of personal space[a]		3.70 (1.01)	1–5
Loss of work or receiving redundancy fund	24.3 (229)		
COVID-19 infected	18.9 (178)		
Severity of COVID-19 symptoms[b]		1.80 (0.90)	1–5
Family member infected	7.5 (71)		
Family member hospitalized	2.6 (25)		
Family member deceased	2.2 (21)		

[a]Rated on a 5-point Likert scale from 1 (not at all) to 5 (very much). [b]Rated on a 5-point Likert scale from 1 (not at all serious) to 5 (very serious).

Correlations Among Trait Health Anxiety, Psychological Flexibility, Mental Health Outcomes, and Demographics

Pearson's and Spearman's correlations were conducted for continuous or categorical variables, respectively, in order to investigate the relationships between trait health anxiety, psychological flexibility, mental health outcomes, and demographics (see **Table 2**). The correlations between higher trait health anxiety and poorer outcomes on all mental health variables were significant and of a moderate magnitude. Lower trait health anxiety was significantly, albeit weakly, correlated with higher global psychological flexibility. Four of the psychological flexibility processes were significantly related to lower trait health anxiety. Present moment awareness was unrelated to trait health anxiety and acceptance was weakly but significantly associated with higher trait health anxiety. Global psychological flexibility and all psychological flexibility processes were related to better outcomes on all mental health variables except acceptance, which was significantly but weakly correlated with higher COVID-19 peritraumatic distress, anxiety, and depression. The six psychological flexibility processes were significantly positively correlated with higher global psychological flexibility. All mental health outcomes were positively and strongly correlated with each other. Of the demographics, only gender and age were significantly but weakly associated with trait health anxiety and all mental health outcomes. Specifically, being female and younger was significantly

TABLE 2 | Descriptive data and correlations among trait health anxiety, psychological flexibility, mental health outcomes, gender, and age (N = 944).

%	*M (SD)*	Range	α	1	2	2a	2b	2c	2d	2e	2f	3	4	5	6
1. Trait health anxiety	16.81 (6.64)	2–45	0.84	–											
2. Global psychological flexibility	3.66 (0.90)	1–6	0.85	−0.21**	–										
2a. Acceptance	2.85 (1.08)	1–6	0.85	0.10**	0.53**	–									
2b. Present moment awareness	3.66 (1.20)	1–6	0.93	−0.04	0.76**	0.48**	–								
2c. Self as context	3.69 (1.20)	1–6	0.93	−0.22**	0.85**	0.34**	0.59**	–							
2d. Defusion	3.40 (1.19)	1–6	0.91	−0.31**	0.81**	0.26**	0.48**	0.75**	–						
2e. Values	4.28 (1.19)	1–6	0.92	−0.20**	0.81**	0.24**	0.50**	0.58**	0.58**	–					
2f. Committed action	4.12 (1.25)	1–6	0.94	−0.24**	0.78**	0.17**	0.41**	0.59**	0.60**	0.73**	–				
3. COVID-19 distress	17.95 (11.50)	0–63	0.90	0.50**	−0.34**	0.09**	−0.12**	−0.32**	−0.45**	−0.32**	−0.39**	–			
4. Anxiety	5.83 (4.55)	0–21	0.90	0.53**	−0.32**	0.10**	−0.09**	−0.32**	−0.47**	−0.30**	−0.35**	0.81**	–		
5. Depression	6.85 (5.00)	0–26	0.87	0.44**	−0.33**	0.11**	−0.09**	−0.33**	−0.43**	−0.34**	−0.41**	0.80**	0.79**	–	
6. Gender[a] 75.28				−0.12**	−0.02	−0.16**	−0.05	−0.00	0.06	−0.04	0.02	−0.19**	−0.18**	−0.19**	–
7. Age	38.85 (13.43)	38.86 (13.20)		−0.13**	0.09**	−0.14**	0.05	0.09**	0.15**	0.15**	0.11**	−0.07*	−0.18**	−20**	0.07*

*$p < 0.05$, **$p < 0.01$. *Gender: 0 = female, 1 = male.* [a]*Spearman's Correlation.*

related to higher trait health anxiety and poorer mental health outcomes.

Mediating Role of Global Psychological Flexibility in the Link Between Trait Health Anxiety and Mental Health Outcomes During a Pandemic Lockdown

Results of mediation analyses indicated that global psychological flexibility significantly mediated the relationship between trait health anxiety and all three mental health outcomes (indirect effect for COVID-19 peritraumatic distress: ab = 0.090, *SE* = 0.018, 99% CI [0.048, 0.142]; indirect effect for anxiety: ab = 0.031, *SE* = 0.018, 99% bootstrap CI [0.016, 0.050], and indirect effect for depression: ab = 0.031, *SE* = 0.007, 99% bootstrap CI [0.016, 0.050]). Participants with higher trait health anxiety reported lower global psychological flexibility (a = −0.028, *SE* = 0.004), which in turn decreased mental health outcomes (COVID-19 peritraumatic distress: b = −0.3.199, *SE* = 0.350; anxiety: b = −1.120, *SE* = 0.137; depression: b = −1.398, *SE* = 0.157). Trait health anxiety also directly influenced the three mental health outcomes independent of this mechanism (total effect for COVID-19 peritraumatic distress: c' = 0.823, *SE* = 0.049, 99% CI = [0.697, 0.949]; total effect for anxiety: c' = 0.342, *SE* = 0.019, 99% CI = [0.293,0.391]; total effect for depression: c' = 0.31o, *SE* = 0.022, 99% CI = [0.254, 0.366]). Each model explained between 34.6% (anxiety) and 29.0% (depression) of the variance. The three simple mediational models showing that global psychological flexibility mediates the relationship between trait health anxiety and COVID-19 peritraumatic distress, anxiety, and depression are summarized in **Figure 1**. In each model, higher psychological flexibility reduced the detrimental impacts of trait health anxiety on all mental health outcomes.

Mediating Role of Psychological Flexibility Processes in the Link Between Trait Health Anxiety and Mental Health Outcomes

Because global psychological flexibility emerged as a significant mediator in the relationship between trait health anxiety and each of the three mental health outcomes, we further explored the mediating role of each of the six psychological flexibility processes using parallel mediator models (M_1 = acceptance; M_2 = present moment awareness: M_3 = self-as-context, M_4 = defusion, M_5 = values, M_6 = committed action). Results showed that three of the six psychological flexibility processes (acceptance, defusion, and committed action) significantly mediated the relationship between trait health anxiety and all three mental health outcomes. Specifically, defusion and committed action mediated decreases in the adverse effects of trait health anxiety on the mental health outcomes, whereas acceptance mediated increases in the negative effects of health anxiety on mental health. Each model explained between 41.7% (anxiety) and 36.8% (depression) of the variance. These parallel mediational models examining the six psychological flexibility processes as mediators

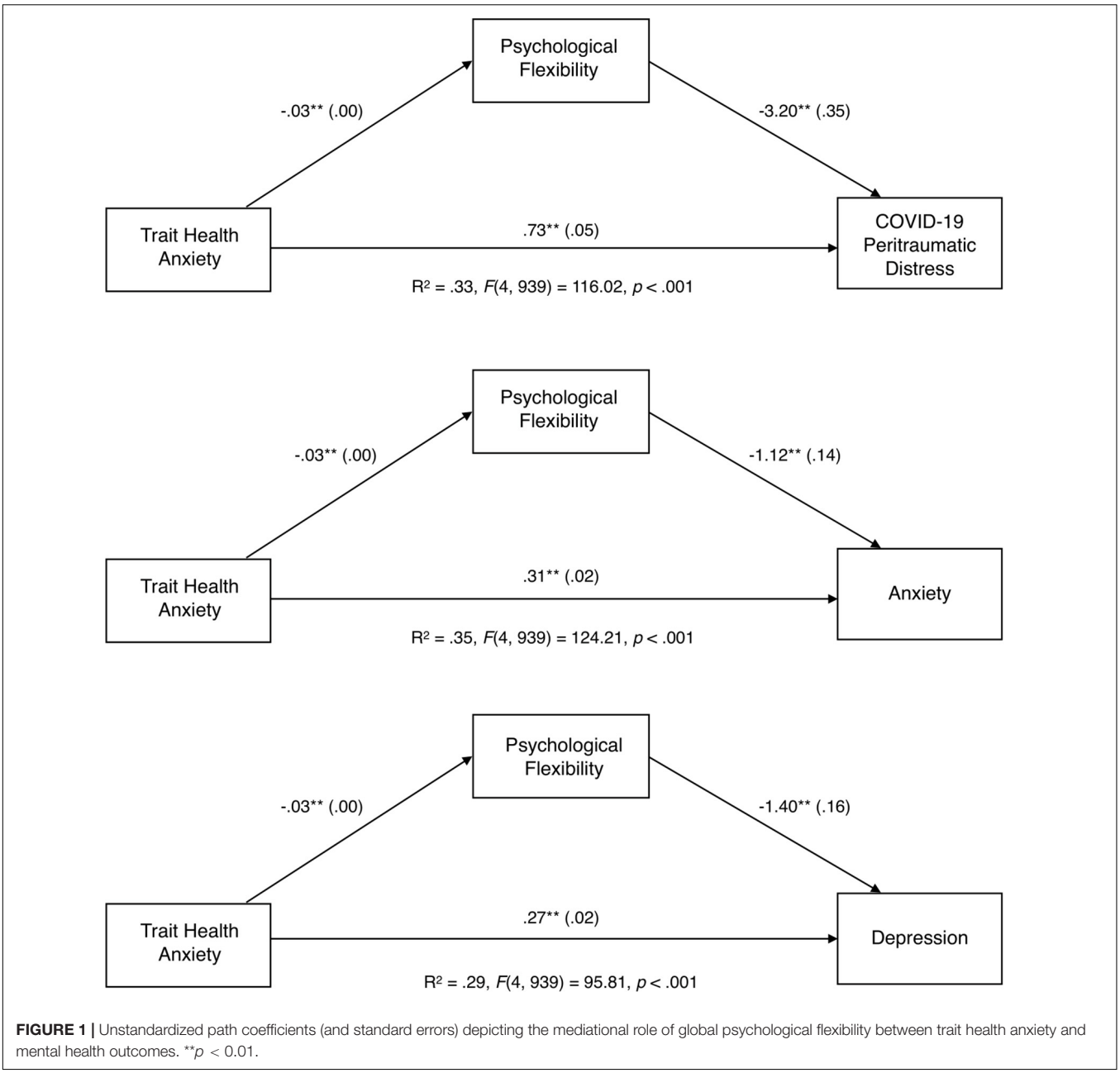

FIGURE 1 | Unstandardized path coefficients (and standard errors) depicting the mediational role of global psychological flexibility between trait health anxiety and mental health outcomes. $^{**}p < 0.01$.

of the relationship between trait health anxiety and COVID-19 peritraumatic distress, anxiety, and depression are displayed in **Table 3** and **Figure 2**.

Moderating Role of Psychological Flexibility in the Link Between Trait Health Anxiety and Mental Health Outcomes During a Pandemic Lockdown

To investigate global psychological flexibility as a moderator of the effects of trait health anxiety on the mental health outcomes, three simple moderation analyses were conducted. Results indicated that the interaction between trait health anxiety and global psychological flexibility was not significant for each of the three mental health outcomes (COVID-19 peritraumatic distress: interaction coefficient for trait health anxiety and psychological flexibility, $b_3 = 0.018$, $SE = 0.048$, $F(1, 938) = 0.132$, $p = 0.717$, 99% CI [−0.107, 0.142], $\Delta R^2 = 0.000$; anxiety: interaction coefficient for trait health anxiety and psychological flexibility, $b_3 = 0.015$, $SE = 0.019$, $F(1, 938) = 0.654$, $p = 0.419$, 99% CI [−0.033, 0.064], $\Delta R^2 = 0.000$; depression: interaction coefficient for trait health anxiety and psychological flexibility, $b_3 = -0.011$, $SE = 0.022$, $F(1, 938) = 0.280$, $p = 0.597$, 99% CI [−0.067, 0.044], $\Delta R^2 = 0.000$). In summary, results indicate that the impact of trait health anxiety on mental health outcomes during a pandemic lockdown is not conditional on the levels of psychological flexibility.

TABLE 3 | Indirect effects of psychological flexibility processes in the relationship between trait health anxiety and mental health outcomes.

	COVID-19 distress			Anxiety			Depression		
	Coeff	***SE***	**95% CI**	**Coeff**	***SE***	**95% CI**	**Coeff**	***SE***	**95% CI**
Total indirect effect	**0.225**	0.028	0.172, 0.282	**0.090**	0.011	0.070, 0.112	**0.104**	0.013	0.079, 0.132
Acceptance	**0.013**	0.007	0.000, 0.027	**0.005**	0.003	0.000, 0.012	**0.007**	0.004	0.000, 0.014
Present moment awareness	−0.003	0.004	−0.014, 0.003	−0.002	0.002	−0.007, 0.002	−0.002	0.003	−0.009, 0.002
Self as context	−0.009	0.017	−0.043, 0.025	0.001	0.007	−0.013, 0.015	0.007	0.008	−0.008, 0.023
Defusion	**0.153**	0.027	0.104, 0.209	**0.069**	0.011	0.048, 0.092	**0.052**	0.011	0.033, 0.075
Values	0.014	0.015	−0.015, 0.046	0.003	0.006	−0.008, 0.015	0.007	0.007	−0.006, 0.022
Committed action	**0.057**	0.018	0.024, 0.096	**0.014**	0.007	0.001, 0.028	**0.033**	0.009	0.017, 0.053

Coeff, unstandardized coefficient of the indirect effect; SE, standard error; CI, 95% confidence interval based on 10,000 bootstrap samples. Significant mediations are displayed in bold.

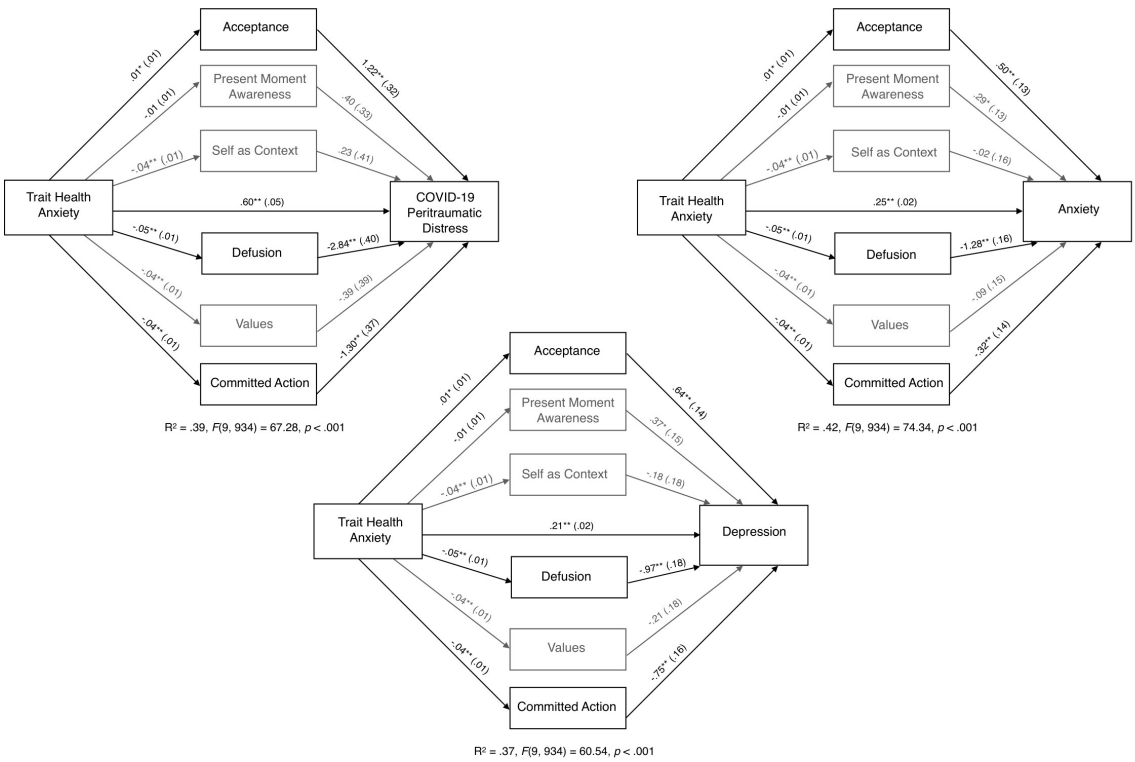

FIGURE 2 | Unstandardized path coefficients (and standard errors) depicting the mediational role of the six psychological flexibility processes between trait health anxiety and mental health outcomes. Gray indicates, non-significant mediation paths; $^{*}p < 0.05$. $^{**}p < 0.01$.

DISCUSSION

Results from the present study supported our prediction that psychological flexibility would mediate decreases in the adverse effects of trait health anxiety on mental health during the COVID-19 lockdown in Italy. As expected, global psychological flexibility did not moderate the link between trait health anxiety and mental health outcomes. Examination of the six psychological flexibility processes showed that three mediated the relationship between trait health anxiety and the mental health outcomes. Specifically, defusion and committed action mitigated the adverse effects of trait health anxiety on all mental health outcomes, whereas acceptance mediated an increase in the negative effects of trait health anxiety on mental health.

The associations between higher psychological flexibility and better mental health outcomes in the present study are consistent with findings in the broader literature on psychological flexibility (Hayes et al., 2006; Kashdan and Rottenberg, 2010) and are aligned with results showing lower psychological flexibility predicts trauma and mental health problems in the aftermath of community crises such as school shootings and devastating storms (e.g., Kumpula et al., 2011; Marshall and Brockman, 2016). Findings from the present study that highlight psychological flexibility decreases the adverse effects of trait health anxiety

on mental health are in accord with results from a randomized controlled trial that showed psychological flexibility mediated the beneficial effects of an ACT intervention on participants' health anxiety symptoms (Eilenberg et al., 2016, 2017). Given that a pandemic and the associated lockdown are likely to exacerbate distress in people vulnerable to elevated health anxiety, it is noteworthy that psychological flexibility demonstrated a protective role in such an anxiety provoking context.

Results from this study showed that defusion and committed action mediated decreases in the negative effects of trait health anxiety on all mental health outcomes. Defusion involves observing unwanted thoughts and feelings and allowing them to pass, which mitigates the distress that is evoked by clinging to or struggling with inner discomfort (Hayes et al., 2012). For example, if a person has the thought "I must have the virus because I coughed" and takes it as literally true and gets absorbed in such thinking, he or she is likely to become anxious about being infected, whereas if the person views the thought for what it is, just thinking, and allows it to pass, their anxiety is less likely to intensify. In addition, they are more likely to respond adaptively in the long-term because they are able to identify mental health anxiety triggers and refrain from reactively engaging in rumination or avoidance (Eilenberg et al., 2016, 2017; Spinhoven et al., 2016). In turn, because defusion frees up cognitive-affective resources, people are more able to reflect and find meaning in the adversity of a national pandemic lockdown. Defusion also frees up energy to invest in values-based action (i.e., committed action), the second protective psychological flexibility process identified in the present study.

Committed purposeful values-based action moves a person toward a deeper connection with their personal values, even in the face of a setback such as a pandemic lockdown (Hayes et al., 2012). The pursuit of values informed goals brings fulfillment, whereas inaction, impulsivity, non-functional actions, or persistent avoidant behaving intensifies distress and leads to discontent (Hayes et al., 2012).

In contrast to the beneficial mediating effects of defusion and committed action, acceptance increased the adverse effects of trait health anxiety on mental health outcomes. Acceptance involves being open to inner experiencing (e.g., unpleasant thoughts, feelings, urges, and bodily sensations) and giving it space to organically unfold and pass. Therefore, engaging in acceptance sensitizes a person to their inner discomfort and this may account for why acceptance was related to increases in the adverse effects of trait health anxiety on mental health. According to the ACT psychological flexibility model and empirical data, in the long-term acceptance is more beneficial than experiential avoidance, which is consistently related to psychopathology (Chawla and Ostafin, 2007). The inherent adversities in a pandemic and lockdown are likely to evoke understandable and reasonable concerns about health, mortality, safety, finances, attachments, and isolation. However, consistent with ACT interventions and the ACT conceptualization of psychological flexibility, the goal is not to decrease distress, but to notice and acknowledge its presence with openness, while at the same time pursuing personal values, which in turn promotes mental health (Hayes, 2019). Hence, in the present study as predicted the overarching construct psychological flexibility was associated with better mental health outcomes, and it mediated decreases in the adverse effects of trait health anxiety on mental health. These findings are consistent with many studies that show psychological flexibility is associated with resilience and post-traumatic growth during adversity (Eakman et al., 2016; Hawkes et al., 2014).

Although values, self-as-context, and present moment awareness were significantly associated with better mental health at the bivariate level, these psychological flexibility processes did not emerge as significant mediators or moderators in the link between trait health anxiety and the mental health outcomes. However, in another study values and self-as-context significantly moderated the adverse effects of COVID-19 risk factors on mental health, and the inverse of present moment awareness exacerbated the negative impacts of these contextual factors (Pakenham et al., 2020). It is likely that the prominence and roles of the six contextually sensitive and dynamic psychological flexibility processes will vary according to the nature of the corresponding independent variables and situational factors investigated within a given model. It is only in recent years that researchers have begun to examine the roles of the individual psychological flexibility and inflexibility sub-processes in shaping mental health. Further research into how their roles vary across real-life contexts, samples, and models is required.

Our descriptive data on the levels of mental health problems in the present sample are in line with data from other studies that have examined the mental health impacts of COVID-19 lockdowns using the same measures employed in the present study. Overall, this body of data suggests that 17–54% of the general population have experienced moderate to severe levels traumatic distress, 18–29% anxiety symptoms, and 17–23% depressive symptoms (Ireland: Hyland et al., 2020; China: Qiu et al., 2020; Wang et al., 2020; Italy: Rossi et al., 2020).

In view of the adverse mental health impacts of COVID-19 and associated lockdowns and of the lingering negative psychosocial effects of prior pandemics (e.g., SARS; Hawryluck et al., 2004; Taylor, 2019), it is essential that effective public health interventions are developed to bolster resilience and promote wellbeing during and in the aftermath of such health crises. Such interventions should target psychological flexibility given the findings from the present study and those from other research indicating that psychological flexibility moderates the adverse impacts of COVID-19 contextual risk factors (Pakenham et al., 2020). Public health ACT-based interventions designed to strengthen psychological flexibility have been shown to promote mental health in a variety of populations using flexible modes of delivery in various contexts: university students via online delivery (Viskovich and Pakenham, 2020), cancer patients via phone (Hawkes et al., 2014), Sudanese refugees using audio-recorded stress-management workshops and a self-help book (Tol et al., 2020), and health anxiety patients via group delivery (Eilenberg et al., 2016). An advantage of psychological flexibility informed interventions is that they have been shown to cultivate skills that foster resilience in the context of health-related adversities, such as chronic disease (e.g., multiple sclerosis, Giovannetti et al., 2020;

diabetes, Ryan et al., 2020), and to mediate the beneficial effects of these programs (Pakenham et al., 2018).

Limitations and Future Research

Findings need to be tempered by considering the following study limitations. First, all data were collected via an online survey and self-report measures. Additional assessment methods such as structured interviews might provide more comprehensive information about the mental health impacts of the pandemic. Second, the study used a cross-sectional design and, hence, the causal directions among trait health anxiety, psychological flexibility, and mental health outcomes remain ambiguous. Longitudinal research is required to examine causal links among these variables over time. Third, convenience sampling and the bias toward female participants limits the generalizability of findings. Fourth, the three mental health outcome measures were highly inter-correlated (range 0.76–0.80), which may account for the similarity in findings across outcomes. Finally, we did not examine the potential personal growth that may be triggered by health-related adversities (Pakenham, 2011) or the wellbeing dimension of mental health. Future research should examine factors that foster benefit finding and wellbeing in the context of the COVID-19 pandemic. Notwithstanding these limitations, this study is the first to evaluate the protective role of psychological flexibility in the link between trait health anxiety and COVID-19 peritraumatic distress, anxiety, and depression.

CONCLUSION

Results from the present study showed that two psychological flexibility processes, defusion and committed action, mediated decreases in the negative effects of trait health anxiety on mental health, while acceptance mediated increases in the adverse effects of trait health anxiety. Overall the combination of these processes mitigated the detrimental impacts of trait health anxiety on mental health during the emergency mandatory COVID-19 nationwide lockdown in Italy. Consistent with the ACT conceptualization of psychological flexibility, findings suggest embracing (rather than avoiding) inner discomfort and observing associated unhelpful thoughts while also engaging in values-based action increases resilience during adversity. These results indicate that public health interventions targeting psychological flexibility are likely to mitigate some of the adverse effects that high trait health anxiety has on mental health during a pandemic. Furthermore, targeting psychological flexibility in public health interventions has been identified as a viable means of improving a wide range of health outcomes in the general community (Gloster et al., 2017). Given that research into the longer-term mental health impacts of prior pandemics show lingering elevated trauma, anxiety, and depressive symptoms (e.g., after the SARS quarantine; Hawryluck et al., 2004; Taylor, 2019), it is anticipated that when this pandemic abates, mental health services will face significant demands. The evidence emerging from the burgeoning literature on psychological flexibility (see reviews Coto-Lesmes et al., 2019; Apolinário-Hagen et al., 2020; Bai et al., 2020) provides strong support for the use of ACT-based interventions to promote psychological flexibility and mental health during the COVID-19 pandemic (Gloster et al., 2017; Polizzi et al., 2020; Presti et al., 2020).

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the University of Bologna ethics committee. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

GL and GB conducted the online survey and analyzed the data. KP and ET provided critical editing and feedback on draft manuscripts. All authors contributed to the conceptualization, data interpretation, and drafting of this manuscript.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.02195/full#supplementary-material

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The Psychological Impact of the COVID-19 Epidemic on Guangdong College Students: The Difference Between Seeking and Not Seeking Psychological Help

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Background: Coronavirus disease 2019 (COVID-19) has considerably psychologically impacted Chinese college students. Several types of online mental health services were widely implemented for college students during the outbreak. This study investigated the relationship between college students' mental health status and psychological help-seeking behavior to test the phases-decision-making model (PDM).

Methods: A cross-sectional survey was conducted among college students in Guangdong Province using an online platform. In total, 4,164 students were assigned to the "counseling group" or "non-counseling group" according to whether they had sought psychological help because of the COVID-19 outbreak; the groups were matched based on age, sex, and grade. Demographics, perceived mental health, and experience with seeking psychological help were recorded. Fear, depression, and trauma were assessed by the COVID-19 Fear Screening Scale, Patient Health Questionnaire, and Impact of Event Scale-6.

Results: The fear, depression, and trauma scores were significantly higher in the counseling group than in the non-counseling group ($P_S < 0.001$). Fear (OR = 1.27, $p < 0.001$), depression (OR = 1.02, $p = 0.032$), trauma (OR = 1.08, $p < 0.001$), poor perceived mental health status (OR = 3.61, $p = 0.001$), and experience with seeking psychological help (OR = 7.06, $p < 0.001$) increased the odds of seeking psychological help.

Conclusion: During the COVID-19 epidemic, the rate of psychological help-seeking was still low, and college students in poor psychological condition sought psychological counseling more. Fear, depression, trauma, experience with seeking psychological help, and perceived mental health can effectively predict psychological help-seeking behavior. These findings emphasized the importance of closely monitoring college students' psychological status, providing psychological intervention, and improving the probability of seeking psychological help.

Keywords: psychological help-seeking, mental health, COVID-19, college students, fear

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INTRODUCTION

In December 2019, the coronavirus disease 2019 (COVID-19) epidemic emerged in Wuhan, China, started to spread nationwide, and subsequently attracted worldwide attention. The World Health Organization (WHO) has recently declared the COVID-19 outbreak a Public Health Emergency of International Concern (PHEIC) (World Health Organization [WHO], 2020). As of February 25, 2020, a total of 81,109 laboratory-confirmed cases had been documented globally (Holshue et al., 2020; Phan et al., 2020; Rothe et al., 2020), and 78,064 confirmed pneumonia cases and 2,715 confirmed deaths had been reported in China (Chinese Center for Disease Control and Prevention, 2020). Guangdong Province ranked first behind Hubei Province in the number of confirmed cases, with a total of 1,347 reported in 1,447 counties and districts (Guangdong Provincial Center for Disease Control and Prevention, 2020). The COVID-19 pandemic has led to unprecedented threats to humans' lives and health.

COVID-19 is an unknown, severe, lethal, and readily transmissible new infectious disease. Massive infectious disease outbreaks usually have a considerable impact on human survival (Chih-Hung et al., 2006), and this COVID-19 epidemic has been no exception. The COVID-19 outbreak has had a profound impact on the daily life of people living in affected areas and on society as a whole. Major sporting events and cultural activities have been canceled, businesses have suffered and closed, the use of public transportation has dramatically decreased, classes have been suspended, and the death toll continues to mount. The implementation of unprecedentedly strict quarantine measures in China has kept a large number of people in isolation (Qiu et al., 2020), and all citizens have been asked to stay at home and go out less. However, the COVID-19 epidemic has not only affected the daily life and physical health of ordinary Chinese but has also caused many psychosocial problems.

Studies have pointed out that the psychological impact of public health emergencies is long-lasting (Chang et al., 2020). The outbreak of COVID-19 can be regarded as a mental health catastrophe. In contrast to common life stressors, the COVID-19 epidemic represents an acute, large-scale, and uncontrollable stressor. Generally, psychosocial responses to such stressors are varied and include feelings of anxiety, shame, personal and social failure, or weakness (Verghese, 2004); underestimation of the possibility of survival; overestimation of the likelihood of infection (Koh et al., 2005); excessive and inappropriate preventive measures; and increased demand for healthcare services in a time of shortage (Rosling and Rosling, 2003). The results of a national survey showed that 98.54% of respondents felt excessive fear, worry, and nervousness, believing that the epidemic posed a serious threat (Chen et al., 2020). Another study pointed out that almost 35% of the general population reported experiencing psychological distress due to the COVID-19 epidemic (Qiu et al., 2020). In addition, an internet-based survey found that public anxiety and panic were relatively high, and ∼32.4% of the respondents were assessed as having depressive symptoms (Cai et al., 2020).

Individuals exposed directly or vicariously to life-threatening situations have a high prevalence of psychological morbidity (Weiss et al., 1995; Catalan et al., 1996). The impact of the COVID-19 outbreak on college students, as a special group in society, cannot be ignored. A study found that individuals between 18 and 30 years of age or above 60 presented the highest scores on the COVID-19 peritraumatic distress index (CPDI) (Qiu et al., 2020). Chinese college students have been exposed to a significant number of COVID-19-related stressful events during the outbreak, including disruptions to their academic, leisure, family, and social life. These disruptions have been shown to frequently cause boredom, frustration, anxiety, fear, and a sense of isolation from the rest of the world (Brooks et al., 2020; Chang et al., 2020), leading to distress among college students.

When psychological distress occurs, asking for psychological help is a way to cope. The National Health Commission of China has published several guideline documents to better address psychological problems in the Chinese population during the COVID-19 epidemic period. The rapid transmission of the virus between people impedes traditional face-to-face psychological interventions. Therefore, because of their safety, convenience, timeliness, and efficiency, online psychological counseling services have been widely established to provide free 24 h service on all days of the week for those in need (Liu et al., 2020; Zhao and Fan, 2020). The state and various social institutions provide a wealth of psychological service resources, but we do not know the degree to which college students use these resources. Previous studies have found that when individuals encounter psychological problems, they show a tendency to care for themselves first and then for others (Jiang and Xia, 2006). Professional psychological counseling or mental health services are not fully utilized by college students (Liang et al., 2017).

The phases-decision-making model (PDM) proposes that individual help-seeking behavior follows a three-stage internal decision-making process: stage 1 involves the perception of psychological problems; stage 2 involves self-service assessment, that is, the assessment of whether an individual has the willingness and ability to deal with the problems independently; and stage 3 involves other-assisted assessment, and turning to a professional institution for help is one of the options that individuals can consider. Possible solutions exist in each stage of the help-seeking process, and turning to professionals is considered at the end of the third stage. College students with poor mental health will turn to professional institutions and personnel for help only when all previous solutions are ineffective, showing a negative attitude toward help-seeking (Zhang et al., 2015). Research has suggested that convenience, economy, recipient self-efficacy, perception of the nature and severity of the problem, social tolerance of problem behavior, help-seeking behavior, previous help-seeking experience, and other determinants may be the main factors affecting the decision-making process, but there is a lack of relevant research evidence, and a large number of hypotheses still need to be tested (Jiang and Xia, 2006). However, during the COVID-19 epidemic, what is the utilization rate of mental health services among college students? What are the differences in mental health status between college students who use these service resources for psychological help and those who do not? What are the influencing factors? The answers are unknown and need to

be studied. Therefore, by comparing the degree of psychological distress between college students who did and did not engage in psychological help-seeking, this study intends to determine the factors influencing college students' help-seeking behavior.

MATERIALS AND METHODS

Participants and Procedure

At the peak of the outbreak, we assessed students from 85 different universities in Guangdong Province using a brief self-administered online questionnaire that included demographic information, the COVID-19 Fear Screening Scale (CV-19FSS), the Patient Health Questionnaire (PHQ-9), and the Impact of Event Scale-6 (IES-6). We had prepared a normative notice applicable to these 85 schools, including the purpose, significance, deadline, and mode of participation of the survey. A contact person from each college was responsible for sending the above notice to each student via WeChat or QQ. Participants could use WeChat to access the survey and answer the online questionnaire anonymously by scanning the two-dimensional barcode or clicking on the relevant link from February 13 to February 22, 2020. An online consent form would be displayed on the front page of the online questionnaire; if participants had no objection to the objectives of the survey, they could officially start the survey by clicking the "next" button below, or they had the right to withdraw from the survey by closing the survey homepage. Each participant was only allowed to answer the questionnaire once. The whole process was entirely voluntary and non-commercial. In addition, all researchers involved in the survey had signed confidentiality agreements. Two sub-samples were formed according to the answer to the question "Have you ever sought psychological assistance in response to the COVID-19 epidemic situation?" and matched for age, sex, and grade. Participants who answered "yes" were defined as the counseling group, while those who answered "no" were defined as the non-counseling group. The study was approved by the appropriate institutional research and ethics committee.

Measures

Demographics and Medical/Counseling Experience

Participants provided demographic information including age, gender, education level, psychiatric history (yes or no), and current location (i.e., Guangdong Province, Hubei Province, and other provinces). Basic information about their perceived mental health (good, general, or poor), experience with seeking psychological help (yes or no), and cognition of the local COVID-19 epidemic situation (peak, growth, flattening, turnaround, or uncertain) (assessed with items such as "What is your mental state at present?," "Have you received psychological counseling services from professionals (counselors, psychiatrists, etc.) in the past?," and "What is the current prevalence of COVID-19 in your region?") was also collected.

Fear Related to COVID-19

The CV-19FSS is a 12-item self-report scale adapted from the SARS Fear Emotion Screening Inventory (Gao and Xie, 2005). The CV-19FSS is designed to assess the fear emotion during a public health emergency. All of the items are answered either "Yes" (1) or "No" (0), and the scores are subsequently summed to derive a total score for the scale. The scores range from 0 to 12, with higher scores indicating higher levels of fear. The CV-19FSS includes fear categories based on score ranges: scores of 10–12 indicate severe fear, scores of 7–9 indicate moderately severe fear, scores of 4–6 indicate mild fear, and scores of 0–4 indicate no fear. The Cronbach's alpha for the CV-19FSS in the current sample was 0.799.

Level of Depressive Symptoms

The PHQ-9 is a nine-item self-report measure reflecting the diagnostic criteria for major depressive disorder. The Chinese version used in the current study was developed by Zhang et al. (2013). Participants were asked to rate how often each symptom bothered them during the past 2 weeks on a scale from 0 (not at all) to 3 (nearly every day). Total scores range from 0 to 27, with higher scores indicating a greater severity of depression. Scores of ≥ 5, ≥ 10, ≥ 15, and ≥ 20 represent mild, moderate, moderately severe, and severe depression, respectively (Martin et al., 2006). The PHQ-9 is a reliable, valid measure of depressive symptoms in the general population (Kocalevent et al., 2013). The Cronbach's alpha for the PHQ-9 in the current sample was 0.816.

Level of Posttraumatic Stress Symptoms

The IES-6 is a useful screening instrument for epidemiological research and clinical practice. It was simplified by Thoresen on the basis of the revised version of the Impact of Events Scale (IES-R) and is strongly correlated with the IES-R (Thoresen et al., 2010). The IES-6 is a six-item self-report measure of psychological responses to trauma. Each item is rated on a Likert scale from 0 to 4, and its three subscales (Intrusion, Avoidance, and Hyperarousal) are closely affiliated with post-traumatic stress disorder (PTSD) symptoms. It can be anchored to any specific event, such as the COVID-19 outbreak. Clinically, the average scores of the IES-6 (the sum of the six items/6) are divided as follows: < 1.09, normal; ≥ 1.09 and < 1.5, PTSD is detected; and ≥ 1.5, may diagnose with PTSD (Asukai et al., 2002). The Cronbach's alpha for the IES-6 in the current sample was 0.920.

Statistical Analysis

Data were analyzed with SPSS Version 22.0. Descriptive statistics, including frequencies and central tendencies, were calculated to characterize the sample's demographic profile, fear level, depressive symptoms, and level of psychological trauma. A reliability test was used to check the internal consistency of the CV-19FSS, PHQ-9, and IES-6. The normal distribution of the quantitative data was checked using a one-sample Kolmogorov–Smirnov test. The results showed that the scores of fear, depression, and trauma were non-normal continuous variables. Differences between groups were tested via the Mann–Whitney U-test and Kruskal–Wallis H test for non-normal continuous variables and the chi-squared test or Fisher's exact test for categorical variables whenever

appropriate. Spearman's correlation analysis was used to explore the relationships among fear, depression, trauma, psychiatric history, experience with seeking psychological help, and self-perceived mental health. Binary logistic regression analysis was performed to explore the potential factors influencing psychological help-seeking (counseling or non-counseling). Odds ratios (ORs) and 95% confidence intervals (95% CIs) were obtained from the logistic regression models. *P*-values of less than 0.05 were considered statistically significant (two-sided tests).

RESULTS

Sociodemographic Profile

Based on data provided by the Guangdong Mental Health Committee of Colleges and Universities, a total of 361,969 college students completed the online survey, and 38,480 were excluded because they indiscriminately filled in information and selected the same option for each item. After for matching sex, age, and grade, we had a final sample of 4,164 participants, 2,082 of whom were in the counseling group and 2,082 of whom were in the non-counseling group. The proportion of respondents seeking psychological help in response to the COVID-19 epidemic was 0.64%.

The final sample included 2,164 (52.0%) males and 2,000 (48.0%) females, with 3,476 (83.5%) between 19 and 22 years old; 438 (10.5%) younger than or equal to 18 years old; and 250 (6.0%) between 23 and 25 years old. Half of them (n = 2,044, 49.1%) were freshmen, 1,262 (30.3%) were sophomores, 660 (15.9%) were juniors, and 198 (4.8%) were seniors. The majority were located in Guangdong Province (n = 3,874, 93.0%) at the time of the survey, while a small number were located in Hubei (n = 23, 0.6%) or other provinces (n = 267, 6.4%).

The comparison between the counseling group and non-counseling group is shown in **Table 1**. Participants who were living in an area where the COVID-19 epidemic was in a growth or peak period at the time of the survey had a significantly higher chance of being in the counseling group (χ^2 = 22.372, d.f. = 4, $P < 0.001$). Those perceiving poor mental health, who had experienced mental illness, or who had sought psychological help had a significantly higher chance of being in the counseling group (χ^2 = 151.647, d.f. = 2, $P < 0.001$; χ^2 = 52.993, d.f. = 1, $P < 0.001$; χ^2 = 269.295, d.f. = 1, $P < 0.001$). The number of students who could be diagnosed with PTSD in the counseling group was much higher than that in the non-counseling group (χ^2 = 423.795, d.f. = 2, $P < 0.001$). The counseling group had a significantly higher likelihood of experiencing fear and depressive emotions (χ^2 = 585.664, d.f. = 3, $P < 0.001$; χ^2 = 259.218, d.f. = 4, $P < 0.001$).

Group Differences in Mental Health State

The comparison of fear, depression, and trauma levels between the counseling group and non-counseling group is shown in **Table 2**. Levels of fear, depression, trauma, avoidance, intrusion, and hyperarousal were significantly higher in the counseling group (Z = −24.734, $p < 0.001$; Z = −16.541, $p < 0.001$; Z = −21.583, $p < 0.001$; Z = −16.984, $p < 0.001$; Z = −17.420, $p < 0.001$; Z = −19.582, $p < 0.001$). The results revealed that the counseling group had a worse mental health state.

Correlations Between the Studied Variables

As presented in **Table 3**, Spearman's correlation analysis was used to explore the relationships among mental health state (trauma, fear, and depression) and demographic variables (perceived mental health, experience with seeking psychological help, and psychiatric history). Fear, depression, trauma, perceived mental health, and experience with seeking psychological help were significantly positively correlated with each other ($P_s < 0.01$). These results suggested that participants who had experience with psychological help-seeking and perceived poor mental health status had higher levels of fear, depression, and trauma. However, psychiatric history was positively correlated with depression, trauma, perceived mental health, and experience with psychological help-seeking (Ps < 0.01) but not with fear (P = 0.146). This result showed that participants with a history of mental illness often turned to counseling, perceived worse mental health status, and had higher levels of depression and trauma.

Associations Between the Studied Variables

The forward likelihood ratio test was used to screen the demographic variables (experience with seeking psychological help, perceived mental health, local epidemic situation, and psychiatric history) and mental health variables (depression, trauma, and fear) that had an influence on psychological help-seeking behavior by logistic regression. The categorical variables were transformed into dummy variables for analysis. The results showed that the regression model after excluding the two variables of psychiatric history and local epidemic situation had a good fitting effect (χ^2 = 1,061.66, $P < 0.01$), and the prediction accuracy was 71.0%. **Table 4** displays how psychological help-seeking behaviors are associated with mental health status (fear, depression, and trauma), experience of psychological help-seeking, and perceived mental health based on binary logistic regressive analysis. Mental health variables (fear, depression, trauma), experience with seeking psychological help, and perceived mental health can effectively predict college students' psychological help-seeking behavior during the COVID-19 epidemic. When the scores of fear, depression, and trauma increased by one unit, the probability of college students seeking psychological counseling increased by 27% (95%CI = 1.23–1.31, $p < 0.001$), 2% (95%CI = 1.00–1.04, $p = 0.032$), and 8% (95%CI = 1.06–1.11, $p < 0.001$), respectively. During the COVID-19 outbreak, the probability of seeking psychological counseling was 7.06 times (95%CI = 5.27–9.45, $p < 0.001$) higher for college students with psychological help-seeking experience than for those without experience. The probability of seeking psychological counseling was 1.56 times (95% CI = 1.21–2.02, $p = 0.001$) and 3.61 times (95% CI = 1.68–7.76, $p = 0.001$) higher for

TABLE 1 | Comparison between subject groups (n = 4, 164).

Variable	All participants (%)	Counseling group	Non-counseling group	χ^2	d.f.	*P*
Current location						
Guangdong Province	3, 874 (93.0)	1,931	1,943	0.732	2	0.694
Hubei province	23 (0.6)	13	10			
Other provinces	267 (6.4)	138	129			
Local epidemic situation of COVID-19						
Peak period	166 (4.0)	106	60	22.372	4	<0.001
Growth period	373 (9.0)	212	161			
Flattening period	1, 486 (35.7)	723	763			
Turnaround period	1, 254 (30.1)	613	641			
Uncertain	885 (21.3)	428	457			
Perceived mental health						
Good	3, 640 (87.4)	1,693	1,947	151.647	2	<0.001
General	434 (10.4)	308	126			
Poor	90 (2.2)	81	9			
Psychiatric history						
Yes	109 (2.6)	92	17	52.993	1	<0.001
No	4, 055 (97.4)	1,990	2,065			
Experience with seeking of psychological help						
Yes	457 (11.0)	394	63	269.295	1	<0.001
No	3, 707 (89.0)	1,688	2,019			
Trauma level						
Normal	1, 621 (38.9)	522	1,099	423.795	2	<0.001
PTSD detected	721 (17.3)	336	385			
PTSD diagnosed	1, 822 (43.8)	1,224	598			
Fear degree						
Not at all	1, 817 (43.6)	554	1,263	585.664	3	<0.001
A little	1, 405 (33.7)	810	595			
Too much	665 (16.0)	478	187			
Extreme	277 (6.7)	240	37			
Depression						
Not at all	2, 479 (59.5)	1,010	1,469	259.218	4	<0.001
Mild	1, 131 (27.2)	662	469			
Moderate	314 (7.5)	211	103			
Moderately severe	156 (3.7)	128	28			
Severe	84 (2.0)	71	13			

COVID-19, coronavirus disease 2019. PTSD, post-traumatic stress disorder.

TABLE 2 | Comparison of fear, depression, and trauma levels (n = 4, 164).

Variables	Counseling group ($M \pm SD$)	Non-counseling group ($M \pm SD$)	*Z*	P^a
Fear	5.50 ± 2.92	3.33 ± 2.36	−24.734	<0.001
Depression	5.92 ± 5.75	3.24 ± 4.06	−16.541	<0.001
Trauma	9.82 ± 4.69	6.84 ± 3.91	−21.583	<0.001
Avoidance	2.55 ± 1.97	1.56 ± 1.63	−16.984	<0.001
Intrusion	3.70 ± 1.96	2.68 ± 1.69	−17.420	<0.001
Hyperarousal	3.57 ± 1.65	2.60 ± 1.42	−19.582	<0.001

M, mean; SD, standard deviation. Avoidance, intrusion, and hyperarousal are subscales of the Impact of Event Scale-6 (IES-6). Fear, total score on the COVID-19 Fear Screening Scale (CV-19FSS); Depression, total score on the Patient Health Questionnaire (PHQ-9); Trauma, total score on the IES-6. P^a values were derived from the Mann–Whitney U-test.

TABLE 3 | Correlations between mental health state and demographic variables.

Variables	1	2	3	4	5	6
1 Fear	1					
2 Depression	0.377**	1				
3 Trauma	0.516**	0.422**	1			
4 Perceived mental health	0.177**	0.362**	0.180**	1		
5 Experience with seeking psychological help	0.066**	0.150**	0.100**	0.165**	1	
6 Psychiatric history	0.023	0.132**	0.048**	0.160**	0.376**	1

*Fear, total score on the CV-19FSS; Depression, total score on the PHQ-9; Trauma, total score on the IES-6; Perceived mental health: good , 1; general, 2; poor, 3; experience with seeking psychological help: yes, 1; no, 0; psychiatric history: yes, 1; no, 0. **$p < 0.01$.*

TABLE 4 | Binary logistic regression of whether college students seek psychological help or not.

Variables	B	S.E.	Wald	OR (95% CI)	*p*
Fear	0.24	0.02	230.01	1.27 (1.23–1.31)	< 0.001
Depression	0.02	0.01	4.59	1.02 (1.00–1.04)	0.032
Trauma	0.08	0.01	68.06	1.08 (1.06–1.11)	< 0.001
Experience with seeking psychological help	1.95	0.15	172.67	7.06 (5.27–9.45)	< 0.001
Perceived mental health					
Good				1 (reference)	
General	0.45	0.13	11.54	1.56 (1.21–2.02)	0.001
Poor	1.29	0.39	10.84	3.61 (1.68–7.76)	0.001
Constant	−2.01	0.09	527.00	0.13	< 0.001

OR, odds ratio; 95% CI, 95% confidence interval.

college students who perceived general and poor mental health, respectively, than for college students with good perceived mental health.

DISCUSSION

As is generally known, COVID-19 is highly infectious, spreads rapidly, and poses a challenge and threat to global public health security (Hiroshi et al., 2020). The Chinese Ministry of Education attaches great importance to the mental health of college students during the COVID-19 epidemic and has set up a number of psychological assistance hotlines. However, to date, the studies on this topic have been limited, and few have explored the psychological help-seeking and mental health status of Chinese college students during the COVID-19 outbreak. This study helped fill the research gaps described above, and it is the first large-scale survey to compare the mental health status of Chinese college students who sought and did not seek psychological counseling during the COVID-19 epidemic.

Our study highlighted a few major findings. First, during the COVID-19 outbreak, although college students faced many stressors, the rate of seeking psychological help was still low. Compared with those in the non-counseling group, college students who had sought psychological help experienced fear, trauma, and depressive symptoms more frequently. Second, the scores of fear, depression, and trauma during the COVID-19 epidemic can effectively predict the psychological help-seeking behavior of college students, and fear is the best predictor among them. Third, the experience with seeking psychological help and self-perceived mental health are also key variables for predicting the psychological help-seeking behavior of college students. College students who have experience with seeking psychological help and who perceive their mental health status as average or poor are more likely to seek psychological counseling during the COVID-19 outbreak.

Although the Ministry of Education and various social institutions have provided rich psychological service resources, the psychological help-seeking rate (0.64%) of college students in this study was still low, and a certain proportion of college students in the non-counseling group suffered from psychological symptoms but did not seek psychological help. This finding confirmed that college students are indeed a risk group for underutilization of mental health services, and they often hold a relatively negative attitude toward psychological counseling, consistent with previous studies (Jiang and Wang, 2003; Hunt and Eisenberg, 2010; Liang et al., 2017). In the face of psychological distress, college students often adopt informal ways to cope by seeking help from friends and family and seldom turn to professional psychological resources (Zhang et al., 2014). Many reasons have been proposed to explain why they do not seek professional help for common psychological distress. These include psychological factors such as negative attitudes toward seeking help, stigma, coping style, self-efficacy, personality, avoidance, passivity, worry about the evaluation of others, lack of understanding, unrealistic expectations of psychological counseling, and practical factors such as cost, transportation, or inconvenience (Zhou et al., 2010; Gulliver et al., 2010; Tan, 2012).

Psychological counseling was regarded as an imperative or last-resort choice by college students with poor mental health, and it was the final "exit" strategy adopted only when other channels for seeking help were blocked (Zhang et al., 2015). Seeking psychological help is an effective coping strategy, whereas not resorting to professional counseling even if suffering from serious mental issues is an evasive coping strategy. This type of help-seeking or coping strategy is consistent with the characteristics of collectivist cultures (including traditional Chinese culture). Avoidant coping, one of the major coping strategies in traditional Chinese culture, is positively related to Chinese young adults' psychological symptoms (Tao et al., 2000) and is generally associated with greater psychological distress (Compas et al., 2001). However, Gan et al. (2004) found that avoidant coping may be more adaptive than active coping when facing uncontrollable stressors such as SARS-related stressors because when individuals engage in avoidant coping, they tend to ignore or avoid the source of stress and thus leave the situation unchanged so as to reduce the emotional stress elicited by a problematic situation. Moreover, stigma can also prevent college students from seeking psychological help. Many college students who are plagued by mental illness try their best to hide their illness when the explicit symptoms are not obvious, fearing that they will be labeled with a stigma once they ask for psychological help. Studies have shown that mental illness stigma (Fang, 2015) and self-stigma (Zhang and Hao, 2019) can lead to negative help-seeking attitudes, interfere with individuals' choice of health-oriented actions, and hinder psychological help-seeking behavior.

According to the health belief model, the perception of disease susceptibility and severity is the core belief of behavior change, which depends on the individual's understanding and evaluation of his/her own psychological problems as well as on the interpretation of the meaning of psychological symptoms. Psychological problems and emotional troubles are often expressed in the form of symptoms. A psychological symptom is a type of abnormal feeling state, and it is also the main manifestation of mental illness. When an individual regards his/her psychological problems as a manifestation of mental illness, he/she may have a positive attitude toward psychological help; otherwise, he/she may ignore the problem or try to solve it on his/her own. After all, most symptoms are transient and mild and do not constitute a diagnosis of the disease, and only meaningful symptoms can lead to health-oriented actions. Those who have suffered psychological pain but avoid counseling may, to some extent, define the psychological pain suffered during the COVID-19 epidemic as temporary, static, and a non-disease that can be alleviated with the control of the epidemic. This low perceived need would prompt them toward self-regulation rather than seeking psychological help (Jorm, 2012). On the other hand, the finding that the college students in the counseling group scored higher in fear, trauma, and depression could also be explained by the health belief model. Generally speaking, the stronger and more persistent the psychological problems or painful symptoms are and the greater the impact on the individual's study, work, and life is, the easier it is to attract the attention of the parties concerned, which may lead to psychological help-seeking behavior (Liang et al., 2002). This is because when psychological distress is identified as a symptom, the perception of susceptibility and severity becomes clearer, which increases the likelihood of behavioral change (i.e., seeking professional psychological help).

The results of correlation and logistic regression analysis in the present study indicated that fear, depression, and trauma were all predictive factors of college students' psychological help-seeking behaviors and that fear was the best predictor among them. This is in line with results from previous research that concluded that individuals who experienced more psychological symptoms during the epidemic were more actively seeking social support than were those with fewer symptoms (Alexandra et al., 2011). With the extremely high infection rate and relatively high mortality rate, individuals, families, and communities experience feelings of hopelessness, despair, grief, bereavement, and a profound loss of purpose due to the COVID-19 pandemic (Levin, 2019). Feelings of loss of control drive fear and uncertainty as the trajectory of the pandemic constantly evolves (Usher et al., 2020). Many studies have suggested that the COVID-19 outbreak has already unleashed and exacerbated fear (Ahorsu et al., 2020; Ren et al., 2020). Fear has been conceptualized as a causal factor in mental distress (Lester, 2003), in severe cases resulting in PTSD and/or depression (Perrin et al., 2009).

However, fear is not only a common known response to infectious disease outbreaks but also a stress response to public health emergencies. Based upon transactional theory (Lazarus and Folkman, 1984), stress is described as an interactive process between stressors and an individual's psychological responses (e.g., appraisal, coping, adjustment). When confronted with a stressful situation, the body initiates the "fight or flight response," and over time, the body may become exhausted, leading to physical and psychological burnout (Melamed et al., 2006). Several studies have pointed out many problems caused by fear during infectious outbreaks, including accelerated disease transmission (Shultz et al., 2016), economic downturn (Lempel et al., 2009), a decline in immune function (Segerstrom et al., 1998) and mental health (Silver et al., 2013), and delays in making help-seeking decisions (Ren et al., 2020). Although fear causes many problems, it also motivates individuals to seek help and cope and thereby drives the contemporary mental health system (Lester, 2003). To deal with stress at its root and restore psychological energy, individuals need to try to do positive things to reduce stress and engage in active coping. Calling a psychological hotline is a primary way for individuals to solve psychological problems during the COVID-19 epidemic. Using such a hotline can help individuals by increasing their psychological motivation, enhancing their psychological strength, stimulating their initiative and autonomy, building their confidence in their ability to overcome their own problems, and helping them to gain a sense of control and certainty (Duan, 2007). For college students who were tortured by fear during the COVID-19 epidemic and were seeking ways to avoid being overwhelmed by the psychological exhaustion caused by the accumulation of pressure and problems, turning to psychological counseling was a concrete manifestation of active coping.

We also found that self-perceived mental health and experience with seeking psychological help play important roles in predicting the psychological help-seeking behaviors of college students. This is in accordance with the results from previous studies (Jiang and Xia, 2006; Lu, 2018). A 6-month follow-up survey of 216 college students facing psychological problems conducted by Li et al. (2016) found that the level of perception of psychological problems can positively predict the level of seeking professional help. The self-rating of perceived mental health has been shown to be stable from ages 23–33 and to be related to psychological distress (Mano et al., 2001). The health belief model and the PDM jointly emphasize the importance of individuals' perception and judgment of their psychological problems, which is often the first step in the help-seeking process. As an extension of health belief theory, protection motivation theory emphasizes the moderating effect of cognitive processes between attitude and behavioral changes, including threat assessment and coping evaluation, which together form protective motivation and then promote the occurrence or maintenance of behavior. The self-perception of mental health is one of the important factors in the process of threat assessment. The perception of poor mental health status by an individual will initiate threat assessment and promote protective motivation, achieving behavioral change (i.e., seeking psychological help).

In terms of psychological help-seeking experience, those who have sought psychological help showed a more positive attitude and a stronger desire for help from psychologists. This is mainly related to these individuals' sense of self-efficacy and the expected benefits of psychological counseling. According to previous research in the field of professional psychological help-seeking, efficacy is mainly divided into two categories: individual self-efficacy in dealing with psychological distress and self-efficacy as a client of psychological counseling. Zhao (2008) reported that the lower an individual's self-efficacy is for dealing with psychological problems, the higher the willingness to seek help, because the person feels that it is necessary to turn to others to solve the problem. On the other hand, self-efficacy as a client of psychological counseling is positively correlated with professional psychological help-seeking attitudes. If individuals think that they can benefit from counseling, then their help-seeking attitude will be more positive (Liu, 2012), and their willingness to seek help will be stronger (Wang and Sun, 2008); this consequently results in a higher likelihood of choosing to seek psychological counseling (Xia and Jiang, 2007). In addition, it is typical to consider the expected benefits (the possible benefits of asking for help) before making a decision to ask for help. From the perspective of motivation theory, when an actor engages in a behavior, the target object of the behavior should be an inducement to the actor, and to a certain extent, the target object should be able to meet the needs of the actor and bring benefits to the actor. It is impossible for actors to pursue goals that are disadvantageous to them (Zhang, 1999). Therefore, it is not difficult to understand that a good psychological help-seeking experience can increase college students' sense of self-efficacy and fulfill their need to resolve their psychological problems, which increases their probability of seeking psychological counseling in the future.

LIMITATIONS

The study has several limitations. First, the cross-sectional design could not explain the cause–effect relationships and does not allow the investigation of changes in individuals' mental health status and psychological help-seeking behavior across different periods of the COVID-19 epidemic, which could more fully reflect the psychological status and psychological help-seeking behavior characteristics of college students during the outbreak. Second, because all the constructs were assessed by self-report, the estimated relations among fear, depression, trauma, and psychological help-seeking behaviors might be subject to response bias. Future research should adopt multi-informant and multimethod assessment approaches. Third, due to the use of the convenience sampling method, the study sample primarily comprised college students in Guangdong Province. Future research needs to expand the scope of the survey to other provinces and cities in China and carry out stratified sampling to obtain a more comprehensive understanding of the situation of Chinese college students. Fourth, this survey lacked the measurement of the three processes of seeking psychological help, namely, help-seeking attitudes, intentions, and behaviors, limiting the explanatory power of the results. Future research can supplement the measurement of these key indicators, to better show the change in the psychological help-seeking process in the context of the epidemic.

CONCLUSION

To summarize, in the context of public health emergencies, the rate of seeking psychological help was still low, and college students with a poor psychological condition turn more to seeking psychological counseling. Fear caused by the COVID-19 outbreak is more likely to predict college students' psychological help-seeking behavior than depression and trauma because it not only causes a stress response but also strengthens college students' motivation to seek help. In addition, college students with good psychological help-seeking experience and poor mental health status have a higher probability of seeking psychological help, which may be related to self-efficacy and expected benefits.

As one of the few studies on mental health and psychological help-seeking behavior among college students during the COVID-19 epidemic, this study has important implications for university counseling services with respect to preventing, identifying, and treating mental health problems among students during acute, large-scale stressors such as an infectious disease outbreak. As students who were not directly affected by COVID-19 reported significant numbers of COVID-19-related psychological symptoms during the epidemic, university campuses should develop and implement effective screening procedures to closely monitor students' exposure to stressors and mental health status. Moreover, fear is the key factor motivating college students to seek psychological help. We should design a psychological intervention program for fear and fully utilize psychological assistance hotlines to help college students better adjust themselves. Last but not least, performing psychological

help-seeking intervention, strengthening the dissemination of mental health knowledge, and improving the level of mental health perception are effective ways to improve help-seeing attitudes and increase the probability that college students will seek psychological help.

DATA AVAILABILITY STATEMENT

The data analyzed in this study is subject to the following licenses/restrictions: The data is related to the subjects' personal privacy. Requests to access these datasets should be directed to S-WL, 357772263@qq.com.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Institutional Ethics Board of Southern Medical University. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

S-WL, R-NC, X-GL, J-BC, and S-YT sorted out the data. S-WL and R-NC did the literature search and analyzed the data. S-WL wrote the manuscript. L-LL provided the statistical methods to improve the manuscript. J-BZ directed the study design, revised the manuscript, and modified the language. All authors contributed to the article and approved the submitted version.

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Differences Between Health Workers and General Population in Risk Perception, Behaviors, and Psychological Distress Related to COVID-19 Spread in Italy

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In this study, we investigated the perception of risk and the worries about COVID-19 infection in both healthcare workers and the general population in Italy. We studied the difference in risk perception in these two groups and how this related to demographic variables and psychological factors such as stress, anxiety, and death anxiety. To this aim, we administered an online questionnaire about COVID-19 together with other questionnaires assessing the psychological condition of participants. First, we found that the exposition to infection risk, due to living area or job, increased the perceived stress and anxiety (i.e., medical staff in North Italy was more stressed and anxious with respect to both medical- and non-medical participants from Center and South Italy). Then, we conducted hierarchical logistic regression models on our data to assess the response odds ratio relatively to each regressor on each dependent variable. We found that health workers reported higher risk perception, level of worry, and knowledge as related to COVID-19 infection compared to the general population. Psychological state, sex, and living area were less related to these factors. Instead, judgments about behaviors and containment rules were more linked to demographics, such as sex. We discussed these results in the light of risk factors for psychological distress and possible interventions to meet the psychological needs of healthcare workers.

Keywords: healthcare workers, risk perception, worry, COVID-19, coronavirus outbreak, distress, mental health, SARS-CoV-2

INTRODUCTION

On December 31, 2019, some cases of pneumonia of unknown etiology have emerged in the Hubei region of China. Then, on January 07, 2020, the causative agent has been identified by means of oropharyngeal swabs, i.e., a virus belonging to the Coronaviridae family called SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2). This new coronavirus was responsible of the respiratory syndrome called COVID-19 (World Health Organization [WHO], 2020). Most patients with positive swab test developed only minor symptoms, such as fever, dry cough, and pharyngitis, with a benign evolution and spontaneous resolution of the clinical picture. However, some patients developed severe complications, such as interstitial pneumoniae with acute respiratory distress

syndrome, pulmonary edema, multiorgan failure, septic shock, and even death (Sohrabi et al., 2020). Patients at risk were especially males, aged older than 60 years, suffering from cardiovascular comorbidities (e.g., arterial hypertension, diabetes, and chronic coronary artery disease), and affected by chronic pneumopathies or cancer (World Health Organization [WHO], 2020; Zhou et al., 2020).

In the following month, the disease spread to other countries outside China, including Italy, where the first positive cases were found on February 21, 2020 (Spina et al., 2020). Italy experienced a significant increase in new cases, mostly in the month of March, in particular in the North regions, and this caused in turn a growing alarm throughout the Italian medical-hospital sector due to the imbalance between the resources of the national health system (indicated as SSN, i.e., "Sistema Sanitario Nazionale") and the expected need for treatment required by forecasts on the virus spread. This concern was publicly expressed in the guidelines published by the Italian Society of Anesthesia, Analgesia, and Intensive Care (named SIAARTI, i.e., "Società Italiana Anestesia, Analgesia, Rianimazione e Terapia Intensiva") on March 06, 2020, which reported that in case of huge imbalance between the population clinical needs and the effective availability of intensive resources, medical doctors should have selected patients for intensive therapies based on their actual hopes of survival (SIAARTI, 2020). In fact, in Italy, there were about 5,200 beds in total for intensive care units, and on March 11, 2020, 1,028 of these beds had already been destined to patients suffering from COVID-19. According to the predicted number of new cases, the peak of contagions would have been reached by mid of April, when at least 4,000 beds in the intensive care units would have been needed in order to treat patients with COVID-19 (Remuzzi and Remuzzi, 2020), with significant consequences also for patients not affected by COVID-19, who would have given less assistance in the aforementioned units.

However, on the one hand, doctors and other health workers multiplied their alarms relatively to this critical situation and to the related recommendations regarding behaviors to be followed and the hygienic conduct to be implemented; on the other hand, there were daily episodes of violation of such medical recommendations by the population, apparently only scarcely aware of the problem. For this reason, i.e., the failure of the unanimous spontaneous compliance of the population to the proposed hygienic rules and health practices, since February 23 the Italian Government implemented increasingly restrictive dispositions to limit the spread of the disease throughout the country with various Prime Minister Decrees (named DPCM, i.e., Decreto del Presidente del Consiglio dei Ministri; see DPCM on February 23, March 01, March 04, March 08, March 09, and March 11, 2020). In fact, a significant portion of population continued to engage in risky behaviors, prompting increasingly stricter rules emanated by the authorities. Therefore, a gap appeared to emerge between the indications and requests from the national health system staff and the reception of these same indications by the population, as well as a general difference in the perception and evaluation of the risks associated with the COVID-19 infection between the two groups. Such a difference seemed more evident especially in the areas of central and southern Italy, where the COVID-19 spread was lower than those of northern Italy, as reported by the daily data provided by the national civil protection (see Cereda et al., 2020).

The spread of the SARS-CoV virus in 2002 has shown how this type of epidemic disease has important psychopathological consequences, in the short and long term, in particular on health workers (Sim and Chua, 2004; Lung et al., 2009; Maunder, 2009). Thus, in the actual spread of the new SARS-CoV-2 virus attention to psychological health of doctors and others healthcare workers had already been expressed regarding the Chinese situation relating to COVID-19 (see for example Xiang et al., 2020), with proposals for intervention and support from the hospital structures (Chen et al., 2020). In fact, Chinese health workers in Wuhan faced a situation characterized by poor safety and protection, with excessive workloads, high infectious risk, absence of adequate personal protective equipment, and shortage of staff. This risky situation for one's own and loved ones' health could have clinical consequences, but also psychic ones. In fact, these health workers showed a symptomatology characterized by tiredness, worry, fear, frustration, isolation, depression, anxiety, stress, insomnia, anger, and negation (Kang et al., 2020). In particular, in this group of workers, women, workers with more than 10 years of service, and operators who had a history of psychological suffering showed higher risk of stress, anxiety, and depression (Zhu et al., 2020).

A further risk factor for psychological distress has been also a reduced social network support, a protective factor in the stress resilience (Ozbay et al., 2007). In the emergency situation caused by SARS-CoV-2, healthcare workers are indeed at high risk of acute stress, and this risk could be even higher if they feel such a disjunction from the social community formed by the other citizens, as the situation in Italy seemed to lead. In addition to the personal consequences on the psychophysical health of the health professionals, this could easily lead to a progressive decline in their health services, with a worsening of the quality of care provided. The experience with the disease caused by H1N1 in Japan showed how policies that take care of healthcare and give physicians confidence positively affected the overall care they provide to the population (Maunder, 2009; Imai, 2020). For all these reasons, it is very important to study the trait and state psychological variables of healthcare workers as risk or protective factors with respect to the actual stressful situation. In this manner, it would be possible to evaluate the analogies and the differences with the Chinese model at both intracultural and intercultural levels (McCrae, 2001), for considering which intervention strategies could be suited for Italian healthcare workers and thus importing the most adequate recently developed for the Chinese healthcare system in response to the spread of COVID-19.

In such an emergency situation, characterized by contrasts between the opinions and the worries of medical doctors on one side and the behaviors and the attitudes of the general population on the other, we designed and conducted this study. According to the evidences reported above, our objectives were (i) to probe the opinions and the worries relative to COVID-19 spread in both the general population and healthcare workers; (ii) to study which demographic, geographic, and psychological variables were

related to a higher perception of the health risks; and lastly (iii) to assess any difference in risk perception relatively to COVID-19 between the general population and healthcare workers. Thus, our aim was to understand the influence of psychological and training/working experience in shaping opinions, worries, and risk perception relatively to COVID-19. To this aim, we administered an online battery including a questionnaire about the direct experience, the opinions and the worries relative to the COVID-19, and some questionnaires evaluating the psychological distress state. To evaluate the participants distress level, we administered questionnaires measuring perceived stress, anxiety, and death anxiety as they usually increased in the general population (Brooks et al., 2020) and in healthcare workers (Brady, 2015; Kang et al., 2020) during emergency situation. As the social-health situation in Italy was evolving continuously in the beginning of March, we limited the data collection in the days 10–12 March 2020.

Based on the evidence reviewed so far, we hypothesized that healthcare workers would show higher levels of distress in terms of stress, anxiety, and death anxiety, particularly in North Italy, where the contagion was higher. In fact, as reported by Lai et al. (2020), direct exposition to virus outbreak affected the psychological health of healthcare workers, with those living in the region of Wuhan reporting higher distress than colleagues living elsewhere. Then, we hypothesized that healthcare workers would perceive higher levels of risk for themselves and for their relatives and that this effect would be true even when controlling for such psychological distress. In fact, we expected that this higher risk perception was not linked only to a worse psychological state, but also to a greater knowledge of the COVID-19 disease and of its possible consequences. Thus, we also expected that healthcare workers would report higher levels of knowledge of the new coronavirus. About containment and prevention measures, we expected that healthcare workers would report a higher engagement in preventing measures with respect to other people and request for more stringent containment measures, in order to prevent SSN collapse due to an increased number of accesses in hospital. Following all the previous hypotheses, we expected that participants not in the healthcare workers group would provide more optimistic forecast about the progress of the spread of COVID-19.

MATERIALS AND METHODS

Participants

Three hundred fifty-three Italian adults participated in this study (mean age = 38.26 years, *SD* = 12.24 years; females = 265, males = 88). We divided our sample by means of their job or training: in the first group, we included medical doctors, nurses, paramedics, and students in medicine/nursing/other medical disciplines ("MED" group; *n* = 167; mean age = 35.56 years, *SD* = 9.90 years; female = 133, males = 34), whereas in the second group, we included all the other participants (no-med or "NOM" group; *n* = 186; mean age = 40.69 years, *SD* = 13.58 years; females = 132, males = 54).

Procedure

We recruited our participants with a convenience sample method via email and social media. Participants received a brief description of the study together with an informed consent module. After providing the informed consent, they completed an online battery of questionnaires, as described afterward. Data were collected in anonymous format, and participants were invited at the end of the battery to leave their email in order to be contacted for possible follow-up measures. In this study, we collected data not reported here, as fully specified in the "Materials and Methods" section.

Materials

In this study, we administered questionnaires to evaluate the psychological condition and personality traits of each participant. Where possible, we opted for short or brief version of each questionnaire, in order to contain the total number of items (45 total items). We included in our battery the following questionnaires:

- The four-item Perceived Stress Scale (PSS; Cohen et al., 2006), a questionnaire evaluating the stress perceived by the participant in the last month, that is, the participant's perceived feeling to be in control over external events, relationships, and emotional life. We used the short four-item version. Each item was evaluated on a five-point Likert scale ranging from 0 (never) to 4 (very often). In our sample, the four-item PSS showed a good reliability score, Cronbach's $\alpha = 0.73$, similar to what was reported in the original version, $\alpha = 0.72$.
- The six-item version of State-Trait Anxiety Inventory (STAI; Marteau and Bekker, 1992), which assessed the anxiety of the participants on six items including emotions or feelings. Each item was evaluated on a four-point Likert scale ranging from 1 (almost never) to 4 (almost always). In our sample, the six-item STAI showed a similar reliability score, Cronbach's $\alpha = 0.85$, to that reported in the original version, $\alpha = 0.82$.
- The death anxiety scale of the Existential Concerns Questionnaire (ECQ; van Bruggen et al., 2017), which evaluated the anxiety of the participant relatively to his/her sense of finitude, to the fear of diseases and death. The total score was computed overall five items. Each item was evaluated on a five-point Likert scale ranging from 0 (never) to 4 (always). In our sample, the ECQ death anxiety scale showed a good reliability score, Cronbach's $\alpha = 0.89$ (in the original version, only the internal consistency for the global score was reported, $\alpha = 0.92$).
- The Marlowe and Crowne social desirability scale (M&C; Manganelli Rattazzi et al., 2000), which assessed the tendency of answering in a socially desirable manner. This version of the scale implied nine items evaluated over a six-point Likert scale ranging from 1 (absolutely false) to 6 (absolutely true). In our sample, the M&C scale showed an acceptable reliability score, Cronbach's $\alpha = 0.62$, slightly lower than that reported in the cited Italian validation, $\alpha = 0.69$.

We also included in the battery other questionnaires, which results were not reported in the present work: the 10-item Big Five Questionnaire (Guido et al., 2015), the Acceptance and Action Questionnaire II (Pennato et al., 2013), and the Emotion Regulation Questionnaire (Balzarotti et al., 2010).

We further developed a questionnaire about SARS-CoV-2 and COVID-19–related experience and personal opinion. Both authors (L.S. and C.G.) compiled a first list of items, and then this list was revised by five experts (medical doctors and psychotherapists) in order to remove, change, or add relevant items. We obtained a final list including 68 items. A complete list of the items was reported in **Appendix A**. To keep the questionnaire simple and easy to understand, we preferred to include mostly yes/no questions. The questionnaire we administered included the following:

- Demographic and personal information, i.e., age, sex, living area in Italy (North, Center, or South), years of study, job, relationship status, number of children, if pregnant or with a pregnant partner, number of cigarettes per day, alcohol drinking, presence (and type) of a chronic disease or other preexistent illness, drugs taken, religious belief, and if vaccinated for flu in 2019;
- Direct experience with the COVID-19 infection, i.e., if tested with the swab, if positive, if COVID-19 symptoms were experienced;
- Preoccupation about infection, at personal, familiar, and social level;
- Opinion about personal and other people's behaviors since the COVID-19 breakthrough;
- Opinion about the containment measures adopted by the Italian Government; and
- Information received about the disease and the social situation relative to the breakthrough of COVID-19.

Data Analysis

Data analysis was conducted with statistical software R, version 3.6.3 (R Core Team, 2014). As first step, we assessed differences in our sample between the MED and NOM groups for the demographic variables in order to control for unbalanced factors in our sample. We conducted these comparisons by means of *t*-tests for numerical data and of χ^2 tests for frequencies. Then, we described the experiences about COVID-19 infection in our sample and compared MED and NOM groups again and areas (North vs. Center vs. South Italy). We also compared the psychological state of our participants by group and area to assess difference in levels of anxiety, stress, and death anxiety. For these comparisons, we implied mixed-effects analyses of variance (ANOVAs) with one between factor (group, two levels: MED vs. NOM) and one within factor (area, three levels: North, Center, South). We further decomposed significant main or interaction effects by means of least significant difference–corrected *post hoc* pairwise comparisons.

As main analysis, we computed hierarchical logistic regression on the dichotomic responses and reported overall our participants about preoccupations, opinions, and behaviors relatively to their experience with the new coronavirus. This analysis allowed us to estimate the odds to obtain a positive response to a particular question given a set of parameters. For non-dichotomous variables (e.g., contagious spread in the next days could either increase, decrease, or stay stable), we created *N* dichotomous dummy variables, where *N* was the number of possible alternative responses to "equal" response (e.g., for contagious spread in the next days, we created a dummy variable for increased forecast and a dummy variable for decreased forecast). We used as reference the middle-point response, i.e., "equal" response, and evaluated the propension to respond "more" or "less" with respect to this point. Moreover, we did not analyze the questions for which we obtained identical or almost identical responses by all our participants, i.e., question with >98% of equal responses. In fact, for such questions, it was easy to find one of the outcome categories so underrepresented that it could lead to rare event outcome or be linearly separated by only one of the independent variables (IVs).

We introduced the regressors in the model at different steps of computation. At the first step, we introduced the demographic variables such as sex, age, and living area (with the North Italy as reference). At the second step, we added to these variables the psychological state factors of perceived stress (PSS score), anxiety (STAI score), and death anxiety (ECQ score), in order to investigate the contribution of these regressors. As last step, we investigated the difference between MED and NOM groups in responding to the questionnaire. For this aim, at the third step, we introduced the group variable as regressor.

When conducting logistic regression analysis, we should check for assumption violations. First, we considered the sample size issue. In the full model, i.e., model at Step 3, we had a total of eight IVs including all the regressors and the covariates. Considering our sample size of 353 participants, this resulted in an event per variable (EPV) of approximately 50, computed as the ratio between number of participants and number of IVs. This EPV could be considered as fairly sufficient to make the interpretation of our global model meaningful (Harrell, 2015; Ogundimu et al., 2016), even if the more stringent Bujang et al.'s rule of thumb Bujang et al. (2018) would suggest to include at least 450 participants for such a number of variables. Moreover, for each tested model, we checked for influential outliers and for multicollinearity. To test for influential outliers, we computed Cook's distance for each data point and check for values larger than 3 SD from the mean, as a large value of Cook's distance indicates an influential observation (Martín and Pardo, 2009; Zhang, 2016). To test multicollinearity, we computed the variance inflation factor (VIF) for each regressor and check for any value greater than 2.5, considered as more strict threshold with respect to the usual value of 5 or 10 (Midi et al., 2010). For all our logistic regression models, we found no influential outliers or any VIFs greater than the threshold value. The results of these tests, together with the reported EPV greater than 50, testified that our logistic regression analyses could be considered sufficiently reliable.

To further support our logistic regression model results, we conducted semipartial correlation analysis by means of the *ppcor* package for R (Kim, 2015). We assessed the degree of relationship between group (coded as NOM = 0 and MED = 1)

and each dependent variable of the COVID-19 questionnaire while controlling for sex, age, living area, anxiety, death anxiety, and stress. Semipartial correlations were reported as Pearson *r* for each computed correlation, with values ranging from −1, very strong negative relationship, to 1, very strong positive relationship.

Even if we conducted a great number of statistical analyses on the same sample, we decided not to apply a general correction to significance level for multiple tests. Because of the exploratory nature of this study, we preferred not to strictly control over false-positive rate (Type I error) while avoiding to inflate false-negative rate (Type II error); i.e., we decided to collect all the significant results emerging from our analysis so to guide further, confirmatory experiments and studies (see Fiedler et al., 2012, for an overview of the problem on multiple testing correction).

RESULTS

Table 1 reports the descriptive statistics for the two groups and the relative tests for samples' comparison. As shown, participants in the MED group were younger (mean = 35.56 vs. 40.69), studied more years (mean = 23.02 vs. 21.34), had less children (mean = 0.40 vs. 0.58), reported to sleep in average less time per night (mean = 6.84 vs. 7.06), and were more frequently vaccinated for annual flu in 2019 (40% vs. 13%).

Experience With the COVID-19

In this first results section, we reported the analysis of the data relatively to the experience with the COVID-19. We thus referred to the data in the first part of the questionnaire, in which we asked if participants had personal experiences or contacts with COVID-19 infection. We reported data overall participants and divided by groups in **Table 2**. Frequencies were compared by means of χ^2 test.

For the overall sample, we found an effect of the living area on question 3, about the presence of symptoms related to COVID-19, $\chi^2(2) = 44.48$, $p < 0.01$; question 4, about thinking that the symptoms relate to a COVID-19 infection, $\chi^2(2) = 11.64$, $p < 0.01$; question 6, about the quarantine status, $\chi^2(2) = 30.67$, $p < 0.01$; question 7, about contact with people at risk of infection, $\chi^2(2) = 21.87$, $p < 0.01$; and question 9, about the presence of positive case in the living area or city, $\chi^2(2) = 132.71$, $p < 0.01$. In answering to all these questions, participants from North Italy reported a greater direct experience with COVID-19 than participants from Center or South Italy, whereas participants from Center Italy reported more personal experiences than participants from the South.

Then, we compared the frequencies between the two groups, MED versus NOM. We found significant differences in question 7, about contact with people at risk of infection, $\chi^2(1) = 14.41$, $p < 0.01$, and in question 8, about contact with people positive for COVID-19 test, $\chi^2(1) = 20.01$, $p < 0.01$, with participants in the MED group reporting more frequent contacts with people at high risk of infection or already positive.

Comparing Psychological Variables Between Groups

We measured various indexes of psychological distress state, i.e., anxiety, death anxiety, and stress. Here, we tested if any difference existed between groups in the psychological state and

TABLE 1 | Descriptive statistics computed overall the sample and for the two groups separately.

Variable	Overall (*n* = 353)		MED group (*n* = 167)		NOM group (*n* = 186)		Statistical comparison
	Mean	*SD*	Mean	*SD*	Mean	*SD*	
Age	38.26	12.24	35.56	9.91	40.69	13.58	t (351) = 4.02*
Years of study	22.14	5.07	23.02	4.66	21.34	5.30	t (351) = −3.15*
Children	0.49	0.80	0.40	0.73	0.58	0.85	t (351) = −2.19*
Sleep hours per night	6.96	0.92	6.84	0.94	7.06	0.89	t (351) = 2.24*
Number of cigarettes per day	2.20	4.77	2.11	4.49	2.27	5.03	t (351) = 0.32
Alcohol consumption (1–4)	0.95	0.73	0.90	0.73	1.00	0.73	t (351) = 1.31
	Proportion		Proportion		Proportion		
Sex	0.75		0.80		0.71		χ^2 (1) = 0.01
In a relationship	0.68		0.68		0.69		χ^2 (1) = 0.93
Pregnant (or pregnant partner)	0.04		0.04		0.03		χ^2 (1) = 0.08
Religion (catholic or others)	0.46		0.46		0.47		χ^2 (1) = 0.61
Chronic disease/illness	0.27		0.28		0.27		χ^2 (1) = 0.17
Flu vaccine in 2019	0.25		0.40		0.13		χ^2 (1) = 19.60*
Italy area							
North	0.18		0.14		0.23		χ^2 (1) = 6.50*
Center	0.63		0.70		0.55		χ^2 (1) = 2.25
South	0.19		0.16		0.22		χ^2 (1) = 0.73

*Comparisons were conducted by means of t test for numerical variables and of χ^2 test for categorical variables. *p < 0.05.*

TABLE 2 | Frequency (in%) of "yes" responses to each question, computed by area and by group.

No.	Question	Area (overall sample)			Group	
		Center	North	South	NOM	MED
(1)	Have you done a throat swab for SARS-CoV-2?	0.00	3.13	0.00	0.00	1.19
(2)	If yes, was it positive?	0.00	1.56	0.00	0.00	0.59
(3)	Do you or have you recently had one or more symptoms related to COVID-19?	36.94	42.19	40.30	36.02	41.32
(4)	If yes, did you think could be COVID-19?	6.76	18.75	1.49	5.91	10.18
(5)	If yes, have you alerted the national health service?	2.70	7.81	0.00	2.63	3.59
(6)	Are you currently or have you been on spontaneous or imposed quarantine for COVID-19?	22.97	31.25	17.91	26.34	20.36
(7)	Are you currently or have you recently been in contact with people at high infectious risk?	22.07	53.13	17.91	15.59	39.52
(8)	Are you currently or have you recently been in contact with people who had a positive test for COVID-19?	4.05	14.06	2.99	0.00	11.98
(9)	Have any positive cases of COVID-19 infection been detected in your living area or city?	88.29	98.44	68.66	83.33	89.82

if this difference was modulated by the living area. To this aim, we conducted mixed-effects (ANOVAs) with a between-variable of group (MED vs. NOM) and a within-variable of living area (North vs. Center vs. South Italy). We controlled for the effect of age and sex as covariates. We probed significant effects by means of *post hoc* corrected tests.

For the death anxiety score (ECQ; see **Figure 1**, left panel), we found no significant main effects or significant interaction, all p's > 0.19. For the Perceived Stress Score (PSS; see **Figure 1**, middle panel), we found a significant main effect of the living area, $F(2,348) = 6.52$, $p < 0.01$, with participants from North Italy reporting higher stress levels than participants from both Center, $p < 0.01$, and South Italy, $p < 0.01$. The analysis also revealed a significant group × living area interaction, $F(5,345) = 3.16$, $p < 0.05$, with MED participants from North reporting higher stress score than other MED participants from both Center, $p < 0.01$, and South Italy, $p < 0.01$, as well as higher stress score than the NOM group participants from all living areas, all p's < 0.05. For the anxiety score (STAI; **Figure 1**, right panel), we found a significant main effect of living area, $F(2,348) = 3.31$, $p < 0.05$, with participants from North Italy reporting higher anxiety levels than participants from Center, and a significant group × living area interaction, $F(5,345) = 2.96$, $p < 0.05$. The interaction was due to a significant difference in anxiety between MED participants from North with respect to the MED participants from Center and South Italy, p's < 0.01, and with respect to NOM participants from Center Italy, $p < 0.01$. This analysis thus revealed that the MED group participants from North Italy reported higher levels of anxiety and stress than the general population and the medical and paramedical staff from other living areas.

Descriptive Statistics of the Questionnaire About COVID-19

Before conducting the regression analysis on the questionnaire data, we reported some descriptive information and statistics about the response frequency of participants. Response frequencies for each item overall sample as well as divided by group are reported in **Table 3**, left group of columns. Here we reported also a χ^2 test comparing the frequency of "yes" responses for the two groups.

Of note, 57% of participants were thought to be at risk of contagion, but only 18% were thought to be at risk when the first cases appeared in Italy. They also thought that their loved ones would be at risk (65%). The MED group reported higher frequency of thinking to be at risk (71%). Many participants in this group (57%) were scared about health consequences or death if infected, but almost all (93%) were more worried for family or loved ones' consequences of infection. Similarly, the 73% of them reported worries about the global sociopolitical implication of virus spread, and the 83% about the possible collapsing of the national health system. Moreover, 83% of them thought that people's behavior could be ever scaring of the infection and 73% were worried by the increased aggression risk for health workers in the near future.

Most of our sample (97%) reported to adhere to hygiene measures and to avoid public events or places (94%), and only a few participants reported to have risky behaviors for themselves (18%) or their family (17%). However, only 16% of NOM and 6% of MED believed that people's behavior was adequate to the situation. About violation of the public health dispositions, most of participants thought that violation should be punished more severely (90%) or that the national army should be implied (91%), as they reported to be preoccupied or angry toward such violations (89%). Few reported to have bought more canned food (23%), and very few participants reported that they would try to escape if the infection would spread in their living area (2%), even if a great part of them (71%) believed that the infection fear could be considered a valid reason to break the containment rules.

About the possible problem of accessing healthcare services, most of participants (71%) believed in the national health system, whereas few thought that it was right to give priority to people with greater hope of survival in case of shortage of hospital beds (25%) and even less (5%) that they would accept an exclusion for them or their loved ones at all kindly.

About their opinions on the containment measures disposed, 98% of the participants thought that these measures were necessary, but only 56% thought that these same measures were adequate (the MED group was more skeptical than the NOM group), and 80% proposed to strengthen them. In line with

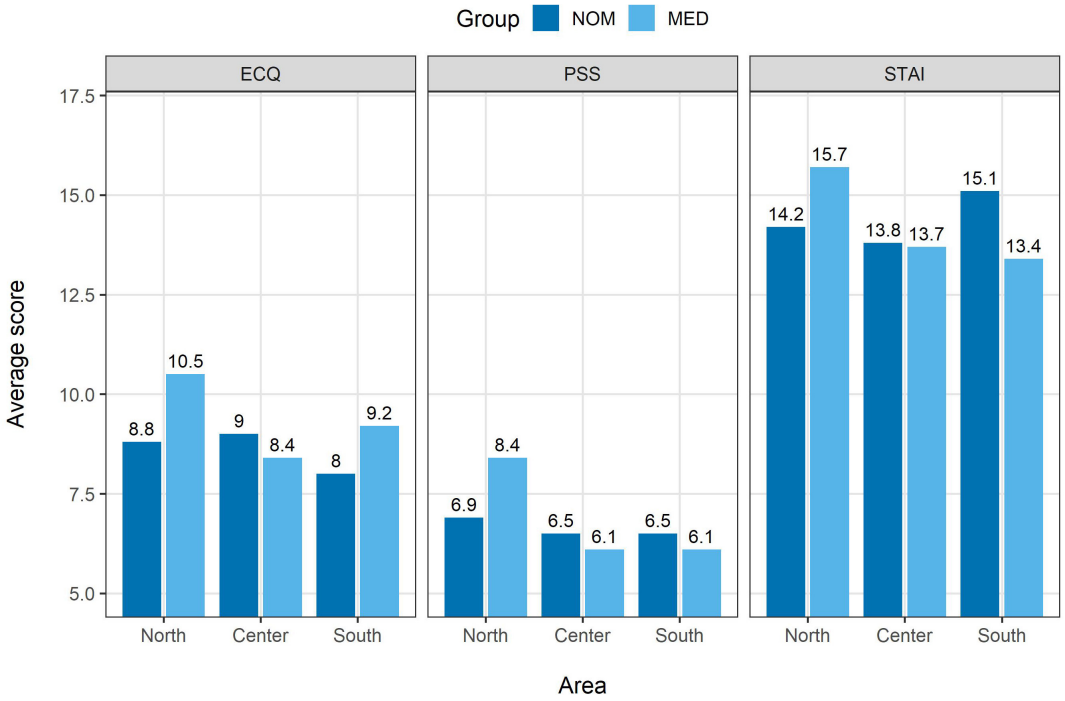

FIGURE 1 | Average score for ECQ **(left)**, PSS (middle panel), and STAI **(right)** plotted by group (MED vs. NOM) and area (North, Center, or South). Average scores for each combination of group and area are reported on top of the bars.

this, most participants thought that it was right to limit people's freedom for controlling the virus (93%), as well as one's own freedom (99%), as they already limited their behaviors (99%).

About the information, they reported to be properly informed about the virus (84%) and the social situation related to it (70%), but also requested more information from experts (68%). About perception of risk in public opinion, 64% of participants reported to think that it was lesser than it should be and 30% that it was greater. Interestingly, 40% reported to think that there was some hidden information about the virus, and 68% of these that such hidden information was related to a greater danger related to the infection. The MED group, instead, reported to be less convinced of the existence of hidden information (34% vs. 46% of the NOM group).

Lastly, about the spread of the virus, the MED group was more pessimistic than the NOM group. In fact, they reported less likely that the spread would slow down in some days (19% vs. 45%) or in some weeks (71% vs. 78%).

Logistic Regression Overall Sample: Effect of Demographics

In this subsection, we present logistic regression results on the COVID-19 questionnaire. We used each question as a dependent variable in a three-step hierarchical logistic regression. At Step 1, we used as regressors the demographic variables (see "Data Analysis" section) and the living area, considering North Italy as the reference (the coefficients reported should be interpreted as the odds that a participant from Center or South Italy would answer "yes" to a question compared to a participant from North Italy). At Step 2, we added as regressors the psychological factors of perceived stress, anxiety, and death anxiety. Finally, at Step 3, we included the group effect. Along with Step 3 results, we also provided semipartial correlation score for the relationship between each dependent variable and the group (coded as 0 = NOM and 1 = MED). For the sake of brevity, we reported only the questions for which we obtained significant regressors.

At Step 1 (see **Table 3**, Step 1 block of columns), we included in the model only demographic variables. Of these, the most influential were sex and age. With respect to male sex, female sex was linked to higher odds to be concerned by the following risks: being infected (1.68), loved ones being infected (1.71), developing serious complication or dying (2.99), global crisis (1.88), people's behavior in response of virus outbreak (1.89), infecting family members or love ones (2.38), and people's violating the containment provisions (2.65). In fact, females had higher odds to report that the public opinion had less risk-related perception about COVID-19 than it should be (1.80), that risky behavior should be punished more severely (3.37), that containment provisions should be improved (1.90), and that it would be right to limit people's freedom in this situation (4.71). In line with these results, they reported more likely to have not continued to attend public places and events (0.32).

About age factor, older age was related to lower odds of reporting worries about the risk of infection for the loved ones (0.98), or about people's behavior as more dangerous that virus infection (0.95), or about the perception of risk in public opinion as lower that is should be (0.95). Older age people also reported

TABLE 3 | Hierarchical logistic regression odds for demographics (Step 1), psychological (Step 2), and group (Step 3) factors for the COVID-19 questionnaire.

Question	Frequency of "yes" responses				Step 1				Step 2			Step 3	
	All	MED	NOM	χ^2 test	Sex	Age	Area Center	Area South	PSS	STAI	ECQ	MED	Sp. cor.
Do you think you are currently at infectious risk?	0.57	0.71	0.45	5.72*	1.68*	0.99	0.46**	0.64	1.11*	0.95	1.02	2.71**	0.23**
Did you think you were at risk when the first cases appeared in Italy in January 2020?	0.18	0.23	0.14	2.25	1.02	1.02	0.38**	0.41*	1.08	0.99	1.03	1.94*	0.13*
Do you think your family members/loved ones are currently at infectious risk?	0.65	0.73	0.57	1.12	1.71*	0.98**	0.59^{+}	1.21	1.05	1.03	1.00	1.70*	0.13*
Are you worried about the possibility that, in case of infection, you may have serious complications or die?	0.57	0.59	0.55	0.08	2.99**	1.03**	1.57	1.30	1.03	0.98	1.16**	1.33	0.04
Are you worried about the possibility that, in case of infection, some of your family/loved ones may have even serious complications or die?	0.93	0.95	0.92	0.51	2.10^{+}	0.98	0.01	0.01	0.95	1.02	1.11*	0.98	0.02
Are you worried about the possibility that the situation may precipitate at global level in the near future due to COVID-19?	0.73	0.76	0.70	0.03	1.88*	1.01	0.72	1.09	1.06	1.03	1.05^{+}	1.33	0.06
Are you worried about the possibility that, if the national health system was unable to guarantee treatment or to support the volume of hospitalized patients, episodes of violence and abuse may occur among patients or their families?	0.83	0.86	0.81	0.17	1.49	0.97**	0.94	1.06	1.10	1.11^{+}	1.02	1.27	0.04
Are you concerned about the possibility that other people's behavior in response to this situation could be more dangerous than the medical risks associated with COVID-19 infection?	0.83	0.86	0.81	0.12	1.89*	0.95**	0.87	0.98	1.06	1.01	1.00	1.08	0.02
If you work in the medical/health sector, do you fear that the scarcity of means and resources of care foreseen for the near future could expose you to episodes of violence or retaliation by patients or their families? (answer "no" if you are not a doctor/other health worker)	0.73	0.73	–	–	0.98	1.00	0.53	1.11	1.00	1.05	1.06	–	–

(Continued)

TABLE 3 | Continued

Question	Frequency of "yes" responses				Step 1				Step 2			Step 3	
	All	MED	NOM	χ^2 test	Sex	Age	Area Center	Area South	PSS	STAI	ECQ	MED	Sp. cor.
Do you think you might have put yourself at risk of infecting yourself with your behavior?	0.18	0.23	0.15	1.86	1.68	0.97*	0.60	0.51	1.08	0.94	1.05	1.34	0.06
Do you think you might have put yourself at risk of infecting your family/loved ones with your behavior?	0.17	0.22	0.13	2.40	2.23^{+}	0.96**	0.55	1.02	1.04	1.00	1.03	2.68	0.06
Are you implementing the hygienic–sanitary prevention provisions such as washing your hands often, avoiding physical contacts (handshakes, kisses, and hugs), sanitizing surfaces, keeping a certain distance from the interlocutors?	0.97	0.98	0.97	0.74	–	–	–	–	–	–	–	–	–
Do you think people are having appropriate behaviors for the situation?	0.11	0.07	0.16	8.10**	1.05	1.03*	2.03	2.19	1.09	0.93	0.96	1.13	-0.12*
Are you worried/angry about the violation of containment provisions shown by some people in the last few days?	0.89	0.90	0.88	0.62	2.65**	1.02	0.51	0.46	1.04	0.89^{+}	1.07^{+}	1.43	0.02
Do you think it would be right to punish more severely public health risky behaviors?	0.90	0.92	0.88	0.32	3.37**	1.00	1.19	1.86	1.04	1.02	1.04	0.46	0.05
Are you continuing or have you continued in the last few days to attend meeting places for recreational purposes such as pubs, restaurants, malls, fairs, events, cinemas, or theaters?	0.06	0.04	0.07	2.33	0.32**	0.95*	1.52	0.36	0.99	1.04	0.96	0.86	-0.08
Have you recently bought more canned, long-life food and/or bottled water to stock up on it?	0.23	0.22	0.24	0.80	1.75^{+}	1.01	0.98	1.06	0.96	1.05	1.00	2.56	-0.03
If the virus spread in your living area, would you try in any way to move to an area considered safer?	0.02	0.02	0.02	0.01	–	–	–	–	–	–	–	–	–
Do you think concern and fear surrounding COVID-19 are valid reasons to violate the sanitary containment provisions?	0.71	0.74	0.67	0.01	0.89	1.00	1.08	0.47*	0.98	1.00	1.00	1.65*	-0.05

(Continued)

TABLE 3 | Continued

Question	Frequency of "yes" responses				Step 1				Step 2			Step 3	
	All	MED	NOM	χ^2 test	Sex	Age	Area Center	Area South	PSS	STAI	ECQ	MED	Sp. cor.
Do you think the national health system would currently be able to take care of you if you got infected?	0.71	0.84	0.60	3.57	1.12	1.00	0.80	0.97	1.03	0.96	1.01	3.78**	0.09
Do you think it is right to give care priority to people with greater hope of survival in case of need or shortage of hospital beds?	0.25	0.26	0.23	0.01	1.12	1.01	0.64	0.94	1.06	0.92^{+}	0.98	1.19	0.27**
If you or one of your family/loved ones were prevented from accessing to intensive care to give priority to patients with a higher probability of survival, would you accept this decision at all kindly?	0.05	0.04	0.05	1.00	0.72	0.99	1.69	1.65	0.93	1.17^{+}	1.08	0.65	0.05
Do you think that virus containment measures are necessary?	0.98	0.99	0.97	0.65	–	–	–	–	–	–	–	–	–
Do you judge the current containment action as adequate?	0.56	0.51	0.61	3.96*	0.85	1.01	2.41**	2.74**	0.98	0.98	0.98	0.72	-0.09
Do you think that the containment measures need to be improved or strengthened?	0.80	0.84	0.76	0.01	1.90*	1.00	0.74	0.81	0.98	1.01	1.04	1.63^{+}	0.09^{+}
Do you think it is right to use the army or the public force to enforce health containment measures?	0.91	0.93	0.89	0.31	0.97	1.02	1.08	0.91	1.06	1.04	1.01	1.90	0.08
Do you think it is right to limit people's freedom in view of greater virus containment?	0.93	0.96	0.91	0.30	4.71**	1.01	1.80	1.28	1.00	1.00	1.05	2.25	0.07
Do you think it is right to limit your risky behaviors autonomously (for example, avoid leisure travel, do not attend crowded places, do not participate in events)?	0.99	0.99	0.99	0.93	–	–	–	–	–	–	–	–	–
Are you currently limiting your risky behavior?	0.99	1.00	0.97	0.56	–	–	–	–	–	–	–	–	–

(Continued)

TABLE 3 | Continued

Question	Frequency of "yes" responses				Step 1				Step 2			Step 3	
	All	MED	NOM	χ^2 test	Sex	Age	Area Center	Area South	PSS	STAI	ECQ	MED	Sp. cor.
Do you think you are properly informed about the characteristics of COVID-19?	0.84	0.93	0.76	0.57	1.39	1.01	0.89	1.29	0.90	1.02	0.99	4.53**	0.24**
Do you think you are properly informed about the political/social situation related to COVID-19?	0.7	0.77	0.65	0.26	0.83	1.00	0.57^{+}	0.50^{+}	0.92	1.02	1.04	1.97**	0.15*
Do you think more communication from experts (such as virologists and other doctors) is needed?	0.68	0.69	0.68	0.50	0.75	0.96**	1.53	1.68	1.14**	0.94	0.97	0.92	-0.03
Do you think that media are too much or too insistently concerned with COVID-19?	0.57	0.59	0.55	0.08	1.40	0.99	0.85	1.14	1.04	1.02	0.99	1.07	0.02
Do you think there is any sensitive information, related to COVID-19, hidden from you?	0.40	0.34	0.46	5.52*	1.13	1.00	1.69^{+}	2.23*	1.04	1.00	0.99	0.60*	-0.12*
If yes, do you think they are related to a real greater danger of the virus? (if you answered "no" to the previous question, select "no")	0.68	0.77	0.62	0.84	1.47	1.04*	1.28	1.65	0.98	1.11	0.96	2.70*	0.18*
According response (to "equal" reference)													
Spread of the virus will slow down in the next few days	0.35	0.19	0.45	15.36**	1.27	1.03^{+}	0.92	1.32	1.01	1.00	0.99	0.28**	-0.23*
Spread of the virus will accelerate in the next few days	0.73	0.75	0.72	0.53	1.37	1.01	0.75	0.98	0.98	1.04	0.97	1.20	0.05
Spread of the virus will slow down in the next few weeks	0.75	0.71	0.78	5.49*	0.97	1.00	1.23	1.52	0.87*	1.07	1.02	0.71	-0.07
Spread of the virus will accelerate in the next few weeks	0.71	0.73	0.69	1.07	1.52	1.00	1.27	1.94	0.85*	1.14*	1.02	1.31	0.05
Perception of risk related to COVID-19 in public opinion is lesser than it should be	0.64	0.72	0.56	1.67	1.80*	0.99	0.50^{+}	0.56	0.99	0.97	1.02	1.83*	0.14*
Perception of risk related to COVID-19 in public opinion is greater than it should be	0.30	0.33	0.29	1.33	0.70	0.95**	0.41^{+}	0.75	0.88	1.00	1.04	0.96	-0.01

Questions in italics showed imbalanced responses (almost all "yes" or "no"). Sex was coded as 0 = male, 1 = female. Group was coded as 0 = NOM and 1 = MED. ECQ = Existential Concerns Questionnaire (death anxiety scale); PSS = Perceived Stress Scale; STAI = State-Trait Anxiety Inventory. Rightmost column (Sp. cor.) reports Pearson r for semipartial correlations between group and questionnaire responses (coded as 0 = "no" and 1 = "yes") controlling for all the other variables, i.e., sex, age, living area, anxiety, death anxiety, and stress. Significance level marked as follows: $^{+}p < 0.10$, $*p < 0.05$, $**p < 0.01$.

lower odds to be concerned about their behavior as risky for themselves (0.97) or loved ones (0.96), but higher odds to be concerned about their health status in case of COVID-19 infection (1.03) and by people reaction to virus spreading (1.03). Lastly, they reported lower odds to request for more information by experts on media (0.96).

Also, the living area had a relative impact on the outcome variables at this step. With respect to participants from North Italy, those from both Center and South Italy showed greater odds to judge the actual containment measures as adequate (Center = 2.41, South = 2.74) and to think that some information about COVID-19 was hidden from them (Center = 1.69, South = 2.23), whereas they reported less likely to be at infectious risk (Center = 0.46, South = 0.64 not significant) or to consider themselves at risk when the first cases were discovered in Italy (Center = 0.38, South = 0.41). Of note, participants in South area reported lower odds with respect to participants in North area to consider fear of infection as a valid reason to violate the containment measures (0.47).

Logistic Regression Overall Sample: Effect of Psychological Factors

At Step 2 (see **Table 3**, Step 2 block of columns) of hierarchical model, we added psychological factors of perceived stress (PSS), anxiety (STAI), and death anxiety (ECQ). We found that these factors were related to few, but interesting outcomes. In particular, the PSS score was related to a higher worry to be currently at infection risk (1.11) and a major need of information by experts (1.14), while their opinion on the virus spread was that it would show equal speed in the weeks following the compilation (0.84 for both accelerated or slowed-down spread). Instead, the STAI score was related to higher concerns of accelerated spread of virus in the weeks following the compilation of the questionnaire (1.14). Lastly, the ECQ score was related to a higher level of worrying about the COVID-19 situation, in particular about possible severe outcome of the disease for themselves (1.16) or loved ones (1.11) and marginally related to higher level of worrying about possible catastrophic social global outcomes (1.05) or violation of containment measures (1.07).

Effect of Group on Logistic Regression Model

At Step 3, we added to the logistic regression model the group factor to check for the predictive effect of being in the MED or NOM group while controlling for both demographic and psychological variables. Results are reported in **Table 3**, Step 3 column (see the rightmost column). Participants in the MED group reported higher odds of thinking to be at actual risk of infection (2.71) and also to be at risk from the beginning of the COVID-19 spread in Italy (1.94). They also reported more likely to think that their family or loved ones were at risk of infection (1.70). The MED group showed higher odds to report that the fear of contagion would be a valid reason to violate the containment measures (1.65) and that the SSN would adequately cure them in case of infection (3.78) and to report a sufficient level of information about the characteristics of the disease (4.53) and about the social situation relative to COVID-19 (1.97). They also reported less likely that some information about the virus was hidden (0.60), but the ones who answered affirmatively to this question had more than two times the odds with respect to the NOM group thinking that such hidden information was related to a greater virus-related danger (2.70). About the spreading of the virus, participants in the MED group were less probably convinced that the virus spread would slow down in the following days after the compilation of the questionnaire (0.28). Lastly, the MED group participants more likely reported that perception of risk in public opinion was lower than it should be (1.83).

Semipartial correlations mostly confirmed this pattern of results. However, differently from the logistic regression, this analysis revealed that the MED group was related to the opinion that people's behavior was not adequate to the situation, $r = -0.12$, and to agree to give care priority to people with greater hope of survival, $r = 0.27$. Also, semipartial correlations did not confirm the regression results for the questions about the fear of contagion as a valid reason to violate the containment measures, $r = -0.05$, and the adequacy of the SSN to take care of people in case of infection, $r = 0.09$.

DISCUSSION

In this article, we investigated the worries and the perception of risk toward the health and social situation in Italy related to the outbreak of COVID-19. To this aim, we conducted a cross-sectional study by means of online questionnaires administered to a convenience sample of volunteer participants including both health workers and the general population. We asked participants to report their worries and opinions about COVID-19 in about 50 different questions combined with psychological variables measuring stress, anxiety, and death anxiety. We obtained and analyzed data from 353 Italian adult, divided in 167 participants in the MED group (medical doctors, paramedics, health workers, and students) and 186 participants in the NOM group. We mainly compared the answers given to the questionnaires by these two groups. We also investigated the effect of the living area in Italy, as the northern regions were more involved than the central and southern ones (Cereda et al., 2020).

Anxiety and Stress as Related to Living Area and Job

First, we assessed risky situations in which people were involved relatively to COVID-19. As expected, people from North Italy reported more direct experiences with COVID-19, including more symptoms related to the infection, more prolonged quarantine status, more contacts with people at risk, and higher numbers of positive cases in their zone. The MED group, instead, reported a higher number of contacts with people currently infected or at risk. Thus, both living area and group predicted a major or minor probability to be involved in risky situations or contacts. Following this, we found that participants from North Italy reported higher levels of stress and anxiety and in particular that health workers in North area showed a higher level of both health workers from other areas and the general population from

the same area. Thus, both living area and job combined with the higher exposition to infection risk in order to increase the level of stress and anxiety in health workers from North Italy.

We would caution about the relatively small number of participants in each area divided by group: our results about living area should be considered strictly as preliminary. Further studies are welcome in order to confirm or refute the results that we presented on this topic. However, we should note that our result was in line with the psychological response of health workers in China, where Lai et al. (2020) found that psychological distress increased for workers closer to the outbreak of epidemic (i.e., who lived and worked in Wuhan region) or assigned to patients affected by COVID-19. Thus, the same rule applies here: the closer to the risk of infection, the higher the risk of acute psychological distress.

Similar results were found in previous researches on new disease outbreaks. For example, Wong et al. (2007) reported higher levels of anxiety in university students during the SARS epidemic, in particular among medicine students and students living in the area in which the infection spread more. Also Wheaton et al. (2012) reported higher levels of anxiety in students in response to pandemic spread of H1N1. More generally, anxiety emerged in response to various viral diseases, from the annual influenza virus to the H1N1 pandemic (Coughlin, 2012). In the period of viruses spread, anxiety seems to increase in population along with mood disorders, and this increase was related to exposition and infection risk. In line with these results, participants of our study reported higher levels of perceived stress and of anxiety proportional to their risk of infection, i.e., health workers from North were more stressed and anxious than both their colleagues in Center and South Italy and the general population.

While our result supports an acute increase of stress and anxiety, we should carefully monitor the psychological state evolution in order to assess also the effect of COVID-19 over time. In fact, we expected that the virus spread and the quarantine state endurance in Italy could have also mid- and long-term consequences. Survivors from SARS reported posttraumatic stress, anxiety, and depression symptoms 1 month after discharge, suggesting that life-threating condition could have important psychic sequelae (Wu et al., 2005). Such sequelae could be even more significant in health workers, showing higher levels of psychological distress both during and after a quarantine period (Brooks et al., 2020). For this reason, supporting psychological intervention for healthcare workers could be crucial in the first phase of an outbreak (Xiang et al., 2020), in particular considering that a timely and effective intervention could greatly reduce the later onset of posttraumatic stress disorder symptoms following a catastrophic event (Watson et al., 2002).

Risk Perception and Worries About COVID-19

We analyzed the answers to our questionnaire on COVID-19 by means of logistic regression. For each item, we computed the response odds related to each regressor in three successive steps, by adding sequentially demographic factors, psychological factors, and the group factor. Here we discussed the implication of all these computational steps by dividing the questionnaire items by content. In this section, we discuss the variable that we found for the items relatively to risk perception and worries related to the COVID-19 outbreak in Italy.

Group was strongly related to risk perception: healthcare workers showed about 2.5 times the odds of other participants to perceive themselves at risk of infection, as well as about two times the odds to think they were at risk even at the very start of virus outbreak in Italy. Moreover, they worried about their family situation and about virus spread as they reported that it would not slow down. This supported the idea that medical doctors, nurses, and paramedics had greater risk perception about the COVID-19 infection, probably due to also a greater exposition to danger and to suspect positive cases. Also, living area predicted the perception of risk, as both participants from Center and South Italy reported 0.5 times less preoccupation about risk of infection with respect to participants from North Italy. Again, combination of work, i.e., health workers, and area, i.e., North Italy, combined for the greater perception risk.

About the demographics, the stronger regressor of such worries was female sex, which was related to higher perception of risk, both at personal and family levels, and of a number of worries about social situation and people's behaviors. In particular, female healthcare workers were reported to be at higher risks of stress, anxiety, and depression during the COVID-19 outbreak in China (Lai et al., 2020; Zhu et al., 2020). This increased distress level in female health workers could be related to an increased perception of risk for themselves and for their relatives as we found in our study, as also reported usually in researches about risk perception in female participants (Gustafsod, 1998). Our results suggested carefully supporting female healthcare workers implied in COVID-19 treatments, as they could be more exposed to risk-related stress compared to their male colleagues. Another important demographic variable was age, as we found that aged people were more worried than younger people about severe consequences of COVID-19, as they already knew that the disease was more dangerous for older people, in particular when older than 60 years (Novel Coronavirus Pneumonia Emergency Response Epidemiology Team, 2020).

Lastly, also psychological factors influenced the odds of perceived risk of infection. In fact, stress was related to increase in perceived risk, while death anxiety was related to the concern about fatal or severe consequences of COVID-19. While the effect of both stress (Traczyk et al., 2015; Sobkow et al., 2016) and death anxiety (Langford, 2002) on risk perception and risk taking was already reported in literature, it should be noted that higher levels of stress could also be due to actual exposure to contagion risk in the case of COVID-19, as shown by our results about comparisons on levels of perceived stress between healthcare workers from North, Center, and South Italy.

Taken together, all these results suggested a higher risk perception relative to COVID-19 in healthcare workers living in outbreak areas, especially if females and with high levels of stress. For COVID-19, knowledge on medicine and on virus could thus increase risk perception, whereas in other fields such as nuclear radiation usually knowledge was associated to lower risk perception (e.g., Sjöberg and Drottz-Sjöberg, 1991). It should be noted that, in case of nuclear radiation, knowledge could be associated to an increase capacity of avoiding risky behavior or situations, whereas in case of COVID-19 spread knowing, the health risks related to disease, but feeling powerless against its containment could exacerbate the danger perception. A reducing stress intervention by means of psychological support to medical workers could reduce the worries due to the perceived risk, so that they could avoid both risky behaviors and overwhelming, stressful concerns.

COVID-19–Related Behaviors and Containment Actions

We proceed here by discussing the variables related to risky behaviors, judgments about behaviors, and confinement actions. In this respect, female participants reported higher levels of worries about their own behavior, as well as other people's behaviors as risky. Related to this, they also were four times more likely than men to report the thought that it would be right to limit people's freedom in order to block the virus spread and three times more likely than men to request more severe punishment for risky behaviors. Capraro and Sippel (2017) showed that females adopted stricter moral judgments than men in personal dilemmas, such as behaving appropriately in the actual COVID-19 outbreak scenario. Females seemed more prone to strict adherence to rules and even to imply stricter rules, probably also in relationship to their increased perception of risk (see section "Risk Perception and Worries About COVID-19").

Also, the living area showed a strong relationship with these dependent variables. Participants from Center and South Italy were more likely to judge the containment measures as adequate compared to participants from North Italy. On note, participants from South also reported less likely than North ones that concerns about COVID-19 were a valid reason to violate the containment measures. This result could be related to the recent great "escape" of people from the North Italy (when virus spread initially) toward the South, increasing worries in South population, politicians, and medical staff. Again, please consider results on living area no more than preliminary because of the limited number of participants per area in our sample.

Lastly, we should mention that both the group variable and the psychological factors had none or little impact on these variables Thus, our data suggest that opinions and judgments about behaviors and containment actions rely more on demographic variables than on psychological or work-related ones.

Perceived Knowledge of COVID-19–Related Information

In this section, we discuss how demographic, psychological, and group variables impacted on the perceived level of knowledge relative to COVID-19 and to its related sociopolitical situation. In this regard, the group was the strongest factor. In fact, healthcare workers reported higher odds than non-medical participants of being properly informed about both COVID-19 and its related social situation. They also were less likely convinced that some information about coronavirus was hidden from public opinion, but those who credited such secret information more likely believed that this information was about a greater virus threat. Also, they reported the opinion that perceived risk in the population was not adequate. This result pattern suggests a large gap between the two groups about the perception of being properly informed.

This information gap could explain the risk perception difference, because a greater knowledge could actually influence the personal risk awareness. It should be noted that, in general public opinion, the risk related to the new coronavirus was mistakenly considered as similar to that related to the common cold or annual influenza viruses, an error that could have been induced by the similarity in the spreading strategy and of some of the symptoms. This underrepresentation of fatal or serious outcomes of COVID-19 led to a poor adherence to health recommendations in the very first phase of the coronavirus outbreak in Italy, with important consequences afterward. These considerations seem to suggest that the reduction of such an information gap could eventually mitigate the disproportion in risk perception between groups and consequently increase the adherence to public health rules. Also, our results seem to support this possibility because of the lack of information from experts lamented by more stressed participants, who also perceived a higher level of personal risk. To this aim, an information campaign about the novel coronavirus characteristics, its related disease symptoms and consequences, and public health problems linked to that could greatly support population in this moment, reducing the stress and also the risky behaviors.

However, increasing the communication and the information could not be the most appropriated solution to the problem. In the last decades, especially because almost everyone has a large access to internet resources, we have witnessed not only a significant spreading of online information, but also misinformation; this is causing the diffusion of baseless rumors, difficult to erase from common people system of beliefs (Kata, 2010; Del Vicario et al., 2016). Misinformation spreading combines with people's distrust in experts' authority, a more and more rising phenomenon despite the increase in the general education level. As a result, as proposed by Gawande (Gawande, 2016, p. 3): "to defend those beliefs, few dismiss the authority of science. They dismiss the authority of the scientific community. People do not argue back by claiming divine authority anymore. They argue back by claiming to have the truer scientific authority." This kind of problem is well known in the field of the unfounded, yet persisting, vaccine fear. In anti-vaccination movement, this mistrust phenomenon has been also exasperated by conspiracy theorists and other actors moving criticisms toward physicians and other experts, accused of having

conflict of interests or searching media visibility. The same criticisms, however, are often not applied, for the antiscientific community, to the studies supporting their theories (Kata, 2010). All these factors could have an effect also on the underestimation of medical advices and warning on COVID-19 infection by the general population, resulting in the unappropriated behaviors expressed. Thus, providing more information to population could be ineffective, if not supported by psychological evaluation of social dynamics underlying the antiscientific phenomenon, for example, the questioning of the legitimacy of traditional authorities (see Kata, 2010). Understanding how to contrast such a phenomenon could be even more important in case a vaccine for COVID-19 is provided, as already happened for the H1N1 flu in 2009, when many people refused to vaccinate despite the availability of a vaccine (see Offit, 2009). Further studies are needed in order to investigate these contrasting hypotheses for planning effective interventions relative to public health problems.

Limitations and Future Directions

This study is not free from limitations. First, it implied a cross-sectional design; thus, a relationship between variables could be interpreted only with cautions. Second, we implied a convenience sample method to recruit our volunteer participants, with a possibility for introducing biases that could undermine the possibility to generalize our results to the entire population. We also collected a small sample with respect to the optimal one, i.e., about 450 participants (as suggested by Bujang et al., 2018), thus calling for caution while interpreting our results. For all these reasons, we should underline that our results could not be considered as conclusive and they should be confirmed with further experiments or studies. However, we should note that we conducted this study with two major difficulties. The first was a time-related issue: we had a very short time to collect data as the containment rules and the virus spread vary at a day-by-day rate. Thus, we should collect our data in a concise and brief timeframe. The second issue was a logistic one: most people in Italy, including the authors of this article, were quarantined at the time we collected and analyzed the data, so we were forced to opt for an online methodology of data collection.

While methodologically limited, our results could open a number of possible future studies. First, this study could be considered as a time-zero data collection for a longitudinal study. In this regard, we would contact our previous participants in order to ask if they will participate to further data collection. Thus, we could follow the change in risk perception and psychological situation in the general population and healthcare workers during the evolution of COVID-19 infection spread. More experimental and cross-sectional studies are requested in order to better understand the relationship between healthcare workers' and the general population's information gap and risk perception in a pandemic disease scenario. This could help scientific community to find new strategies for conveying lifesaving information to population. Reducing such information gap could also help in reducing the sense of separation between the healthcare workers and the rest of population and thus the sense of isolation with its negative psychological consequences on both groups.

CONCLUSION

Our study supports that a difference in risk perception between health workers and the general population exists and suggests a number of explanations for its causes as well as possible solutions to reduce it, with benefits in the psychological conditions of both groups of participants. More efforts need to be done in this direction, also because reducing psychological distress could advantage physical health state (Prince et al., 2007), in particular for medical staff facing such a difficult time, improving the quality of care they could provide (Maunder, 2009; Imai, 2020).

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

LS and CG designed the study and administered the questionnaire. LS conducted the data analysis. LS and CG wrote and revised the manuscript. Both authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.02166/full#supplementary-material

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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BRIEF RESEARCH REPORT
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Individual Differences, Economic Stability, and Fear of Contagion as Risk Factors for PTSD Symptoms in the COVID-19 Emergency

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On January 30th 2020, the World Health Organization (WHO) declared the COVID-19 pandemic a Public Health Emergency of International Concern (PHEIC). Italy has been one of the most affected countries in the world. To contain further spread of the virus, the Italian government has imposed an unprecedented long-period lockdown for the entire country. This dramatic scenario may have caused a strong psychological distress, with potential negative long-term mental health consequences. The aim of the present study is to report the prevalence of high psychological distress due to the COVID-19 pandemic on the general population, especially considering that this aspect is consistently associated with PTSD symptoms. Furthermore, the present study aims to identify the risk factors for high PTSD symptoms, including individual differences and subjective perception of both economic and psychological aspects. We administered an online survey to 1253 participants during the peak period of the contagion in Italy. A logistic regression on the Impact of Event Scale – Revised (IES-R) scores was used to test the risk factors that predict the possibility to develop PTSD symptoms due to the COVID-19 pandemic. Gender (female), lower perceived economic stability, higher neuroticism, and fear and consequences of contagion were predictors of high PTSD symptomatology. The results, highlighted in the present study, extend our understanding of the COVID-19 pandemic's impact on the population's mental health, by identifying individuals at high-risk of developing PTSD. This may help with the implementation of specific protocols to prevent the possibility of developing symptoms of PTSD in target populations.

Keywords: COVID-19, PTSD, IES-R, distress, neuroticism, economic stability

INTRODUCTION

Coronavirus disease 2019 (COVID-19) arises from SARS-CoV-2, which is an infection that affects the lower respiratory tracts (Ashour et al., 2020; Wölfel et al., 2020). Specifically, COVID-19 symptoms range from asymptomatic infections to mild-severe respiratory symptoms, often accompanied by fever and dry cough, and in some cases, a severe lethal form of pneumonia, acute respiratory distress, and fatality (Rothan and Byrareddy, 2020). It has been estimated that around 20% of COVID-19 patient symptoms will show a severe form of the disease (Zhong et al., 2020). At this time, there is no specific vaccine or treatment for this disease and the elective clinical procedures consist in isolating patients to manage their clinical symptoms. In early December 2019, several cases of this new acute respiratory infection were reported in Wuhan, Hubei Province, China. On January 30th 2020, the World Health Organization (WHO) declared the COVID-19 outbreak as a Public Health Emergency of International Concern (PHEIC) (Mahase, 2020). Although China has been relatively successful in containing its outbreak by reducing new cases of infection by more than 90%, the number of infections spread in other countries, especially Italy, Iran, and United States (Callaway, 2020). Currently, to contain further spread of the virus, governments are implementing unprecedented strict restrictive measures to reduce person-to-person transmission of COVID-19. Consequently, entire nations in different parts of the world have been lockdown, with a full or partial lockdown. The implementation of restrictive measures, such as "social distancing" or "social isolation," have caused an inevitable readjustment in the daily life of modern societies causing limitations in traveling, social interactions, and work life.

Psychosocial Impact of COVID-19

Although the psychological impact of COVID-19 pandemic has not yet been well-documented, based on previous experience with coronavirus infections (e.g., MERS-CoV and SARS-CoV), it has been hypothesized that the pandemic is leading to several health problems such as stress, anxiety, depressive symptoms, insomnia, denial, anger, and fear (Torales et al., 2020). In support of this, a study on the psychological impact of the COVID-19, found that more than half of the respondents reported a moderate-to-severe psychological impact, and approximately one-third reported moderate-to-severe anxiety during the initial phase of the outbreak in China (Wang et al., 2020a). Specifically, anxiety levels seem to be related to the fear for contagion of COVID-19, as assessed on an Iranian sample using a new validated self-report questionnaire (Ahorsu et al., 2020). Furthermore, a study on the psychological impact of the lockdown in Italy showed a high increase of distress levels associated to several factors including gender, personality traits, depression and anxiety levels (Mazza et al., 2020).

Beyond the direct effects on mental health, the spread of the pandemic and the consequent restrictive measures are significantly impacting the world economy, resulting in a sharp decline in major financial indices and prompting fear of a global recession (Uddin et al., 2020). Crucially, the ILO Monitor (ILO, 2020), published on April 7th 2020, reports that full or partial lockdown measures, adopted to contain the spread of the virus, are affecting almost 2.7 billion workers globally, which represents around 81% of the entire world's workforce. Many families are experiencing higher financial distress because of the uncertainty of their incomes. As a result, consumers are reducing spending and are avoiding making new investments (Fernandes, 2020).

Although the psychological and economical long-term effects of the COVID-19 are not yet predictable at this time, it is possible to hypothesize that the COVID-19 emergency is causing drastic changes in the daily life of individuals, causing levels of distress similar to those found in response to traumatic events.

Factors Predicting PTSD Symptoms

Post-traumatic stress disorder (PTSD) refers to the development of specific negative symptoms after exposure to one or more traumatic events. This symptomatologic presentation may include fear-based re-experiencing, emotional and behavioral changes, dysphoric moods, and negative effects on cognition (American Psychiatric Association, 2013). A self-report questionnaire often used to measure the subjective response to a specific traumatic event, related to the consequent development of PTSD symptoms, is the Impact of Event Scale – Revised (IES-R) (Horowitz et al., 1979). In previous studies, IES-R has been used to evaluate the traumatic impact of past epidemics (SARS, H1N1) during previous cases of lockdown (Hawryluck et al., 2004; Wu et al., 2008, 2009; Wang et al., 2011; Liu et al., 2012). Furthermore, two recent studies used IES-R to measure the psychological distress caused by the COVID-19 pandemic (Wang et al., 2020a,b). These studies highlighted a significant impact of the COVID-19 pandemic in determining high levels of psychological distress, showing, also, differences related to gender with females reporting higher IES-R scores. Several studies have highlighted a similar link between PTSD and gender (Carmassi et al., 2018; Gilmoor et al., 2019). Furthermore, symptoms of PTSD have also been associated to additional variables such as personality traits, socio-economic level, and educational level. Regarding personality traits, the role of neuroticism (alias emotional stability at the opposite end of the continuum) has been widely studied in PTSD. Neuroticism is characterized by aspects of affective negativity (Watson and Tellegen, 1985; McCrae and Costa, 1987) and is constituted by a negative emotional response to frustration, or loss, that often overlaps with specific aspects of arousal symptoms (Yin et al., 2019). Authors have investigated the relationship between neuroticism and stressful events, highlighting the significant correlation between neuroticism, risk of developing PTSD symptoms, and worsening in mental health conditions following a stressful/traumatic event (Holeva and Tarrier, 2001; Engelhard et al., 2003; Frazier et al., 2011). Furthermore, a longitudinal study using IES-R to measure PTSD symptoms, due to the 2004 Tsunami, highlighted that neuroticism was negatively related to PTSD symptoms improvement (6–24 months post-disaster) (Hussain et al., 2013). People who reported high levels of neuroticism tend to react with strong emotions to stressful events. The literature has also highlighted that lower education may be a risk factor in developing PTSD (Carmassi et al., 2018; Kvestad et al., 2019). For instance, education level was associated

with the IES-R avoidance score (Wu et al., 2005). Furthermore, a recent meta-analysis highlighted that lower socioeconomic status, lower education level, and gender (female) were predictors of PTSD (Tang et al., 2017). Finally, research highlighted that fear is one of the main factors involved in PTSD (Blechert et al., 2007; Beckers et al., 2013). Notably, during a health crisis the degree of fear can be influenced by the probability of contracting the disease and the consequences derived by it (Yuen et al., 2020).

In the present study we specifically focus on the role of individual differences, perception of economic stability, and psychological factors (including neuroticism and fear for the COVID-19 pandemic) in predicting symptoms of PTSD. We conducted a nationwide survey on a large sample of the Italian population in the period starting from April 1st, 2020 to April 20th, 2020 (the peak of the contagion in Italy, see **Supplementary Material**). As of May 2020, official data showed that Italy represents one of the most affected countries in the world with approximately 231,000 confirmed cases and more than 33,000 deaths. Furthermore, since March 9th, 2020, the entire country has been experiencing an unprecedented long-term period of lockdown with strict measures including the impossibility for people to leave their home for non-essential reasons, the closure of shops and public spaces, and the ban on gatherings and traveling. This is a crucial aspect considering that a recent review study, on the psychological effects of the lockdown during previous outbreaks, pointed out that individuals experiencing the lockdown showed higher levels of psychological distress compared to their counterparts (Brooks et al., 2020).

METHODS AND MEASURES

Participants

We recruited 4121 participants using a web-based survey. Economic stability was one of the variables considered for this study. For this reason, we identified individuals who receive a stable income and those who do not receive an income by selecting only unemployed and full-time workers. Other categories such as students, stay-at-home individuals, and retirees were excluded. A total of 1253 (808 female) Italian adults between 18- and 64-years-old (M = 39.48, SD = 11.94) were included in the present study (see **Table 1** for all sample characteristics). The entire survey lasted approximately 15 min. The study was approved by the Board of the Department of Human Neuroscience, Faculty of Medicine and Dentistry, Sapienza University of Rome and all participants provided their consent to participate.

Materials and Procedure

The study was administered as a battery of questionnaires using the Qualtrics survey software. The entire survey consisted of two *ad hoc* questionnaires and two standardized measures, described below. Also, a set of socio-demographic questions were presented. Specifically, based on the study hypothesis, we examined gender (male vs. female), work status (full-time worker vs. unemployed), education level (high school degree or less vs. more than high school degree), and home-living condition (not alone vs. alone). Socio-demographic data are shown in **Table 1**.

Fear for COVID-19 (*ad hoc* Questionnaire)

The eight items in the questionnaire were specifically created for the COVID-19 emergency and referred to either self or loved ones' health. These items are presented in **Table 2**. Participants answered on a scale from 0 (*not at all*) to 100 (*extremely*). The component structure and reliability of the questionnaire was explored in a larger sample (n = 4121), using principal component analysis (PCA) and Cronbach's alpha. The results from these analyses revealed two factors, with four items per factor. A first factor, "Belief of contagion," reflects the conviction of being infected, either in the past or in the future. The second factor, "Consequences of contagion," reflects the possibility of suffering severe consequences due to the contagion (i.e., to be hospitalized or to die). Two scores ranging from 0 to 100 were computed by averaging the items in each scale.

PCA of the fear for COVID-19 questionnaire

The factor structure of the questionnaire was evaluated using PCA. An oblique (promax) rotation was used. The scree plot, eigenvalues, and parallel analysis (with 1000 replications) were used to guide the retention of components. The results showed a structure of two moderately correlated factors, r = 0.45. The pattern matrix is reported in **Table 2**. Four items showed satisfactory loadings (i.e., >0.40) on the first factor. These items reflected the conviction to be infected, either in the past or in the future, as well as the beliefs that a loved one has been/will be infected. We labeled this factor "Belief of contagion." The second factor comprises four items regarding the possibility of suffering severe consequences following contagion (i.e., to be hospitalized, to die), both for her/himself and for a loved one. This factor was labeled "Consequences of contagion." Only one item showed cross-loadings (i.e., a difference < 0.20 between the loadings on two or more components), which was excluded from the final measure (Howard, 2016). Internal consistency of the final 8-item measure was tested with Cronbach's alpha. The results showed excellent values for both the Belief of contagion scale, α = 0.82, and Consequences of contagion scale, α = 0.80.

Perceived Change in Economic Stability (*ad hoc* Questionnaire)

Two of the questions in the survey dealt with perceived economic stability, either before or during the pandemic. Specifically, the questions were presented as follows: "Before the emergency, I considered my family and I to be economically stable"; and: "During the emergency, I consider my family and I to be economically stable." Answers were given on a scale from 0 (*not at all*), to 100 (*extremely*). To determine the change in the perceived economic stability, we computed a difference score, labeled as "Economic Stability," between these two items (before the emergency – during the emergency). Therefore, higher scores on this variable should reflect severe decline in perceived economic stability, while scores approaching zero indicated no changes in personal economic stability. Negative scores, possible but not likely, indicated an improvement in economic stability during the pandemic.

TABLE 1 | Sample characteristics (Age: *M* = 39.48, *SD* = 11.94) and chi-squared tests.

				IES-R group			
		N	**%**	**low-PTSDs < *33; N (%)***		**high-PTSDs ≥ *33; N (%)***	
Total participants		1253	100.00	807 (64.41)		446 (35.59)	
Gender	Female	808	64.50	463 (57.37)	$\chi^2 = 35.05^{**}$	345 (77.35)	$\chi^2 = 266.60^{**}$
	Male	445	35.50	344 (42.63)		101 (22.65)	
Work Status	Unemployed	328	26.20	203 (25.15)	$\chi^2 = 398.43^{**}$	125 (28.03)	$\chi^2 = 172.03^{**}$
	Full-time worker	925	73.80	604 (74.85)		321 (71.97)	
Education	High school degree or less	659	52.60	420 (52.04)	$\chi^2 = 2.69$	239 (53.59)	$\chi^2 = 4.59^{*}$
	More than high school degree	594	47.40	387 (47.96)		207 (46.41)	
Home-living condition	Not alone	1109	88.50	704 (87.24)	$\chi^2 = 894.78^{**}$	405 (90.81)	$\chi^2 = 593.57^{**}$
	Alone	114	11.50	103 (12.76)		41 (9.19)	

$^{*}p < 0.05$, $^{**}p < 0.001$, Low PTSD symptomatology (low-PTSDs), High-PTSD symptomatology (high-PTSDs).

TABLE 2 | Pattern matrix of the PCA for the Fear for COVID-19 questionnaire.

	Item	**Factor loading**	
		A	**B**
(A) Belief of contagion	I often thought I was infected with the virus	0.734	
	I think I could be infected with the virus in the future	0.802	
	I think that a dear or close person to me could potentially be infected with the virus	0.848	
	I think that a dear or close person to me could potentially be infected with the virus in the future	0.843	
(B) Consequences of contagion	I think that a person infected with the virus could recover		0.841
	I think that a person infected with the virus could die		0.800
	I think it is probable that I would recover after being infected with the virus		0.810
	I think that being infected with the virus could be lethal for me		0.721
	Sometimes I have negative thoughts and feelings about the virus*	0.470	0.281

**Item excluded for cross-loadings.*

The Big Five Inventory 10-Item (BFI-10)

The Big Five Inventory 10-item (BFI-10) is a short scale (Rammstedt and John, 2007) measuring the Big Five personality traits: Agreeableness/Antagonism, Conscientiousness/Lack of direction, Emotional stability/Neuroticism, Extraversion/Introversion, and Openness/Closedness to experience. The BFI-10 has two bidirectional items for each of the Big Five personality factors. Participants are asked to respond to each item indicating whether they agree or disagree with the statement, using a 5-point Likert-type scale, ranging from 1 (*not agree at all*) to 5 (*totally agree*). The scale was developed based on the 44 item Big Five Inventory (Rammstedt, 1997) and designed for contexts in which respondents' time is severely limited. A previously validated Italian version was used in this study (Guido et al., 2015). In the current study, we focused on Neuroticism (anxiety, angry hostility, depression, self-consciousness, impulsiveness, vulnerability).

The Impact of Event Scale – Revised (IES-R)

The Impact of Event Scale – Revised (IES-R) (Christianson and Marren, 2012) assesses the intensity of 22 post-traumatic symptoms pertaining to intrusion, avoidance, and hyper-arousal on a Likert-type scale ranging from 0 (*not at all*) to 4 (*extremely*).

The IES-R was designed and validated providing a specific traumatic event and a specific time frame, as a reference for the subjects. The scale has been found to successfully discriminate between subjects with probable diagnosis of PTSD and subjects with non-probable diagnosis of PTSD. A cut-off score of 33 was found to provide the best accuracy for detection of high levels of PTSD symptoms (Creamer et al., 2003). In this study "COVID-19 epidemic" and "during the emergency" are respectively used for the subjects as a reference of a traumatic event and a specific time frame.

Statistical Analysis

First, we categorized participants in two groups based on their IES-R total raw score. Specifically, we adopted the optimal cut-off of 33 (Creamer et al., 2003) to distinguish between low PTSD symptoms (low-PTSDs) and high PTSD symptoms (high-PTSDs). We compared the PTSDs groups in terms of individual differences (gender, work status, education, and home-living conditions) performing two-by-two tables chi-squared tests (Campbell, 2007). Based on correlation analysis, we performed a binary logistic regression to predict people's belonging to low-PTSDs or high-PTSDs group. Specifically, we entered individual differences, perceived change in economic stability,

and psychological factors (i.e., neuroticism and fear for COVID-19) as predictors.

RESULTS

Our aim was to examine the factors leading to high PTSD symptoms related to COVID-19 pandemic. The first striking result was that 35.59% (N = 446) of our sample belonged to the high-PTSDs group, reporting a score on IES-R above the cut-off. Furthermore, the low-PTSDs and high-PTSDs groups differed on all individual differences. Specifically, women, full time workers, individuals with high school degree or less, and individuals who did not live alone were more inclined to develop PTSD symptoms compared to men, unemployed individuals, subjects with a higher level of education, and individuals who lived alone respectively. All values are reported in **Table 1**.

Results of the point-biserial correlations indicated that there was a significant positive association between the IES-R group and "belief of contagion," "consequences of contagion," and "economic stability." Therefore, all these variables could further impact the development of high PTSD symptoms. Furthermore, a significant negative association was found between the "IES-R group" and "Neuroticism," therefore this personality trait is related to a greater probability of developing PTSD symptoms due to the COVID-19 pandemic. Detailed results of correlations, including means and standard deviations for all variables, are shown in **Table 3**.

Finally, results of the binary logistic regression analysis showed that all entered variables predict the belonging on IES-R groups (see **Table 4**). Specifically, in the first step gender, work status, education, and home-living conditions were entered. This model explained 6.2% of the variance and only gender resulted as a significant predictor, suggesting that women report higher scores on IES-R. Neuroticism was entered in step 2. The resulting model explained a significant amount of further variance, leading to a total explained variance of 18.2%. Step 3 included perceived change in economic stability, and the effect of this variable was also significant. Specifically, as economic stability goes up, which represents a greater perception of economic instability during the COVID-19 emergency compared to before, the PTSD symptomatology measured by IES-R increases. The total explained variance in step 3 was 20.1%. Finally, in step 4 "belief of contagion" and "consequences of contagion" were entered, and both variables resulted as significant predictors. Hence, increased fear of COVID-19 expressed as the "belief of contagion" and the "consequences of the contagion" also increase the likelihood of being in the high-PTSDs group. The variance explained by the final model was equal to 31.5%.

DISCUSSION

The COVID-19 epidemic has caused a largescale lockdown worldwide. This pandemic is already showing a high negative impact on physical and mental health. Consequences at the socio-economic level will also be significant which, in turn, will possibly negatively affect mental and emotional stability amongst all individuals.

Little is known about the long-term psychological impact of this pandemic which is characterized by the implementation of public health measures of immense unprecedented magnitude. It appears reasonable to expect an increase of acute stress disorders, PTSDs, emotional, sleep, and depressive disorders because of the emerging effect of several factors, such as the fear of being personally infected or that someone close could be infected (Mucci et al., 2020), and the experience of very negative economic consequences (Marazziti and Stahl, 2020). Furthermore, the impact of all these factors may occur in relation to individual differences. Several studies have been conducted in China; the first country affected by the COVID-19 epidemic. A longitudinal study conducted on 1738 respondents reported the average mean IES-R scores of respondents was above the cut-off score, suggesting a substantial presence of PTSD symptoms among the population (Wang et al., 2020b). Moreover, comparing two-time responses, they found that a prolonged lockdown had an incremental psychological impact on mental health, especially among younger respondents.

Drawing from these findings and considerations, the current study has investigated multiple factors that would influence the

TABLE 3 | Means, standard deviation, and correlations between variables in the study.

Variable	1	2	3	4	5	6	7	8	9	10	*M*	*SD*
(1) IES-R group[a]	—										—	—
(2) Belief of contagion	0.36**	—									39.60	24.52
(3) Consequences of contagion	0.31**	0.47**	—								47.10	22.70
(4) Neuroticism	−0.34**	−0.23**	−0.26**	—							6.17	2.07
(5) Economic Stability	0.18**	0.12**	0.15**	−0.10**	—						12.02	19.88
(6) Age	−0.02	−0.03	0.06*	0.08**	0.05	—					39.48	11.94
(7) Gender[a]	—	−0.11**	−0.12**	0.20**	−0.17**	−0.02	—				—	—
(8) Work Status[a]	—	0.09**	−0.04	0.09**	0.01	0.39**	—	—			—	—
(9) Education[a]	—	0.08**	−0.09**	0.02	−0.01	−0.04	—	—	—		—	—
(10) Home-living condition[a]	—	−0.02*	−0.06**	0.06**	−0.03*	0.03*	—	—	—	—	—	—

[a]*Point-biserial coefficient, *p < 0.05, **p < 0.001.*

TABLE 4 | Summary of Logistic Regression Analysis for variables predicting IES-R group.

Variable	Step 1				Step 2				Step 3				Step 4			
	B	SE B	Wald	Exp(B)	*p*	*B*	SE B	Wald	Exp(B)	*p*	*B*	SE B	Wald	Exp(B)	*p*	*B*	SE B	Wald	Exp(B)	*p*
Gender	0.959	0.136	49.528	2.609	0.000	0.745	0.143	27.240	2.107	0.000	0.652	0.145	20.221	1.919	0.000	0.619	0.153	16.330	1.857	0.000
Work Status	0.064	0.137	0.222	1.067	0.638	−0.048	0.145	0.109	0.953	0.741	−0.020	0.147	0.018	0.981	0.894	0.138	0.156	0.784	1.148	0.376
Education	0.197	0.123	2.560	1.218	0.821	0.122	0.130	0.891	1.130	0.345	0.104	0.131	0.637	1.110	0.425	0.197	0.140	1.986	1.218	0.159
Home-living condition	−0.295	0.201	2.168	0.744	0.141	−0.228	0.209	1.182	0.797	0.277	−0.205	0.210	0.957	0.814	0.328	−0.251	0.220	1.299	0.778	0.254
Neuroticism						−0.346	0.034	106.797	0.707	0.000	−0.343	0.034	103.077	0.709	0.000	−0.286	0.036	63.674	0.751	0.000
Economic stability											0.015	0.003	19.430	1.015	0.000	0.012	0.004	10.922	1.012	0.001
Belief of contagion																0.026	0.003	59.528	1.026	0.000
Consequences of contagion																0.013	0.003	13.931	1.013	0.000
χ^2			57.766					178.306					198.352					325.967		
Df			4					5					6					8		
P			0.000					0.000					0.000					0.000		
Nagelkerke R^2			0.062					0.182					0.201					0.315		

psychological impact of COVID-19 among the Italian general population. Our hypothesis about the relation among individual factors, economic stability, and fear of contagion as risk factors for PSTD symptoms related to COVID-19 was supported.

The main striking result of the present study is that, during the peak of the COVID-19 epidemic, more than one-third of the respondents (35.59%; N = 446) reported high PTSD symptoms. The rate of individuals with PTSD symptomatology on the Italian population was two times the rate shown in Spain (González-Sanguino et al., 2020). We may hypothesize that higher rates of contagion registered in Italy, at the time of data collection, have caused higher psychological distress in the Italian population.

Also, our results are in line with literature which recognizes the female gender as a risk factor for PTSD symptoms (Christiansen and Elklit, 2008; Ditlevsen and Elklit, 2012). A study reported that women are 6.35 times more likely to have PTSD than men (Pyari et al., 2012). Biological factors are expected to play a role in these differences. For example, women are reported to be more sensitive to stress hormones and threats, less likely to use adaptive coping strategies, and more likely to provide negative appraisal to emergency situations than men (Zhou et al., 2013; Tang et al., 2017). It has also been reported that women tend to assume more caregiving responsibilities. Having to balance work and/or household tasks makes them a group at risk in highly demanding situations (González-Sanguino et al., 2020).

It has also been showed that higher PTSD rates were reported among people with a lower education compared to those with a higher education. Despite conflicting results about the potential relationship between education level and PTSD (Perrin et al., 2007), the strongest evidence seems to suggest that lower levels of education were associated with a higher risk for PTSD (Carmassi et al., 2018; Kvestad et al., 2019) in previous epidemics as well (Wu et al., 2005). As recently highlighted, individuals with a higher level of education and socio-economic status might use better coping strategies because of greater social and economic resources, and ultimately be less impacted by environmental disaster, which in turn reduces the prevalence of PTSD (Tang et al., 2017).

The findings regarding the role of individual factors increasing the risk for PTSD symptomatology, support the consideration that women with a lower educational level, not employed, with higher levels of neuroticism are more at risk to develop emergency trauma-related PTSD symptomatology. It is well known that individuals with higher levels of neuroticism tend to respond with strong emotions to stressful events, experience anxious and depressive affects, tend to appraise events more negatively, and have more difficulty in coping with stressful situations (Suls and Martin, 2005). Each of these factors have been previously considered to propose neuroticism as a risk factor for PTSD in several potential traumatic experiences such as earthquakes, terrorism, and domestic accidents (Breslau and Schultz, 2013; Stevanoviæ et al., 2016; Yin et al., 2019).

Following our regression results, all considered factors, excluding age, work status, education, and the living situation variables, appeared to be important factors in determining high PTSD symptoms due to COVID-19. Specifically, the contributing factors to worsening psychological impact of COVID-19 were gender, neuroticism trait, fear of contagion, and reduced economic stability. A similar study conducted at the time of SARS on 195 adult patients in Hong Kong found higher scores on the avoidance dimension of the IES-R among women (Wu et al., 2005). This evidence was also found among the Spanish population in relation to COVID-19 (González-Sanguino et al., 2020). Considering that PTSD is a fear-based disorder, belief of contagion and consequences of contagion were predictors of PTSD symptoms in Italian adults. Not surprisingly, neuroticism shows a consistent association with higher post-traumatic stress symptoms (Holeva and Tarrier, 2001), and the present study contributes to this knowledge extending the evidence on a pandemic scenario.

The results of the present cross-sectional survey provide relevant data about the post-traumatic psychological distress of COVID-19 in Italy, suggesting the need for greater psychological support in general and especially for high-risk groups. In addition to psychological support, cognitive behavioral therapy (CBT) and eye movement desensitization reprocessing (EMDR) may provide positive effects on core PTSD symptoms. EMDR treatment (Lang, 1977; Bower, 1981) seems to obtain greater results (Moghadam et al., 2020). Reprocessing of eye movement desensitization leads people to overcome feelings of guilt, anxiety, and fear that are typical symptoms deriving from traumatic experiences in general. Since fear of contagion of inappropriate magnitude may result in PTSD (Rau et al., 2005) CBT may help to reduce the level of fear about the dangerousness of COVID-19 and to encourage adaptive emotional responses (Taylor et al., 2020).

Furthermore, the practice of mindfulness is widely used in women (Katz and Toner, 2013; Rojiani et al., 2017) in order to restore a sense of awareness of one's own experience. The mindfulness based stress reduction (MBSR) technique allows to increase the awareness of responses at a sensorial, affective, and cognitive level. Mindfulness does not require direct exposure of the traumatic event as in most therapeutic strategies targeting PTSD but focuses on the here and now of the subject's experience (Dutton et al., 2013). Assimilated mindfulness skills can reduce avoidant behaviors related to PTSD by promoting self-management (Gregg et al., 2007) and improving self-compassion (Shapiro et al., 2005; Thompson and Waltz, 2008).

Our results may be helpful to mental health professionals to recognize individuals who are at a higher risk and most in need of interventions, in order to prevent a possible rise of high post-traumatic stress for future infectious disease outbreaks.

Some caveats of the current study need to be acknowledged. First, the data were collected through an online survey, and this may result in participants' self-selection; hence, we cannot exclude a systematic sampling bias. Second, we used a self-reported questionnaire to investigate PTSD symptoms, however, this administration format may have some biases. The IES-R is a widely used screening tool, scores should not be confused with a diagnosis, which can be obtained only by mental health professionals. Also, the study was conducted during the initial stage of the COVID-19 outbreak; hence, it is possible that we underestimated the actual occurrence of traumatic stress in the population, as delayed onset of PTSD symptoms is conceivable. Third, our study allowed discriminating between people at risk and not at risk for high PTSD symptoms during the COVID-19 pandemic, yet the use of a cross-sectional study design prevented to directly examine causal effects.

Notwithstanding these limitations, this study is a first attempt to elucidate the occurrence of PTSD symptoms in relation to COVID-19 pandemic in the Italian population. Current results extend our knowledge of the links between individual and psychological factors and distress, with potential implication for the general populations' mental health.

CONCLUSION

Our results showed that the COVID-19 pandemic has already had a great psychological impact on the Italian population. Crucially, in the present study more than one-third of the respondents reported PTSD symptoms during the peak of the COVID-19 pandemic. Moreover, it has been highlighted that several individual, economic, and psychological factors play a role in the development of higher levels of PTSD symptomatology. Taken together, these results can provide a benchmark for future studies that aim to focus on the long-term effects of the COVID-19 pandemic. Furthermore, these data can be fundamental in identifying high-risk individuals to reduce the probability of developing PTSD. However, the most important aspect showed in the present study is the need to improve mental healthcare in the immediate future. Therefore, the National Health System and politicians must move in this direction to improve treatment for mental health problems and financial assistance. More professionals (i.e., psychologists, psychiatrists, nurses) should be hired in hospitals and clinics to cope with this emergency in the short and long term (Mucci et al., 2020). In this context, government institutions are called upon to make an effort to provide immediate and long-term financial support in order to fight the war against COVID-19 and try to limit as much as possible the physical, mental, and economic burden.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Board of the Department of Human Neuroscience, Faculty of Medicine and Dentistry,

Sapienza University of Rome. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

ADD, MCV, RP, DM, IC, and NM: conceptualization. ADC, PLM, RM, and MCV: data collection. ADC, IC, RP, DM, and PR: data analyses and interpretation. All authors contributed to writing and review the manuscript.

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SUPPLEMENTARY MATERIAL

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Psychological Consequences of Social Isolation During COVID-19 Outbreak

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Perceived social isolation during the COVID-19 pandemic significantly has had an extraordinary global impact, with significant psychological consequences. Changes in our daily lives, feeling of loneliness, job losses, financial difficulty, and grief over the death of loved ones have the potential to affect the mental health of many. In an atmosphere of uncertainty, it is essential that clear and precise information is offered about the problem and how to manage it. In this contribution, a rationale is provided for an urgent call for a rapid response to the mental health impacts of COVID-19. Moreover, suggestions for individuals to regulate their emotions effectively and appropriately are provided.

Keywords: social isolation, COVID-19, psychological consequences, loneliness, depression, clinical psychology

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INTRODUCTION

The mental health consequences of COVID-19 are already visible and even by conservative estimates they are yet to reach their peak and likely to considerably outlive the current pandemic.

The most common psychological disorders emerging are anxiety and panic, obsessive-compulsive symptoms, insomnia, digestive problems, as well as depressive symptoms and post-traumatic stress (Rogers et al., 2020). These are not only a direct consequence of the pandemic but also largely driven by the effects of prolonged social isolation – that is the objective lack of interactions with others (Leigh-Hunt et al., 2017). The medical journal *The Lancet* recently published an article from which a clear and alarming picture emerges: periods of isolation, even less than 10 days, can have long-term effects, with the presence – up to 3 years later – of psychiatric symptoms (Brooks et al., 2020).

Although necessary to limit the spread of the epidemic, in fact, human beings are not "designed" to manage segregation for a long time. As the Greek philosopher Aristotle reminds us, man is a "social animal," unable to live isolated from others, since the absence of relationships removes essential conditions for the development of personal identity and the exercise of reason. Although our first instincts may be to react angrily at (and with) people who pour out onto the streets, there is a need for a more universal compassionate stance – and recognition that the very nature of the human being is in stark contrast with the situation we are experiencing.

Moreover, research shows that nourishment and movement – besides being important therapeutic expedients – are a fundamental vehicle for communicating with ourselves,

others, and the world, and have an enormous influence on our biopsychological balance.

Prolonged isolation can adversely affect physical and emotional health, altering sleep and nutritional rhythms, as well as reducing opportunities for movement (Cacioppo and Hawkley, 2003). As a result, the natural channels of human expression and pleasure become depressed, with attendant impacts on mood and subjective well-being (Nardone and Speciani, 2015).

Furthermore, in accordance with current regulations, we have begun to behave "as if" other people are potentially dangerous for our health and for the health of our loved ones. This turn of events has cultivated a new universal belief based on vulnerability-to-harm, whereby proximity to fellow human-beings poses a direct threat (Nardone and Portelli, 2005). To date, more and more people are avoiding social relations, no longer by imposition, but as a choice. A decision initially moved by the fear of an invisible enemy and by the total uncertainty about what is right to do/not to do, to say/not to say, to think/not to think, derived from the information – ambiguous and conflicting – that we have received. In turn, this determines behavior that will gradually replace our old worldview and interpersonal relationships.

While the levels of environmental stress continue to rise, we are witnessing the deterioration of relationships. Rather than connecting people, restrictive measures are creating rivalries and arousing discord between people. As conveyed by the Latin phrase "*Divide et impera*" (literally divide and conquer), an authority that exerts high levels of control and division in governing a population, tends to fragment them. The magnitude and impact of fragmentation can be influenced substantially by leadership style. Grandiose leadership, for example, may create the seductive illusion of safety, with claims of invincibility and omnipotence, while providing an outlet for a range of grievances associated with inequalities and poverty through paranoia and blame of perceived "enemies." These processes provide fuel for xenophobia and deeper divisions within society (Case and Maner, 2014; O'Reilly and Hall, 2020).

Anger and nervousness, unspoken and lasting, come back to haunt us with psychological problems.

Likewise, spending an unusual amount of time together in confined spaces – often unsuitable for the purpose itself – increases the risk of conflicts and domestic violence. China has experienced a significant rise in separations and divorces, particularly stressful events, which can act as a trigger – especially among the most sensitive – for the development of mental health problems, primarily depression.

On the other hand, prolonged social isolation characterized by reduced social connections and contact, generates deep disconnection among those who live alone or cannot rely on an adequate social network, thus increasing the likelihood that depressive symptoms will emerge. Social isolation has been linked to cognitive impairment, reduced immunity, increased risk of cardiovascular disease, and ultimately, mortality (Cohen et al., 1997; Bassuk et al., 1999; Barth et al., 2010; Heffner et al., 2011). The association between physical frailty and social isolation has been linked to heightened inflammatory activity, as indicated by increased levels of C-reactive protein and fibrinogen (Loucks et al., 2006).

Social isolation and loneliness are related concepts and often coexist – loneliness can lead to isolation, and vice versa (Shankar et al., 2011). Loneliness has been an emerging issue in society in recent years, and has been linked to depression, irritability, and preoccupation with negative self-related thoughts, alongside a 26% increase in risk of premature death. Research suggests that this has been a growing problem in industrialized countries, with approximately one-third of the population affected, and one in 12 people affected at a severe level. Further, it appears that income and socioeconomic status are no barrier to loneliness – everyone is equally at risk (Cacioppo et al., 2015; Holt-Lunstad and Smith, 2016).

Loneliness is increasingly recognized as a public health issue, especially due to the detrimental effects on health and potential for premature mortality (Grant et al., 2009; Cole et al., 2015; Murthy, 2017; Yanguas et al., 2018; Bzdok and Dunbar, 2020). Loneliness is associated with feelings of emptiness, sadness, and shame, alongside the subjective perception that one is disconnected from others. It not only can occur in the context of social isolation but can also persist beyond this and can be experienced even when others are physically present. Like social isolation, loneliness has been linked to depression (Cacioppo et al., 2006; Han and Richardson, 2010), increased cortisol levels (Edwards et al., 2010; Miller, 2011), lowered immunity (Cole et al., 2011), and clinical disease, with attendant increases in length and frequency of hospital stays (Thurston and Kubzansky, 2009; Hawker and Romero-Ortuno, 2016). Further, social isolation and loneliness may be stronger predictors of suicidality than other well-known risk factors, such as anxiety and hopelessness (Hom et al., 2017). In spite of the clear risks associated with loneliness, treatments to date based on cognitive-behavioral principles have shown poor outcomes (Masi et al., 2011). With the onset of COVID-19, enforced social isolation is likely to be exacerbating what is already a significant issue in our society (Hughes et al., 2004).

Added to this is the devastating and understandable impact of concerns related to economic problems and the loss of a loved one. During the coronavirus epidemic, we are forced to deal with death in ways unrelated to human civilization: from the thought of not being able to be with the deceased in his/her last moments of life, to the sense of guilt for the idea of having inadvertently infected the person, to the distress of not being able to properly honor him/her with a funeral ceremony, fundamental to the process of mourning – these are all factors that amplify the pain of death, increase the rates of depression, the consumption of alcohol, drugs and risky behaviors and, in the more extreme cases of suicide.

Unlike the common and ineliminable moments of crisis that characterize the existence of each of us – which, although destabilizing, represent a unique and fundamental opportunity to review personal strategies for problem management – in this period, people are experiencing impotence, vulnerability, and a feeling of loss of control over one's life as a response to something indeterminate in time and space. This generates anguish for an uncertain future and, once again, favors the appearance of depressive symptoms – especially in those most

vulnerable, including those who already suffered from mental health problems and in health workers.

Those who have been placed in quarantine and those working on the front lines to deal with the epidemic are also at risk of being stigmatized: as possible "plague-spreaders," they are viewed with fear and suspicion.

Certainly, some will prove to be more resilient than others and will be able to count on the presence of greater personal, social, and economic resources, but we all will be affected – to varying degrees – by the impact of this revolution on our way of living and relating to each other and on our physical and psychological health.

A STORM OF RISKS FOR DEPRESSION

The environmental stressors that characterize this particular historical moment clearly suggest the risk of a new epidemic, and this time there are signs it could be our mental health; but the national health system, once again, may not be ready to stem the effects of the epidemic.

As the reality of social isolation persists throughout and beyond the pandemic, loneliness and interpersonal disconnection will emerge, particularly for those most socially vulnerable. Psychophysical exhaustion, anxiety, fear and pain, anguish, trauma, and anger – these emotions alternate, mix, and grow in intensity to the point of overwhelm, leading to clinically significant psychological disorders, such as "reactive depression."

While the COVID-19 crisis increases the risk of depression, depression affects the individual's ability to solve problems, set and achieve goals, and function effectively, at work and in relationships, making recovery from the crisis even more difficult. In fact, even if it manifests in different ways, at the basis of depression there is always an attitude of renouncement. People gradually lose any form of active reactivity in the face of life's difficulties: there is an increasing tendency to complain, let off steam, and rely completely on others in the management of themselves, all actions of delegation, therefore of renunciation. And, as described by Emile Cioran, the renunciation is nothing more than "a small daily suicide."

Feeling safe and protected is a fundamental primary need of the human being to be able to move freely in the surrounding world, as well as the feeling of having control over the events of our own life. When all this fails, when the belief that whatever we do will not improve things begins to develop, a sense of "learned helplessness" takes hold, blocking any possibility of liberation or change.

HOW TO PREVENT COVID-19 DEPRESSION

The anguish we experience is a normal human response to a serious crisis. Recognizing and accepting these feelings prevents them from turning into disorder.

Giving up, delegating, and complaining are all attitudes that at the beginning of a crisis can help us, but after several months can become entrenched, self-perpetuating, and end up complicating the situation, evolving as a slow drift into a depressive mindset. Recognizing these patterns immediately in one's thought processes and behavior is the best way to move in the opposite direction and to break the vicious circle that leads to global renunciation – and that characterizes the most severe depressive forms.

This pandemic will inevitably lead to redefining our relationship styles, which will no longer be based on proximity but on distance. Physical contact will be replaced by negotiated sharing, while the digitalization of lives, already started with the advent of social media, technology, and virtual reality, will be further emphasized, thanks to medical-scientific legitimacy.

Abandoning the idea that "things will go back to normal" and facing the changes taking place with flexibility mitigates the onset of psychopathology.

The human being – by nature – is extremely flexible – facilitating adjustment to the reality that change will become the new normality (Rossi et al., 2020). In Lao Tzu's words, "Water is fluid, soft, and yielding. But water will wear away rock, which is rigid and cannot yield. As a rule, whatever is fluid, soft, and yielding will overcome whatever is rigid and hard. This is another paradox: what is soft is strong." But it takes time.

Specific treatment options are available for the most problematic situations, and more available than before the advent of the coronavirus, as mental health professionals – even the most resistant – are – *flexibly* – offering online support and advice.

First, however, there is a need for higher level changes: state economic support measures are crucial responses to both the economic recession and the psychological depression. Institutions must ensure that this experience is as tolerable as possible for people. Alarmist messages, such as the emphasis on the negative aspects of the pandemic (number of seriously ill people or deaths) rather than on the positive ones (number of recovered), the abuse of alarmist expressions ("death even among young people"), and stories rich in personal details about the victims, are as counterproductive as excessive references to positivity and optimism, which, on the other hand, produce a paradoxical effect: the unrealistic nature of the messages may lead to greater mistrust and perhaps dismay ("they do not tell it as it is"). Even vague or ambiguous messages ("if we are united, everything will be fine," "be responsible," "stay alert, control the virus") dilute the desired effects.

Human resilience is closely linked to the depth and strength of our interpersonal connections, including our involvement in groups and communities. In contrast, loneliness appears to be one of the greatest threats to our health, survival, and well-being. In an atmosphere of uncertainty and fear, it is essential that clear and precise information is provided on the problem and on the management of the emergency. Greater cultural and economic investments will therefore have to emerge to support better and more timely prevention, treatment, and rehabilitation programs in the field of mental health, because "there is no health without mental health."

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

AUTHOR CONTRIBUTIONS

GP drafted and edited the manuscript. SS critically revised the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Psychological Variables Related to Adaptation to the COVID-19 Lockdown in Spain

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Recent studies show that quarantine and lockdown are effective measures for controlling COVID-19 outbreaks, but may be an unpleasant experience with psychological consequences. For this reason, the main aim of this study was to determine which personal sociodemographic and psychological variables are related to adapting to lockdown in a Spanish population. Questionnaires were administered to 2,055 individuals (60.7% women) who were resident in Spain and aged between 18 and 80 years old. We also administered some items related to feelings and behaviors during lockdown. The results showed that sex and age are variables to be taken into account. In fact, women tended to show greater stress, a more pessimistic attitude, and lower self-esteem. However, older people adapted better to lockdown although they were also more worried. Married people also adapted better although they too were more worried. The results also showed that more resilient people, with higher subjective happiness and life satisfaction, develop strategies for adapting positively to adversity, and tend to adapt better to lockdown, with more positive attitudes and behaviors. In terms of personality traits, higher neuroticism and lower extraversion were related to worse adaptation to lockdown. This study also showed that lockdown has had a negative psychological impact on those people who did not adapt well to the situation and the changes during the first 4 weeks of lockdown.

Keywords: lockdown, COVID-19, coronavirus disease, psychological impact, resilience, stress

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INTRODUCTION

In the last quarter of 2019, the first cases of people who had gone down with a pneumonia of unknown origin were identified in the city of Wuhan (People's Republic of China). The disease, caused by the severe acute respiratory syndrome–coronavirus 2 (SARS-CoV-2), was first reported to the World Health Organization (WHO) on 31 December 2019. In a relatively short period of time it spread to several countries, so on 11 March 2020 the WHO declared the pandemic derived from coronavirus disease (2019-nCoV, now renamed COVID-19). As there are no vaccines or effective treatments or preventive measures, quarantine and lockdown measures have been imposed in many countries to prevent the virus from spreading. Quarantine involves restricting the social contact of asymptomatic people who may have been exposed to a contagious disease to see whether they become ill, while lockdown involves a mass quarantine for the residents of a particular region or country to reduce spread beyond the lockdown area. Lockdown means that members of the

general public are prevented from having social contact with others, and have restrictions placed on movement and traveling.

On 14 May 2020, the WHO alerted that the pandemic may impact on people's mental health, and that depression and anxiety are increasing, especially in the most vulnerable groups (health-care workers, children, women who are juggling home-schooling or working from home and household tasks, people with pre-existing mental health conditions, etc.), although mental health services have been interrupted in many countries, and face-to-face services closed. The pandemic has involved social isolation, fear of contagion, loss of family members and even loss of income or employment for many people, all of which generates considerable distress. Although recent studies show that quarantine and lockdown are necessary because they are effective measures for controlling COVID-19 outbreaks (e.g., Lau et al., 2020; Nussbaumer-Streit et al., 2020), they can be an unpleasant experience because of the loss of freedom, the lack of contact with loved ones, boredom and uncertainty about the future and the progression of the disease, etc. The review by Brooks et al. (2020) on quarantine in previous pandemics (SARS, Ebola, and H1N1 influenza) has shown that it can have an impact on people's psychological health, and give rise to long-lasting effects such as post-traumatic stress symptoms, confusion, and anger. Likewise, recent studies on COVID-19 have also shown the impact of quarantine and lockdown on the psychological well-being of people. For example, Moccia et al. (2020) assessed the psychological distress perceived by the general Italian population during the first phase of the COVID-19 pandemic, and the results showed that 38% of the sample suffered mild or high levels of psychological distress. Furthermore, a study carried out in the general Chinese population showed that about 53.8% of respondents suffered moderate-to-severe psychological impact in the first weeks of quarantine, 16.5% reported moderate-to-severe depressive symptoms, 28.8% reported moderate-to-severe anxiety symptoms, and 8.1% reported moderate-to-severe stress levels (Wang et al., 2020a). The longitudinal study carried out by Wang et al. (2020b) suggests that social distancing and quarantine have a greater psychological impact in the first weeks of imposition and this impact decreases after 4 weeks (Wang et al., 2020b). However, previous studies on SARS have shown that psychological problems can last for months or even years after the social distancing ends (e.g., Hawryluck et al., 2004; Liu et al., 2012).

Recent studies show that some sociodemographic variables can protect against the psychological impact of the COVID-19 quarantine and lockdown. More specifically, being a man (Brooks et al., 2020; Brouard et al., 2020), having a partner (Li et al., 2020; Moccia et al., 2020), having at least one child (Brooks et al., 2020), having confidence in the health and political system (Brouard et al., 2020), having a positive perception of public social distancing measures (Brooks et al., 2020), having daily routines (Brooks et al., 2020), and being older (Brooks et al., 2020; Brouard et al., 2020; Li et al., 2020) can lessen the impact of quarantine on psychological health. Moreover, as the study by Brooks et al. (2018) shows, highly resilient people seem to cope better with uncertainty and other problems in disaster situations (terrorism incidents, floods, etc.), so they would be expected to cope better with lockdown difficulties. Personality traits can also play a role in how lockdown is handled, because they are related to subjective wellbeing and resilience. More specifically, extraversion, neuroticism and conscientiousness are the main predictors of subjective wellbeing (e.g., Grant et al., 2009; Brajša-Žganec et al., 2011), and they are also predictors of resilience (e.g., Ercan, 2017; Oshio et al., 2018). Therefore, these traits represent personality predispositions for subjective wellbeing and resilience, so they may be relevant in predicting how lockdown is experienced. In fact, it seems that people with high extraversion levels tend to have greater difficulty in reducing social proximity and show less engagement with lockdown measures, while people with high conscientiousness levels are more engaged with these measures (Carvalho et al., 2020). However, the studies linking personality traits to subjective wellbeing and resilience suggest that extraverted people tend to experience more wellbeing and resilience, not less (e.g., Brajša-Žganec et al., 2011; Oshio et al., 2018).

Spain is one of the countries with the highest number of infections and deaths by COVID-19 worldwide. To prevent a greater spread of the virus throughout the country and to deal with the health emergency, the Spanish Government declared the state of alarm (Royal Decree 463/2020) on March 14, 2020, which led to the imposition of a national lockdown as the main measure. However, for the first 2 weeks the confinement was less severe, since exceptions were made for some services and jobs. However, in the third week (March 28, 2020) the lockdown was made stricter, and all non-essential service workers had to stay at home. Taking into account the negative effects of lockdown that have been reported in other countries, the main goal of the current study is to determine which sociodemographic and personal psychological variables are related to the ability to adapt to lockdown. More specifically, we expect to find that high levels of resilience, subjective happiness and life satisfaction, and low levels of neuroticism and extraversion, make adaptation to lockdown easier, and lead to more positive attitudes and behaviors. As previous studies show that being older can lessen the impact of quarantine on psychological health (Brooks et al., 2020; Brouard et al., 2020; Li et al., 2020), we also expect to find a relationship between age and adaptation to lockdown. Some studies have shown the importance of having a partner in this kind of situation (Li et al., 2020; Moccia et al., 2020), so we expect to find that people who are married or who have a formal partner adjust better to lockdown. We also expected to find that those people who are alone during lockdown, without a couple or other family, have greater difficulty in adapting to the situation.

We also expect that more positive attitudes and behaviors during lockdown lessen its negative psychological impact, and lead to lower levels of stress, higher levels of self-esteem and successful coping (which involves not having problems of concentrating, making decisions, playing a useful part, enjoying day-to-day activities and feeling reasonably happy) in comparison with people with negative attitudes and behaviors. As far as work is concerned, we expect that losing a job during

lockdown, or being afraid of losing it, also has a psychological impact during lockdown.

Another goal of this study is to determine if there are any changes in several variables during the first 4 weeks of lockdown. We expected to find a decrease in life satisfaction, subjective happiness, self-sesteem, stress and succesful coping, but we did not exepct changes in extraversion and neuroticism, because they are personality traits, so they tend to be relatively stable.

MATERIALS AND METHODS

Participants

The participants were 2,055 individuals (60.7% women) who were resident in Spain aged between 18 and 80 years old ($M = 41.6$, $SD = 13.3$). A total of 25.9% of the sample was single, 44.3% were married, 7.5% were divorced or separated, 12.3% lived with their partner but without being married, and 10.0% had a partner although they lived apart. Moreover, 49.6% of participants did not have children, 37.8% lived with one or more sons or daughters, and 12.6% had sons or daughters although they did not live with them. As far as work is concerned, 87.9% of the sample had a job, 6.8% had lost their job during the lockdown and 5.3% were afraid of losing it. Finally, 32.7% answered the questionnaires during the first week of lockdown, 23.4% during the second week, 25.0% during the third week, 15.7% during the fourth week and 3.2% during the fifth week.

This is not a longitudinal study, so the sample for each week consisted of different people. The mean age of the participants in the first week was 43.4 ($SD = 14.1$), 23.1% were single, 48.1% were married, 8.2% were divorced or separated, 10.7% lived with their partners but were not married, and 10.0% had a partner although they lived apart. Moreover, 46.0% did not have children, 32.9% lived with one or more of their children, and 21.1% had children but did not live with them. As far as work is concerned, 84.1% of the sample had a job, 7.5% had lost their job during the lockdown and 8.4% were afraid of losing it.

The mean age of the participants in the second week was 41.3 ($SD = 14.9$), 26.4% were single, 41.0% were married, 6.1% were divorced or separated, 14.0% lived with their partner but were not married, and 12.5% had a partner although they lived apart. Moreover, 51.1% did not have children, 35.9% lived with one or more of their children, and 13.1% had children but did not live with them. As far as work is concerned, 88.1% of the sample had a job, 7.3% had lost their job during the lockdown and 4.6% were afraid of losing it.

The mean age of the participants in the third week was 42.3 ($SD = 11.2$), 26.1% were single, 41.6% were married, 8.0% were divorced or separated, 13.8% lived with their partner but were not married, and 10.5% had a partner although they lived apart. Moreover, 53.7% of participants did not have children, 37.5% lived with one or more of their children, and 8.8% had children but did not live with them. As far as work is concerned, 89.5% of the sample had a job, 6.0% had lost their job during the lockdown and 4.5% were afraid of losing it.

The mean age of the participants in the fourth week was 40.6 ($SD = 12.4$), 25.7% were single, 48.9% were married, 8.4% were divorced or separated, 10.2% lived with their partner but were not married, 6.8% had a partner although they lived apart. Moreover, 42.41% of participants did not have children, 49.23% lived with one or more of their children, and 8.36% had children but did not live with them. As far as work is concerned, 89.4% of the sample had a job, 7.1% had lost their job during the lockdown and 3.4% were afraid of losing it. Therefore, the participants from each week have similar characteristics: most of them had a job and very few were afraid of losing it, about 40% were married, and about half of each subsample did not have any children.

Therefore, the participants from these 4 weeks have similar characteristics: most of them had a job and very few were afraid of losing it, about 40% were married, and about half of each subsample did not have any children. Since there were few subjects in the fifth week, the comparison between the different weeks does not include the participants of this week. In fact, these participants were only included for the factor analysis. The mean age of the participants in the fifth week was 40.5 ($SD = 12.4$), 41.5% were single, 32.3% were married, 3.1% were divorced or separated, 13.8% lived with their partner but were not married, 9.2% had a partner although they lived apart. Moreover, 69.2% of participants did not have children, 26.2% lived with one or more of their children, and 4.6% had children but did not live with them. As far as work is concerned, 92.3% of the sample had a job, 3.1% had lost their job during the lockdown and 4.6% were afraid of losing it.

Measures

General Health Questionnaire (GHQ-12; Goldberg and Williams, 1988)

The instrument consists of 12 items (6 positive and 6 negative) that assess the severity of a mental problem over the previous few weeks. Respondents answer on a four-point Likert-type scale (from 0 to 3). Positive items are corrected from 0 (more than usual) to 3 (far less than usual) and the negative items are corrected from 3 (more than usual) to 0 (far less than usual). The study by Sánchez-López and Dresch (2008) revealed three factors in the Spanish population, which coincided with several other studies: Successful coping, Self-esteem and Stress. The factor Successful coping includes items on the difficulties of concentrating, making decisions, playing a useful part, enjoying day-to-day activities and feeling reasonably happy. The factor Self-esteem includes items about not being able to overcome difficulties, losing confidence, and thinking of oneself as worthless. The factor Stress includes items about losing sleep over worry, feeling constantly under strain, and feeling unhappy and depressed. This study shows that the questionnaire has adequate reliability and validity in the Spanish population. We found the following internal consistencies: 0.72 for Successful coping, 0.83 for Self-esteem, 0.76 for Stress, and 0.87 for the overall scores.

The Satisfaction With Life Scale

The Satisfaction with Life Scale questionnaire was used (SWLS; Diener et al., 1985) in the Spanish version developed by Atienza et al. (2000). This adaptation has adequate psychometric

properties and an internal consistency of 0.84, the same value found in the current study. The questionnaire has a unifactorial structure made up of five items on a Likert type scale (1 = Totally disagree, 5 = Totally agree).

Subjective Happiness Scale (SHS; Lyubomirsky and Lepper, 1999)

This scale evaluates the degree of global subjective happiness through four items on a 7-point Likert type scale. We used the Spanish adaptation developed by Extremera and Fernández-Berrocal (2014), which has adequate internal consistency and convergent validity. In the current sample we found an internal consistency of 0.77.

Connor-Davidson Resilience Scale – 10 Items (CD-RISC 10; Campbell-Sills et al., 2009)

This questionnaire assesses resilience, which is understood as the development of strategies for positive adaptation to adversity. It consists of 10 Likert-type items with five response options (0 = completely disagree to 4 = completely agree). The study by Soler et al. (2016) shows that the Spanish adaptation of the 10-item version of the CD-RISC has adequate psychometric properties and a unifactorial structure. In the current sample we found an internal consistency of 0.88.

Big Five Inventory (BFI, John et al., 1991)

This questionnaire assesses the Big Five personality traits. We used the Spanish adaptation developed by Benet-Martínez and John (1998), although we only administered two subscales: extraversion (eight items) and neuroticism (eight items). We decided not to include the other BFI subscales so as not to further increase the time required to answer the battery of questionnaires and the descriptive items. In fact, our initial intention was to include all the subscales, but a pilot study with a few subjects revealed that they considered it too long. This could have been a problem because subjects tend not to complete the study when they consider it too long, especially when it is online and no compensation is offered for participation, as in the current study. The Spanish adaptation of this questionnaire has adequate psychometric properties, and good internal consistency and convergent validity. In the current sample we found an internal consistency of 0.84 for extraversion and 0.75 for neuroticism.

COVID-19 Questionnaire

We administered 15 items on adaptation to lockdown, the behaviors displayed during this situation (for example, keeping routines, using sense of humor to reduce anguish and fear, getting information only from official media, etc.), feelings about the disease (worry, fear of getting infected or that a family member may get infected, etc.) and trust in the health system and the appropriateness of lockdown. The content of these items can be seen in **Table 1**. All the items were answered on a 5 point Likert scale (1 = Totally disagree and 5 = Totally agree for items 1–13; 1 = Very badly and 5 = Very well for items 14 and 15). These items were written specifically for this research.

Procedure

The Ethical Committee of the Faculty of Education Sciences and Psychology of the Universitat Rovira i Virgili approved this project. We also obtained informed consent from all participants, in accordance with the Declaration of Helsinki. The battery of questionnaires was administered online by means of a survey designed for this purpose. The exclusion criteria were being under 18 years old, not resident in Spain, or not providing informed consent. Each questionnaire included information about the response format and the procedure for completing it. Participants had to accept the conditions of the study before participating and they could decide to drop out at any time. Confidentiality and data protection were guaranteed, and the questionnaires were completely anonymous.

We used several procedures to recruit a sample that was as heterogeneous as possible, considering the limitations imposed by the lockdown situation. Some of the participants were recruited through WhatsApp and Facebook groups during the five first weeks of lockdown in Spain, using a non-probabilistic sampling procedure known as "snowball" (Snijders, 1992). We also contacted several Spanish associations to help us disseminate the questionnaire. Several mass media published articles about this project, and included the link of the questionnaire so that their readers could answer it. Once the participants had finished the questionnaire, the website allowed them to share it with other people on the social networks (e.g., WhatsApp and Facebook). We chose the online format because the lockdown made recruitment with other procedures difficult. Several authors have suggested that psychological questionnaires can be administered online and that the results are similar to those of paper administrations (e.g., Mangunkusumo et al., 2006).

The *COVID-19 questionnaire* was specifically developed for this study. The items were written by three researchers, one of them with experience in the development of questionnaires and the other two with experience in research about life satisfaction, depressive symptomatology and social support. The content and wording of these items was also assessed by two external judges with experience in the field, who considered they were suitable for the purposes of this research and the population under study. The items are shown in **Table 1**.

Data Analysis

To assess the dimensionality of the factor structure of the *COVID-19 questionnaire*, we performed an exploratory factor analysis on the polychoric inter-item correlation matrices, using the optimal implementation of parallel analysis to determine the number of factors to retain (Timmerman and Lorenzo-Seva, 2011). The extraction method was unweighted least squares because it is more robust against the excess of skewness and kurtosis usually present in Likert-type data. Data was rotated using Promin (Lorenzo-Seva, 1999) which tends to obtain the simplest solution possible even in the presence of complex items.

The effect of sociodemographic variables on psychometric measures was analyzed using analysis of variance, or the Brown–Forsythe test when the Levene test indicated heteroscedasticity,

TABLE 1 | Rotated pattern matrix of items, in bold dominant saturation.

Item	Positive	Negative
(1) I feel really worried about the COVID-19 health crisis.	−0.036	0.709
(2) I only consult official or responsible information channels for information about COVID-19.	**0.228**	0.133
(3) I am always talking about the health crisis and COVID-19.	−0.172	**0.444**
(4) I share news about COVID-19 without checking whether the information channel is official.	−0.132	**0.249**
(5) I follow certain routines (like respecting a timetable or using a particular space) when working from home or doing other daily activities.	**0.417**	0.071
(6) I follow the recommendations and prevention measures of the health authorities.	0.354	**0.369**
(7) I trust in science and in the experience of the health system.	**0.402**	0.101
(8) I take part in communal events (WhatsApp groups with neighbors, "meetings" on the balcony, volunteering, etc.).	0.171	**0.240**
(9) I use humor to reduce anguish and keep my fear in check.	**0.330**	0.039
(10) The COVID-19 quarantine is a good measure to guarantee the health of the population as a whole.	**0.417**	**0.365**
(11) I am afraid of being infected with coronavirus (COVID-19).	−0.159	**0.807**
(12) I am afraid that a loved one will be infected with coronavirus (COVID-19).	−0.113	**0.762**
(13) I think that the family atmosphere and the experience of living together during quarantine is pleasant and safe.	**0.562**	0.107
(14) As far as lockdown is concerned, how do you feel emotionally about staying so long at home?	**0.798**	−0.258
(15) To what extent have you adapted to the lockdown situation?	**0.845**	−0.256

and *post hoc* procedures (the Tuckey or Tamhane test depending on homoscedasticity).

All the data were analyzed using the program Factor (Lorenzo-Seva and Ferrando, 2013) and SPSS 25.0.

RESULTS

We performed an exploratory factor analysis on the 15 items related to COVID-19. The value of the Kaiser–Meyer–Olkin index was 0.76, so we concluded that the correlation matrix was suitable for factor analysis. The multivariate kurtosis coefficient was 325.78 ($Z = 70.25$; $p < 0.001$). In this situation a factor analysis method that assumes normal multivariate distribution is not advisable. For this reason, we chose Unweighted Least Squares as the factor extraction method. **Figure 1** shows the result of parallel analysis which advised to retain two factors. **Table 1** shows the pattern matrix after oblimin rotation. As can be seen, one factor comprised positive attitudes, behaviors and feelings such as adapting well to the situation, not spreading fake news, etc., while the other one comprised negative attitudes and feelings such as being worried, having fears of being infected, etc. The correlation between both factors was $r = 0.29$ and their factor reliabilities were $r_{\theta\theta} = 0.84$ and $r_{\theta\theta} = 0.83$, respectively.

We computed factor scores for each individual in both factors and related them to the other variables measured. These factor scores were transformed from typical scores to T scores (i.e., mean 50 and standard deviation 10).

Table 2 shows descriptive statistics for the psychometric variables and for the extracted factors and sex effects on these variables. Women had higher levels of extraversion, neuroticism, low self-esteem and stress, and were more pessimistic about the situation and about being infected (negative factor). Most of these effects were small or, in some cases, moderate.

Table 3 shows product moment correlations between all psychometric measures and age. As can be seen, the positive factor was more related to all variables than the negative factor. In this regard, the people that best adapted to the lockdown situation showed higher levels of life satisfaction, resilience, happiness,

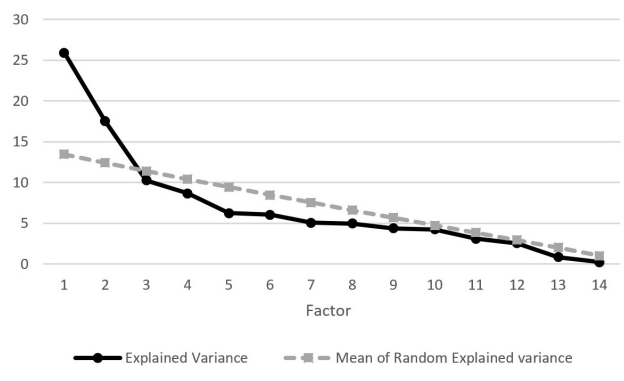

FIGURE 1 | Parallel analysis of items.

TABLE 2 | Descriptive statistics and sex differences.

Variable	Mean	*SD*	Men	Women	*p*	Cohen's *d*
Life satisfaction	18.23	3.68	18.08	18.28	n.s	
Resilience	26.89	6.13	27.45	26.65	<0.05	0.03
Happiness	20.63	4.54	20.40	20.76	n.s.	
Extraversion	27.22	6.42	25.94	27.65	<0.01	0.27
Neuroticism	23.93	4.76	22.77	24.25	<0.01	0.52
Successful coping	10.00	2.77	10.15	9.97	n.s.	
Self-esteem	8.80	2.79	9.17	8.68	<0.01	0.18
Stress	3.97	2.37	3.47	4.16	<0.01	0.29
Positive	50.00	10.00	49.30	50.09	n.s.	
Negative	50.00	10.00	47.03	50.43	<0.01	0.34

TABLE 3 | Product moment correlation between measures.

	Positive	Negative	Age	Life satisf.	Resilience	Happiness	Extrav.	Neurot.	Succ. coping	Self-esteem	Stress
Positive	–										
Negative	0.29**	–									
Age	0.23**	0.17**	–								
Life satisfaction	0.39**	−0.07**	0.16**	–							
Resilience	0.36**	0.01	0.12**	0.44**	–						
Happiness	0.36**	0.01	0.12**	0.57**	0.55**	–					
Extraversion	0.17**	−0.07**	0.07**	0.28**	0.44**	0.40**	–				
Neuroticism	−0.27**	0.16**	−0.17**	−0.37**	−0.52**	−0.54**	−0.23**	–			
Successful coping	0.42**	−0.14**	0.16**	0.27**	0.27**	0.33**	0.11**	−0.29**	–		
Self-esteem	0.47**	−0.15**	0.17**	0.39**	0.41**	0.50**	0.21**	−0.47**	−0.66**	–	
Stress	−0.43**	0.28**	−0.13**	−0.28**	−0.27**	−0.34**	−0.08**	0.40**	0.60**	0.77**	–

$^{**}p < 0.01$.

TABLE 4 | Analyses of variance of the effect of week on measures.

	Week					
	1	2	3	4	*p*	η^2
Life satisfaction	18.74	18.06	17.90	18.12	<0.01*	0.01
Resilience	27.50	26.75	26.40	26.73	n.s.	
Happiness	21.22	20.31	20.40	20.87	<0.05	0.007
Extraversion	27.87	26.95	26.88	27.23	n.s.	
Neuroticism	23.64	23.88	24.18	23.74	n.s.	
Successful coping	10.19	10.05	9.67	10.18	<0.01*	0.01
Self-esteem	9.20	8.88	8.46	8.59	<0.01*	0.015
Stress	3.56	3.72	4.30	4.39	<0.01*	0.023
Positive	50.72	49.69	49.38	49.74	n.s.	
Negative	50.17	49.55	49.28	49.48	n.s.	

**The Brown–Forsythe Statistic was used due to lack of homoscedasticity.*

extraversion, self-esteem and successful coping, and lower levels of neuroticism and stress with correlation coefficients ranging from $r = 0.170$ to $r = 0.472$ in absolute values. On the other hand, the people who worried most and were more afraid of being infected showed more stress and neuroticism, low successful coping and low self-esteem, with correlation coefficients ranging from $r = 0.072$ to $r = 0.275$ in absolute values. Age was related to both factors, positive $r = 0.224$ and negative $r = 0.166$, showing that older people tend to adapt better to lockdown but are also more worried.

Table 4 shows the effects of the number of weeks of lockdown on psychometric measures. As can be seen, the weeks locked down reduced life satisfaction, happiness, successful coping and self-esteem, and increased stress. All these effects were small and *post hoc* procedures showed that in all cases the significant differences were between the first and third week of lockdown. In the case of self-esteem and stress the difference between the first and fourth week was also significant, but no other difference was significant, which seems to show that there was an increase in stress levels related to the change from partial lockdown to total lockdown and a subsequent stabilization.

Table 5 shows the effect of job status on the measures. Job status refers to having lost one's job or not because of the COVID-19 crisis and having a job but being afraid of losing it because of COVID-19. As can be seen, this variable had only small effects on life satisfaction, successful coping, self-esteem and stress. *Post hoc* procedures showed that all these effects were due to the difference between people who had not lost their jobs and people who still had a job but were afraid of losing it. This last group showed lower life satisfaction, lower successful coping, lower self-esteem and higher levels of stress.

Table 6 shows the effects of civil status on positive and negative factors. As can be seen, both measures were sensitive to this variable and effect sizes were low. *Post hoc* procedures showed that married people scored higher than other groups on the positive factor and people with a partner but not living together showed the lowest levels of adaptation to lockdown. For the negative factor, married people showed higher levels of worry than the other groups. Finally, being locked down with your partner or with your family showed a small increase in the positive factor.

TABLE 5 | Analysis of variance of the effect of losing a job because of COVID-19 on measures (only significant effects are shown).

	No	Yes	No, but I'm afraid I will	*p*	η^2
Life satisfaction	18.35	17.52	17.21	<0.01	0.007
Successful coping	10.10	9.83	8.93	<0.01*	0.012
Self-esteem	8.88	8.25	7.85	<0.01*	0.01
Stress	3.93	4.32	4.68	<0.05*	0.006

**The Brown–Forsythe Statistic was used due to lack of homoscedasticity.*

TABLE 6 | Analyses of variance of the effect of civil status and lockdown partners on measures.

	Civil status					
	Single	**Partner but living apart**	**Married/ partner**	**Divorced**	***p***	η^2
Positive	48.51	45.54	51.41	49.94	<0.01*	0.037
Negative	47.38	47.15	51.11	49.75	<0.01	0.033
	Who is with you during lockdown					
	Nobody	**Couple**	**Couple and sons**			
Positive	47.81	51.03	50.02		<0.01	0.008
Negative	48.8	50.8	50.10		n.s.	

**The Brown–Forsythe Statistic was used due to lack of homoscedasticity.*

DISCUSSION

Several studies show that quarantine and lockdown measures have a negative impact on the population (e.g., Moccia et al., 2020; Wang et al., 2020a). For this reason, the main goal of the current study was to determine which sociodemographic and psychological variables are related to adaptation to lockdown. This information may be useful for detecting which people are especially vulnerable in this situation. According to the results, there are several important variables, but the fact that for many of them the effect sizes were small suggests that, in general, the lockdown had little impact on the general Spanish population, which is a positive result. Therefore, it seems that the sample adapted quite well to the constraints of staying at home.

The results show that sex and age are variables to be taken into account. In fact, women tend to show a more pessimistic attitude in this situation: they worry more about the health crisis, are more afraid of getting infected or relatives getting infected, and spend more time talking about the disease. Women also show more stress and less self-esteem than the usual, which means that the psychological impact is worse for them than for men. This is congruent with the review by Brooks et al. (2020) on previous pandemics, which shows that being a man is one of the sociodemographic variables that can act as a protective factor. Older people also adapted better to lockdown, although they were also more worried. The review by Brooks et al. (2020) on previous pandemics and some recent studies on COVID-19 also show that being older is a protective variable. Therefore, it seems that younger people have more problems adapting to lockdown. In terms of civil status, as expected, married people showed better adaptation, although they were also more worried, which is understandable given that they may be afraid that the pandemic will affect their partner, children, etc. In contrast, people with a romantic relationship, but not living together, showed a worse adaptation than the other groups. The results also show that those people locked down with the couple or the family adjusted better than people alone, as expected. These results are congruent with previous studies that show the importance of having a partner in this kind of situation (Li et al., 2020; Moccia et al., 2020).

As far as the relationship between psychological variables and adaptation to lockdown is concerned, the results show that more resilient people develop strategies to positively adapt to adversity, tend to adapt better to lockdown, and have more positive attitudes and behaviors. This means that they tend to establish routines during lockdown; for example, they separate teleworking times and places from leisure times and places, they tend to use sense of humor to reduce anguish and fear, they believe in the importance of lockdown, and they trust in the science and health system. This result was expected because the study by Brooks et al. (2018) shows that highly resilient people seem to cope better with uncertainty and other problems in disaster situations such as terrorist incidents or floods. Likewise, the current study also shows that more optimistic and positive people, with greater subjective happiness and life satisfaction, tend to adapt better to lockdown, and have more positive attitudes and behaviors. Therefore, according to these results, people who are more resilient, happier and with higher life satisfaction (which is the cognitive component of subjective wellbeing) tend to adapt to lockdown better. All these variables are related to personality traits (e.g., Soto, 2015; Suldo et al., 2015; Ercan, 2017). In fact, traits such as extraversion or neuroticism represent personality predispositions to resilience and subjective wellbeing (e.g., Grant et al., 2009; Brajša-Žganec et al., 2011; Oshio et al., 2018), which may explain the relationship between these traits and the adaptation to lockdown. In the current study, as expected, higher neuroticism was related to worse adaptation to lockdown and higher levels of worry and fear about COVID-19. In fact, many studies show that higher levels of neuroticism are related to more stress and worse coping in several events (e.g., Gallagher, 1990; Gunthert et al., 1999). However, we did not find the expected relationship between extraversion and adaptation to lockdown. More specifically, we expected to find a negative correlation between extraversion and adaptation to lockdown, because extraverted people have more need of social contact, so we expected that being locked down at home could be a more negative experience for them. In fact, the study by Carvalho et al. (2020) shows that people with high extraversion levels tend to find it more difficult to reduce social proximity, and show less engagement with lockdown measures. But the results of the current study suggest just the opposite, as we found a positive correlation between the two variables, which means that higher extraversion is related to better adaptation. One possible explanation of this result is the social characteristics of the Spanish population. In Spain the

social networks are strong, which can make it easy to maintain social contact even in a confined situation with neighbors or online with tools such as Facebook, Instagram, etc. In fact, during lockdown many Spanish people have increased contact with neighbors from their balconies. Moreover, communal events have been organized throughout the lockdown, such as the daily applause for the health personnel. Other examples are bingo games or musical events. This situation may have mitigated the negative effect of confinement on the more extraverted people in Spain. Another possible explanation is the positive relationship that extraversion has with other variables such as resilience or subjective wellbeing (e.g., Brajša-Žganec et al., 2011; Oshio et al., 2018). In fact, in the current study a positive relationship has also been found between extraversion and resilience. The fact that extraverted people tend to be more resilient, and are more predisposed to experience subjective wellbeing, may help them to better resist the difficulties associated with lockdown. To sum up, the results of the current study suggest that more extraverted people with lower neuroticism tend to adapt better to lockdown.

With regard to the psychological impact of the lockdown, worse adaptation to the situation is related to lower levels of successful coping than usual. This involves greater difficulty in concentrating, making decisions, playing a useful part or enjoying day-to-day activities. It is also related to lower levels of self-esteem than usual, with feelings of not being able to overcome difficulties, losing confidence, and thinking of oneself as worthless. Furthermore, it is related to higher levels of stress than usual, which means losing sleep over worry, feeling constantly under strain and feeling unhappy and depressed. Recent studies in other countries have also shown the negative effects of lockdown. For example Moccia et al. (2020) in Italy and Wang et al. (2020a) in China have revealed that many people suffered from psychological distress, with anxiety and depressive symptoms.

Another variable that had a pyschological impact during lockdown was job status, although effects were only small. More specifically, people who had a job but were afraid of losing it had lower levels of life satisfaction, successful coping and self-esteem, and higher levels of stress than people who were not afraid of losing their jobs. Therefore, this fear of losing their job increased anxiety and reduced concentration, the ability to make decisions and the enjoyment of daily life activities.

In the first 4 weeks of lockdown, there was a small but significant decrease in life satisfaction and happiness between the first and the third week. Moreover, the levels of stress increased between the first and the third week, and successful coping decreased during the same period, which means that people found it more difficult to concentrate, make decisions, play a useful part or enjoy day-to-day activities during the third week. However, in the fourth week these variables stabilized. This negative change in the third week may be explained by the fact that the first 2 weeks of the lockdown in Spain was only partial. In the third week stricter restrictions were imposed, which seems to have generated greater psychological distress in the sample. Therefore, it seems that the transition from a partial to a full lockdown, not only the length of the lockdown, is a factor that also has psychological impact. Although in the current study there was a stabilization in the fourth week, Wang et al. (2020b) found that this stabilization occurred later, after the fourth week. To sum up, the current study shows several sociodemographic and psychological variables that may affect how people adapt to a situation as stressful as confinement. This information may be useful for similar situations in the future so that strategies can be developed to rapidly detect the most vulnerable people and provide them with psychological advice and support. Our results indicate that this advice and support should promote more positive behaviors during a lockdown, such as establishing routines (separating teleworking times and places from leisure times and places), or getting information only from official media. It should also aim to increase confidence in the health system and belief in the lockdown by providing objective data to correct false perceptions and hoaxes. Likewise, it should provide strategies to better cope with stress, anxiety and uncertainty by promoting psychological well-being and preventing loss of self-esteem.

A limitation of the current study is that only two of the Big Five personality traits have been assessed: extraversion and emotional stability. Further studies should be made that include the other traits, especially conscientiousness, because they may also play an important role. Moreover, the results suggest that lockdown did not have a great impact on the general Spanish population, but other studies should focus on vulnerable groups (for example, people with mental disorders or people under great pressure during the lockdown, such as health professionals). Further studies should also be done with longitudinal data so that we can better understand the different phases that people experience during lockdown. Although the current study provides important information about this, it should be taken into account that the sample for each week consists of different people, which is a limitation. However, the current study provides valuable information not only about adaptation to lockdown but also about the psychological impact of lockdown on the Spanish population. It would be interesting to carry out a further study with the same variables in order to determine the changes undergone by the time lockdown finishes, and a third study some months later when the situation has returned to normal.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by The Ethical Committee of the Faculty of Education Sciences and Psychology of the Universitat Rovira i Virgili approved this project. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

FM-V contributed to the design of the study, carried out part of the statistical analyses, supervised the research, wrote most of the article, and provided the final approval of the version to be published. J-MD formulated the research question, supervised the research, contributed to disseminate the questionnaires, and wrote part of the article. AV-C was responsible for the statistical design of the study, wrote part of the article, and provided the final approval of the version to be published. MC-F contacted the associations, contributed to disseminate the questionnaires, and wrote part of the article. All authors contributed to the article and approved the submitted version.

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Linguistic Markers of the Emotion Elaboration Surrounding the Confinement Period in the Italian Epicenter of COVID-19 Outbreak

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The expressive writing method has rarely been proposed in contexts of large-scale upheavals that affect large populations. In this study this method was applied as an intervention and tool of investigation during the confinement period in the Lombardy region, the Italian Epicenter of COVID-19 outbreak. Sixty-four participants took part in an online expressive writing project, and a total of 167 writings were collected together with some self-report evaluations on emotions and physical sensations. A linguistic analysis through two different sets of computerized linguistic measures was conducted on the collected writings in order to study the linguistic markers of emotion regulation and elaboration. Results indicated that online expressive writing has helped respondents to get more in touch with the intense emotions that were experienced following the upheavals they witnessed. Writing even only once or twice helped, particularly those respondents who had at least one COVID-19 patient among close friends or relatives. Their writings showed an intense emotional involvement together with the ability to reflect and reorganize the personal meaning of the events and emotions experienced. This study shows that expressive writing can be used in the context of a psychological emergency, both as a powerful instrument to investigate and detect the complex psychodynamic processes underpinning the distress, and as a useful intervention to reduce the negative impact of traumatic events.

Keywords: expressive writing, emotion elaboration, writing and health, referential activity, linguistic measures, COVID-19

INTRODUCTION

In late February 2020, Italy suddenly discovered itself overrun by the Coronavirus Disease 2019 (COVID-19) outbreak. It was the first country in Europe to witness the rapid spread of the virus. The population was hit by feelings of great uncertainty and fear, compounded by the lack of knowledge about the virus' lethality and confusion and about the effective measures to be taken

to counter it. This happened in a particularly marked way in the city and surrounding areas of Bergamo and across the Lombardy region, which became the Italian epicenter of the epidemic, with about 40% of all confirmed cases and about 50% of all deaths in Italy. Within 2 weeks from the discovery of the first confirmed COVID-19 case, the Italian Government decided to impose a mandatory confinement at home for the entire Italian population as a preventive measure, a legal disposition never taken previously in Italian history. The strict confinement began on March 9, 2020 and gradually was decreased beginning May 4, 2020. Subsequently, most European countries adopted similar restrictions within a few weeks following the discovery of their first confirmed cases.

We can say thus that the COVID-19 pandemic and the consequent adopted confinement measures marked the greatest worldwide health, psychological, and economic crisis since the second World War. Millions of people were quarantined, hospitals were overwhelmed, experts warned of healthcare collapse, riots and protests broke out in various places, including prisons; countless people lost their jobs, and there were growing concerns of food shortages. Gloves and surgical masks, used as a barrier to viral transmission, were selling out (Rubin and Wessely, 2020). As we write this, the dire situation is still far from a complete resolution. It is thus evident that the current situation may be experienced as threatening not only from a physical health point of view, but also from a psychological one.

The situation generated by the COVID-19 outbreak can in all respects be considered as a psychological emergency for people. A psychological emergency can follow, not only a single traumatic event but can also be associated with a much more complex context, such as the one created by a pandemic (Goldmann and Galea, 2014). People in fact (a) experienced a real or perceived threat, (b) felt a strong pressure to act and make quick decisions, (c) sensed not having enough resources to deal with the threat, and (d) experienced a set of negative and intense emotions. A growing number of empirical studies is investigating this psychological impact. Personnel of COVID-19-dedicated healthcare settings, hospitalized or quarantined infected patients, relatives unable to visit in hospital or accompany to death their loved ones were the most exposed to the risk of this traumatic impact (Folkman and Greer, 2000). However, the general population also experienced a psychological emergency due to the non-stop stream of frightening information carried by news outlets, and in response the government-enforced measures of confinement. Most of the studies about the epidemics' psychological effects document a series of negative symptoms including distress (Al-Rabiaah et al., 2020), post-traumatic stress disorder (Hawryluck et al., 2004), anxiety (McAlonan et al., 2007), depressive syndromes and anger (Dell'Osso et al., 2011), worries about the effects of quarantine and contagion on relatives, colleagues and friends (Maunder et al., 2003, 2006), abuse of alcohol and tobacco (Morganstein et al., 2017), shame and guilt (Van Bortel et al., 2016). Negative emotions are experienced by individuals especially during the closure of schools and businesses (Hall et al., 2008) and can have long-term psychological implications (Lee et al., 2007). Wang et al. (2020) highlighted that during the initial phase of COVID-19 outbreak in China, more than half of the respondents in a research study, rated the psychological impact as moderate-to-severe, and about one-third reported moderate-to-severe anxiety. Also dysfunctional behavioral reactions to the perceived threat have been registered, ranging from denial of fear to real panic attacks (Xiang et al., 2020). Moreover, the physical distancing required by confinement measures increased feelings of loneliness and exacerbated the eventual relational and mental health problems that may have been preexisting conditions prior to the pandemic.

Recent research has aimed to investigate and describe in depth the processes underpinning psychological symptoms and generic psychological distress registered during quarantine or the period marked by the outbreak. In particular, this research has focused on the intense emotional arousal and the associated defensive or dissociative processes surrounding the COVID-19 outbreak. Porcelli (2020), for example, has speculated that anxiety and fear are adaptive emotions that can protect the integrity and unity of the self. Scalabrini et al. (2020) argued that the fear of being infected or infecting others undermines the implicit and automatic process of anchoring the self to the world, leading to a collapse of an intersubjective connection and thus to existential anxiety and anguish. Schimmenti et al. (2020) analyzed the bodily, interpersonal, cognitive and behavioral manifestations of fear triggered by the COVID-19 outbreak. During a pandemic people typically become hypervigilant about any bodily change that might suggest an infection (fear of the body), try to protect the body as a treasure that may be lost (fear for the body), experience themselves as being potentially dangerous to their loved ones (fear for significant others), and experience significant others as potential threats (fear of significant others). Venuleo et al. (2020) described how the heightening uncertainty caused by the COVID-19 pandemic leads to immediate, black-and-white thinking and generalized interpretations of reality, at the cost of more analytical thought.

It is evident that empirically studying these complex psychodynamic processes underlying the experience associated with the COVID-19 pandemic is not a simple endeavor. They need to take into account conscious and unconscious reactions of individuals; familial and interpersonal transactions; and the social and communication processes, which are particularly powerful in the context of the profound uncertainty generated by a pandemic. One way to investigate these psychodynamic emotional processes is to study the language used by people in describing their experience. Language can be considered as a catalyzer of the emotional processing during the pandemic period performed by the body-mind-environment system. An example of the centrality of language in the construction, amplification, magnification, modulation and, hopefully the elaboration of emotions can be found in the ways in which social and mass media were used by people, journalists, politicians, scientists and governments during the outbreak. The type, quantity, credibility, context and form in which information was given heavily influenced the emotional experience of millions of people. The increase in the amount of information and misinformation broadcasted, which normally characterizes the initial phase of a pandemic, can produce an inevitable emotional over-reaction if it is not adequately managed (Loveday, 2020). It has

been shown (Strong, 1990) that the language and the images used to describe the phenomenon of infection have an effect on people's psychological reactions. For example, words like "war," "killer," "battle," "invisible threat" contribute in fueling the negative feeling people can have in defining the danger (Wald, 2008).

Studying language also has the advantage of making possible the development of measures that tap the elaborative or dissociative processes used by people with respect to the emotions they are experiencing. This study takes as a point of reference the theories and research of Bucci (1997, 2013) and Pennebaker (1982, 2011), which connect the linguistic qualities of speech to specific psychological and interpersonal processes.

Bucci (1997, 2013) (Maskit and Murphy, 2011; Maskit, 2012; Mariani et al., 2013, 2020; Negri et al., 2019) have developed computerized linguistic measures of what they call the "referential process," which is based on Multiple Code Theory (MCT). The referential process is the ability of human beings to translate the continuous and indistinct flow of emotional and sensorial experience into images and words, thus making it mentally manageable and communicable to others. It is not possible to completely translate all emotional and sensory experience into words. There is, therefore, always a certain amount of disconnection between what a person feels and what s/he can think and communicate of this experience. Such a disconnection could increase when the person experiences painful events and emotions, since some distancing process of painful sensations are activated. The greater the disconnection, the more the person feels emotional arousal without being able to mentally manipulate and communicate the experience being aroused. Interpersonal communication can reactivate the referential process. Normally the interpersonal communication that is able to reactivate the referential process proceeds from an emotion arousal phase to a symbolization one in which the emotional experience is put into images and words, and finally passes to a phase of reorganization and reflection that expands the meanings attributed to the experience. The computerized linguistic measures developed by Bucci and colleagues are able to detect all three phases described (emotional arousal, symbolization, and reorganization) and therefore to measure the emotional elaboration process put in place by a speaker or a writer.

Pennebaker (1982, 2011), Pennebaker and Smyth (1997), and Pennebaker and Evans (2014) developed a well-known research paradigm based mainly on the study of language contents and styles. Expressive writing is the principal method used by Pennebaker; it consists of asking people to write about their emotions and thoughts in at least three consecutive sessions. Several studies (Pennebaker and Beall, 1986; Booth et al., 1997; Smyth et al., 1999; Rosenberg et al., 2002; Stanton and Danoff-Burg, 2002; Gallant and Lafreniere, 2003; Frisina et al., 2004; Norman et al., 2004; Baikie et al., 2012; Doherty and Wenderoth, 2017) demonstrated that expressive writing can bring many important benefits, such as a reduction in medical visits, an increase of immune defenses, a reduction in drug use, a reduction of pain intensity level, better school and academic grades, general sensation of better well-being, a reduction in feelings of depression and anger, a decrease in time to find a new job if unemployed or fired, less absenteeism at work, reduction of stress and of some physical symptoms or negative emotions, improvement of interpersonal communication. Also Tausczik and Pennebaker (2010) have developed a set of computerized measures or dictionaries to measure some content and stylistic features of language associated with several psychological and interpersonal dimensions, demographic variables, the dominance in the conversation, some basic personality dimensions, proneness to depression and suicide, social bonding after trauma, and lying or truth-telling.

In the present study we sought to investigate the emotion-elaboration processes by applying the linguistic measures developed by Bucci and Pennebaker to writings remotely collected during the confinement period in the Italian Epicenter of COVID-19 Outbreak. Based on the results published in the literature (Lange et al., 2000; Hirai et al., 2020) the expressive writing method proposed online could be a way to promote the health of citizens. However, to the best of our knowledge, the expressive writing technique has never been applied as a method of investigation or intervention during a pandemic outbreak and the consequent confinement at home. We had considered Kacewicz et al. 's (2007) proviso indicating that a technique such as expressive writing may be inappropriate until several weeks or months later a stressful event because people who face a traumatic experience often psychologically distance themselves from the emotional turmoil of the event and this process could be quite healthy in the hours and days after an upheaval. We are also aware that other studies (Range et al., 2000; Stroebe et al., 2002; Bower et al., 2003; Zachariae and O'Toole, 2015) evidenced no effects of writing disclosure when the traumatic experience was uncontrollable, such as a fatal illness or a recent loss. Although these results suggested caution, we considered it useful to test whether the expressive writing technique could be a valid method of investigation and intervention even during the COVID-19 outbreak. In fact, the pandemic and the ensuing confinement, although traumatic, were perhaps not as serious and powerful as the traumas usually investigated in the literature. The state of uncontrollability created by the pandemic may have been less intense than that caused by a fatal illness or a loss. The latter were potential outcomes of the pandemic but not inevitable ones. A previous study (Cohn et al., 2004) conducted in the period before and after the 9/11 terrorist attack had allowed the indicators of emotional change to be effectively detected during that collective tragedy. We therefore set out to conduct a similar study to see if such detection was possible even in the context of the COVID-19 pandemic in the most affected part of the Italian population. Moreover, proposing the expressive writing in an online modality was one of the few ways that adhered to the imposed measures of social distancing while at the same time allowing us to go beyond the global impressionistic evaluations of well-being/distress, and grasp more deeply the subjective processes experienced by people during this critical period.

The aims of the study were: (a) to investigate the main physical, psychological and emotional sensations, and the prevailing themes experienced by the Lombardy population

during the confinement period; (b) to detect the eventual changes in emotions, sensations, and themes across the writing sessions; (c) and to test the efficacy of expressive writing in pandemic times by monitoring the emotion elaboration indices from the beginning to the end of the investigation.

MATERIALS AND METHODS

Participants

Sixty-four participants (56 women, 8 men) took part in the online expressive writing project, with ages ranging from 18 to 72 years (M = 38.1, SD = 15.4).

All but four participants (93.7%) were living in Lombardy during the COVID-19 lockdown period. Twenty-one were single (32.8%), 42 were married or cohabiting (65.6%), and one was divorced (1.6%). During the confinement, 23 were living with their parents (35.9%), 23 were living with a partner and children (35.9%), 17 were living with a partner and no children (26.5%), and one was living alone (1.6%).

The highest level of education obtained was on average quite high: Eight participants (9.4%) had middle school as the highest level of education obtained; 20 (31.3%) had a high school education; 18 (28.1%) a bachelor's degree; 17 (26.6%) a Master's degree; and three (4.7%) had a doctorate or similar degree.

Twenty-three participants were students (35.9%); 10 were social and health care professionals (15.6%); 10 were clerical or manual laborers (15.6%); 9 were teachers (14.1%); 6 were retired (9.4%); 3 worked at home (4.7%); and 3 were unemployed (4.7%). Of the 64 participants, one was employed in health care setting dealing with COVID-19 patients, and one had lost her job due to the emergency confinement.

Out of 64 participants, one (1.6%) was a confirmed COVID-19 patient; 37 (57.8%) had no family members or close friends infected with COVID-19; eight (12.5%) had a family member or close friend who had died due to COVID-19; 12 (18.8%) had a family member or close friend hospitalized for COVID-19 symptoms; and six (9.4%) had a family member or close friend infected with COVID-19 but not hospitalized.

Instruments

Expressive Writing Method

Expressive writing is a method created by Pennebaker and Beall (1986) based on the hypothesis that writing about emotional problems can help to improve psychological and physical health of the writer, generating a sense of well-being that can be useful to manage the negative/traumatic experiences and related emotions. Following Pennebaker's instructions, we gave respondents the following prompt:

Find a time and place where you won't be disturbed. Ideally, pick a time at the end of your workday or before you go to bed. Promise yourself that you will write for a minimum of 15 min a day for at least 3 or 4 times. You can write every day or less frequently but write at least 1 day a week.

Once you begin writing, write continuously. Don't worry about spelling or grammar. If you run out of things to write about, just repeat what you have already written. You can write about the same thing on several days of writing or you can write about something different every day. It is up to you.

What to write about: Something that you are thinking or worrying about too much; something that you are dreaming about; something that you feel is affecting your life in an unhealthy way; something that you have been avoiding for days, weeks, or years.

Over the next days, try to write about the deepest emotions and thoughts that you have lived in this period of life. They can be positive or negative, they can concern the present, the past or the future. Whatever you choose to write about, however, it is critical that you let yourself go and explore your very deepest emotions and thoughts.

Questionnaire on Personal Data, Emotions, and Physical Symptoms

The questionnaire contained 12 demographic questions: gender, age, job, employment difficulties due COVID-19, voluntary or professional involvement in COVID-19 care settings, place of residence, education, marital status, number and relationship to other people living together with the respondent, and friends or relatives infected by COVID-19. Respondents used a code to track and match their writing submissions.

Afterward a questionnaire proposed by Pennebaker et al. (1990) and Richards et al. (2000) was administered to assess each participant after each writing session. Respondents were asked to rate on a 5-point scale (from 0 – not at all – to 5 – a great deal) the degree to which they had in the past 3 days experienced physical symptoms (e.g., racing heart, upset stomach, headache, dizziness, shortness of breath, cold hands, sweaty hands, and pounding heart), and specified emotions (sad, happy, guilty, altruistic, fearful, brave, proud, humiliated, loved, abandoned, disoriented, suffocated, sacrificed, transgressive, powerful, resigned, angry, and peaceful).

The questionnaire ended with four questions about how the participant felt about their essay that day: "Overall, how much have you told other people about what you wrote today?" "Overall, how much did you reveal your emotions in what you wrote today?" "Overall, how do you feel from a psychological point of view today?" "Overall, how do you feel from a physical point of view today?" The scale for these four questions ranged from 1 to 5.

Linguistic Inquiry and Word Count (LIWC)

The Linguistic Inquiry and Word Count (LIWC; Pennebaker et al., 2015) is a software that compares a document to a dictionary of more than 2,300 words and word stems. Each word of the dictionary is assigned to specific linguistic categories; the outputs of the software are percentages of total words of the document associated to each category. The categories of words we examined in this study are as follows:

- *Emotion-related words (Positive sensations, Positive emotions, Optimism, Negative emotions, Sadness, Anger, and Anxiety).*
- *Cognitive process words (Causation, Introspection, Inhibition, Self-discrepancies, Possibility, and Certainty).*

- *Time markers (Past tenses, Present tenses, and Future tenses).*
- *Current concerns (Movement, Occupation, Work, School, Achievement, Leisure, Home, Sport, TV, Music, Money, Metaphysical issues, Religion, Death, Physical functions, Body, and symptoms, sexual issues, grooming, eating, and sleep).*

Discourse Attributes Analysis Program (DAAP)

The Italian Discourse Attribute Analysis Program (Italian DAAP; Bucci and Maskit, 2006; Maskit and Murphy, 2011; Mariani et al., 2013; Negri et al., 2018) compares any kind of Italian text with word lists or dictionaries; the output is a list of counts and indices indicating the proportion in which those words are present in the texts examined or the average weight of words in respect to a certain construct, weight previously empirically assigned to each word present in the dictionaries. For this study we applied the following Italian dictionaries or linguistic measures of the referential process:

- *IAffN*: Italian dictionary of negative affects; it provides the proportion of words in the text related to negative affects.
- *IAffP*: Italian dictionary of positive affects; it provides the proportion of words in the text related to positive affects.
- *IREF*: Italian dictionary of refection-related words; it provides the proportion of words in the text referring to cognitive or logical functions, and to communication processes that imply the use of cognitive functions;
- *IWRAD:* The Italian Weighted Referential Activity Dictionary allows to define for each analyzed text the average of the weights that the words assume in terms of referential activity (i.e. weights related the degree of concreteness, specificity, clarity and imagery). The referential activity in fact can be defined as the degree to which the speaker or writer is able to translate their emotional, visceral and relational experience into words, so as to evoke corresponding experiences in the listener or in the reader (Bucci et al., 1992). It is a measure of emotional involvement and the connection between words and the emotional experience. IWRAD scores range from 0 (lowest) to 1 (highest RA).
- *HPIWRAD*: High Proportion Italian WRAD is the proportion of texts examined that has a WRAD above the average value.
- *IWRRL*: The Italian Weighted Reflection and Reorganization List is a dictionary of Italian words associated to the Reflection and Reorganization function. This can be defined as the degree to which the speaker is trying to recognize and understand the emotional significance of an event or set of events in their own or someone else's life, or in a dream or fantasy. IWRRL is an index of personal elaboration of emotional experiences; IWRRL scores range from 0 (lowest) to 1 (highest RR).
- *IWRAD_IWRRL*: It is the covariation in the texts of WRAD and WRRL measures. A positive covariation generally indicates a good elaboration process since the emotional involvement in the storytelling indicated by WRAD is associated with a personal and not abstract reflection on this emotional activation.

Procedure

The aims of the study were presented thorough a 3-page website entitled "#IStayAtHomeAndWrite." In the first page there was an invitation to participate in a study designed to explore how people were managing the psychological emergency produced by the COVID-19 outbreak. It was specified that whoever participated would not receive particular advice or recommendations, but would instead, potentially activate and enhance their own personal resources already at their disposal for facing the emergency and confinement period. In order to engage and motivate potential respondents, the second page reported a detailed and documented list of benefits derived from the expressive writing method. The third page presented the expressive writing instructions as proposed by Pennebaker et al. (1988): that is, when and how much to write, what to write about, and what to do with the writing samples. The page contained a link to an online form with the questionnaire, and a field in which to enter the personal writing required. Respondents could choose to fill out anonymously the form or, if they wanted, to receive an automated report of what they had written by entering an email address. The link to the website was circulated mainly through social networks, websites of the local community (as local library websites), general practitioners' mailing lists and word of mouth. We excluded from participation one person who entered two writings, each composed of just one nonsense word.

Writings Collected

Due the COVID-19 outbreak the Italian Government had decreed a mandatory confinement at home for all resident population for 8 weeks, form March 9 to May 4, 2020. It was possible to leave the home only for serious health reasons or for work, and only if performing in a few essential jobs. During this period, we launched the expressive writing project, collecting a total of 167 writings from 64 respondents. The average length of writing was 1031 words (SD = 1187; min = 38, max = 6267). Thirty-one respondents (48.4%) sent only one writing sample, nine respondents (14.1%) sent two writings; ten respondents (15.6%) sent 3 writings; four respondents (6.3%) four writings; four respondents (6.3%) five writings; one respondent (1.6%) six writings; two respondents (3.1%) seven writings; two respondents (6%) eight writings; and one respondent (1.6%) sent 14 writings. Regarding the distribution of the writings along the 8 weeks of confinement, 49 texts (29.3%) were written in the third week; 45 (26.9%) were written in the fourth week; 31 (18.6%) in the fifth week; 19 (11.4%) in the sixth week; 13 (7.8%) in the seventh week; and 10 (6.0%) in the eighth week.

Statistical Analyses

To test for significant differences between groups of respondents we ran a series of analysis of variance (ANOVA); to detect significant differences between measurements of the same variables at different times we ran a series of repeated measures

ANOVAs, as well as to test different but similar measurements on the same participants (e.g., for ratings about the various emotions perceived or about psychological and physical well-being); to test a causal relationship between different variables, we ran a series of linear regression analyses; finally, to summarize the ratings on physical sensations, those on perceived emotions, and those on the themes emerging in the texts, we conducted a series of exploratory factorial analyzes, using the "minimum residual" extraction method in combination with a "varimax" rotation.

RESULTS

Physical Sensations

After each writing session, respondents were asked to rate on a scale ranging from 1 (very bad) to 5 (very well) how they felt from a psychological and physical point of view. On average, physical well-being was significantly higher than psychological [$F_{(1,\ 63)} = 13.02$, $p < 0.001$, $\eta^2_p = 0.173$] and the average score exceeded the neutral value indicating a prevalence of a feeling of physical well-being ($M = 3.25$, $SD = 0.88$). Physical well-being scores did not vary by age, education, profession, total number of writing sessions held, and also with respect to being among close friends or relatives who either had been infected or deceased from COVID-19. There was also no difference in physical well-being between the first and last writing session.

Overall, the participants reported very little unpleasant physical sensations (see **Figure 1**; the means ranged from 0.70 to 1.09 on a 5-points scale); among those they experienced, headaches and cold hands prevailed and were significantly higher than the sensation of sweaty hands [$F_{(7,\ 441)} = 6.31$, $p < 0.001$, $\eta^2_p = 0.091$]. The cold hands sensation was even greater in respondents with at least one confirmed or deceased COVID-19 patient among their close friends or family members [$F_{(1)} = 6.14$, $p = 0.028$, $\eta^2 = 0.075$] along with shortness of breath [$F_{(1)} = 4.51$, $p = 0.038$, $\eta^2 = 0.068$]. The sensation of cold hands finally decreased significantly between the first and the last writing session [$F_{(1,\ 32)} = 5.58$, $p = 0.024$, $\eta^2_p = 0.148$].

Emotions

Self-Reported Emotions

As previously mentioned, perceived psychological well-being was overall lower than the physical well-being [$F_{(1,\ 63)} = 13.02$, $p < 0.001$, $\eta^2_p = 0.173$], with average score close to neutral value "neither well nor bad" (3) values ($M = 2.94$, $SD = 0.72$). None of the variables (age, educational qualification, profession, total number of writing sessions held, and the presence among close friends and relatives of at least one confirmed or deceased COVID-19 patient) had any effect on self-reported emotions. There was also no difference in psychological well-being between the first and last writing session.

Analyzing the emotions felt by respondents during the days of confinement we observed a well-defined and consistent profile both in self-reported evaluation and in the emotions emerging from writings.

The emotions that respondents rated higher were "sad" ($M = 2.05$, $SD = 0.90$), "disoriented" ($M = 2.04$, $SD = 1.07$), "angry" ($M = 1.94$, $SD = 1.13$), "fearful" ($M = 1.92$, $SD = 1.09$), "loved" ($M = 1.87$, $SD = 1.07$), and "suffocated" ($M = 1.59$, $SD = 1.20$). Emotions like "powerful" ($M = 0.40$, $SD = 0.65$) and "transgressive" ($M = 0.38$, $SD = 0.68$) were almost absent (see **Figure 2**); a significant difference was found between the most present and the least present emotions [$F_{(17,\ 1071)} = 19.8$, $p < 0.001$, $\eta^2_p = 0.239$].

The younger respondents (18–25 y) felt significantly sadder than older ones (51–72 years) [$F_{(1)} = 4.89$, $p = 0.004$, $\eta^2 = 0.196$]; those who had a confirmed infection or a deceased COVID-19 patient among their relatives or close friends felt much more fearful than those who did not [$F_{(1)} = 4.23$, $p = 0.044$, $\eta^2 = 0.064$]. In the last writing session, the respondents felt less fearful [$F_{(1,\ 32)} = 5.71$, $p = 0.023$, $\eta^2_p = 0.152$] but also less altruistic [$F_{(1,\ 32)} = 5.45$, $p = 0.026$, $\eta^2_p = 0.145$] and happy [$F_{(1,\ 32)} = 5.40$, $p = 0.027$, $\eta^2_p = 0.144$].

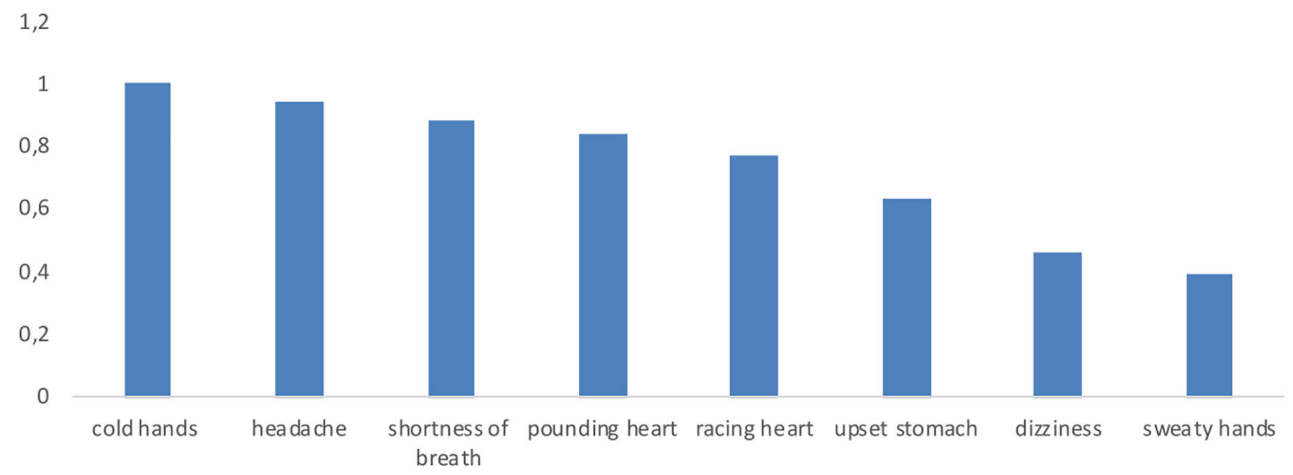

FIGURE 1 | Respondents' physical sensations and symptoms average ratings.

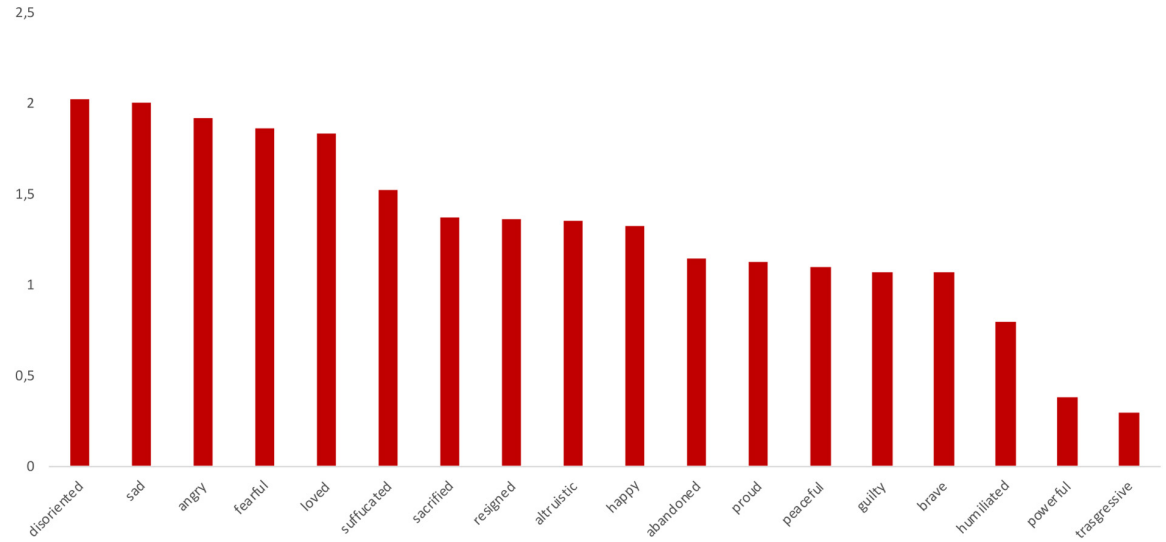

FIGURE 2 | Respondents' emotions average ratings.

Exploratory factor analysis on self-rated emotions revealed two dimensions, or two sets of emotions that tend to be felt together (see **Table 1**): a negative emotion factor (28.4% explained variance) and a prosocial emotions factor (18.9% explained variance). Both factors decreased from first to last writing session [negative emotions: $F_{(1,\ 32)} = 5.08$, $p = 0.031$, $\eta^2_p = 0.137$; prosocial emotions: $F_{(1,\ 32)} = 4.89$, $p = 0.034$, $\eta^2_p = 0.133$].

Emotions Emerging in Writings

To the question "how much did you reveal your emotions in what you wrote today?" the respondents' rating was between "somewhat" (3) and "much" (4) ($M = 3.16$, $SD = 1.15$). The writings thus were considered emotion-laden by those who wrote them. This was even more marked for those who wrote at least three times consecutively ($M = 3.56$, $SD = 0.99$), as instructions required, compared to those who wrote only once or twice [$M = 2.92$, $SD = 1.18$; $F_{(1)} = 4.80$, $p = 0.032$, $\eta^2 = 0.072$].

The presence of emotions in the writings is confirmed by the computerized analysis through both the DAAP and LIWC dictionaries. Words referring to emotions were 5.02% for DAAP and 5.46% for LIWC; Negative affects (2.43%) prevailed over positive affects (1.95%) and over neutral affects (0.6%) for DAAP [$F_{(2,\ 126)} = 5.08$, $p = 0.031$, $\eta^2_p = 0.137$]. Negative emotions (2.98%) prevailed over positive emotions (0.82%) for LIWC as well [$F_{(1,\ 63)} = 91.7$, $p < 0.001$, $\eta^2_p = 0.593$]. In particular, sadness (1.26%) prevailed over anxiety (0.81%) and anger (0.56%) [$F_{(2,\ 126)} = 16.6$, $p < 0.001$, $\eta^2_p = 0.209$].

Respondents with at least a close friend or a relative with confirmed infection or deceased from COVID-19 produced writings with less positive emotions (DAAP) compared to those without infected relatives and friends [$F_{(1)} = 4.56$, $p = 0.037$, $\eta^2 = 0.068$], however, the two groups did not differ in negative emotion words. No significant variations were found in emotion-related words between first and last writing session.

TABLE 1 | Exploratory Factor Analysis on self-reported emotions.

	Negative emotions	Prosocial emotions	Uniqueness
Suffocated	**0.765**	−0.151	0.391
Sad	**0.763**	−0.158	0.392
Fearful	**0.737**	0.226	0.404
Disoriented	**0.732**	0.200	0.423
Abandoned	**0.678**	−0.024	0.539
Angry	**0.664**	−0.023	0.558
Scarified	**0.619**	−0.108	0.605
Humiliated	**0.576**	−0.116	0.654
Resigned	**0.557**	−0.130	0.672
Guilty	**0.529**	0.110	0.708
Altruistic	0.161	**0.802**	0.330
Brave	0.097	**0.768**	0.400
Proud	−0.021	**0.768**	0.409
Happy	−0.172	**0.629**	0.575
Loved	−0.054	**0.592**	0.646
Powerful	−0.090	**0.498**	0.743

"Minimum residual" extraction method was used in combination with a "varimax" rotation. In bold the factor loadings of the items retained in each factor.

Themes

Considering all writings, present time markers were more prevalent than past or future time markers [$F_{(2,\ 126)} = 16.6$, $p < 0.001$, $\eta^2_p = 0.209$]. In regards to themes (see **Figure 3**), words related to movement, leisure, home, body and symptoms, physical functions, achievement, and occupation were much more present than words related to school, job, sport, TV, music, money, metaphysic, religion, death, sexual, sleep, eating, grooming [$F_{(19,\ 1197)} = 57.3$, $p < 0.001$, $\eta^2_p = 0.476$].

An exploratory factor analysis revealed four dimensions (see **Table 2**) or themes: a pleasant theme factor (17.9% explained variance), an existential theme factor (17.2% explained variance), a bodily theme factor (15.6% explained variance), and a duty theme factor (17.2% explained variance). Both pleasant and

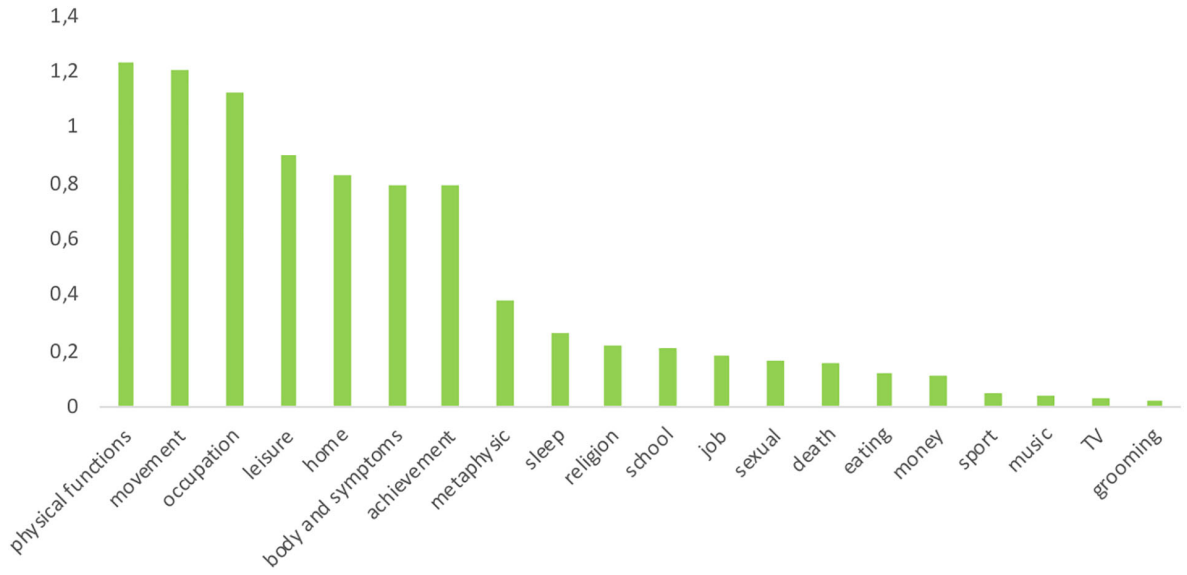

FIGURE 3 | Themes emerging from respondents' writings.

duty themes factors decreased from first to last writing session [pleasant themes: $F_{(1,\ 32)} = 3.39$, $p = 0.050$, $\eta^2_p = 0.096$; duty themes: $F_{(1,\ 32)} = 5.02$, $p = 0.032$, $\eta^2_p = 0.136$].

Emotional Elaboration

Expressive writing appeared to significantly facilitate the processing of emotions as evidenced by multiple linguistic markers measured by the DAAP as well as the LIWC measures.

First, respondents considered what they had written as something quite personal and when asked "overall, how much have you told other people about what you wrote today?" they gave an average score close to 2 (little) value ($M = 2.33$, $SD = 1.17$). As mentioned above, participants tended to consider their writings as emotionally charged ($M = 3.16$, $SD = 1.15$).

TABLE 2 | Exploratory factor analysis on themes emerging from writings.

	Factor				Uniqueness
	Pleasant	**Existential**	**Bodily**	**Duty**	
Leisure	**0.982**	−0.036	−0.086	0.082	0.019
Home	**0.966**	−0.018	−0.097	0.083	0.049
Metaphysic	−0.031	**1.039**	−0.034	−0.075	−0.089
Religion	−0.043	**0.796**	−0.103	−0.102	0.342
Death	0.006	**0.395**	0.098	−0.015	0.833
Physical	−0.007	0.015	**1.029**	−0.022	−0.060
Body	−0.030	0.036	**0.672**	−0.003	0.545
Sleep	−0.075	−0.005	**0.402**	−0.004	0.832
Occupation	0.241	−0.083	−0.055	**0.982**	−0.033
Job	0.008	0.036	−0.005	**0.574**	0.668
School	−0.009	−0.090	0.009	**0.353**	0.867

"Minimum residual" extraction method was used in combination with a "varimax" rotation. In bold the factor loadings of the items retained in each factor.

If we consider all the writings together, the referential activity and the reflection/reorganization activity was above average value (IWRAD = 0.505, $SD = 0.006$; IWRRL = 0.551, $SD = 0.004$). The proportion of text in respondents' writings with referential activity above the average value was very high (HPIWRAD = 0.68 corresponding to 68% of textual corpus, $SD = 0.20$) and the covariation between referential activity and reflection/reorganization activity was on average positive (IWRRL_IWRAD = 0.39, $SD = 0.37$). The percentage of words related to cognitive processes (causation, introspection, discrepancy, inhibition, possibility, certainty) as detected by the LIWC was equal to 5.47% ($SD = 1.69$), and words related to the abstract reflection, as measured by DAAP, was equal to 0.03 ($SD = 0.01$) corresponding to 3% of total number of words.

The writings of those who wrote following the instructions – write at least three times – compared to those who wrote at most once or twice, were much longer [$F_{(1)} = 37.1$, $p < 0.001$, $\eta^2 = 0.374$].

Emotional processing indexes were significantly better for those who had a confirmed infected or dead COVID-19 patient among their relatives or close friends, than those who did not. They had lower abstract reflection [$F_{(1,\ 62)} = 7.81$, $p = 0.007$, $\eta^2_p = 0.112$]; higher –although marginally significant– referential activity [$F_{(1,\ 62)} = 3.56$, $p = 0.064$, $\eta^2_p = 0.054$], and the covariation between referential and reflection/reorganization activities [$F_{(1,\ 32)} = 3.74$, $p = 0.058$, $\eta^2_p = 0.057$]. These differences mean that having a relative or close friend infected or deceased from COVID-19 predicted almost significantly the emotional processing indexes in the respondents' writings [IRef: $R^2 = 0.112$, $F_{(1,\ 62)} = 7.81$, $p = 0.007$, $t = -2.80$, $p = 0.007$; IWRAD:

R^2 = 0.054, $F_{(1,\ 62)}$ = 3.56, p = 0.064, t = 1.89, p = 0.064; IWRAD_IWRLL: R^2 = 0.057, $F_{(1,\ 62)}$ = 3.74, p = 0.058, t = 1.93, p = 0.058].

The results are even more significant when taking into account the level of psychological well-being perceived by the respondents. Lower levels of perceived psychological well-being predicted higher levels of emotional processing scores in writings [IWRRL: R^2 = 0.135, $F_{(1,\ 54)}$ = 8.43, p = 0.005, t = −2.90, p = 0.005; Cognitive Processes: R^2 = 0.079, $F_{(1,\ 54)}$ = 4.67, p = 0.035, t = −2.16, p = 0.035; Introspection: R^2 = 0.112, $F_{(1,\ 54)}$ = 6.84, p = 0.012, t = −2.61, p = 0.012; Inhibition: R^2 = 0.095, $F_{(1,\ 54)}$ = 5.66, p = 0.021, t = −2.38, p = 0.021].

In regard to themes, existential themes (existential themes factor) correlated positively with IWRAD (r = 0.568, $p < 0.001$) and WRAD_WRRL covariation (r = 0.257, $p < 0.05$). When respondents wrote about death, religion and, more generally, about existential themes, the indices of emotional engagement and emotional processing tended to increase.

The effect of repeating the writing was multifaceted. When we compared the first session writings with those of the last session, we did not find any significant difference in the indices of emotional processing. When instead we computed in the analyses the comparison between those who wrote only 2 times (2-times writers) with those who wrote at least 3 times (3plus-times writers), and between those who had a family member or close friend infected or deceased form COVID-19 with those who had not, then significant interaction effects on the changes between the first and the last writings were found. In particular between first and last session of writing we found the following significant interaction effects (see **Figure 4**):

a) cognitive processes (as measured by LIWC, both globally as well as individually considered) increased only in 2-times writers [cognitive processes: $F_{(1,\ 29)}$ = 6.18, p = 0.019, η^2_p = 0.166; cognitive processes x 2/3plus-times writers: $F_{(1,\ 29)}$ = 4.50, p = 0.042, η^2_p = 0.127];
b) the referential activity increased much more in 2-times writers, especially in those with an infected or dead CODIV-19 patient among close friends or relatives than in the opposite group [IWRAD: $F_{(1,\ 29)}$ = 10.64, p = 0.003, η^2_p = 0.269; IWRAD x Infected; $F_{(1,\ 29)}$ = 4.27, p = 0.048, η^2_p = 0.128; IWRAD x 2/3plus-times writers: $F_{(1,\ 29)}$ = 11.63, p = 0.002, η^2_p = 0.286];
c) the text proportion with high referential activity increased only in 2-times writers [HPIWRAD: $F_{(1,\ 29)}$ = 5.40, p = 0.027, η^2_p = 0.157; HPIWRAD x 2/3plus-times writers: $F_{(1,\ 29)}$ = 7.26, p = 0.012, η^2_p = 0.200];
d) the abstract reflection decreased only in responders with friends or relatives COVID-19 infected [IRef: $F_{(1,\ 29)}$ = 5.20, p = 0.030, η^2_p = 0.152; IRef x Infected: $F_{(1,\ 29)}$ = 3.97, p = 0.050, η^2_p = 0.120];
e) the covariation between IWRAD and IWRRL increased only in 2-times writers [IWRAD_IWRRL: $F_{(1,\ 29)}$ = 7.15, p = 0.012, η^2_p = 0.198; IWRAD_IWRRL × 2/3plus-times writers: $F_{(1,\ 29)}$ = 8.38, p = 0.007, η^2_p = 0.224].

DISCUSSION

The corpus of texts we collected thorough an online expressive writing project presents an overall picture of subtle but pervasive change in linguistic markers of emotional elaboration during COVID-19 outbreak in Lombardy, the Italian region that first was affected by the pandemic in Europe, and has had the highest number of deaths and confirmed cases in Italy.

First of all, from our results we see that that despite the upheavals of the COVID-19 outbreak and of the sudden and unprecedent experience of confinement, which lasted 8 weeks, participants maintained a very good level of perceived physical well-being and quite good perceived psychological well-being. The health and psychological emergencies appear to have mobilized a person's resources and resilience to face the new threat. A similar effect was registered during the 9/11 terrorist attack where it was observed that the majority of the population maintained a relatively high level of wellbeing despite the upsetting situation (Bonanno et al., 2006). Probably the fact that all respondents were living during confinement with their relatives provided enough support to maintain a sense of control and to foster their resilience (Yang and Ma, 2020).

The profile of emotions experienced by respondents highlighted a positive side of their emotional reaction. The negative emotions prevailed, first of all sadness – especially in younger participants – followed immediately by fear – especially in respondents with friends or relatives who had been COVID-19 infected – and then followed by disorientation, and anger. Alongside these emotions, however, respondents experienced – albeit with less intensity – a parallel set of emotions, such as being loved, feeling altruistic, proud, happy, and brave. Both negative and positive emotions significantly decreased as the writing sessions followed.

A similar manifold profile results from the analysis of themes. Writings developed around four thematic areas: pleasant (home and leisure), existential (metaphysic, religion, death), bodily (physical, body, and sleep), and duty themes (occupation, job, and school). Duty and pleasant ones decreased over writing sessions.

Perhaps the most important findings are in regard to the linguistic measures of emotion processing. We sought to understand whether the online expressive writing task helped respondents to get more in touch with the intense emotions experimented following the upheavals they witnessed. Multiple results from our study support an affirmative answer to this question.

First of all, respondents on average reported that they had revealed their emotions to a considerable extent in their writings, while they considered to have only partially talked to other people about what they wrote. These evaluations were even more marked in the respondents who followed the instructions completely, i.e., writing at least three times on consecutive days. A sign of their greater involvement was also evidenced by the length of their writings, which was lengthier than those who wrote only once or twice.

The linguistic analysis of all the writings confirmed the full emotional involvement of the respondents and their ability to narrate in a vivid, clear, specific and concrete way their

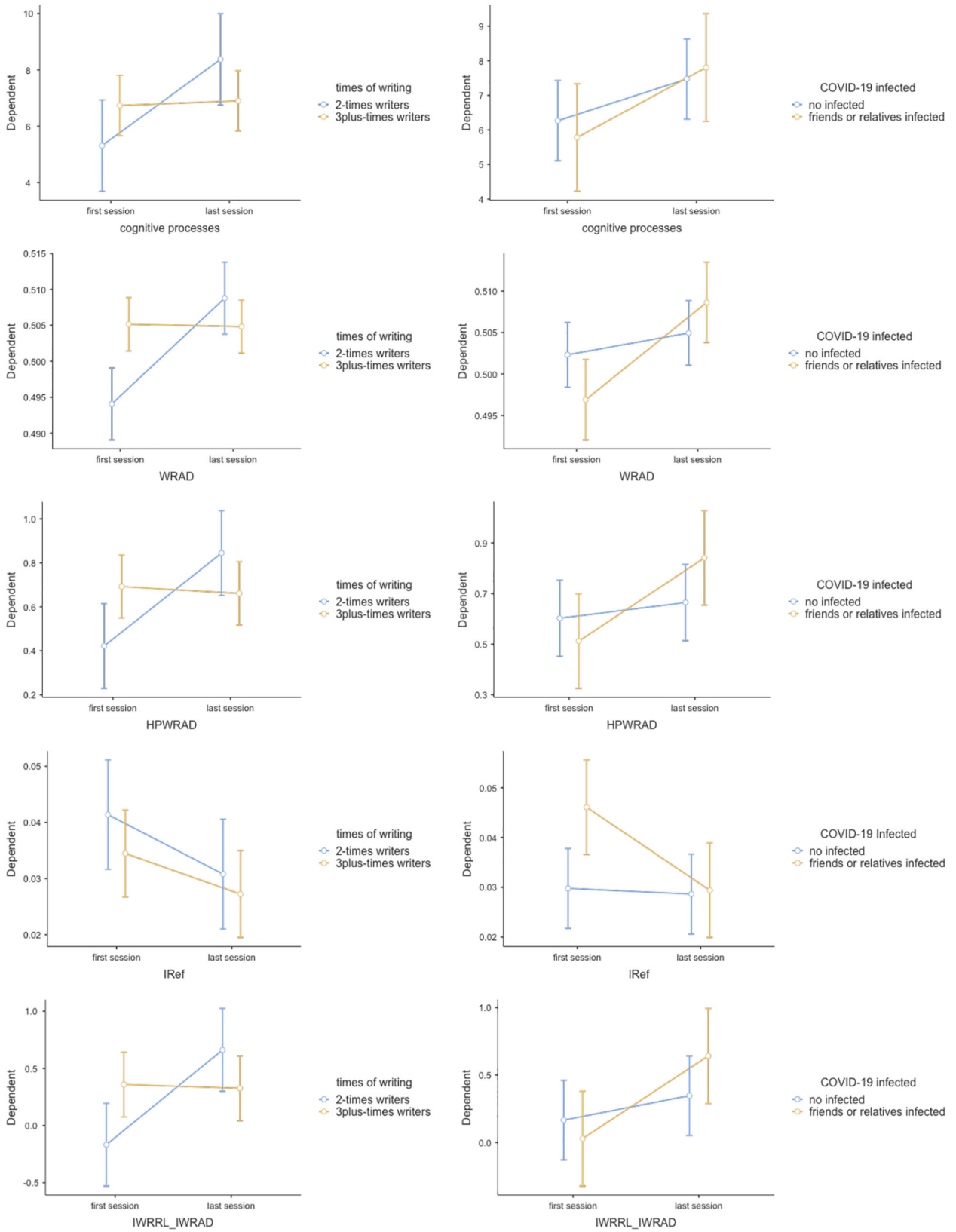

FIGURE 4 | Estimated marginal means from repeated measures ANOVAs between first and last writing sessions – interaction effects about "Emotion-elaboration-indices" × "COVID-19 infected" × "Times-of-writing" model.

emotional experience. In terms of Bucci's Multiple Code Theory, their stories had a level of referential activity above average (see IWRAD and HPIWRAD). They were also able to develop personal reflections on the emotional meaning of what they were writing and experiencing, thus activating a process of reorganization of the experience and a capacity for introspection (see WRRL, IWRAD_IWRRL, LIWC cognitive processes).

Analyzing the between-subjects differences, the respondents who had a friend or a relative who was confirmed to be infected or had passed away from COVID-19, showed the highest emotional engagement and emotional processing values. Compared to the others, they had higher referential activity, lower abstract reflection and more positive covariation between referential and reflection/reorganization activities, indicating a better emotional elaboration. Their experience was certainly more threatening and potentially traumatic. In fact, they were prevented from visiting their loved ones if they were hospitalized, from accompanying them in the last moments of their life and from taking part in their funerals. In these cases, the writing protocol appears to have allowed an increased expression and elaboration of intense emotions.

Another finding along these lines is the high positive correlation between themes related to death, religion and more generally to existential aspects on the one hand, and referential activity and its covariation with reflection/reorganization activity on the other. It is precisely when they wrote about these topics that respondents showed an increase in these indices of emotional engagement and elaboration.

Also, the level of perceived psychological well-being had an impact on the emotional processing indexes. The more the person perceived low psychological well-being, the more the reflection/reorganization activity and, more generally, the cognitive processes activated in writing increased.

Lastly, we found that the improvement of the emotional processing indices between the first and the last writing session applied only to those participants who had had at least a COVID-19 infected or deceased patient among close friends or relatives and to those participants who wrote only twice. Analyzing the average values of those who wrote at least three times and those who did not have a friend or relative infected from COVID-19, it is noted that the emotional processing values were already high in the first writing session and remained so over all sessions. These data are important in that they help us understand to what extent and for whom the expressive writing method could be useful in times of pandemic. It is likely that participants who wrote at least three times were already used to writing about themselves or more generally to reflecting on their emotions. For them, the expressive writing experience allowed them to be more in touch with their emotions. By contrast, those who wrote only twice had a significant emotional activation from first to second writing session. For these participants this high emotional activation probably led to the interruption of the task, which may have been too intense to be expressed and processed during the writing period. Some studies (Jensen-Johansen et al., 2018; Renzi et al., 2020), in fact, evidenced that the degree of people's emotional regulation ability have a moderating effect on writing disclosure effectiveness. People who score too low or too high in emotion regulation ability found it difficult to benefit from expressive writing. We can therefore hypothesize that those who interrupted the writing task did so due to difficulties in regulating the emotions activated by it. However, those of this group who wrote even only twice saw an improvement in the indices of emotional elaboration. Lastly, the expressive writing method proved to be particularly useful for participants who had at least a COVID-19 infected or deceased patient among close friends or relatives. In fact, in their writings there was an increase in both the emotional involvement and the ability to reflect and give meaning to the challenging emotional experience.

In sum, on the basis of these findings we can argue that the online expressive writing experience can be useful in situations of psychological emergency such as that of a pandemic, and that writing even just once or twice is particularly useful for those who are more directly in contact with situations of contagion and death. However, for some people – especially those with difficulty in emotion regulation – the task of writing about themselves can be too demanding and challenging. For these people, expressive writing could probably be of greater benefit if inserted in a context of support and containment such as that represented by the relationship with a clinician.

Our findings are consistent with those of Cohn et al. (2004). They investigated the linguistic markers of the psychological change surrounding the 9/11 terroristic attack analyzing the diaries of 1,084 U.S. users of an on-line journaling service. They also found an increase in negative emotions and cognitive processes related to the upsetting event and a subsequent decrease in the following days and months. However, they also registered an increase in social orientation (namely how often participants used words such as talk, share, or friends and personal pronouns other than first-person singular) and psychological distancing (namely articles and words of more than six letters and inverse scores for first-person singular pronouns, words indicating discrepancy from reality, and present-tense verbs) that we did not observe. We believe that this difference is due to the fact that in our case the participants did follow a real expressive writing protocol differently from Cohn and colleagues' study where diaries were posted to be read online. Moreover, the different nature of the threats that the writers were experiencing in the two different contexts may also have played a role. The linguistic analyses of our respondents' writing have showed that expressive writing in times of an upheaval, such as a pandemic, can lead to a significant emotional engagement and elaboration.

A limitation of our study includes the fact that our participants were not a casual representative sample and thus results may differ from those of the general population. Furthermore, more than half of the participants did not follow the instructions in full, and wrote only once or at most twice; so, those who accepted our invitation to participate in the project, and wrote at least three times, were perhaps already used to writing or thinking about themselves; therefore, it remains to be seen if expressive writing is an effective tool for everyone. Secondly, differently from other studies on the expressive writing efficacy, we cannot plan follow-up measurements; also, in our study we do not have an external criterion of improvement, such as measures of behavior change or physiological indexes of wellbeing. Thirdly,

mainly for ethical reasons, we have not involved a control group which could have highlighted if the observations related to the writing process could be linked to time passage, independently from the writing intervention.

Notwithstanding the above limitations, this project offers fresh insights into how people respond psychologically to large-scale upheavals that affect large populations. In particular, our results indicate that expressive writing can be used in the context of a psychological emergency, both as a powerful instrument to investigate and detect the complex psychodynamic processes underpinning the distress, and as a useful intervention to reduce the negative impact of traumatic events.

DATA AVAILABILITY STATEMENT

The data set supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

ETHICS STATEMENT

The present study involving human participants was reviewed and approved by the Ethics Committee, University of Bergamo. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AN contributed to the research design ideation, online instruments (website and form) setting, statistical analyses, and manuscript writing. GA contributed to the online instruments setting, statistical analyses, and manuscript writing. AB contributed to the statistical analyses and manuscript writing. CZ contributed to the online instruments setting and manuscript writing. CC contributed to the research design ideation, online instruments setting, manuscript writing, and English editing. All authors contributed to the article and approved the submitted version.

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Telepsychiatry During the COVID-19 Pandemic: Development of a Protocol for Telemental Health Care

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Background: The rapid spread of the Coronavirus disease 2019 (COVID-19) has forced most countries to take drastic public health measures, including the closure of most mental health outpatient services and some inpatient units. This has suddenly created the need to adapt and expand telepsychiatry care across the world. However, not all health care services might be ready to cope with this public health demand. The present study was set to create a practical and clinically useful protocol for telemental health care to be applied in the context of the current COVID-19 pandemic.

Methods: A panel of psychiatrists from 15 different countries [covering all World Health Organization (WHO) regions] was convened. The panel used a combination of reactive Delphi technique and consensus development conference strategies to develop a protocol for the provision of telemental health care during the COVID-19 pandemic.

Results: The proposed protocol describes a semi-structured initial assessment and a series of potential interventions matching mild, moderate, or high-intensity needs of target populations.

Conclusions: Telemedicine has become a pivotal tool in the task of ensuring the continuous provision of mental health care for the population, and the outlined protocol

can assist with this task. The strength of this protocol lies in its practicality, clinical usefulness, and wide transferability, resulting from the diversity of the consensus group that developed it. Developed by psychiatrists from around the globe, the proposed protocol may prove helpful for many clinical and cultural contexts, assisting mental health care providers worldwide.

Keywords: COVID-19, Coronavirus disease, mental health, protocol, psychiatry, telemedicine, telemental health, telepsychiatry

INTRODUCTION

The Coronavirus disease 2019 (COVID-19) pandemic has placed the world in an exceptional situation, forcing communities and governments to make fast decisions. The World Health Organization (WHO) has highlighted the importance of measures aimed at delaying the spread of the virus (1). Among these measures, there are non-pharmaceutical interventions, a critical part of current public health measures addressing the pandemic (2–4). These interventions aim at protecting people by physically distancing those with confirmed and suspected COVID-19 or potentially carrying the virus from the general population (2). Such interventions include physical distancing, quarantining, mandatory or voluntary isolation, closing national borders and other travel-related restrictions, closing schools and workplaces, and canceling social gathering events (2).

The rapid spread of the disease, along with the public health measures taken to reduce its progression, present a challenge to mental health services around the world, both in terms of a potential higher demand and difficulties in providing onsite services (5). In this scenario, telemedicine services provide a vital asset for mental health care (6). Telemedicine is defined as the use of telecommunication technologies to provide remote health care (7). The COVID-19 pandemic has created the need to expand telepsychiatry care; in fact, telepsychiatry use among mental health professionals has increased worldwide (8, 9). Unfortunately, these services are limited in various countries, and not all health care services around the globe might be ready to cope with this public health demand (10). Also, mental health care professionals and service providers may have feelings of apprehension or ill-preparedness when facing the sudden need to set up telepsychiatry services and/or to provide mental health care primarily *via* this approach (10). At the same time, not all services count with local guidelines for telepsychiatry (11), and available guidelines may not be transferable to different social and cultural contexts. Moreover, not all available guidelines may have contemplated the particular circumstances imposed by the current COVID-19 pandemic. The present project was set to assist with this situation, with the goal of creating a practical and clinically useful protocol for mental health care that would cater to most clinical and cultural contexts, assisting mental health care providers around the world.

METHODS

The project sought to take advantage of the knowledge and experience of psychiatrists from a wide range of countries, connected by the Early Career Psychiatrists Section of the World Psychiatric Association (12). A panel of 16 psychiatrists from 15 different countries covering all WHO regions was convened. The study used a combination of a modified Delphi technique, called reactive Delphi, and strategies drawn from the consensus development conference method (13–15) (**Tables 1**, **2**).

All participants were provided with a set of trigger questions and topics *via* the social network messaging application WhatsApp® and prompted to reply about what was applicable in their countries (**Table 2**). All answers were collected by the lead (RRam) and co-lead (LO) authors and entered into an Excel spreadsheet. Informed by these answers, RR developed a first draft of the protocol with the support of LO and then shared it with all participants as a Google® document, who were asked to provide feedback using a reactive Delphi Technique (14, 15). All feedback was incorporated into a second draft and then shared and discussed with all participants using the Zoom® platform and strategies drawn from the consensus development conference method (13). The final draft was unanimously accepted by all participants (**Table 1**). Group discussions were accompanied with a review of the emerging scientific literature about COVID-19 and its impact on mental health, as available in online journals and databases. Also, the answers provided to the trigger questions and topics informed the development of other manuscripts published (11) and to be published in the near future.

This study did not involve the management of sensitive data; all of the authors participated voluntarily, and their contributions reflect their own views and not necessarily those from their institutions. Due to the nature of this study, prior assessment by an Institutional Review Board was not necessary.

TABLE 1 | Protocol development pathway.

Consensus group identified and invited to participate
↓
Set of trigger questions and topics to consensus group*
↓
1st draft developed incorporating replies
↓
1st draft to consensus group (reactive Delphi)
↓
2nd draft to consensus groups (consensus conference)
↓
Final draft

*See ***Table 2***.

TABLE 2 | Trigger questions and topics.

** Each of the questions and topics prompted contributors to reply about what was applicable in their countries.*

- Was telepsychiatry something already used before the pandemic? To what extent and in which way? How did the pandemic change that?
- Which is the most widely used tool (e.g., videoconferences, audio calls, text messages, instant messaging mobile apps, phone lines/call centers)? Are there any pre-consultation screenings?
- Who is handling the consultations conducted in this way (e.g., nurses, psychologists, psychiatrists)?
- What are people most commonly consulting for?
- Reception and acceptability by patients
- Technical and bureaucratic resources and challenges
- Are there any protocols or guides being used in your country?
- Level of training regarding telepsychiatry before and after the pandemic
- Role of early career psychiatrists in telepsychiatry
- Any suggestions on what should be something to consider when drafting recommendations?

RESULTS

The consensus group was composed of 16 participants representing countries from all WHO regions: African Region, Region of the Americas, South-East Asia Region, European Region, Eastern Mediterranean Region, and the Western Pacific Region. These were representatives from lower middle income (Egypt, India, Indonesia, Nigeria, and Tunisia), upper middle income (Brazil, Colombia, Iran, Kosovo, and Lebanon), and high income countries (Italy, New Zealand, Portugal, Spain, and United States of America).

Delivery Platform

There are some contexts where video conferencing is available for specialists and the population. However, while it would be ideal for everybody to have access to the tools and the necessary digital literacy to liaise with mental health providers online, this is not always the case. An actual means available for the wider population and mental health care providers in most contexts involve phone calls (landline or mobile), primarily *via* telephone hotlines. The following protocol was created with this limitation in mind. Still, whenever possible, video conferencing should also be made available to the public.

Resources Required

We recommend mental health departments to provide an entry point to mental health care *via* telephone hotlines or helplines. But before making this service widely available, these departments should first organize the necessary resources, including human resources. This organization should include securing the contact information of, and/or an open line of communication with, available hospitals, ambulance services, and any other potentially necessary resource (e.g., hotlines for people experiencing intimate partner violence). Depending on availability, this organization should also include securing up-to-date information about COVID-19, public health measures, essential services, and any financial assistance available to the population in times of quarantine. It should also include setting up a filing system for records, if these were to be used.

The service would require, ideally, a coordination team, a technical support team, and mental health care providers (from here on referred to as providers). The coordination team should be responsible for ensuring resources, both material and human resources, including technical support. In case that not all members of the providers team were mental health specialists, the protocol we are presenting offers a guide for when to refer the call to these specialists. All providers should possess the appropriate and necessary competencies in terms of mental health care. In regard to the provision of telemental health care, it might be necessary to organize brief training at the service, either through professional associations, by inviting national or international consultants, or even through active learning under a self-training scheme. There may be contexts where it would be the same providers who are in charge of coordinating the service. Still, it is advisable for them to organize first the necessary resources, according to the service capabilities.

Care Provision

Providers should be aware that telepsychiatry carries some additional challenges in regard to establishing rapport. This is due to the loss of nonverbal cues during the interaction, the lack of physical closeness, and, in cases where it is conducted *via* video conferencing, the artificiality of eye contact through a screen (16). Providers should demonstrate a high tone of professionalism in their verbal communication, maintaining an attitude of active, empathic, and non-judgmental listening. They should act as if they were, in fact, face-to-face with the caller, being mindful of their background and self-presentation, and trying to avoid multitasking and getting distracted during the conversation.

When contacted for the first time, providers should conduct an immediate assessment and intervention, tailored to each person's needs to the best of the provider's capabilities. **Table 3** shows a suggested guideline for conducting this initial assessment. After greeting the caller and introducing themselves, providers would set the frame of the consultation, assuring callers about its confidentiality, and obtain their informed consent. Providers will then ask for a name and contact information, the latter due to the possibility of having the call dropped out in the middle of a conversation; however, providers should be open to the possibility of callers not willing to share that information through telecommunication means. The initial assessment will then move to explore four areas: the caller's current living conditions, the presence and quality of any psychological distress, COVID-19 diagnosis and misinformation about it, and the caller's medical history. This assessment could also include the administration of screening scales, such as the Patient Health Questionnaire 9-item

TABLE 3 | Semi-structured outline of an initial assessment.

Good Morning/Afternoon/Night.
Welcome to (name of hotline or department, if applicable).
My name is ……. I am a mental healthcare provider/mental health specialist (specify) and I belong to [institution].
Could I get your name and your contact information, please?
Hi [name], I need to ask you some questions to better determine how I can help you. Should I proceed?

Explore current living conditions

Presence or absence of social networks, support, resources, and challenges

Explore loneliness and the individual's subjective experience of physical distancing, presence and quality of social support in the house, whether the person is caring for people at home and if they are and feel supported in that care. Examples of questions:
- Who lives with you at this moment?
- How is your relationship with your family/people you are living with?
- Do you have children or senior citizens living at home?
- Are you caring for someone (ill or not) at home?

Employment and financial situation

Type of work and working conditions, whether working or not, economic situation. Examples of questions:
- What is your job?
- Are you currently working?
- Are you working on essential services?
- Are you a healthcare professional?
- Is anyone currently living with you a healthcare professional or working on essential services?
- Are you currently facing financial issues due to the COVID-19 pandemic?

Disconnection from previous hobbies, leisure activities, and coping strategies

Explore hobbies, presence or absence, and previously used coping strategies such as physical activities, eating outside, social gatherings. Examples of questions:
- Did you use to go for walks or to the gym?
- Did you use to care for your garden? Are you still doing it?
- Are you still able to chat with your friends over the phone?

Explore psychological distress and coping strategies

Explore specific situations, thoughts, and emotions related to any perceived psychological distress. Examples of questions:
- Are you currently experiencing any distressing emotion, sensation, or feeling? How long have you been feeling that way? How often? How strong is it?
- Is there any specific situation worsening that feeling?
- What do you normally do when you feel that way?

Explore COVID-19 diagnosis and misinformation about COVID-19

Explore whether the person or someone close to the person is a confirmed or probable case of COVID-19 and the measures adopted. Explore knowledge about the virus, transmission, symptoms of COVID-19, and individual and public health measures used to battle the pandemic. Examples of questions:
- If you were tested, do you suspect you would have right now high chances to test positive for COVID-19? Why?
- Where do you seek for information about the virus and COVID-19?
- Have you been tested for COVID-19? Are you in isolation due to COVID-19 positivity?
- Do you have someone at home in isolation due to COVID-19 positivity?

Medical history

Explore any previous or current psychiatric diagnosis, as well any comorbid physical condition. Examples of questions:
- Do you have any diagnosis of a psychiatric or mental health condition, including substance and behavioral addictions?
- Do you have any family members with a psychiatric diagnosis?
- Do you have any general medical condition, such as diabetes, asthma, hypertension, other chronic or oncological diseases?
- Do you use any substance (including alcohol and tobacco)? [Explore pattern of use]
- Are you taking any medication or natural supplement? Are you following any psychological treatment?

Scales

Explore the presence or absence of psychiatric symptomatology *via* well established and validated scales, such as GAD-7 and PHQ-9.

Note: People matching the below conditions at the moment of the call should be further assessed by the mental health specialist or referred to an emergency service within the same call and as soon as possible:
- while experiencing a psychiatric emergency (e.g. acute psychosis or suicidality), or
- due to worsening psychological and/or psychiatric symptomatology, or
- for being in a situation that places them or others at risk of harm, or
- calling on behalf of someone in any of these situations.

Providers will follow the department's pre-established guidelines for referrals and all other necessary immediate actions, such as contacting emergency services.

Depression scale (PHQ-9) and the 7-item Generalized Anxiety Disorder scale (GAD-7), two validated and widely used depression and anxiety measures (17, 18).

As an outcome of this initial assessment, callers will then be matched to one of three potential lines of intervention (**Table 4**). Most people contacting the department will likely match either the first or the second-line interventions (**Table 5**). First-line interventions aim to provide trustworthy and appropriate information, reduce the distress associated with the pandemic and manage its emotional impact, and assist in the process of complying with public health measures of physical distancing. Providers who are not mental health specialists should be able to provide first-line interventions. Second-line interventions aim at providing the necessary support to people who are facing

TABLE 4 | Target population and matching interventions.

First-line interventions: People with mild-intensity needs.
• People with no known psychiatric or physical condition showing signs of psychological distress due to uncertainty or misinformation, financial concerns, or physical distancing and self-isolation.
Second-line interventions: People with moderate-intensity needs.
• Health care workers and people providing essential services.
• People with a stable psychiatric or general medical condition or those caring for them, including people with chronic health conditions, neurodevelopmental disorders or intellectual disabilities, or older adults in need of constant home-based assistance.
• People with COVID-19 in forced self-isolation due to asymptomatic condition or mild flu-like symptoms, or people being treated for or recovering from COVID-19, as well as those caring for them, including healthcare workers or other professionals. Particular attention should be paid to those with comorbid mental health disorders.
Third-line interventions: People with high-intensity needs.
• People who present with worsening or uncontrolled psychological and/or psychiatric symptomatology.
• People grieving the loss of someone due to COVID-19.
• Psychiatric emergencies, including but not limited to suicide ideation, suicide attempt, and alcohol and/or other substance intoxication or severe withdrawal symptoms.
• People at risk of self-harm behaviors, harm to others, or harm from others, including victims of any type of violence.

TABLE 5 | First, second, and third-line interventions.

First-line: First-line interventions include
• Providing appropriate information about COVID-19 and public health measures. Recommending trusted sources, yet, recommending not to get overloaded or obsessed with information beyond what is needed to know in order to stay safe and avoid the spread of the infection.
• Validating and normalizing the emotional response to the general situation, specific circumstances, or physical distancing and self-isolation. Explaining that worry, to a certain extent, is a normal coping mechanism.
• Offering strategies to stay physically, mentally, and socially healthy, coping with the stress and boredom produced by physical distancing and self-isolation:
• Healthy daily routines, including eating and sleeping habits, and leisure activities.
• Physical exercise.
• Advice regarding how to improve social interactions with the people living with them (if applicable) and maintaining or enriching group and one-on-one social connections *via* phone calls, instant messaging, or video calls.
• Training and practicing relaxation and mindfulness techniques. For service users without previous experience in these techniques, training could be offered during the call or by referring to online resources and apps.
• Providing information about any financial assistance available to the population in times of quarantine.
• Scheduling a follow up call.
Second-line: Second-line interventions include (besides those previously mentioned in the first-line)
• Providing strategies to cope with the fear of infection or spreading the virus to family, friends, and colleagues.
• Providing additional advice for self-care to those caring for others ("caring for the carer").
• Emphasizing the need to continue with any prescribed psychiatric or general medical treatment or to continue to provide it to those under their care.
• Note: Second-line interventions should always be assisted by a mental health specialist, whether in the same call or *via* a scheduled call to one, and follow up calls should always be scheduled with this population.
Third-line: Third-line interventions include
• Contacting emergency services (police or an ambulance).
• Referring callers to a specialized mental health care provider without losing contact with them.
• Contacting a caller's support person to assist or asking the caller to put one on the call.
• Providing emotional support to the person calling on behalf of someone with high-intensity needs, while simultaneously contacting the police or ambulance, or referring the caller to a specialized mental health care provider.

situations of particular distress or may be more susceptible to the mental health impact of the pandemic. Second-line interventions will require contact with a mental health specialist, whether during the same call or by referral to a scheduled one. Close monitoring *via* follow up calls and further communication should be scheduled with this population. People experiencing a psychiatric emergency or a situation that places them or others at risk of harm require third-line interventions, which include immediate contact with a mental health specialist or an emergency service.

All interventions should follow the criteria of appropriateness and evidence-based efficacy. It is highly recommended for providers to review and follow, according to the provider's and service capabilities, the best practice guidelines provided by either local or international entities, e.g., those published by the American Psychiatric Association and the American Telemedicine Association (19), and other researchers (20). Finally, as much as with face-to-face consultations, cultural responsiveness is an essential component of telepsychiatry. All providers should be sensitive to the caller's cultural identity and cultural conceptualisation of distress, as well as the impact of cultural features on the caller-provider relationship (DSM-5) (21). There is one extra component that needs to be taken into account, that is, the influence of the service user's cultural background on the use of the provided service (22, 23). Providers should assess callers and communities' acceptability of this service, adapt and respond to this assessment, and continuously monitor changes.

DISCUSSION

The rapid progression of COVID-19 and the non-pharmacological interventions adopted to reduce the spread of the virus have led to increasing difficulties in the provision of mental health care. As a result, telemedicine has become a pivotal tool in the task of ensuring the continuous provision of mental health care for the population. It is extremely important for mental health services around the globe to prepare and take action (24); the protocol here outlined can assist them with both.

The strength of this protocol lies in its practicality, clinical usefulness, and wide transferability, resulting from the diversity of the consensus group that developed it. Country representatives from a wide range of social, cultural, and economic contexts contributed to the development of this protocol. As such, it represents a valuable tool with a likely wide transferability across different regions and contexts. Nevertheless, it should be acknowledged that there is a potentially high degree of resource allocation needed to apply these recommendations, which may indeed limit its transferability to some contexts. Therefore, further studies are recommended to ensure a match between the here proposed protocol and country/context-specific conditions or to guide all necessary adjustments before it is implemented locally. Moreover, both these studies and/or the implementation of the present protocol in any mental health service should abide by specific local health regulations and the institutions' ethics committees.

Still, the proposed protocol could help mental health providers to identify and address the mental health impact of physical distancing and misinformation during the COVID-19 pandemic, two key issues highlighted in the literature (25). Furthermore, mental health departments should also acknowledge the impact of physical distancing and provide adequate mental health support (26). This support may prove a valuable resource in assisting people to comply with prescribed physical distancing measures, and thus with the battle against the pandemic (27, 28). The WHO has called people to resort only to official sources when seeking information about COVID-19 (29). Mental health departments should support this call and combat misinformation, but they should also provide people with strategies to avoid a hyperconsumption of information (30, 31). These are all points addressed in the recommended protocol and should be acknowledged when developing local adaptations.

The literature also suggests that it may prove beneficial to develop targeted telepsychiatry interventions for different populations during the pandemic (32). Particular attention should be paid to older adults, children, and those caring for them (33–35). Similarly, healthcare professionals require special consideration (30, 36, 37). The proposed protocol would allow mental health departments to identify and support these and other particularly vulnerable populations, such as those with a pre-existing or emerging mental health disorder (5, 38) and those in situations of domestic or intrafamilial violence, which may dramatically increase during the quarantine (39). It is highly recommended for local adaptions of this protocol also to identify and cater for different populations within each specific context in case these were not contemplated in the present protocol.

As suggested by other authors (6, 26, 40), telemedicine services should be formally provided as a crucial component of the public health response to the ongoing COVID-19 pandemic. The adoption and expansion of telepsychiatry in mental health care would simultaneously improve access to this care and decongest those mental health care services already working at capacity. The proposed protocol can support mental health departments to provide care in non-urgent situations that do not necessarily require a face-to-face interaction, minimizing the risk of contagion between members of the population and the health care workforce. It can also help with redirecting and maximizing the use of available resources, including specialized mental health care professionals. But further research is needed on its use and applicability to local healthcare systems, services, and resources during the pandemic.

The mental health impact of the COVID-19 pandemic has forced mental health services around the world to adapt. The adoption of this protocol can complement existing guidelines during the pandemic in those contexts where telepsychiatry was well established already, but most importantly, it can also provide a starting point to those where telepsychiatry has played a marginal role until now. These are particularly difficult moments in time. However, they also offer the opportunity to advance the way in which mental health services worldwide support the population, and this protocol also highlights the importance of acknowledging and harvesting the knowledge and expertise of early career psychiatrists around the globe in that task.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

AUTHOR CONTRIBUTIONS

RRam developed the trigger questions and topics and wrote the first draft of recommendations and article with the support from LO. All authors contributed to the article and approved the submitted version.

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Adolescents in Quarantine During COVID-19 Pandemic in Italy: Perceived Health Risk, Beliefs, Psychological Experiences and Expectations for the Future

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Since March 2020, many countries throughout the world have been in lockdown in response to the COVID-19 pandemic. In Italy, the quarantine began on March 9, 2020, and containment measures were partially reduced only on May 4, 2020. The quarantine experience has a significant psychological impact at all ages but can have it above all on adolescents who cannot go to school, play sports, and meet friends. In this scenario, this study aimed to provide a general overview of the perceived risk related to COVID-19 and the psychological experience of quarantine in a large sample of Italian adolescents. Nine hundred and seventy eight adolescents (males = 339; females = 639) living in 13 Italian regions and attending upper secondary school (age range: 13–20, *M* = 16.57, *SD* = 1.20), responded to an internet-based questionnaire about perceived health risk related to COVID-19, knowledge and information on measures to control the pandemic, beliefs and opinions on stage two of the quarantine, and psychological experiences related to quarantine. 31.1% of the participants lived in "red zones," which are places where the government has imposed stricter measures of containment due to exponential and uncontrolled growth in contagion cases compared to other areas in Italy. According to our results, Italian adolescents had a low perception of risk of COVID-19. Perceived comparative susceptibility and perceived seriousness were also very low. However, they were aware of the restriction measures necessary to contain the spread of the virus, and they agreed with the limitations imposed by the government. Females and adolescents living in a “red zone” showed more significant psychological negative feelings about the quarantine experience. However, no significant differences were found about the regions where the teenagers of our sample live and the other variables related to the COVID-19 experience. This is very interesting data, leading us to hypothesize that the participants’ negative feelings may be more related to the adolescent period than to the pandemic itself.

Keywords: COVID-19, quarantine, adolescents, health risk, Italy

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INTRODUCTION

Since March 2020, many countries throughout the world have been in lockdown in response to the COVID-19 pandemic. In Italy, the quarantine began on March 9, 2020, and containment measures were partially reduced only on May 4, 2020. People had to stay at home. All social and sporting activities were canceled, and many work activities were forbidden; schools were closed and will reopen only with the new academic year.

Many countries around the world have temporarily closed educational institutions to contain the spread of the COVID-19 pandemic. According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), school closures have impacted over 90% of the world's student population (UNESCO, 2020). Italy and several other countries have used educational technologies, including online platforms, radio, television, and texting, to support access to remote learning during the COVID-19 pandemic, and so guarantee the students' right to education (UNESCO, 2020).

Changes in life caused by the pandemic were dramatic for people of all ages. However, the revolution of behavioral routines caused by quarantine can have been particularly hard to accept for young people who could not go to school, play sports, and meet friends. Usually, adolescents spend much of their waking time in school or other social contexts, such as gyms or recreational spaces (Mahoney et al., 2009). Now they have had to stay home all day for months, with online relationships only with peers and adults, such as their teachers, except the persons that live with them. Moreover, their home has become a "school." For these reasons, there was an extensive debate between scientists on the effects of quarantine, limitations of freedom, and school closures on adolescents' emotional and affective states.

Previous studies on the effect of quarantine, which is the separation and restriction of movement of people who can be potentially exposed to a contagious disease, report common psychological effects (Brooks et al., 2020). Research conducted on the Severe Acute Respiratory Syndrome (SARS) epidemic (Hawryluck et al., 2004; Mihashi et al., 2009; Liu et al., 2012) reported a high prevalence of symptoms of psychological distress, such as insomnia, irritability, anger, and other mood disorders. However, although the risk for psychological disorders related to changes in life caused by an epidemic is largely documented, there is evidence that several sociodemographic and psychological variables influence the emotional responses to behavioral limitations (Hawryluck et al., 2004). In particular, the perceived health risk for disease affects the emotional responses to the prevention measures and the acceptance of limitations of behavior (Tang and Wong, 2003; Commodari, 2017).

Health-related perceived risk depends on perceived "seriousness" and perceived "susceptibility" to a disease. Risk perception is one of the key drivers of health behavior (Brewer et al., 2004; Ibuka et al., 2010; Commodari et al., 2020) and influences the adoption of precautionary measures. Perceived seriousness refers to how at risk a person considers himself to develop a disease, while perceived susceptibility concerns the perceived probability of getting a disease. Perceived susceptibility can be differentiated into perceived personal susceptibility, which is the perceived probability that one will be harmed by a hazard (Rogers, 1983), and perceived comparative susceptibility, which is the perceived probability that a hazard will hurt one compared with other people of the same age and gender.

Research on health-related risk perception in young people has shown that adolescents engaged in risky behavior do not have a complete appreciation of their exposure to harm (Johnson et al., 2002). However, there are no previous studies on the health risk perception for pandemic diseases and the psychological experiences related to quarantine in this stage of the life span.

Study Aim and Hypotheses

Based on these considerations, the main goal of this study was to investigate the perceived risk related to COVID-19 and the psychological experiences of adolescents during the pandemic. In particular, the purpose of the study was to analyze the perceived seriousness of and susceptibility to COVID-19, the beliefs of adolescents in the first phase of quarantine and their opinions on the stage two of quarantine, during which a partial reduction of behavioral measures was hypothesized. Moreover, the study explored adolescents' moods, emotions, and feelings, with attention to expectations for the immediate future. More specifically, the study intended to verify the following hypotheses:

Hypothesis 1 (H1): Living in an area with more restrictions than in other areas of the country contributes significantly to increasing the disease's perception of risk.
Hypothesis 2 (H2): Living in an area with more restrictions than in other areas of the country significantly contributes to accentuating the negative psychological impact of the quarantine experience.
Hypothesis 3 (H3): Other sociodemographic variables influence health risk perception and psychological experiences of the adolescents in the sample. In particular, a higher perception of risk and a greater concern of contracting COVID-19 were expected to predict more negative feelings during the quarantine. Conversely, it was expected that higher adherence to government measures to contain the infection and greater confidence in the information received on COVID-19 were predictors of positive emotions.

MATERIALS AND METHODS

Participants

Participants were 978 adolescents (males = 339; females = 639) who attended upper secondary school (age range: 13–20, M = 16.57, SD = 1.20), which corresponds to the International Standard Classification of Education Level 3. The participants lived in 13 of the 20 Italian regions which are the first-level constituent entities of the Italian Republic. Five hundred and seventy four of the respondents lived in a provincial seat, while 404 lived in towns that are not the provincial seat. Teachers and some students collaborated in the recruitment of the participants, sharing an online survey on the leading social networks and inviting students to respond to the questionnaire.

Measures

Data were collected using an internet-based questionnaire. In total, the questionnaire consisted of 81 multiple-choice and open-ended questions. Participation was voluntary, and the questionnaire required approximately 10–15 min to complete. The survey collected sociodemographic information, such as age, gender, area in which the respondents live, type of upper secondary school, academic grade, number of persons in the household, and other information. Moreover, it explored perceived health risk related to COVID-19, knowledge and information on measures to control the pandemic, beliefs and opinions on stage two of the quarantine, routines and habits of life that adolescents miss most (such as going out with friends, meeting boyfriend or girlfriend, going to visit their relatives, for a total of six items), and psychological experiences related to quarantine. The survey also collected information on e-learning experiences during quarantine, but this subject is beyond the scope of this article.

Perceived seriousness, perceived personal susceptibility, and perceived comparative susceptibility to COVID-19, which are the main dimensions of risk perception related to health, were investigated using an adjustment of the Italian version (Commodari, 2017) of the Risk Perception of Infectious Diseases Questionnaire (Brug et al., 2004). Participants responded to questions using a five-point Likert-type scale. The participants were invited to report (a) how serious it would be for them to get the disease, (b) how likely they think they are to contract the disease, (c) whether they would have a smaller or larger chance of getting the disease before summer, compared with their peers of the same age and gender, and (d) if they believed that students could be a category particularly at risk of contracting the virus.

The original version of the Risk Perception of Infectious Diseases Questionnaire was developed during the SARS epidemic, and it was translated into several languages (de Zwart et al., 2010). Its psychometric characteristics are good (Cronbach's $\alpha = 0.79$), and many international studies have used this measure in different contexts (de Zwart et al., 2009, 2010; Commodari, 2017). In this regard, a recent study by Commodari (2017) used the Italian adjustment of this questionnaire to investigate the risk perception of flu and the role of sociodemographic and psychological variables on perceived risk. A confirmatory factor analysis was run to assess the validity of this adapted version and a good model fit was obtained [$\chi^2(5) = 21.5$; $p < 0.001$; RMSEA = 0.05; SRMR = 0.03; CFI = 0.945; TLI = 0.95]. The reliability is also good (Cronbach's $\alpha = 0.80$).

Regarding their opinions and beliefs, participants were asked to indicate whether they agreed with statements of reported information on COVID-19 and quarantine (e.g., "There are some categories of people at higher risk for COVID-19 than the general population"; "In stage two of the quarantine it is necessary to avoid the use of public transport to reduce the risk of contagion and to avoid a new increase in the epidemic," and others). Regarding feelings, emotions, and moods, participants were asked to complete a Likert-type scale that focused on the personal feelings about one's cognitive, physiological, and behavioral state. Participants indicated their level of agreement with several statements using a five-point Likert-type scale (e.g., "In this period in which I have to stay at home, I feel well physically"; "In this period in which I have to stay home I am tense and I feel tight"). The scale measured two aspects: "negative feelings" and "positive feelings." A high score corresponded to high perception of negative or positive feelings, respectively. A CFA was also performed to assess the validity of these scores. Regarding the model for the "negative feelings," although the Chi-square statistic resulted to be statistically significant [$\chi^2(27) = 165$; $p < 0.001$], the other values were indicative of a good model fit (RMSEA = 0.07; SRMR = 0.04; CFI = 0.943; TLI = 0.95). The same result was obtained also for the model of the "positive feelings" [$\chi^2(9) = 40.6$; $p < 0.001$; RMSEA = 0.05; SRMR = 0.03; CFI = 0.932; TLI = 0.96]. Both the scales showed a good reliability (negative feelings: Cronbach's $\alpha = 0.81$; positive feelings: Cronbach's $\alpha = 0.78$). The scores were converted into z scores for the purpose of statistical analyses.

Finally, participants were asked to answer questions about their routines and habits of life they missed most, and to complete, without a word limit, the sentence "In this period in which I have to stay home, I think my summer will be. . .".

Procedures

Participants completed the online survey between April 22 and May 1, 2020. The Statistical Package for the Social Sciences (SPSS) version 25.0 (IBM Corporation, Armonk, NY, United States) was used for the statistical analyses. Quantitative data were expressed as frequencies and percentages in the case of categorical and ordinal variables and as mean and standard deviation in the case of continuous variables. Independent-samples t-test were run and the magnitude of the differences between the means were assessed using Hedges's g formula (Hedges, 1981) to calculate effect size (ES), with 0.20 indicating a small ES, 0.50 a medium ES, and 0.80 a large ES (Cohen, 1988). Besides, two multiple regression analyses were calculated to investigate the impact of sociodemographic variables and risk perception on positive and negative feelings experienced during the lockdown. For this purpose, the main sociodemographic variables and risk perception values were the independent variables, and the "positive feelings" and "negative feelings" scores were the dependent variable.

Qualitative data were coded and analyzed to show emerging themes. The thematic coding structure's development and confirmation was an iterative process involving two researchers conducting individual, recursive reading of the textual data and group meetings to discuss and test the emerging themes. Discrepancies were resolved by consulting specific instances in the data, discussing their relationship to establish themes, and reaching consensus as a group (Corbin and Strauss, 2014). The participants' responses to some items were free, and these could be single words or full sentences. Codification was realized using "thought unit," also denoted "sense unit" or "unit of meaning." The units comprised one idea communicated, whether it was expressed as a sentence, a verb-object sequence, or a single word. The responses were first categorized into 55 categories. Then, these categories were progressively reduced. Finally, the responses were coded in 52 categories (Srnka and Koeszegi, 2017).

The study was performed following the ethical standards of the 1964 Declaration of Helsinki and followed the Ethical Code for Italian psychologists (L. 18.02.1989, n. 56), Italian law for data privacy (DLGS 196/2003), and the Ethical Code for Psychological Research (March 27, 2015) approved by the Italian Psychologists Association. No sensitive data that could identify the participants was collected. The schools involved in the research had previously informed the students' parents to consent to the study's participation. The Chair of School and Family Psychology, DISFOR, University of Catania, approved this study.

RESULTS

Sociodemographic Characteristics of the Sample and Diffusion of COVID-19 Among Adolescents

Table 1 shows the sociodemographic characteristics of the participants. Participants lived in 13 of the 20 Italian regions. COVID-19 was not diffused equally throughout Italy. The regions in which participants lived reported on May 3 different levels of contagion, with a broader spread of the virus in the regions of Northern Italy. Of the student participants, 31.1% lived in "red zones," which were places in which the government has imposed stricter measures of containment due to an exponential and uncontrolled growth in cases of contagion compared to other areas in Italy. Regarding the number of persons with whom respondents were spending quarantine, 20.1% reported that the size of their household was more than four people, including themselves; 46.5% reported four persons; 24.9%, three persons; 7.6%, two persons; and 0.8% reported living alone during the quarantine. Five of the respondents (0.5%) had been or was currently suffering from COVID-19, while 0.8% of the respondents reported that they were uncertain about having had this disease; 3.1% of respondents reported that one or more family members living with them had been or was currently suffering from COVID-19. Furthermore, 10.2% of the sample had at least one family member who worked with people affected by COVID-19 (health care or other essential services).

TABLE 1 | Socio-demographic characteristics of the sample.

		N	%
Gender	Female	639	65.3
	Male	339	34.7
Age (years old)	13	7	0.7
	14	58	5.9
	15	96	9.8
	16	303	31.0
	17	284	29.0
	18	195	19.9
	19	27	2.8
	20	8	0.8
School	High school	782	80.0
	Technical institute	148	15.1
	Professional institute	48	4.9
Town	Chief town	574	58.7
	Not chief town	404	41.3
Regions	Lombardy	44	4.5
	Piemont	11	1.1
	Trentino Alto Adige	2	0.2
	Friuli Venezia Giulia	2	0.2
	Emilia Romagna	22	2.2
	Abruzzo	11	0.5
	Molise	7	0.7
	Toscana	9	0.9
	Umbria	44	4.5
	Lazio	337	34.5
	Campania	80	8.2
	Puglia	17	1.7
	Sicily	398	40.7
"Red zone"	Yes	304	31.1
	No	674	68.9
Size of the household	1	8	0.8
	2	74	7.6
	3	244	24.9
	4	455	46.5
	>4	197	20.1
Affected by	Yes	5	0.5
COVID-19	No	965	98.7
	Uncertain	8	0.8
Family member	Yes	30	3.1
with COVID-19	No	948	96.9
Family member working	Yes	100	10.2
with COVID-19 people	No	878	89.8

Perceived Health Risk

Table 2 reports data on the perceived health risk in the sample. In general, adolescents considered the possibility of getting COVID-19 before summer to be low: 60.3% responded that their probability was very low or low, while only 4.5% think that this probability was high or very high (27.7% very low; 32.6% low; 33.9% neither low nor high; 3.7% high; and 0.8% very high). Furthermore, most subjects believed they had a low or very low probability of contracting the virus before the summer compared to peers of the same age and gender (20.7% very low; 33.7% low; 39.7% neither low nor high). Only 4.3% of the sample thought that this probability was high and 0.9% very high.

Regarding the perceived seriousness of the disease, 36% of the sample believed that contracting the virus could be serious or very serious (30.4% serious and 5.6% very serious), and 31.1% believed that it was neither serious nor not serious. Only a limited percentage believed that getting COVID-19 was not at all or not very serious (3.8% not at all serious and 18.6% not very serious). The respondents who lived in a red zone presented a higher perceived risk compared to those that live in other places of Italy with an ES approaching to large (red zone: $M = 2.75$, $SD = 0.91$; non-red zone: $M = 2.09$, $SD = 0.89$; $t = 3.55$, $p < 0.001$; $g = 0.74$). Furthermore, females showed a higher perceived risk than males with a medium ES (females: $M = 2.54$, $SD = 0.90$; males: $M = 2.08$, $SD = 0.89$; $t = -1.99$; $p = 0.04$; $g = -0.51$).

TABLE 2 | Frequencies and percentages of the perceived seriousness, personal and comparative susceptibility to COVID-19 in the sample.

	Perceived personal susceptibility		Comparative susceptibility		Perceived seriousness	
	n	%	*n*	%	*n*	%
No answer	12	1.2	7	0.7	5	0.5
Very low	271	27.7	202	20.7	37	3.8
Low	319	32.6	330	33.7	182	18.6
Neither low nor high	332	33.9	388	39.7	304	31.1
High	36	3.7	42	4.3	297	30.4
Very high	8	0.8	9	0.9	153	5.6

There were no differences by regions in perceived health risk, although some of these regions were the most affected by the disease. Moreover, the presence of parents or other family members who had been or was currently suffering from COVID-19 did not influence risk perception. Interestingly, both the perceived susceptibility (family member working with people who had COVID-19: $M = 2.61$, $SD = 0.92$; no family member working with people who had COVID-19: $M = 2.13$, $SD = 0.89$; $t = 3.36$; $p = 0.001$; $g = 0.53$) and comparative susceptibility (family member working with people who had COVID-19: $M = 2.71$, $SD = 0.97$; no family member working with people who had COVID-19: $M = 2.26$, $SD = 0.85$; $t = 4.91$; $p < 0.001$; $g = 0.52$) were higher in those adolescents whose parents or other relatives worked with persons sick with this disease and the ES was medium. To better analyze the perception of the risk for COVID-19, students were also invited to report how frightened they were of getting COVID-19. The majority of the sample was not particularly afraid of contracting COVID-19. There were no significant differences in the responses of the students by region. The students who lived in the regions with higher diffusion of the disease did not show greater fear of the disease than their peers. However, the students who lived in a red zone were more fearful of COVID-19 than their peers with a medium ES (red zone: $M = 2.91$, $SD = 1.32$; non-red zone: $M = 2.22$, $SD = 1.20$; $t = 2.71$; $p = 0.007$; $g = 0.55$) (**Table 3**).

Knowledge and Opinions on COVID-19 and Stage Two of Quarantine

Ninety three percent of respondents believed that there were categories of people more at risk of getting COVID-19, but, interestingly, 76.2% of the respondents did not consider students as a category at risk for COVID-19. The remaining participants (21.9%) believed that students were an at-risk category for this disease. These students motivated their response with the argument that the school setting does not permit social distancing. The remaining 1.9% did not answer the question.

A significant percentage of the respondents reported having confidence in the information that they received on the disease (56.1% trust enough; 18.3% trust a lot; 0.2% trust very much). Moreover, the most critical information the adolescents would have liked to receive on COVID-19 concerned on how to cure the disease (42.8% of the respondents). Interestingly, only 17.2% of respondents were interested in how to prevent the infection. Furthermore, 11.2% wanted information on the likelihood of contracting the virus in an area of residence, 10.6% how to recognize the symptoms of the disease, 3% the geographical areas where the virus is most present, and only 0.2% would have liked to have been more informed about how the virus was transmitted.

Regarding adolescents' opinions of the behavioral measures that could be useful to maintain in stage 2 of quarantine, during which there was a partial reduction of containment measures, a very high percentage of respondents (89.1%) agreed on the need to avoid public transport, such as trains or busses, as well as to confined spaces such as bars, restaurants, cinemas, theaters, and school classrooms (91.8%). Similarly, 90.2% of the respondents agreed with the need to avoid going into shops if not necessary and only with personal protective equipment, such as a face mask. Further, 84.4% of the respondents agreed with the need to avoid going to gyms or swimming pools, and 72.5% considered it useful to avoid medical consultations if possible. However, adolescents did not think it will be necessary to maintain social distancing in the second quarantine stage. Most respondents did not agree on the need to avoid staying with persons who are not cohabiting (57.0%), and 82.6% think that it is not necessary to avoid staying in open places such as parks. Data are summarized in **Table 4**.

Interestingly, adolescents showed a high awareness of the particularity of the moment in which Italy was living. The vast majority of the sample reported having no difficulty complying with the government's restrictive provisions (73.1%), and they substantially agreed with the restrictions imposed on citizens due to the pandemic (81.9%).

Daily Routines of Adolescents During the Quarantine

The majority of the adolescents interviewed said they had more homework than before due to the remote school activities (66.8%), and a significant percentage of them (40.5%) reported having little free time. However, a large percentage was coping with quarantine by dedicating at least 1 h a day to a hobby (61.5%), watching television or playing video games (42.4%), or spending much more time on social networks such as Facebook or Instagram (62.3%). More specifically, males tended to devote themselves to hobbies (males: $M = 3.84$, $SD = 1.38$; females: $M = 3.53$, $SD = 1.42$; $t = 3.29$, $p = 0.001$; $g = 0.22$) and to watching TV or playing video games (males: $M = 3.49$, $SD = 1.27$; females: $M = 2.81$, $SD = 1.40$; $t = 7.62$; $p < 0.001$; $g = 0.50$), while females spent more time on social networks (females: $M = 3.83$, $SD = 1.18$; males: $M = 3.30$, $SD = 1.31$; $t = -2.74$; $p = 0.006$; $g = -0.43$). These

TABLE 3 | Differences in health risk perception according to socio-demographic variables.

	Male (n = 337)		Female (n = 629)		t-test	g	"Red zone" (n = 301)		Not "Red zone" (n = 665)		t-test	g	Family member working with COVID-19 people (n = 100)		Family member not working with COVID-19 people (n = 866)		t-test	g
	M	*SD*	*M*	*SD*			*M*	*SD*	*M*	*SD*			*M*	*SD*	*M*	*SD*		
Perceived susceptibility	2.08	0.89	2.54	0.90	−1.99*	−0.51	2.75	0.91	2.09	0.89	3.55**	0.74	2.61	0.92	2.13	0.89	3.36**	0.53
Perceived comparative susceptibility	2.29	0.87	2.31	0.87	−0.29	−0.02	2.37	0.87	2.28	0.87	1.55	0.10	2.71	0.97	2.26	0.85	4.91**	0.52
Perceived seriousness	3.29	1.11	3.39	1.04	−1.41	−0.09	3.41	1.10	3.33	1.05	1.07	0.07	3.24	1.24	3.37	1.04	−1.00	−0.12
Fear of getting COVID-19	2.20	1.21	2.35	1.25	−1.723	−0.12	2.91	1.32	2.22	1.20	2.71**	0.55	2.34	1.20	2.29	1.24	0.36	0.04

*$p < 0.05$; **$p < 0.01$. *M*, mean; *SD*, standard deviation; *g*, Hedge's *g*.

TABLE 4 | Adolescents' opinions on the behavioral measures to maintain in the stage 2 of the quarantine.

	Yes		No	
	n	%	*n*	%
Avoid using public transport (trains, busses, planes)	871	89.1	107	10.9
Avoid going to closed places such as bars, restaurants, cinemas and theaters, classrooms	898	91.8	80	8.2
Avoid going to shops if not necessary and with the necessary protections (facial mask)	882	90.2	96	9.8
Avoid meeting non-cohabiting people	42	43.0	557	57.0
Avoid unnecessary medical visits	709	72.5	269	7.5
Avoid walking in open places	170	17.4	808	82.6
Avoid playing sports in gyms or swimming pools	825	84.4	153	15.6

differences were small or approaching to medium. Furthermore, adolescents living in a red zone tended to watch TV or play video games more than peers who did not live in a red zone but the difference was small (red zone: $M = 3.20$, $SD = 1.34$; no red zone: $M = 2.97$, $SD = 1.41$; $t = 2.44$; $p = 0.015$; $g = 0.16$) (**Table 5**).

As for what the teenagers in the sample missed most in this time of restrictions, the majority of the participants stated that they especially missed being able to meet friends (55.8%) and relatives (62.5%) and staying out later in the evening due to the closure of premises such as restaurants, pubs and discos and the prohibition to go out except for reasons of absolute necessity (52%). To confirm this, a large majority of the sample said they found significant support from family (81.1%) and friends (65.3%) to face this time when they had to stay home.

Psychological Experiences During Quarantine (Feeling, Mood, and Emotions)

The responses of the adolescents show heterogeneous psychological reactions to the experience of quarantine. To better investigate the specific emotion and feeling they perceived, the responses to some of the more relevant items were first examined. This analysis aimed to capture a snapshot of the emotional state of adolescents during the quarantine.

The majority of those interviewed stated that they stayed physically well (68.7%). Males felt better than females but the difference was small (males: $M = 3.32$, $SD = 1.17$; females: $M = 2.97$, $SD = 1.16$; $t = 4.54$, $p < 0.001$; $g = 0.30$). However, quarantine influenced their sense of security and self-confidence: 43.1% of the students reported feeling less secure than in the past. Females were less self-confident than males with a medium ES (females: $M = 2.50$, $SD = 1.23$; males: $M = 3.18$, $SD = 1.14$; $t = 8.58$, $p < 0.001$; $g = 0.56$) while there were no significant differences by age, the area in which the person lived, and other socio-demographic variables.

Concerning psychological status, about 40% of students reported feeling tenser and sadder (42.6%) and more irritable

TABLE 5 | Comparison of the answers to the questionnaire according to gender and residence in a "red zone."

	Male (*n* = 337)		Female (*n* = 629)		*t-test*	*g*	Living in a "red zone" (*n* = 301)		Not living in a "red zone" (*n* = 665)		*t-test*	*g*
	M	*SD*	*M*	*SD*			*M*	*SD*	*M*	*SD*		
In this period in which I have to stay at home I feel physically well	3.32	1.17	2.97	1.16	4.54**	0.30	2.99	1.18	3.14	1.17	−1.81	−0.12
In this time when I have to stay home, I get bored listening to other people's problems	2.89	1.16	2.53	1.28	4.54**	0.29	2.69	1.36	2.64	1.20	0.59	0.04
In this time when I have to stay home, I frankly express my emotions	3.19	1.20	3.13	1.27	0.66	0.04	3.18	1.26	3.13	1.24	0.58	0.04
In this time when I have to stay at home, I feel confident in myself	3.18	1.14	2.50	1.23	8.58**	0.56	2.75	1.20	2.73	1.26	0.30	0.01
In this time when I have to stay home, I feel tense or I feel tight	2.87	1.26	3.40	1.27	−6.22**	−0.41	3.23	1.34	3.21	1.27	0.14	0.01
In this time when I have to stay home, I feel my heart beat faster or irregularly	1.81	1.17	2.33	1.34	−6.33**	−0.40	2.72	1.38	2.07	1.26	2.82**	0.50
In this period in which I have to stay at home, I have difficulty falling asleep	3.15	1.48	3.60	1.40	−4.67**	−0.31	3.73	1.44	3.37	1.44	2.45*	0.25
In this time when I have to stay at home, I always think of the same things and feel my head full of thoughts	3.30	1.31	3.83	1.18	−6.13**	−0.43	3.72	1.26	3.61	1.24	1.26	0.08
In this period when I have to stay at home, I am irritable and I lose patience	2.95	1.38	3.53	1.36	−6.36**	−0.42	3.98	1.37	3.25	1.40	2.70**	0.52
In this time when I have to stay home, I am discouraged, depressed, downcast	2.65	1.38	3.29	1.37	−6.98**	−0.46	3.35	1.46	3.00	1.38	2.21*	0.25
In this time when I have to stay at home, I feel like crying more frequently than usual	1.86	1.20	3.18	1.50	−14.93**	−0.94	2.86	1.56	2.66	1.52	1.91	0.13
In this period in which I have to stay at home, I especially miss not meeting my friends	3.74	1.35	3.33	1.47	4.32**	0.28	3.50	1.45	3.46	1.44	0.35	0.02
In this period in which I have to stay at home, I especially miss not meeting my relatives	3.58	1.29	3.80	1.25	−2.58*	−0.17	3.79	1.28	3.69	1.26	1.11	0.07
In this period when I have to stay at home, I spend at least an hour a day playing a musical instrument, dancing, gymnastics, acting, drawing, or doing the things I like	3.84	1.38	3.53	1.42	3.29**	0.22	3.63	1.45	3.64	1.40	−0.15	−0.007
In this time when I have to stay at home, I spend more than half of my day fantasizing	2.60	1.29	2.88	1.37	−3.09**	−0.20	2.86	1.36	2.74	1.34	1.28	0.09
In this time when I have to stay at home, I spend many hours a day in the morning and / or afternoon playing video games or watching television	3.49	1.27	2.81	1.40	7.62**	0.50	3.20	1.34	2.97	1.41	2.44*	0.16
In this period in which I have to stay at home, I spend much more time than before on social media such as Instagram or Facebook	3.30	1.31	3.83	1.18	−2.74**	−0.43	3.71	1.26	3.62	1.30	0.99	0.07

*$p < 0.05$; **$p < 0.01$. *M*, mean; *SD*, standard deviation; *g*, Hedge's *g*.

(49.6%) than usual, with increased ruminations (59.6%). A high percentage reported difficulty concentrating (55.9%) and sleeping (55.6%). However, only a small percentage of the students reported difficulties eating, such as forgetting to eat or skipping meals (13.7%), disturbances in heartbeat (18.7%), crying frequently (34.4%), or other symptoms that showed a clear condition of pathological stress. According to the t-test results, females and adolescents living in a red zone tended to have more significant difficulties in this regard, as shown in **Table 5**.

Interestingly, the responses of the students showed their great empathy and interest in socialization. A high percentage of respondents said they were not bored listening to others' problems (46.7%) and reported being able to manifest their emotions (41.5%). These results agree with the findings discussed in the previous section, which showed that the things and situations students missed most were meeting friends, staying with relatives, and being out late in the evening.

Multiple regression analyses were performed to investigate the impact of sociodemographic and perceived health risk variables on the psychological outcomes (positive and negative feelings *z* scores). Sociodemographic variables, perceived health risk, and adherence to government restrictive measures were used as independent variables while positive and negative feelings *z* scores were the dependent variable. All regression assumptions were checked. There was linearity as assessed by partial regression plots and a plot of studentized residuals against the predicted values. There was independence of residuals, as assessed by a Durbin–Watson statistic of 1.9. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1. There were no studentized deleted residuals greater than ±3 standard deviations, no leverage values greater than 0.2, and values for Cook's distance above 1. The assumption of normality was met, as assessed by a Q-Q Plot.

Regarding positive feelings, a significant regression equation was found ($F = 6.995$, $p \leq 0.001$), with an *R square* of 0.11. More specifically, significant predictors of positive feelings were gender ($t = -5.851$, $p < 0.001$, *Std* β = −0.185), region ($t = 2.326$, $p = 0.02$, *Std* β = 0.074), confidence in the information received on COVID-19 ($t = 2.631$, $p = 0.009$, *Std* β = 0.084), perceived susceptibility ($t = -2.386$, $p = 0.017$, *Std* β = −0.089), ease in respecting government measures ($t = 4.698$, $p < 0.001$, *Std* β = 0.152), and belief that the government measures were justified ($t = 2.480$, $p = 0.013$, *Std* β = 0.082). According to these results, females reported less positive feelings than males on average as well as adolescents living in Northern Italy. Furthermore, higher confidence in the information received on COVID-19, higher perceived susceptibility, higher ease in respecting government measures and higher beliefs that these measures are justified were predictive of positive feelings. **Table 6** shows the significant results of the regression analyses and the contribution of each predictor to the dependent variable.

Regarding negative feelings, the regression model was significant ($F = 11.103$, $p < 0.001$), with an *R square* of 0.16. More in detail, significant predictors of negative feelings were gender ($t = 9.291$, $p < 0.001$, *Std* β = 0.284), age ($t = 3.900$, $p < 0.001$, *Std* β = 0.119), living in a red zone ($t = 2.905$, $p = 0.004$, *Std* β = 0.090), perceived seriousness ($t = 2.690$, $p = 0.007$, *Std* β = 0.085), fear of getting COVID-19 ($t = 2.809$, $p = 0.005$, *Std* β = 0.091), and compliance with government measures ($t = -3.281$, $p = 0.001$, *Std* β = 0.152). According to these results, females and older adolescents reported more negative feelings than males and younger adolescents on average. Furthermore, living in a red zone, a higher perceived seriousness, a higher fear of getting COVID-19 and a lower compliance with government measures were predictive of negative feelings. **Table 6** presents the significant results of the regression analyses and shows the contribution of each predictor to the dependent variable.

TABLE 6 | Multiple regression analyses of possible predictors for positive and negative psychological outcomes in the sample.

	Std β	*t*	*p*
Negative Feelings F = 11.103; p ≤ 0.001; R square = 0.16			
Gender	0.284	9.291	<0.001
Age	0.119	3.900	<0.001
Living in a "red zone"	0.090	2.905	0.004
Perceived seriousness	0.085	2.690	0.007
Fear of getting COVID-19	0.091	2.809	0.005
Compliance with Government measures	−0.103	−3.281	0.001
Positive Feelings F = 6.995; p < 0.001; R square = 0.11			
Gender	−0.185	−5.851	<0.001
Region	0.074	2.326	0.020
Confidence in information on COVID-19	0.084	2.631	0.009
Perceived susceptibility	−0.089	−2.386	0.017
Compliance with Government measures	0.152	4.698	<0.001
Beliefs that restrictions are right	0.082	2.480	0.013

In summary, the model showed a moderate but significant impact of both the sociodemographic and the health risk perception variables related to COVID-19 experience on the perception of negative and positive feelings.

Expectations for the Immediate Future

Participants' expectations for the immediate future were also investigated through an open-ended question about how they imagined the upcoming summer holidays. Data were codified according to the modality described in the Procedure section. We first categorized the responses into 55 categories and then progressively reduced these categories. The adolescents were aware that the experience of quarantine would continue to produce effects during the summer period. In this regard, a significant percentage of the adolescents in the sample said that their summer would be "different" or would have "different limitations" (24.1%). Uncertainty and doubt were widespread feelings, as expressed by these answers: "My summer will be full of anguish, doubts, and perplexity, but my friends are enough for me to feel good"; "I am very worried because I cannot imagine how it will be but I look forward to it as much as every year."

In addition, 26.3% of the sample thought that summer would be sad, boring, or horrible, as demonstrated by the following quotes: "If transportation does not reopen, my summer will be wasted, the collapse of different dreams and projects that have so far pushed me to go on and resist a very dense pool of mud in which I will struggle so much not to sink"; "Like a prison, locked between the walls and between the screams, as if it were winter or autumn, without being able to see the seawater, which is freezing or boiling." In some cases, quarantine only highlighted pre-existing difficult situations, such as in this case: "It will be the usual summer in which it is amplified that I have no friends and that no one ever invites me to go out and I will spend the day in

my pajamas eating food at will and watching Netflix and Sky until I vomit."

However, 8.9% thought summer would still be interesting and fun: "Interesting, I have high school exams, a girl, and too many friends to share my life with. I'm curious to see how everything will evolve."

In general, the teenagers in the sample looked to the future with the hope of overcoming the difficult period of the pandemic and resuming a normal life, even if different from the previous one: "I don't care what my summer will be like, I just hope that we will be able to get out of this situation with a new unitary spirit, I hope people understand that we are one family in one house"; "Meeting again, with the necessary restrictions, my friends, my grandparents, will be difficult as if we had to learn to live in a different way from what we were used to until a couple of months ago. It will be exciting!".

DISCUSSION

This study aimed to provide a general overview of the psychological experience of quarantine in a large sample of Italian adolescents. According to other recent studies conducted on this topic in the Italian population, the COVID-19 emergency was a very difficult experience from an emotional point of view, and several categories such as health professionals have undergone significant stress with a consequent negative impact on their psychological well-being (Ramaci et al., 2020). To the best of the knowledge, this is the first study investigating the experience of the COVID-19 pandemics in Italian adolescents and with such a large number of subjects.

First, the perceived seriousness and susceptibility to COVID-19 were evaluated, as well as the impact of sociodemographic variables on the perception of health risk. According to the study results, Italian adolescents had a low perception of risk of COVID-19. Perceived comparative susceptibility and perceived seriousness in Italian adolescents were also very low. These results show that young people think that COVID-19 is not a potentially severe disease for them. Indeed, there is some evidence that young people are less vulnerable to the effects of the new coronavirus SARS-CoV-2 (Kolifarhood et al., 2020), although the possibility of getting the disease depends on the diffusion within the population. They underestimate the probability of getting the disease and show a very high trust in their good health, neglecting that the probability of being infected, albeit slight, is similar to that of their peers and people of other age groups.

Interestingly, as hypothesized, teenagers residing in a red zone reported higher perceived seriousness and susceptibility than those who did not reside in these zones. Furthermore, females showed a higher perceived seriousness than males. In both cases, the medium effect size suggests a role of these variables in influencing health risk perception. Therefore, living in an area with more restrictions than in other areas of the country may have contributed significantly to increase the perception of risk about the disease. Also, this information seems consistent with several studies demonstrating that women tend to have a higher perception of risk than men, thus avoiding risky behaviors to a greater extent (Harris et al., 2006).

Despite underestimating their risk of infection, however, the Italian teenagers who participated in this study were aware of the restriction measures necessary to contain the spread of the virus and they agreed with the limitations imposed by the government. These responses show high awareness of the potential danger of COVID-19 and acquire more value when considering that young people were conscious that they were not at serious risk, but that the risk was high for society as a whole.

The study also wanted to investigate the emotional and psychological impact of the quarantine period on the youth population in Italy. As underlined in the literature on this topic, prolonged school closure and home confinement during an epidemic can have a detrimental effect on children's and adolescents' physical and psychological well-being (Brooks et al., 2020; Wang et al., 2020). According to the results, this study also shows that Italian adolescents suffered the psychological effects of this quarantine period. Indeed, they had more marked negative feelings. More specifically, females and adolescents residing in the red zones with more restrictions showed higher levels of negative feelings related to the quarantine, in accordance with the study's hypotheses. In this regard, effect sizes approaching to medium indicate a possible role of these variables in determining negative feelings in the adolescents of the sample, even if these feelings may be likely influenced also by other variables not considered in the study. However, it is essential to emphasize that these feelings are subjective perceptions rather than a psychopathological state. Indeed, quarantine did not reduce the empathy and sociability of young people. In this regard, the adolescents who participated in this study reported that they engaged in school activities remotely and carried out the assigned homework. Furthermore, they continued to listen to the problems of others and to express their emotions. No significant differences related to the regions where the teenagers lived were found. This is very interesting data, leading to hypothesize that the negative feelings reported by the participants may be more related to the adolescent period than to the pandemic itself.

The results also showed a moderate but significant impact of both the sociodemographic and the health risk perception variables related to the COVID-19 experience in the perception of negative and positive feelings. More specifically, being male, living in a region with less virus spread, reporting low levels of perceived susceptibility and high compliance and agreement with government measures were all variables associated with the perception of positive feelings. On the contrary, being female and older, living in a red zone, reporting high levels of perceived seriousness and fear of getting COVID-19, and being less compliant with government measures were associated with more negative feelings.

As recently underlined by Wang et al. (2020), the adverse effects on psychological well-being are more significant when children and adolescents are confined to their homes without the possibility of carrying out activities outside and meeting peers. In confirmation of these considerations, this study showed that the majority of teenagers interviewed suffered in particular from not

being able to meet friends and relatives, as well as from not being able to go out and stay out late in the evening.

The results also confirmed the literature data demonstrating that when children and teenagers do not go to school and stay home, they are physically less active, are exposed to much more screen time, and have irregular sleep patterns. Similarly, the teenagers in the sample had difficulty falling asleep and spent more time watching television, playing video games, or using social networks. However, a significant percentage stated that they dedicated at least an hour a day to playing a musical instrument, dancing, exercising, acting, or drawing. In light of these insights, it is important to promote healthy habits and lifestyles in adolescents to reduce psychosocial stress and improve the psychological and physical well-being of the young population.

Finally, the quarantine experience was also associated with a widespread sense of uncertainty about the near future in the adolescents interviewed in this study. Although some participants were convinced that the virus would disappear during the summer, allowing a return to normal life, most believed that their near future would be unpredictable or different due to the various health and social distancing rules that must be respected. In this regard, it is important to support the youth population in addressing the uncertainties related to the period following the quarantine to ensure better adherence to the limitations that will have to be faced to avoid a new outbreak of the epidemic.

This study has some important strengths. As already underlined, this is one of the first studies conducted in Italy about the perceived seriousness and susceptibility for COVID-19 as well as the effects of school closures and home confinement on the physical and psychological well-being of adolescents. Another strength is certainly the large sample size, with almost 1000 Italian teenagers interviewed from North, Central, and South Italy.

However, there are also several limitations. First, this is a cross-sectional study so an exact causal relationship between the variables could not be established. Secondly, an internet-based questionnaire with self-reported measures was used, so it was not possible to ascertain the accuracy of the answers to the questions and the possible influence of self-report bias on the results. Finally, not all Italian regions are represented in the sample; however, it is representative of the three main areas in which Italy is generally divided (North, Central, and South).

CONCLUSION

This study has several social and psychological implications. In particular, the results underline that the COVID-19 emergency has undoubtedly had a significant impact on the lifestyle and psychological well-being of Italian adolescents. In light of these findings, the physical and mental impact of the COVID-19 epidemic on children and adolescents is a matter of fundamental importance both for governments and families and cannot be neglected, especially in this phase of a progressive resumption of ordinary life. Therefore, it is necessary to prepare adequate strategies to support the youth population in addressing the uncertainty associated with the pandemic and the quarantine period to reduce the psychological impact of school closures and home confinement as much as possible and guarantee adequate support to deal with the return to school.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Chair of School and Family Psychology, DISFOR, University of Catania. Written informed consent to participate in this study was provided by the participants, and where necessary, the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

EC designed the study, analyzed the data, and wrote the first draft. VLLR revised the manuscript. Both authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Meaning in Life and Self-Control Buffer Stress in Times of COVID-19: Moderating and Mediating Effects With Regard to Mental Distress

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Background: As evidenced by several studies, mental distress increased substantially during the COVID-19 pandemic. In this period, citizens were asked to exercise a high degree of self-control with regard to personal and social health behavior. At the same time, we witnessed an increase of prosocial acts and shared creative expressions, which are known to serve as sources of meaning. Meaning in life and self-control are acknowledged psychological resources. Especially in times of crisis, meaning in life has been shown to be a crucial factor for resilience and coping. However, threatening and stressful situations can also jeopardize existential security and trigger crises of meaning. The present study aimed to document levels of acute COVID-19 stress and general mental distress in Germany and Austria during the lockdown and in the weeks thereafter. In order to identify potential risk factors related to demographics and living conditions, their associations with COVID-19 stress were analyzed exploratively. The primary objective of the study, however, was to investigate the buffering effect of two psychological resources—meaningfulness and self-control—with regard to the relation between acute COVID-19 stress and general mental distress. Finally, a potential aggravation of mental distress due to the occurrence of crises of meaning was examined.

Method: A cross-sectional survey was conducted online during lockdown (survey group 1) and the subsequent weeks characterized by eased restrictions (survey group 2). A total of N = 1,538 German-speaking participants completed a questionnaire battery including a novel measure of acute COVID-19 stress, meaningfulness and crisis of meaning (SoMe), self-control (SCS-KD), and a screening of general mental distress, measured by core symptoms of depression and anxiety (PHQ-4). In a first step, associations between living conditions, demographics, and COVID-19 stress were explored. Second, a moderation and a mediation model were tested. Meaningfulness, a measure of presence of meaning in life, as well as self-control were proposed to serve as buffers in a time of crisis, thus moderating the relation between acute COVID-19 stress and general mental distress (double moderation). Crisis of meaning, operationalizing an experienced lack of meaning in

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life, was proposed to mediate the relationship between acute COVID-19 stress and general mental distress, with an assumed moderation of the association between COVID-19 stress and crisis of meaning by survey group (lockdown versus eased restrictions after lockdown), and a hypothesized moderation of the link between crisis of meaning and general mental distress by self-control (dual moderated mediation).

Results: COVID-19 stress was slightly right-skewed. Scores were higher during lockdown than in the weeks thereafter. The rate of clinically significant general mental distress was high, exceeding prevalence rates from both the general population and clinical samples of the time before the pandemic. In the weeks following the lockdown (group 2), general mental distress and crisis of meaning were significantly higher than during lockdown (group 1), whereas meaningfulness and self-control were significantly lower. Demographically, age had the strongest association with COVID-19 stress, with older participants perceiving less acute stress ($r = -.21$). People who were partnered or married suffered less from COVID-19 stress ($\eta 2 = .01$). Living alone ($\eta 2 = .006$), living in a room versus a flat or house ($\eta 2 = .008$), and being unemployed due to the pandemic ($\eta 2 = .008$) were related to higher experience of COVID-19 stress. COVID-19 stress and general mental distress were strongly related ($r = .53$). Both meaningfulness and self-control were negatively associated with general mental distress ($r = -.40$ and $-.36$, respectively). They also moderated the relationship between COVID-19 stress and general mental distress: When meaningfulness was high, high COVID-19 stress was related to substantially lower PHQ-4 scores than when meaningfulness was low. The same held for self-control: High scores of self-control were associated with lower PHQ-4 scores especially when COVID-19 stress was high. Crisis of meaning mediated the relationship between COVID-19 stress and PHQ-4. There was a higher likelihood of crises of meaning occurring when COVID-19 stress was high; crisis of meaning, in turn, was associated with general mental distress. Survey group moderated the first path of this mediation, i.e., the relationship between COVID-19 stress and crisis of meaning: High scores of COVID-19 stress were associated more strongly with crisis of meaning in the second survey group (after the lockdown). Self-control moderated the second path, i.e., the relationship between crisis of meaning and PHQ-4: When a crisis of meaning was present, self-control could buffer its effect on general mental distress.

Conclusions: Also in the present study among German-speaking participants, general mental distress was high. Scores were higher after than during the lockdown, indicating an ongoing destabilization for a significant part of the population. People who saw a meaning in their lives and who were capable of self-control reported substantially less mental distress. Meaningfulness and self-control also served as buffers between COVID-19 stress and general mental distress: When COVID-19 stress was high, the presence of meaningfulness and self-control accounted for lower general mental distress. Moreover, people who suffered strongly from COVID-19 stress were more likely to develop a crisis of meaning which, in turn, was associated with higher general mental distress. This suggests that ongoing anxiety and depression might (also) be based on existential struggles. Again here, self-control buffered the impact of crisis of meaning on general mental health. We conclude from these findings that public health policies can support citizens in coping with large-scale crises by enabling experiences of meaningfulness, e.g., through transparent and reliable modes of communicating goals and necessary intermediate steps. Moreover, health professionals are well advised to invite individuals to confront existential questions

and struggles, and to encourage them to exercise self-control. The latter can be boosted by keeping higher-order goals salient—which again is inherently linked to an understanding of their meaning.

Keywords: COVID-19, meaning in life, self-control, PHQ-4, crisis of meaning, depression, anxiety, living conditions

INTRODUCTION

Within the first months of the COVID-19 pandemic, evidence from all over the world has accumulated that mental distress has increased substantially. The majority of psychosocial research was conducted in the beginning of the pandemic, when the public atmosphere was dominated by lockdown measures and diverse aspects of uncertainty. From a public health perspective, there was a lack of clarity of how to prevent and reduce most effectively massive waves of outbreaks. From individual perspectives, stress arose from multiple problems associated with the pandemic, such as how to protect oneself and loved ones against infections, confusion, frustration, social isolation, and various fears of the future (1–15).

These stressors took their toll, as indicated by recent studies which report high prevalence rates of clinically significant general mental distress from 16.5% to 46%, of depression from 5.3% to 34.19%, of anxiety from 8.7% to 32.1%, and symptoms of acute stress reactions from 3.8% to 41.8% (8–10, 16–24). A first systematic review and meta-analysis of mental distress during the COVID-19 pandemic found pooled prevalence rates of anxiety, depression, and insomnia of 23.2%, 22.8%, and 38.9%, respectively (25).

These findings suggest that the magnitude of mental health burden caused by the COVID-19 pandemic is comparable to the burden of previous epidemics (26, 27) and of traumatic life events (28). Among the discussed factors to improve mental health associated with epidemics, disasters, and traumatic life events are various treatment approaches, but also public health interventions utilizing resilience factors (4, 26–28). Thus, research on resilience factors and resources that are associated with less mental distress during the recent COVID-19 pandemic will provide important insights for dealing with future crises.

Self-control as well as a sense of meaning in life are acknowledged psychological resources. Especially in times of crisis, meaning in life has been shown to be a crucial factor of resilience and coping ability. However, extremely threatening and stressful situations can also jeopardize existential security and trigger crises of meaning. The present study thus examined a hypothesized buffering effect of meaningfulness and self-control with respect to the relationship between COVID-19 stress and general mental distress, as well as a potential mediation of this relationship by crisis of meaning.

Self-control is defined as the ability to modify or override one's inner responses as well as to interrupt undesired behaviors (29, 30). It is associated with many indicators of mental well-being, such as satisfaction with life (31), happiness (32), self-esteem (29), and meaning in life (33). Moreover, it is related with lower degrees of depression and anxiety (34). According to longitudinal studies, self-control can predict well-being and health up to 30 years later (35).

Meaning in life is a multi-dimensional construct, covering qualities of experienced meaning in life and sources of meaning (36, 37). Meaning can be experienced as present, i.e., meaningfulness; as absent without ensuing search, i.e., existential indifference; or as painfully lacking, as in a crisis of meaning. In the present study, we will focus on the role of meaningfulness and crisis of meaning during the pandemic. Meaningfulness is the basic trust that life is worth living. It is based on a (mostly unconscious) evaluation of one's life as coherent, significant, directed and belonging. People with a high sense of meaningfulness are more hopeful and optimistic than people who see little meaning in their lives (38, 39). They experience themselves as more competent, more self-determined, and better socially integrated (40, 41). Their self-regulation abilities are also more pronounced: It is easier for them to activate, motivate, and calm themselves, to direct their attention and to overcome failures (42). They also show higher degrees of self-compassion, self-efficacy, and resilience (33, 43). Meaningfulness is robustly associated with lower mental distress (36, 43–47), higher physical health (48–51), and lower mortality risk (49, 50, 52–54).

A crisis of meaning is defined as a judgement on one's life as frustratingly empty, pointless, and lacking meaning (36, 37). It is accompanied by disorientation and disintegration of self-view and worldview (55) and is typically associated with depression, anxiety, pessimism and negative mood (36, 38, 43, 45). At the same time, positive affect, life satisfaction, hope and self-efficacy are greatly reduced (36, 38, 45). Also resilience and self-regulation are significantly diminished (42, 43). Crises of meaning were found to predict suicidality among youth independently of depression (56).

A large number of studies have documented that meaningfulness serves as a buffer in times of crisis [see (55, 57)]. It moderates the relationships between stressors and distress, as evidenced for suicide risk factors (58), Alzheimer's disease (59), traumatic events (60), cancer (47), multiple chronic diseases (61), etc. This buffering effect is reflected in the way individuals deal with and experience stressors, as reported by the above studies: Among those who see meaning in their lives, stressors cause less symptoms and illness behavior, lower perception of pain and suffering, and degrees of mental distress. This suggests that meaning in life may serve as a secure existential foundation that allows people to view stressors more as a worthwhile challenge rather than as harm or loss. Moreover, the purpose fueling a person's meaning in life can still serve as motivation and compass, even when some pillars of identity break away in times of crisis. A crisis of meaning, on the other hand, often occurs as the result of severe

stressors. If not dealt with, it can prevent constructive coping and aggravate distress (62, 63) or provoke self-harming behavior (64).

These findings suggest that people with high degrees of meaningfulness can count on a variety of resilience factors that help them to successfully cope with stressful life events, such as the current pandemic. A high sense of stress due to the pandemic, on the other hand, might jeopardize people's existential security and bring about a crisis of meaning, which then makes life even harder for them. We thus tested a double moderation and a dual moderated mediation model. First, we expected both meaningfulness and self-control to moderate the relationship between COVID-19 stress and general mental distress (**Figure 1**). Meaningfulness and self-control were hypothesized to serve as buffers with regard to the stress caused by consequences of COVID-19. People who see meaning in their lives and are able to regulate impulses, emotions, and thoughts were expected to be better equipped to deal with restrictions and challenges due to the virus, and thus to be less likely to develop signs of general mental distress.

Moreover, we posited that COVID-19 stress could also result in crisis of meaning [cf. (65)], thus adding to the probability of general mental distress. Also here, we hypothesized that an ability to self-control would attenuate the association between crisis of meaning and general mental distress. We further included survey group (during versus after lockdown) as a moderator of the path between COVID-19 stress and crisis of meaning. This was based on the fact that COVID-19 stress is explicitly situation-related, while crises of meaning are more stable (55) and therefore likely to follow different temporal dynamics. **Figure 2** depicts this model.

MATERIALS AND METHOD

Using an online questionnaire tool (SoSciSurvey), this cross-sectional survey was carried out in Germany and Austria between April 10 and May 28, 2020. It thus covers three weeks of lockdown and four weeks of increasing ease of restrictions, starting from May 1. Invitations to the study were sent out *via* university, business, and regional network newsletters and posted in several newspapers and news websites. We thus used a kind of convenience sampling with the aim of addressing as many different people as possible. Participation was voluntary, without compensation and could be terminated anytime. Ethical approval was issued by the Review Board (Psychology) of the University of Innsbruck, No 09/2020. All participants expressed their informed consent by explicitly agreeing to continue with the questionnaire after being informed about the study's aims, employed data protection, participants' rights and contact points for questions or concerns.

Participants

A total of N = 1,538 participants completed the questionnaire. For this study, inclusion criteria were a minimum age of 18, agreement to participant consent and completion of the questionnaire. Exclusion criteria were self-report of not having responded honestly (n = 4) and disproportionately short response times (n = 7). After exclusion, a sample of N = 1,527 remained. Of these, 65% (n = 993) identified as women, 35% (n = 528) as men, and 0.4% (n = 6) as divers. (Due to their small number, these were excluded from analyses that

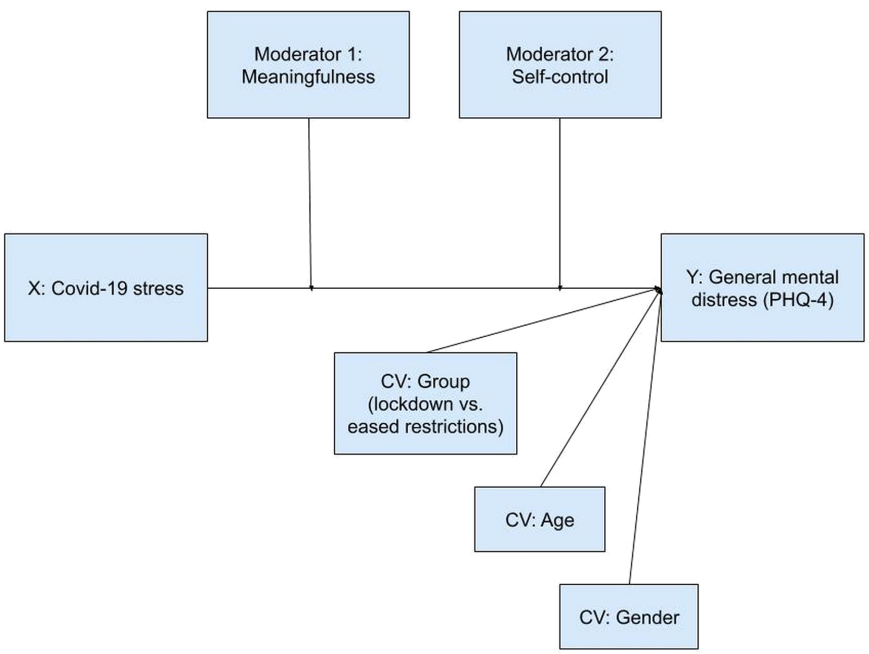

FIGURE 1 | Meaningfulness and self-control moderate the relationship between COVID-19 stress and general mental distress (double moderation, PROCESS model 2).

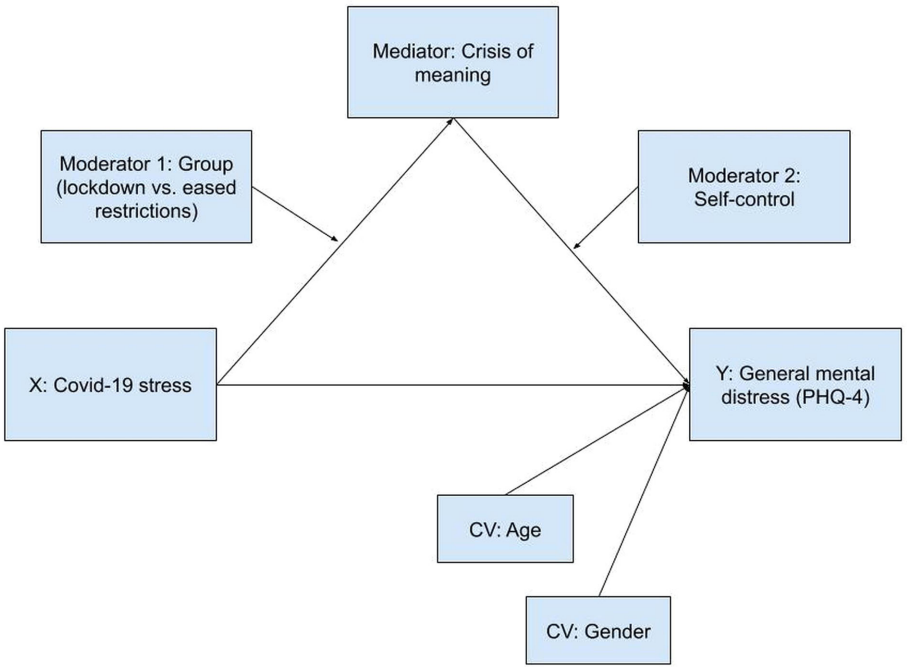

FIGURE 2 | Crisis of meaning mediates the relationship between COVID-19 stress and general mental distress, with self-control and group as moderators (dual moderated mediation, PROCESS model 21).

contained gender as a variable.) Mean age was 40 (SD = 17; n = 5 missing values), ranging from 18 to 99 years. The majority were German (52%), followed by Austrian (38%). Six percent were of Italian origin, 5% from other nationalities. In terms of highest educational qualifications, 12% had completed their General Certificates of Secondary Education, 30% had an advanced-level qualification, and 58% had a university degree. The majority of participants (99%) had not been diagnosed with COVID-19. The majority also did not know anyone who had been diagnosed (91%) or died of COVID-19 (99%). Fifty-nine percent of the sample participated during lockdown.

Variables

Demographics and Living Conditions

The sociodemographic section assessed participants' age, gender, nationality, relationship status, children, education, own infection with COVID-19, and infection/death of close persons due to COVID-19. Moreover, we asked participants if they were living alone or with others, about their housing (room, flat or house) and access to a private outside area (balcony, terrace, garden). Finally, the work situation was surveyed (unemployed due to COVID-19 yes/no).

COVID-19 Stress

To determine the extent of acute psychological stress due to COVID-19, we developed a novel scale. After examining the relevant literature and drawing on population surveys released by the media, we generated seven items tapping a broad range of affective reactions to the current situation (feelings of intolerability, boredom, anger, and being left alone) and fears and pessimism about internal resources and the future. Items were rated on a six-point Likert scale ranging from 0 (strongly disagree) to 5 (strongly agree). Internal consistency in the present study was Cronbach's alpha = .71.

General Mental Distress

General mental distress was measured by the PHQ-4 (66, 67), a brief four-item measure of core symptoms of current depression and anxiety. It uses a four-point Likert scale ranging from 0 (not at all) to 3 (nearly every day). Participants were asked to respond to the items with a view to the past two weeks. The PHQ-4 has demonstrated good reliability and validity in both clinical and population samples [e.g., (66–70)]. Cronbach's alpha in this study was .84. Several cut-off points have been validated with ≥3, ≥4, and ≥6 indicating mild, moderate, and severe mental distress (66, 69).

Meaning in Life

Two dimensions of meaning in life were assessed by employing the meaningfulness and crisis of meaning scales from the Sources of Meaning and Meaning in Life Questionnaire [SoMe; (36, 71)]. The questionnaire's reliability and validity have been shown in numerous studies [see (37, 55)]. Meaningfulness measures the degree of experienced meaning in life, and crisis of meaning measures the degree of a perceived lack of meaning. Both five-item scales are rated on a six-point Likert scale ranging from 0

(strongly disagree) to 5 (strongly agree). Internal consistencies in this study were Cronbach's alpha = .81 and .92, respectively.

Self-Control

Self-control was assessed using the validated German version of the SCS [SCS-KD; (29, 72)]. It measures a person's ability to control their impulses and modify inadequate emotions and thoughts. The 13 items are rated on a five-point Likert scale ranging from 1 (totally disagree) to 5 (totally agree). In the present study, Cronbach's alpha was .83.

Statistical Analyses

The primary objective of this study was twofold: to test if two psychological resources—meaningfulness and self-control—would buffer stress resulting from the COVID-19 pandemic by attenuating related general mental distress, and to examine if high levels of COVID-19 stress would be associated with crisis of meaning and, *via* this path, statistically predict elevated general distress. We used PROCESS 3.5 for SPSS (73) to conduct a double moderation (see **Figure 1**) and a dual moderated mediation model (see **Figure 2**). Scale distributions were examined. Skewness and kurtosis were all in acceptable ranges [skewness < 2, kurtosis < 7; cf. (74)]. Parameter estimation used maximum likelihood estimation. Moderation and mediation analyses employed bootstrapping with 5,000 samples. All variables were continuous except for gender (dichotomous: male/female) and survey group (dichotomous: during lockdown/after lockdown). For additional documentation, we report degrees of COVID-19 stress with respect to the temporal context (during/after lockdown), demographics and living conditions. ANCOVAs were used to test for differences.

RESULTS

Descriptive Statistics

Table 1 reports descriptive statistics for all variables during lockdown, immediately afterward, and for the total sample. Additionally, significance levels and effect sizes for differences between the two groups are shown. Since they differed with regard to age, gender, children, and education, these are included as covariates in the comparison between groups (ANCOVAs).

Table 2 shows the prevalence of PHQ-4 scores for different cut-offs discussed in the literature (66, 69), as well as the prevalence of crises of meaning [cut-off according to (75)]. Prevalences are shown in percent, for the total sample, men and women, three age groups, and the two survey groups (lockdown/after lockdown). Chi-square significance levels are given for differences between the two survey groups.

Stress due to COVID-19 was right-skewed and thus not widespread. It was more marked during lockdown than in the weeks thereafter. Nevertheless, people were apparently affected by the situation, as shown by general mental health scores that surpassed those reported before the virus [e.g., (66–70)]. During lockdown, as many as 58% stated at least mild symptoms of general mental distress, with 42% indicating moderate symptoms and 17% indicating the occurrence of severe symptoms. Suggesting a dynamic different from COVID-19 stress, severe mental distress

TABLE 1 | Means and standard deviations (total), means and standard errors (lockdown and after lockdown), significance levels, effect sizes, and 95% confidence intervals for group comparison.

	Total	Lock- down	After lock- down	*p*	Partial η^2	*95% CI for the difference*	
						lower	*upper*
COVID-19 stress[a)]	1.79 (0.93)	**1.83 (0.03)**	**1.72 (0.04)**	.03	.003	.011	0.215
General mental distress[b)]	3.48 (2.82)	**3.21 (0.10)**	**3.87 (0.12)**	<.001	.01	−.968	−.341
Meaningfulness[a)]	2.94 (1.17)	**3.12 (0.04)**	**2.69 (0.05)**	<.001	.03	.309	.565
Crisis of meaning[a)]	1.16 (1.31)	**0.87 (0.04)**	**1.55 (0.05)**	<.001	.06	−.826	−.539
Self-control[c)]	3.10 (0.69)	**3.14 (0.02)**	**3.01 (0.03)**	.001	.007	.053	.207

N = 1,516; [a)]range 0–5; [b)]range 0–12; [c)]range 1–7; covariates set at age = 40, gender = 1.65 (1-male, 2-female), children (0/1) = 0.36, education = 2.46; bold = significant differences between lockdown and afterward.

TABLE 2 | Percentage beyond cut-off for PHQ-4 and crisis of meaning and significance levels for chi-square test lockdown/after lockdown.

	Total	Gender		Age group			Survey group		*p (chi square)*
		f	m	18–39	40–59	60–99	lock- down	after lock- down	
General mental distress									
% beyond cut-off 3[a)]	56%	60%	50%	63%	51%	44%	58%	54%	.13
% beyond cut-off 4[b)]	41%	44%	35%	47%	37%	31%	42%	40%	.61
% beyond cut-off 6[c)]	19%	20%	17%	22%	18%	10%	**17%**	**22%**	.03
Crisis of meaning									
% beyond cut-off 3[d)]	13%	12%	15%	14%	14%	7%	**9%**	**18%**	<.001

N = 1,521/1,522/1,527; [a)]at least mild symptoms of depression/anxiety; [b)]moderate symptoms of depression/anxiety; [c)]severe symptoms of depression/anxiety; [d)]presence of a crisis of meaning; bold = significant differences between lockdown and afterward.

was more frequent in the second group. After lockdown, both the total score as well as the cut-off score indicating severe symptoms (22%) were significantly higher, while at least mild symptoms were still reported by 54% and moderate symptoms by 40% of the participants. Mirroring this dynamic, also meaningfulness was lower in the second group, compared with levels during lockdown [and also before lockdown, when the average population mean was 3.15 (55)]. Crises of meaning during lockdown appear to have been curbed, with 9% [compared to 14% before the pandemic (55)] reporting scores beyond the cut-off of 3. This also changed after the lockdown, when the number of participants suffering from a crisis of meaning was 18%. For self-control, no reference scores for German speaking populations were available. Mean scores showed a higher level during lockdown than in the immediately following weeks.

Correlations between age and variables included in the moderation and mediation analyses are shown in **Table 3**. COVID-19 stress was highly positively related with PHQ-4. It had moderate negative associations with meaningfulness and self-control, and a moderate to high positive correlation with crisis of meaning. COVID-19 stress, PHQ-4, and crisis of meaning were less pronounced among older participants; these also had slightly higher scores in self-control and meaningfulness.

TABLE 3 | Correlations between study variables and age.

	COVID-19 stress	PHQ-4	Age
COVID-19 stress			−.21
Meaningfulness	−.28	−.40	.13
Crisis of meaning	.41	.65	−.12
Self-control	−.21	−.36	.17
PHQ-4	.53		−.17

N = 1,522; Pearson correlation; all coefficients significant at p <.001.

Predicting COVID-19 Stress

Before testing our main hypotheses, we report potential predictors of increased stress due to COVID-19. **Table 4** shows associations between living conditions, demographics, and COVID-19 stress, controlling for survey group. The biggest effect can be attributed to age, with older participants experiencing significantly less stress

TABLE 4 | Living conditions and demographics affecting COVID-19 stress: estimated means, standard errors, significance levels, effect sizes, and 95% CI.

		n	COVID-19 stress		*p*	Partial η^2	*95% CI for est. M*	
			Est. M	SE			*LL*	*UL*
Age[a]					<.001	.03		
	18–39	817	**1.93**	(0.03)			1.87	2.00
	40–59	462	**1.65**	(0.04)			1.56	1.73
	60–99	243	**1.57**	(0.06)			1.45	1.68
Gender[b]					.08	.002		
	Female	993	1.81	(0.03)			1.76	1.87
	Male	528	1.73	(0.04)			1.65	1.80
Nationality[b]					.004	.009		
	German	792	**1.80**	(0.04)			1.73	1.87
	Austrian	573	**1.71**	(0.04)			1.63	1.79
	Italian	89	**2.08**	(0.10)			1.89	2.28
	Other	73	**1.79**	(0.11)			1.58	2.00
Relationship status[b]					<.001	.01		
	Married/partnered	953	**1.71**	(0.03)			1.99	2.24
	Other	574	**1.90**	(0.04)			1.84	2.11
Children[b]					.74	.00		
	Yes	552	1.77	(0.05)			1.68	1.86
	No	975	1.79	(0.03)			1.73	1.85
Education[b]					.36	.001		
	Secondary	190	1.84	(0.07)			1.71	1.98
	Advanced level	453	1.81	(0.05)			1.73	1.90
	University	884	1.76	(0.03)			1.70	1.82
Living alone[b]					.002	.006		
	Alone	328	**1.92**	(0.05)			1.82	2.02
	With others	1,199	**1.75**	(0.03)			1.69	1.80
Housing[b]					.001	.008		
	Room	134	**2.04**	(0.08)		1.89	2.20	
	Flat or house	1,393	**1.76**	(0.02)			1.71	1.81
Access to outside[b]					.09	.002		
	No	216	1.88	(0.06)			1.76	2.01
	Yes	1,311	1.77	(0.03)			1.72	1.82
Work situation					.001	.008		
	Unemployed due to COVID-19	72	**2.14**	(0.11)			1.93	2.35
	Other	1,455	**1.77**	(0.02)			1.72	1.81

[a]ANCOVA controlling for group (1/2; set at 1.41); N = 1,527; [b]ANCOVA, controlling for age (set at 40) and group (set at 1.41); N = 1,522. CI, confidence interval; LL, lower limit; UL, upper limit; bold, significant differences.

due to COVID-19. Due to this finding, age was controlled in all other analyses. According to the data, people who were married or partnered experienced less stress. Participants of Italian origin reported higher stress than all others. So did individuals who were unemployed due to COVID-19, and who lived alone or in a room instead of a flat or house.

Meaningfulness and Self-Control Moderate Effects of COVID-19 Stress on General Mental Distress

To test the hypothesis that general mental distress is a function of personal characteristics and external stressors, and more specifically whether meaningfulness and self-control would moderate the relationship between COVID-19 stress and general mental distress, a double moderation analysis was conducted (using PROCESS 3.5 macro for SPSS, model 2). Because values differed significantly between lockdown and the time thereafter, group was included as a covariate. Because COVID-19 stress was related to age and PHQ-4 scores are known to be related to gender (68–70), also these two variables were included as covariates. All variables defining products were mean centered.

The model was significant at F (8, 1507) = 122.8789, p <.001, R^2 = .40. COVID-19 stress, meaningfulness, self-control, survey group and gender explained 40% of variance in general mental distress. Both meaningfulness and self-control acted as independent moderators of the association between COVID-19 stress and general mental distress, as shown by statistically significant interactions (see **Table 5**). Addition of the interaction between meaningfulness and COVID-19 stress yielded an F(1, 1507) = 11.17, p = .001, change R^2 = .005; addition of the interaction between self-control and COVID-19 stress F(1, 1507) = 4.49, p = .03, change R^2 = .002. The inclusion of both interactions yielded an F(2, 1507) = 11.65, p <.001, change R^2 = .009.

As an examination of the interaction plots shows (see **Figure 3**), general mental distress increased with COVID-19 stress. The increase was attenuated by both meaningfulness and self-control. At differing degrees of COVID-19 stress, general mental distress decreased when meaningfulness increased (lower PHQ-4 levels in the second and third row). General mental distress also decreased when self-control increased (higher PHQ-4 levels in the dashed and dotted lines). Participants with low meaningfulness and low self-control had the highest PHQ-4 scores. These ranged from average PHQ-4 scores of around 3 when COVID-19 stress was low, to average PHQ-4 scores of around 6 when psychological strain due to COVID-19 was high. Effects of both meaningfulness and self-control specifically showed when COVID-19 stress was high (right hand side of the figure).

Crisis of Meaning as a Moderated Mediator Between COVID-19 Stress and General Mental Distress

Our second hypothesis suggested that increased suffering due to COVID-19 might jeopardize existential security and thus instigate crises of meaning. These, in turn, have been shown to further increase mental suffering (62, 63). This hypothesis frames crisis of meaning as a mediator between COVID-19 stress and general mental distress. Also here, we assumed that perceived self-control would reduce the probability of experiencing general mental distress. Self-control should thus moderate the path between crisis of meaning and PHQ-4. Moreover, we included another moderator: As could be seen in the preliminary analysis testing for differences between lockdown and the weeks thereafter, COVID-19 stress was lower in the second group, but crisis of meaning was higher. We therefore posited that group would moderate the path between COVID-19 stress and crisis of meaning. Again, age and gender were included as covariates. **Table 6** displays the results of the dual moderated mediation (using PROCESS 3.5 macro for SPSS, model 21). All variables defining products were mean centered.

COVID-19 stress, group, and an interaction of both explained 25% of variance in crisis of meaning (see **Table 6**), with crisis of meaning being higher when people experienced stress due to COVID-19, and after lockdown. The interaction between COVID-19 stress and group was also significant, indicating that when suffering due to COVID-19 was still high after lockdown, crisis of meaning was especially prominent (see **Figure 4**). Addition of the interaction between COVID-19 stress and group yielded an F(1,1510) = 21.72, p <.001, change R^2 = .01.

TABLE 5 | Double moderation of COVID-19 stress predicting general mental distress.

Effect	Estimate	*SE*	*t*	*95% CI for estimate*		*p*
				LL	*UL*	
Intercept	2.38	0.32	7.40	1.74	2.99	<.001
COVID-19 stress (IV)	1.27	0.07	19.21	1.14	1.40	<.001
Meaningfulness (Mod 1)	–0.50	0.05	–9.16	–0.60	–0.39	<.001
Interaction IVxMod 1	–0.18	0.05	–3.22	–0.27	–0.07	.001
Self-control (Mod 2)	–0.81	0.09	–9.25	–0.98	–0.64	<.001
Interaction IVxMod 2	–0.18	0.09	–2.24	–0.36	–0.02	.03
Group[a)]	0.44	0.13	3.36	0.18	0.69	.001
Gender[b)]	0.38	0.15	3.01	0.13	0.62	.003
Age	–0.01	.00	–1.31	–0.01	–0.00	.19

N = 1,516. CI, confidence interval; LL, lower limit; UL, upper limit. [a)]lockdown = 1, after lockdown = 2.[b)]male = 1, female = 2.

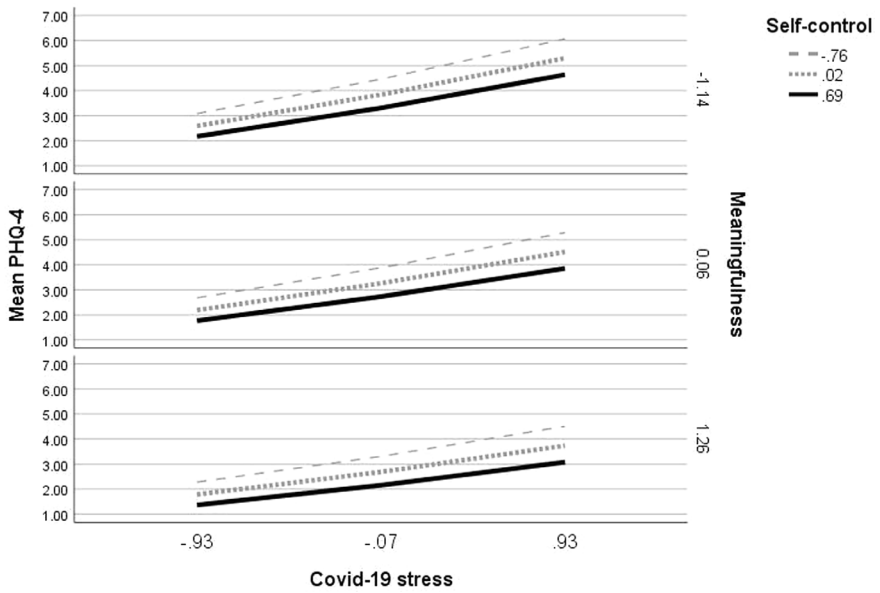

FIGURE 3 | Meaningfulness and self-control moderating the relationship between COVID-19 stress and general mental distress.

TABLE 6 | Dual moderated mediation.

Effect	Crisis of meaning (Mediator)						General mental distress (DV)					
	Est.	*SE*	*t*	*95% CI for est.*		*p*	Est.	*SE*	*t*	*95% CI for est.*		*p*
				LL	*UL*					*LL*	*UL*	
Intercept	.82	.14	5.69	0.53	1.10	<.001	2.91	.25	11.61	2.41	3.41	<.001
COVID-19 stress (IV)	.61	.03	18.74	0.54	0.67	<.001	.91	.06	14.89	0.79	1.03	<.001
Crisis of meaning (Med)							1.00	.05	21.29	0.90	1.09	<.001
Group (Mod 1)	.77	.07	11.64	0.63	0.90	<.001						
Interaction IVxMod 1	.31	.07	4.66	0.18	0.44	<.001						
Age	−.01	.00	−6.49	−0.02	−0.01	<.001	−.00	.00	−0.56	−0.01	0.01	.58
Gender[a)]	−.17	.06	−2.65	−0.29	−0.04	.008	.35	.11	3.20	0.14	0.57	.012
Self-control (Mod 2)							−.44	.08	−5.54	−0.60	−0.29	<.001
Interaction MedxMod 2							−.17	.05	−3.10	−0.27	−0.06	.001
	R^2 = .25 F(5,1510) = 102.3614, p <.001						R^2 = .52 F(6,1509) = 269.1002, p <.001					

N = 1,516. CI, confidence interval; LL, lower limit CI; UL, upper limit CI. [a)] male = 1, female = 2.

COVID-19 stress and crisis of meaning were also positive predictors of general mental distress, and self-control predicted it negatively. With 52%, a substantial amount of variance in general mental distress could be explained by the predictors and their interactions. The data showed the expected interaction between crisis of meaning and self-control, as illustrated by the plotted interaction in **Figure 5**. The higher crisis of meaning, the larger was the effect of self-control with regard to general mental distress. Especially when crisis of meaning was high, people with high self-control suffered significantly less from general mental distress than people with low self-control. Addition of the interaction between crisis of meaning and self-control yielded an F(1,1509) = 9.61, p = .002, change R^2 = .003.

The index of the moderated mediation was −.05 (SE = .02, 95% CI −0.10/−0.01), thus supporting the hypothesis that the indirect effect was conditional on the level of the moderator variables: Group and self-control significantly moderated the indirect effect of crisis of meaning on general mental distress. All indices of conditional moderated mediation by group among low, medium, and high degrees of self-control were significant, indicating that the moderation of the indirect effect by group differed with varying degrees of self-control. (Indices and estimates for the indirect effects are available from the first author upon request.)

Due to the cross-sectional character of the present study, causal effects cannot be determined. To test alternative directions in the present model, we also carried out the above analysis with the

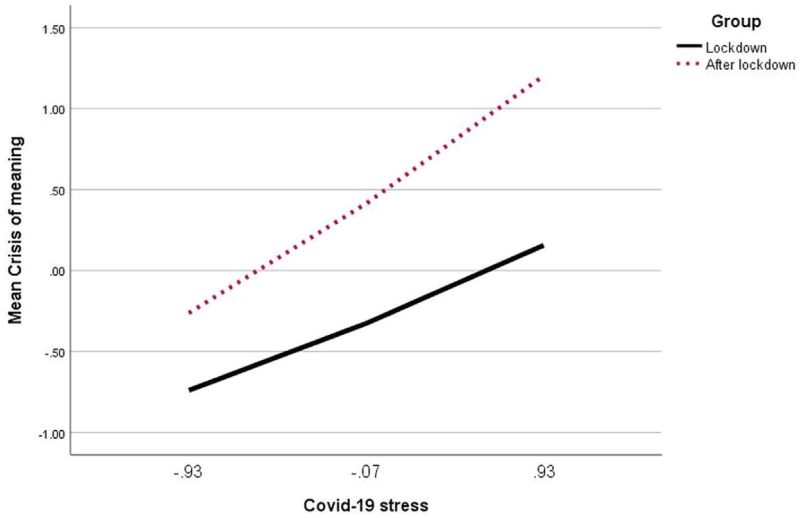

FIGURE 4 | Survey group moderating the relationship between COVID-19 stress and crisis of meaning.

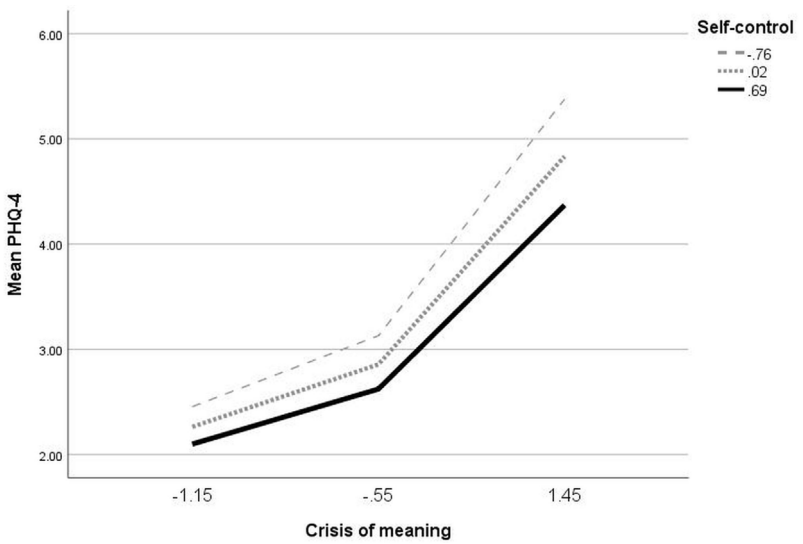

FIGURE 5 | Self-control moderating the relationship between crisis of meaning and general mental distress.

following models: crisis of meaning as independent variable and COVID-19 stress as mediator (index of moderated mediation = .003, SE = .01, 95% CI −0.01/0.02). Crisis of meaning as independent variable and PHQ-4 as mediator (index of moderated mediation = .001, SE = .00, 95% CI −0.01/0.01). PHQ-4 as independent variable and COVID-19 stress as mediator (index of moderated mediation = .005, SE = .00, 95% CI 0.00/0.01). PHQ-4 as independent variable and crisis of meaning as mediator (index of moderated mediation = .002, SE = .00, 95% CI −0.00/0.01). Since all 95% CIs included zero, none of these indices was significant, thus supporting the hypothesized model.

DISCUSSION

The present study examined degrees of acute psychological stress due to COVID-19 and general mental distress reported by German-speaking participants during the lockdown (survey

group 1) and in the subsequent weeks (survey group 2) of the COVID-19 pandemic.

COVID-19 Stress Not Widespread, But Related to Mental Distress

On average, COVID-19 stress was moderately marked. Most participants only felt low to moderate degrees of intolerability, boredom, anger, or being left alone; their view of the future was neither very fearful nor pessimistic. After restrictions had been eased, stress due to COVID-19 was lower, too. However, those participants who did report higher stress due to COVID-19 also expressed elevated general mental distress. This has also been reported by studies from other countries, such as Bangladesh (13), Canada (10), Iran (1), Israel (3), Italy (76), Turkey (15), and the United States of America (6, 7, 10).

Demographics and Living Conditions as Predictors of COVID-19 Stress

The emerging picture portraits German and Austrian citizens as largely unaffected by the crisis [see also (77)]. For a smaller, but not unsubstantial part of society, however, longer-term mental health problems seem to be emerging. According to our analysis of demographic parameters and living conditions, these were only fragmentarily responsible for the reported strain. We saw higher acute stress scores among younger people, people who had no partner, who lived alone and in constricted housing conditions. Unemployment due to the pandemic also predicted higher COVID-19 stress. In more heterogeneous populations, these effects might be larger than the ones found here, since the present sample was marked by relatively high education and comfortable living conditions. Nevertheless, these findings add to practical knowledge about predictors of critical experiences by specific subgroups during large-scale events (1, 3, 5–7, 9–13, 15, 76), especially since recent studies have scarcely reported results on associations between COVID-19 stress and demographic factors and living conditions.

Concerning age, Lee reported a significant negative correlation with the Coronavirus Anxiety Scale (CAS) total score of $r = -0.32$ (6), which is comparable to, but slightly larger than the negative correlation in the study at hand ($r = -0.21$). Other authors found no relations between age and their respective measures of COVID-19 stress (5, 6, 11, 13, 76). Among the investigations of gender and COVID-19 stress, two studies also reported no differences between men and women (6, 11), while four found higher stress in women than in men (3, 5, 13, 78).

Meaningfulness and Self-Control Serve as Stress Buffers

Besides investigating the occurrence of mental and existential distress during the pandemic, the present study posited positive direct and moderating effects of two psychological resources, i.e., meaningfulness and self-control. As expected, acute COVID-19 stress was associated with substantially less general mental distress when people saw a meaning in their lives, and when they perceived themselves as capable of exercising self-control. The proposed buffering effect of meaning in life was thus supported, suggesting that a sense of meaningfulness provides a stable existential foundation to cope with critical life-events. The data also indicated that self-control served as a buffer of acute suffering due to COVID-19, since this strain was associated with lower general mental distress when self-control was high.

Both resources seem to have supported a lot of people during the lockdown. Concerningly, both were less marked in the data collected after the lockdown. The difference was particularly marked for meaningfulness, which changed from $M = 3.12$ to $M = 2.69$, a score much beyond the average seen in the years preceding the pandemic (55). This finding must be interpreted with caution, since the participants after the lockdown were not the same as before, and we can therefore not talk about personal changes. Nevertheless, and considering that demographics were controlled, the systematic differences between the two survey groups suggest some association with the time of the survey. Lower meaning scores after lockdown mirror the high level of severe mental distress, but they also point beyond personal levels of suffering. Perceptions of meaning are based on the evaluation of immediate circumstances with reference to higher-level contexts (36, 37), implying a so-called "surplus of meaning" [(55), p. 28ff]. Therefore, acts are perceived as meaningful when they result in intended goals, and goals are perceived as meaningful when they concur with higher order life purpose/sources of meaning. During the COVID-19 pandemic, citizens were required to act in different-than-usual ways. Courses of action were drastically restricted. Inferring from this study's data, the majority of participants could see their lives and actions as meaningful in spite of these restrictions—perhaps due to clear and consistent communication of government policies. During the lockdown, Austrian and German governments clearly communicated which kinds of action were demanded to pursue also quite clearly communicated goals. These goals were further justified by higher order objectives, i.e., putting health concerns first and safeguarding those who are weak and at risk. Moreover, the policies were brought into force in a way that enhanced all four facets contributing to a sense of meaning: Each person mattered (significance); the direction of action was clear and justified (orientation); directives applied to everybody and all areas of life (coherence); everybody was at risk and the only reasonable reaction was to be a collective effort (belonging).

Insecurity After the Lockdown

Experiences seem to have changed considerably after restrictions were started to be eased. The "exit" was characterized by a much higher degree of insecurity, by inconsistencies and contradictions in the communication of guidelines and by different strategies employed by different regions. Under such conditions, the meaningfulness of one's actions is much less apparent and the perceived meaningfulness of prescribed goals is easily jeopardized by ambiguous rationales and communication. This situation is the context in which we found that acute COVID-19 stress was lower compared to the time of lockdown, while PHQ-4 scores were even higher than during the lockdown. Negative psychological reactions to the pandemic thus either take place time-delayed or derive from a state of insecurity and incoherence rather than from clearly

communicated restrictions in social behavior. This also showed in crisis of meaning scores. In the weeks following the lockdown, crises of meaning were twice as frequent as during the lockdown. This increase could be attributed to various causes. On the one hand, it could be due to material existential worries that were not identified in this study. On the other hand, it is possible that individuals were motivated by the external restrictions to a more intense reflection of their inner lives, their goals and beliefs. From psychotherapy and posttraumatic growth research we know that in situations of crisis a reorientation often occurs, which in many cases is preceded by the abandonment or destruction of the previous life plan or even worldview (79). Thus, crises of meaning could be understood as a transitional phase to a more realistic life- and worldview. Last but not least, increases in crises of meaning could be related to the state of society after the lockdown, as characterized above. In addition to the prevalent insecurity, the reinstatement of a "new normality" is prone to belie expectations of fundamental changes in social, ecological, and economical matters as held and voiced by many during the pandemic [see, e.g., (80)].

Long-Term Ego Depletion Effects?

At the same time, and perhaps connected with these developments, we saw lower scores of perceived self-control in the second survey group of our study. Also this finding must be interpreted with caution; because the study design was not longitudinal, we cannot speak of a decrease in self-control. However, lower scores after lockdown tie in with evidence for a spreading ignorance of social distancing in society [e.g., (81)] and numerous protests against further coronavirus restrictions (82). For explanation of this phenomenon, ego depletion theory might be considered, i.e., an impairment of subsequent self-control after initial exertion of self-control. This is also known to pertain to moral behavior, which becomes less likely after initial exertion of self-control (83). The effect has so far been associated with much shorter time frames, typically in experimental settings. The original explanation of ego depletion—the strength model (84, 85)—assumed that exertion of self-control draws on a limited pool of mental resources and can thus be "used up". This understanding has been contested [for a meta-analysis, see (86)]. Alternatively, ego depletion effects are attributed to reduced motivation to engage in further self-control (87, 88). Studies that reduced ego depletion by priming goals (89) or self-awareness (90) support this explanation.

These studies also suggest an inherent connection between self-control and meaningfulness. Top-down control processes that modulate or inhibit predominant responses can be boosted by reminding people of the reasons for exercising self-control, i.e., their higher order goals (91). According to the hierarchical model of meaning (37, 55), meaningfulness is based on coherence between action, goals, and higher order purpose/sources of meaning. When public health policies are communicated in a way that ties in with life orientations held by a majority of the society and the link between these values and particular goals is clear and comprehensible, then citizens have the chance to identify with these values, adopt the respective goals and orient their behavior accordingly, including the exercise of self-control, when necessary.

Limitations

The study at hand used a large, but cross-sectional sample in order to yield early insights into German-speaking participants' mental health and existential standpoints. Therefore, a direction of effects as implied by mediation models cannot be determined. We tried to mitigate this problem by testing models with different implied directions. All of these did not yield significant results, thus suggesting that they are less probable than the originally hypothesized and supported model. Follow-up studies are programmed and the findings reported here will be replicated in longitudinal designs.

Our main outcome measure, the PHQ-4, does not establish diagnoses of depression or anxiety according to ICD-10 or DSM-5. It measures core symptoms of both, thus indicating, by means of several cut-off scores, occurrence of at least mild, moderate, or severe, clinically relevant symptoms. The PHQ-4 has been demonstrated to be a valid screening tool for general mental distress in the general population and clinical populations [e.g., (66–70)].

The COVID-19 stress scale was newly developed for the current investigation, as no validated instruments were available at the time we initiated the study. Preliminary indications of its validity can be inferred from the fact that the scale correlated with demographic characteristics and indicators of mental distress in a comparable way to published validated scales (1, 3, 5–7, 10–13, 15, 76). Also, its relationships with other constructs in our study corresponded to our hypotheses and can thus be considered as first evidence for construct validity.

Finally, the sampling we used is prone to several limitations. As in the majority of studies, it is impossible to determine why some people chose to take part and others did not. The results can therefore not be generalized to the population as a whole. We also cannot determine the response rate since we do not know how many subjects read the open invitation to participate in the study.

Conclusions and Implications

This study indicated that younger people might be more vulnerable than older to suffer from stress due to COVID-19. Stress was also related to living alone and in confined housing conditions, and to unemployment due to the pandemic. These population groups should thus be given special attention in large-scale crises. We saw concerningly high general mental distress and crises of meaning especially in the time after the lockdown, suggesting that long-term negative developments were triggered by the lockdown or the handling of the exit. Mental health support services should be made widely accessible to prevent psychological suffering. With regard to crises of meaning, it should be noted that they are not exclusively negative, but also hold potential for personal growth (75, 92, 93). Especially here, therefore, care should be taken not only to eliminate the symptoms of suffering, but to take arising questions seriously and search for possibilities of fundamental change and improvement. This also applies to crises at social level. Many initiatives and citizens' movements currently share their visions and proposals for a better future (e.g., #EUvsVirus Hackathon). A great opportunity

lies in involving them in social development processes in a participatory manner, and to listen to voices in all their diversity. This might be a way of preventing a growing number of people from experiencing themselves as alienated and powerless, with the possible effect of turning to conspiracy theories [cf. (94)].

Including diverse groups in decision and policy making processes can also enable citizens' sense of meaning, which our data showed to work as a buffer in critical times: people who saw a meaning in their lives were less affected by acute COVID-19 stress and by general mental distress; when their COVID-19 stress was high, it was associated with significantly lower general mental distress. Experiences of meaning are based on four facets, i.e., *significance, coherence, orientation*, and *belonging* (37, 55). All four facets can be strengthened by the implementation of democratic values: Significance is the experience of mattering, of making a difference. Mattering is enhanced by being heard and seen, by being offered real possibilities of participation and attribution of responsibility [e.g., (95)]. Coherence is based on comprehensibility and consistency, which are mutually dependent: The more we understand about ourselves and our world, the better we can orientate our actions accordingly, thus creating coherence and consistency. In practical terms, it should be ensured that sufficient information also reaches those sections of the population who, for linguistic or infrastructural reasons, have no access to the usual channels. This might be the case for, e.g., migrant workers with little knowledge of German. Orientation refers to the direction pursued. The more clearly communicated and justified it is, the easier it is for citizens to position themselves. Here, it is of importance for governments to elaborate the societal norms and values it bases its decisions on, and how specific codes of practice—such as physical distancing and personal hygiene—as well as measures like economic lockdown concur with these values. Honesty and transparency in this regard will again affect coherence. Fourth, a sense of belonging can strengthen joint action when needed, and counteract a disintegration of society. The more citizens perceive themselves as part of society, or humanity, the more they will be willing to act responsibly. This should be kept in mind especially with regard to groups of people who consider themselves marginalized, and insignificant.

Finally, our data confirmed the importance of self-control as a buffer attenuating the link between COVID-19 stress and general mental distress. Being a top-down process, self-control is most likely when we know why we *should* modify or interrupt our desires. Again, modes of communicating governmental policies play a major role here. Some governments may choose to communicate in a way that induces fear, as has apparently been the case in Austria (96). Indeed, fear of COVID-19—also termed "functional fear"—has been established as a stable predictor of compliant behavior change (97). But, there are alternatives to this. When policy making is based on multi-perspective advice (covering, e.g., medical and social science, economy and philosophy), when policy communication is clear and substantiated, when citizens are invited to express questions and objections as, e.g., in round-table meetings or other forms of democratic participation [cf. (82)], then self-control is not obedience, but a possible outcome of informed personal decision.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Review Board (Psychology) of the University of Innsbruck. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

TS conceptualized the project and analyzed the data. TS and HK collected and interpreted the data, drafted and revised the manuscript, and read and approved the submitted version of the manuscript.

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The Psychosocial Fuzziness of Fear in the Coronavirus (COVID-19) Era and the Role of Robots

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The coronavirus disease 2019 (COVID-19) pandemic has prompted much research on the possible use of robots in different areas of intervention. One of them is related to the deployment of social robots to cope with different needs elicited by and depending on the emergency. According to a recent article published in *Science* (Yang et al., 2020, p. 1) "social robots could be deployed to provide continued social interactions and adherence to treatment regimens without *fear* of spreading disease." In this context, social isolation and quarantine—often significantly prolonged due to the duration of the infection—have plausibly exerted a negative impact on well-being and perhaps mental health, whose jeopardy was even more likely if a previous psychological vulnerability was present. If historically robots have been employed in dangerous and risky duties, presently, some of the most promising domains of robots' development also include rehabilitation, caring, and educational and clinic intervention. We are witnessing a shift from the concept of "robot as slaves" to "robots as companions, nurses, teachers…" that, in a word, behave, interact, and work "like us" (cfr. Marchetti et al., 2018). Yang et al. argue that social robots used to "adherence to treatment regimens without spreading of fear" need to be implemented following sophisticated human models, including mental states like emotions and beliefs, as well as the context and environment of the interaction (p. 2). In our opinion, the "environments" are the affordances strictly linked to survival in an evolutionary sense. The "context" is represented by everyday life socio-material and socio-cognitive cues. Furthermore, we believe that the implementation of social robots based on every possible human model cannot merely be the product of "a fusion of engineering and infectious disease professionals" (Yang et al., 2020, p. 2). The model would require an interdisciplinary perspective that includes also the contribution of psychologists. The recent pandemic has in fact laid the foundations for rereading our daily relationships from the point of view of not only human relations but also other agents, such as robots. In the present Opinion, we therefore suggest that the use of robots is not only a purely technical issue but also supported by important changes in the way we view relationships, particularly with those who are close to us. With this aim in mind, we focused on identifying some psychological components most subject to change due to the current global situation. Let's take, for example, the emotion of fear mentioned above. Fear will probably take (if not already has) a different form because of the virus. Fear is a primary (Ekman and Friesen, 1971) and adaptive emotion developed through evolution to enable coping with danger and ensure survival. Predators, contaminants, and invaders are the potentially dangerous enemies that are all risky variables toward which close relationships usually act as protective factors. In case of fear, the options for the individual are represented by the so-called "fight or flight" behaviors. On the relational level, it is the search for a secure base (Bowlby, 1988), where a place can be found for reassurance and affective supply. This tendency persists also in adulthood due to the transgenerational transmission of attachment patterns.

Nonetheless, COVID-19 pandemic confronted us with a scenario where "fear has no face." Now, it also involves close relationship partners, i.e., people who potentially are sources or recipients of care. This profoundly contrasts with a series of fundamental developmental achievements that make physical proximity the embodied prototype of psychological proximity. The individual undertakes a path in which the "known social other"/"unknown social other" dichotomy acts as an organizer of beliefs and attitudes, thus contributing to the construction of the Self as a distinct and separate entity from the Other. From a sensorineural point of view, the human baby is equipped to recognize and trustfully orient herself/himself toward primary figures of care and protection; it is precisely on this basis that trust is built in others and ourselves (Di Dio et al., 2019, 2020a,b; Manzi et al., 2020a,b). The so-called "anguish of the stranger" (Spitz, 1945; Schaffer, 1966) emerges around 8 months of age. It marks the distinction between the caregivers and all the others: before becoming a neutral agent that the child will observe and know, the "other" *per se* is perceived as scary (worthy of fear in other words). This step appears to be in line with the older child's behavior observed within the Strange Situation (a paradigm aimed at evaluating attachment; Ainsworth et al., 1978): the response of distress and fear toward the stranger, who is generally more accepted if the mother is at the child's presence, and the reactions toward whom are predicted by the security of the child's attachment to the mother. Later in life, the developing child can establish attachment bonds with other people in her/his life contexts: friends, schoolmates, relatives of the extended family, teachers, and educators in various contexts, from school to sports activities (Pianta, 1999). While the theoretical perspective of multiple attachments postulates that the widening of the "known social other" sphere is characterized by a differentiation of the functional roles played by multiple relationships, it maintains the fundamental developmental ability to identify the other as a "secure-safe social partner," distinguishing him/her from the "risky-unsafe social partner." The possibility to create multiple attachments prevents a series of developmental risks and acts as an enhancer of positive primary attachment relationships and as a vicarious protective factor in the conditions of relational affective fragility. Besides, not only are secure relationships with multiple figures—with the teacher, just to give an example—connected with the personal well-being within the affective sphere, but also with cognitive performance at school, as well as with socio-cognitive indexes like school climate, peer acceptance, and so on. In order to exert an enhancing-protective role, all these "others" (educators, teachers, relatives) have to be perceived as "besides me." The physical sense of "besides" —in its literal meaning—anticipates in development, and continues to support in the life span, the metaphorical sense of the human experience of psychological closeness and proximity. And it is precisely the impossibility to fully get the chances offered by the different meanings of "besideness" (physical proximity and security/safeness) that is responsible for the erosion of the feeling of being protected from fear within the contexts of affective bonds. Although technology allows us to be connected even when physically separated, the experienced loneliness and isolation largely reported during COVID-19 may depend both on the technological inability to embody affective relationships and perhaps also on more or less implicit awareness that "the known social other" (also my caregiver, daughter-son-teacher-girlfriend/boyfriend-teacher, educator) could be dangerous for me. Consequently, the pervasive mood of close relationships is no longer that of security but rather a widespread sense of fuzzy fear (Furthermore, if people reflect on the possibility of being an active agent of contagion for their beloved ones, the basic emotion of fear should be added to the complex emotion of potential fuzzy guilt). So, if in-group/out-group dynamics—up to the attitudes toward the "stranger" in a geographical and political sense (Antonietti and Marchetti, 2020)—are the result of this primary articulation according to which "known-familiar" equals to reliable and "unknown-unfamiliar" equals to potentially dangerous (danger from which—phylogenetically and ontogenetically—the "known-familiar" is in charge of protecting us), the effect of the fuzziness of emotions, and especially of fear on mental health in a stressful situation like the one represented by the COVID-19 pandemic, can be easily imagined. In fact, the COVID-19 pandemic implies the possibility of indiscriminate contagion by anyone, including those closest to us in a psychic sense. Because of this, it undermines the dynamics depicted above by eliciting an unprecedented form of fear, in which the boundaries between safety and risk fall. If infected, it is necessary to adhere to the rule of indiscriminate social distancing from everyone. The same applies if a relative is infected. The work of mercy to "visit the sick" cannot be accomplished, just as it is impossible to extend the final farewell to those who left us forever. In a word, COVID-19 has completely changed the physiognomy of security/trust/danger/risk and fear, suddenly destroying a bond that evolution and ontogenetic development have taken a long time to build. The feelings of neglecting if not abandoning the beloved ones, or to be neglected if not abandoned by them to ensure the protective purposes of social distancing, are not easy to be managed from a psychological point of view; the experience of isolation, loneliness, and the worry of being forgotten are difficult to explain and to make comprehensible for children as well as the elderly. This is to say that the erosion of the foundations of the distinction between "known-familiar-safe/unknown-stranger-unsafe" could vary according to the developmental phases of the individual as well as the status of experts/novices. In terms of developmental phases, the cognitive, social, and affective resources typical of specific ages allow children to assimilate and elaborate differently information about the virus, its effects, and the dangers of proximity to beloved people. On the other end, if viewed from the perspective of expert/novices status, which is partially connected with the developmental phases, to have reliable information or real scientific knowledge on the spread of the virus could help to better manage the effect of the new form of fuzzy fear. Going back to the role played by robotics within the psychological framework briefly outlined here, the use of robots may change depending on a series of factors that only the contribution of psychologists may help to highlight. First of all, the "like me experience," which represents the basis of acceptance/refusal of social robots, changes with age. Like the people's sense of people (to paraphrase Legerstee, 2005), also people's sense of social robots depends

on the development, as well as the aims and contexts, of the robots' use (Marchetti et al., 2018). For these reasons, it is fundamental that the design of social robots meant to be deployed in situations of "fuzzy fear" like the one we are experiencing not only includes the purposes of assistance, companionship, or tutoring associated with medical regimens but also takes the real role of "fear-free" mediators of affective functions. In this way, robots do not become substitutes for close relationship partners from whom social distancing separates us, but act as relational bridges between those who are separated for health and safety reasons. As an effect of this rethinking the functions of social robots in emergency situations, some current negative attitudes toward social robots—from resistance and ambivalence up to the uncanny valley phenomenon (Mori, 1970; MacDorman and Ishiguro, 2006)—could significantly change. To pursue the goal of designing useful social robots for the psychological needs described here (i.e., coping with fuzzy fear and taking advantage of robots as affective mediators), a deep, psychologically driven afterthought will be needed around three basic axes of reflection. The first two axes are more general. The first one regards the psychological understanding of people involved in human–robot interactions during a sanitary emergency in terms of level of development, socio-demographic characteristics, and previous experience with social robots (see the experts/novices distinction above). Expectations and attitudes toward social robots may in fact change according to both development and expertise. The second axis regards the construction of social robots that are able not only to take into account the needs of their human partners but also to relate with the human agent in an understandable way. This represents an extremely important feature that every human would expect from the interactive experience. The literature on robotics calls it "transparency"/"explainability" (Holzinger et al., 2019), which would correspond to the experience of the Theory of Mind (Perner, 1991; Wellman et al., 2001) in the domain of human–human interaction. The third axis of reflection relates to a goal that we hope to achieve in a not too distant future. Specifically, it concerns the identification of the best way to devise social robots that are able to sensitively manage and respond to the behavior of a human partner with a possible acute temporary breakdown in the ability to scaffold the sense of emotional security—like some of us during this COVID-19 emergency—that is the very basis of Self construction.

The theoretical reflections discussed in this Opinion reread therefore the question of fear in the light of a danger that poses new questions and that, as is suggested, leads to rethinking particular psychological and social dynamics. In reading the new relational dynamics hypothesized in the present work, from which the robot is spared, COVID-19 pandemics added novelty to the physiognomy of fear, which (unlike anxiety) is an emotion linked to objects and situational antecedents, and which may therefore be affected by the nature of its objects at the level of subjective experiences, behavioral reactions, as well as coping strategies. These theoretical suggestions may enrich knowledge from an interdisciplinary perspective, such as robotics and psychology, providing important starting points for future research by emphasizing which psychological components should be investigated in people interacting with robots. An example is the perception of in-group/out-group, as well as the components of fear that, in our opinion, are mitigated toward robots in the specific COVID-19 situation, which forces us to adapt to the inclusion of new social agents devoted to care assistance.

AUTHOR CONTRIBUTIONS

All authors contributed to the writing of the manuscript.

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PERSPECTIVE
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Psychological, Behavioral, and Interpersonal Effects and Clinical Implications for Health Systems of the Coronavirus (COVID-19) Pandemic: A Call for Research

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The novel coronavirus disease (COVID-19) emerged at the end of 2019 and was classified as a pandemic by the World Health Organization (WHO) on March 11, 2020. Both the COVID-19 emergency and the extraordinary measures to contain it have negatively affected the life of billions of people and have threatened individuals and nations. One of the main goals of clinical and health psychology during this pandemic is to investigate the behavioral, cognitive, emotional, and psychobiological responses to the COVID-19 emergency as well as to the preventive measures that have been imposed by governments to limit the contagion, such as social isolation. Psychological research has the responsibility to deliver sound empirical evidence to inform public health policies and to support and advise governments and policymakers in their introduction of sustainable, feasible, and cost-efficient prevention and intervention guidelines. Hence, the goal of this call for research is to stimulate theoretical discussions and empirical investigations on the bio-psycho-social impacts of COVID-19 for individuals, groups, and nations. We invite contributions that address the challenges that the COVID-19 emergency has imposed on couples, families, and social systems. In addition, we call for studies that assess the specific effects of the COVID-19 pandemic on highly vulnerable populations such as children, adolescents, pregnant women, patients suffering from chronic and life-threatening conditions, healthcare workers, and elderly citizens. Papers focusing on the impact of emotion regulation and coping strategies are encouraged. Original research, data reports, study protocols, single case reports and community case studies, theoretical perspectives, and viewpoints are invited to help improve our understanding of the COVID-19 pandemic.

Keywords: coronavirus, COVID-19, pandemic, clinical psychology, health psychology, mass reactions, resilience, emergency strategies

PAPER

The novel coronavirus disease (COVID-19) emerged at the end of 2019 and was classified as a pandemic by the World Health Organization (WHO) on March 11, 2020. COVID-19 is a respiratory disease with a very high transmissibility and mortality rate. Therefore, governments and health agencies declared public health emergencies. Indeed it is very important to take into account that people are facing an unprecedented situation. For example, in several countries (e.g., Italy, Spain, Germany, and Turkey), this pandemic has led to a lockdown and quarantine of the entire country.

Obviously, both the COVID-19 emergency and the extraordinary measures to contain it have negatively affected the life of billions of people. The COVID-19 pandemic has threatened individuals, nations, and international relationships. Therefore, the WHO has issued guidelines for managing to contain, mitigate, and limit the horrendous negative impacts of this pandemic. However, it is our contention that psychological preventive and therapeutic measures are just as crucial in facing the COVID-19 pandemic.

Thankfully, academic and social institutions around the world have offered online platforms to provide psychological counseling for confirmed patients, patients with suspected infection, quarantined family members, at-risk individuals, healthcare workers, and first responders. Online mental health services could provide cheap and feasible solutions, taking into account the enormous bio-psycho-social costs of the pandemic (Duan and Zhu, 2020; Liu et al., 2020; Xiang et al., 2020).

One of the main goals of clinical psychology and health psychology during and in the aftermath of this pandemic is to investigate the behavioral, cognitive, emotional, and psychobiological responses to the COVID-19 emergency and to the preventive measures that have been imposed by governments to limit the contagion, such as social isolation. In addition, psychological research must deliver sound empirical evidence to inform public health policies and to support and advise governments and policymakers in their introduction of sustainable, feasible, and cost-efficient prevention and intervention guidelines. Hence, the goal of this call for research is to initiate and stimulate theoretical discussions and empirical investigations on the bio-psycho-social impacts of COVID-19 for individuals, groups, and nations. Furthermore, we invite contributions that address the challenges that COVID-19 has imposed on couples, families, and social systems. In addition, we call for studies that assess the specific effects of the COVID-19 pandemic on highly vulnerable populations such as children, adolescents, pregnant women, patients suffering from chronic and life-threatening conditions, healthcare workers, and elderly citizens. Papers addressing the impact of emotion regulation (De Giorgio, 2016) and coping strategies are encouraged. Even when people face the same stressor all over the world, individuals differ enormously at multiple levels, from degrees of exposure to appraisal and coping ways, as well as in their social, family, and work settings, which can moderate as well as mediate the effect of the COVID-19 emergency on people's health and well-being.

The broad scope of this call for research allows us to invite papers that address the use of new technologies for the implementation of psychological prevention and protocols in healthcare, clinical, social, educational, and work settings, including telepsychology and mHealth-based experiences (Castelnuovo et al., 2015; Smith et al., 2020), taking into account that physicians and psychologists around the globe have been forced to modify their traditional settings to provide online and remote services (Castelnuovo, 2017).

Moving from a deficit-oriented approach toward a positive psychology of trauma and loss, we also encourage papers that address the COVID-19 emergency as a "chance" to foster individual coping skills, enhance social relations, modify healthcare systems, and fight health disparities—for example, reducing preventable differences in the burden of disease, such as considering and supporting elderly patients or other frail populations.

Particular attention has to be dedicated to those patients severely affected by COVID-19 and those who require hospitalization. According to Jiang et al. (2020), the psychological needs of various groups could differ: "the guiding principles divide the population affected by NCP (new coronavirus pneumonia) into 4 levels and require the first-level population to be the focus of PCI (psychological crisis intervention) (Chinese Society of Psychiatry, 2020; Ma et al., 2020):

(1) Patients with severe symptoms of NCP, front-line medical staff, CDC researchers or administrative staff;
(2) Patients with mild symptoms of NCP, close contacts, suspected patients, or patients with fever who come to the hospital for treatment;
(3) People related to the first- and the second-level populations, such as family members, colleagues, or friends and rescuers, such as commanders, administrative staff, or volunteers;
(4) People in affected areas, susceptible groups, or the general public" (pp. 2 and 3).

In summary, original research, data reports, study protocols, single case reports and community case studies, theoretical perspectives, and viewpoints are invited to help improve our understanding of the psychological, social, and behavioral correlates of the COVID-19 pandemic.

The important subject areas of this research topic include:

- Individual, family, and interpersonal coping with the COVID-19 emergency,
- Risk factors for psychological distress at the individual, family, interpersonal, and cultural level (e.g., activity restriction and reduction of pleasant events, personality traits, hypochondria and cyberchondria, mental disorders, family characteristics, social support, high relational mobility or very low tightness, bereavement, social isolation, etc.),

- Impact of mass media and social media on psychological attitudes and behaviors in the context of the COVID-19 emergency,
- Coping as a health professional during the epidemic (e.g., emotions, psychological burdens, anxiety, traumatic experiences, post-traumatic stress disorder),
- Clinical and health-based psychological interventions for sufferers, high-risk individuals, and those living in worst-hit communities,
- Clinical emergency protocols to manage mental health problems: evidence-based suggestions and recommendations to governments and policymakers,
- Behavior-change interventions to improve adherence to and compliance with preventive regulations and guidance,
- Internet interventions, remote psychological support, mHealth–eHealth-based treatments, and psychology-oriented digital tools and apps in the COVID-19 emergency,
- Monitoring changes in psychological, behavioral, and interpersonal responses to the COVID-19 emergency over time, and
- Cross-cultural comparisons in responding to and coping with the COVID-19 emergency at the individual, family, and interpersonal levels.

Rapid response by the psychological scientific community is necessary; thus, due to the exceptional nature of the COVID-19 situation, Frontiers is waiving all article publishing charges for COVID-19-related research.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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BRIEF RESEARCH REPORT
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Impact of COVID-19 on Online Gambling – A General Population Survey During the Pandemic

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The COVID-19 pandemic may have severe impact on mental health, and concerns have been raised about potentially increased online behavior and possibly increased gambling problems, such as in sports bettors at risk of transfer to even riskier forms of gambling during sports lock-down. Given the need for objective data about gambling behavior during the pandemic, the present analysis, from a project assessing online gambling in Sweden, aimed to study past-30-day gambling patterns in online gamblers in Sweden. The study, carried out in May, 2020, during the pandemic and its restrictions on society, included past-year online gamblers (N = 997). Past-30-day gambling for several gambling types was lower compared to a previous study in online gamblers in the same setting, while online non-sports gambling remained at high levels. Those reporting sports betting even during a period with decreased sports betting occasions proved to have markedly higher gambling problems. COVID-19 may alter gambling behaviors, and online gamblers who maintain or initiate gambling types theoretically reduced by the crisis may represent a group at particular risk.

Keywords: COVID-19, gambling disorder, problem gambling, behavioral addiction, online gambling, sports betting

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INTRODUCTION

The COVID-19 pandemic has raised a number of issues related to health, beyond the most urgent and life-threatening consequences. The risk of mental health consequences has been highlighted (Holmes et al., 2020), and this also includes a risk of increased online behavior, such as increased video gaming (King et al., 2020) or addictive internet use (Sun et al., 2020).

Likewise, concerns have been raised about COVID-19-related consequences on gambling behavior. Problem gambling and the gambling disorder represent conditions which are globally widespread; past-year problem gambling has been reported to occur in between 0.1 and 5.8% of the general population across different countries and continents (Calado and Griffiths, 2016). The gambling disorder is associated with severe financial, social and psychological consequences, including psychiatric comorbidity, but can be treated, primarily with cognitive-behavioral therapy and motivational interventions (Potenza et al., 2019).

It has been documented in previous national financial crises that these may affect gambling behavior (Economou et al., 2019), although experiences from such crises are somewhat inconclusive (Olason et al., 2015). The COVID-19 crisis, and the confinement and other restrictions associated with it, represent a previously unseen situation with both financial consequences for the population, other changes to the labor market, schooling and leisure activities. These changes include an

increase in the time spent at home, possibly more time spent online, a risk of increased worry about the future, and may potentially affect gambling behavior (Håkansson et al., 2020).

One specific circumstance is the substantial change in the gambling market itself, as virtually all sports typically subject to sports betting disappeared during a significant period of time (Håkansson et al., 2020). Given the possible effects on other types of online behavior from COVID-19-related confinement (King et al., 2020; Sun et al., 2020), it may be hypothesized that some gambling types would be more favored than others, whereas others may decrease (Håkansson et al., 2020). Sports betting is one of types of gambling known to increase the risk of problem gambling, and represents the second most common gambling type reported by treatment-seeking gambling disorder patients in the present setting (Håkansson et al., 2017). One concern is that given the large impact on sports during the pandemic, due to lockdown regulations and canceled events (Radio Sweden, 2020), people with otherwise predominating sports betting habits would turn to gambling types with potentially even higher addictive potential, such as online casino games or other online-based gambling, due to the lack of sports events and land-based gambling opportunities (Håkansson et al., 2020). Early in the pandemic, fear of such a transition within the gambling market led politicians to take legal action, such as through a limit to gambling advertising (SBC News, 2020), or other proposed limits to the extent of online gambling (Reuters, 2020). Sweden, the setting studied here, is one of the countries where the online gambling market is strong and online gambling is common among treatment-seeking patients (Håkansson et al., 2017; Håkansson and Widinghoff, 2020), which contributes to the perceived risk of further online gambling predominance during COVID-19. The fear of a transition to online gambling is supported by the general impression of online gambling being more addictive (Chóliz, 2016).

However, so far, population data are very limited with respect to actual gambling habits during the COVID-19 crisis. A previous general population study (including both gamblers and non-gamblers) in Sweden found a modest percentage reporting an increased gambling behavior during the crisis. As a response to decreased sports events, a minority reported either turning to other remaining sports events, online casino, or horse betting. In total, those reporting an increase in their gambling behavior were more likely to be problem gamblers (Håkansson, 2020). From a population survey in Ontario, Canada, it was reported that during the first weeks of lockdown of physical facilities such as land-based casinos, a substantial migration appeared to have occurred from land-based-only gambling to online gambling (Price, 2020).

Given the theoretically increased role of online behaviors (King et al., 2020; Sun et al., 2020), and the cancelation of sports activities, the present study focused on people reporting to be online gamblers. For the present study, data were derived from a population study on gambling behaviors, designed prior to the COVID-19 crisis as a web survey which was carried out during the month of May, 2020, i.e., during the ongoing crisis. This sub-study used the past-30-day data in order to describe gambling patterns during COVID-19.

The aim of the present study was to describe past-30-day use of different gambling types during the COVID-19 pandemic in individuals defined as online gamblers, in order to enable a comparison with past-30-day data reported from a previous survey in online gamblers carried out in 2018. In particular, given the considerable changes in sports world-wide, the study also aimed to assess whether online sports bettors still reporting past-30-day sports betting differed from those who did not. Here, it was hypothesized that past-30-day gambling in Swedish online gamblers would be more common (in relation to a measure of past-year gambling behavior) for some gambling types, such as online casino or other online-based gambling types likely to be unaffected by the COVID-19 constraints, compared to gambling types more clearly affected by the pandemic. Also, it was hypothesized that people who maintained gambling during the crisis, particularly for gambling types such as sports betting believed to be reduced during COVID-19-related restrictions, would present other characteristics than other online gamblers.

METHODS

Study Design

The present analysis is a partial analysis from a larger study on online gambling in Sweden. This sub-analysis focuses on past-30-day and past-year gambling patterns in Swedish online gamblers, in order to highlight the online gambling situation during the ongoing COVID-19 crisis. The overall study was designed prior to the COVID-19 crisis, and aimed for a larger number of analyses of the online gambling behavior in the setting. As a past-30-day measure for different gambling types is available, this subset of data was used for the present analysis. The survey was carried out from May 5 to 12, such that the 30-day period for each participant refers to a period well within the period of time when constraints due to COVID-19 were actively ongoing, and during that whole 30-day period, sports betting related to major sports events, such as major soccer leagues, were completely canceled. The study data was collected using the same inclusion criteria and the same methodology as in a previous study carried out in 2018, and which previously has reported associations between specific types of online gambling patterns and problem gambling and indebtedness (Håkansson and Widinghoff, 2020).

The study was reviewed by the Swedish Ethical Review Authority (file number 2020-00364), which expressed that the study did not formally require ethical permission according to Swedish law, as it does not deal with data that can be directly or indirectly linked to a specific individual, and also expressed no ethical concerns with respect to the study. The study was opened only after a participant provided informed consent. Participation in the study was paid following the credit system used by Ipsos for other studies, and where a survey of the present extent and duration is rewarded with credit points corresponding to a value of around 1.50 Euros within the credit system of the company.

Setting

The present study took place in Sweden, where gambling, since January 1st, 2019, is regulated in a license-based system, with

a large number of licensed operators. Land-based casinos and land-based electronic gambling machines are run by a state-based monopoly, whereas betting on sports and horse racing, online casino and bingo games, as well as land-based and online lotteries, are subject to competition between a number of operators. A large percentage of the gambling advertisements seen in television promote online gambling, with online casino representing the largest share of these commercial messages (Håkansson and Widinghoff, 2019). Likewise, a majority of treatment-seeking gambling disorder patients report online casino as their predominating gambling type, with sports betting being the second most common type (Håkansson et al., 2017). Slightly below 1.5% of the general population are believed to be problem gamblers, with an increase reported to have occurred particularly in women, according to official general population survey data (BBC, 2019). During the period analyzed in the present study, sports events on competitive level in Sweden were canceled, whereas land-based horse track racing continued, although without present audience but available through wagering online. Likewise, the four major land-based casinos, all owned by the state monopoly, were closed.

Participants

The present study aimed to include past-year online gamblers. The sample addressed were web panel members of a Swedish market survey company, Ipsos, i.e., individuals already enrolled with that company's web panel, and typically receiving market surveys and political opinion polls. The same methods and the same recruitment strategy were used in a previous study assessing online gamblers in Sweden, recruited through the same web survey company and with the same screen-out question (Håkansson and Widinghoff, 2020). Participants of the web panel are regularly addressed with offers to participate in different surveys. In this case, they were included with the question "if you think about the past 12 months, how often have you gambled on sports betting or online casino games?" with the options to respond "don't gamble on sports betting or online casino," "1–4 times," "5–9 times," "10 times or more," or "unsure/don't know." Only individuals responding "10 times or more" were further considered in the study. The study had the intention to include 1,000 individuals. When closing the study, 1,007 individuals had answered the survey. For 13 of them, at least one of the nine items of the gambling severity instrument (PGSI, see below) were missing, and therefore could not be categorized in a gambling severity category. Three of them, however, had a total value already reaching above the cut-off for the highest problem level in that instrument (eight points or more) from the available items, and were accordingly categorized into that highest problem gambling category and included in the study. The remaining 10 individuals were excluded from further analyses (based on the uncertainty of their problem gambling status), such that a final sample of 997 individuals were included in the study.

Measures

Patterns of recent gambling was measured for each of the gambling types included, asking for whether that gambling types had been used (1) during the past 30 days, and if not (2) at any time during the past-year (gambling types assessed were online casino, land-based casino, online horse betting, land-based horse betting, sports live betting, sports non-live betting, online poker, land-based poker, land-based electronic gambling machines, online bingo, and gambling within video games). Thus, respondents endorsing the past-30-day item were not asked about the period of time prior to the past 30 days. Individuals reporting any past-year gambling for a gambling type, but not past-30-day gambling for that type, were compared to those reporting past-30-day gambling (non-recent vs. recent gamblers). As no comparable 30-day period was available for comparison, the proportions of past-year gamblers who reported past-30-day gambling, for each gambling type, were used as a measure of the extent to which different gambling types were affected by the COVID-19 period. Problem gambling severity was measured using the Problem Gambling Severity Index (PGSI), a nine-item scale (Wynne and Ferris, 2001) frequently used for the measure of a hazardous or problematic gambling behavior, with questions asked with a time frame of the past 12 months. The same instrument was used, among other studies, in the preceding study on online gamblers in the present setting (Håkansson and Widinghoff, 2020). As in previous research, respondents were categorized as having no risk gambling (0 points), low risk gambling (1–2 points), moderate-risk gambling (3–7 points), or problem gambling (8 points and above). Gender and age (the latter in age groups) were reported, as well as living conditions (categories collapsed into living alone without children vs. not living alone) and occupation (categories collapsed into working/studying vs. unemployed/retired/sick-leave). Also, it was reported whether the individual had ever self-excluded from gambling through the national self-exclusion system *Spelpaus*[1], a governmental authority-based system introduced in Swedish gambling legislation since January 1st, 2019, and which allows a person to self-exclude for a duration of up to 12 months (with the possibility of prolongation) from all legal (licensed) gambling operators in the country.

Statistical Methods

Sample characteristics and gambling patterns were reported as descriptive data. Also, for each gambling type, descriptive data report the percentage of past-year gamblers for that gambling type who report having used it during the past 30 days. Past-30-day gamblers—for each gambling type—were compared to non-30-day past-year-gamblers for that gambling type, using chi-square analyses.

RESULTS

Seventy-five percent of respondents were men, and a majority were either working or retired. In total, 7% had a history of self-exclusion from the *Spelpaus* system. Fifty-two percent had no risk gambling according to the PGSI measure, 23% had low-risk gambling, 15% were moderate-risk gamblers, and 10% were

[1] spelpaus.se

TABLE 1 | Characteristics of included individuals (N = 997).

	n (%)
Male gender	744 (75)
Age groups (years)	
18–24	11 (1)
25–29	45 (5)
30–39	134 (13)
40–49	162 (16)
50–59	265 (27)
60–69	217 (22)
70 and above	163 (16)
Living conditions	
Alone with children	70 (7)
Alone without children	246 (25)
With partner and children	304 (30)
With partner without children	363 (36)
With my parents	14 (1)
Occupation	
Working	600 (60)
Studying	18 (2)
Unemployed	38 (4)
Retired	309 (31)
Other	32 (3)
History of national self-exclusion	
Yes	66 (7)
No	925 (93)
Wish not to answer	6 (1)
Gambling severity	
No risk	514 (52)
Low risk	230 (23)
Moderate risk	154 (15)
Problem gambling	99 (10)

problem gamblers. A full description of the characteristics of the study sample is found in **Table 1**.

In women (n = 253), 17% were moderate-risk gamblers and 20% were problem gamblers (a total of 37%), and in men (n = 744), the corresponding percentages were 15 and 6 % (total 21%, $p < 0.001$ for gender difference, chi-square linear-by-linear).

Patterns of Past-30-Day Gambling

Expressed as the percentage of past-year gamblers who gambled during the past 30 days, for each gambling type, this ratio of past-30-day gambling was the highest for online horse betting (90%), online casino (81%), online poker (74%) and online bingo (72%), as well as for the less frequent gambling within video games (86%), but lower for sports live betting (58%), non-live sports betting (56%), electronic gambling machines (46%), land-based horse gambling (42%), and land-based casino games (26%, **Table 2**).

For those reporting past-30-day gambling, compared to those denying that but reporting past-year gambling for the same gambling type, being a moderate-risk or problem gamblers was significantly more likely among the recent gamblers for land-based casino gambling, land-based electronic machine gambling, and for any sports betting, but less likely for online horse betting. The past-30-day gamblers for online casino and land-based poker were significantly more likely to be female, whereas the recent online horse bettors were significantly more likely to be men (**Table 3**). The percentage of respondents in active work or studying were lower in recent gamblers for online casino (68 vs. 86%, $p < 0.01$) and for online horse betting (59 vs. 74%, $p = 0.02$), whereas no significant differences were seen in other gambling types (data not shown).

Characteristics of Past-30-Day Sports Bettors Compared to Past-Year Sports Bettors

Among respondents reporting any sports betting during the past-year (n = 619), those who reported past-30-day sports betting (n = 400) were more likely to report past-30-day online casino gambling (30 vs. 22%, $p < 0.05$), land-based casino gambling (5 vs. 0%, $p = 0.001$), online poker gambling (22 vs. 11%, $p < 0.001$), land-based poker gambling (8 vs. 3%, $p = 0.001$), land-based electronic gambling machines (9 vs. 1%, $p < 0.001$), online bingo (18 vs. 12%, $p < 0.05$), and gambling within video games (11 vs. 4%, $p < 0.01$), while there were no significant differences regarding other types of gambling. Those who reported past-30-day sports betting were more likely to have a history of indebtedness (11 vs. 6%, $p = 0.04$), and had higher levels of gambling problems ($p < 0.001$, linear-by-linear, with the proportions of moderate-risk and problem gamblers being 18 and 13% vs. 16 and 5% vs., respectively). Instead, they did not differ with respect to gender, age, history of self-exclusion, living alone without children, or currently in work/studies (data not shown).

DISCUSSION

The present study is among the first studies reporting recent online gambling data from the COVID-19 crisis. The present study included online gamblers, and focused on the characteristics of those reporting or not reporting recent gambling, in a situation with a changing gambling market where all major sports events had been canceled world-wide. Thereby, the study attempts to shed light onto the discussion about whether the dramatic changes in the society during COVID-19 could affect gambling among online gamblers. In summary, it can be concluded that online gambling types were more common compared to their past-year rates than were the land-based gambling types. Importantly, sports bettors who did report sports betting even during this period, where such betting in the society was assumingly rare, had a very high degree of gambling problems and indebtedness, and gambled more. There was no indication that past-year sports bettors who denied betting in the recent COVID-19-affected period would have an increased gambling on other types of gambling. However, online horse bettors appeared to have a lower degree of gambling problems if they were recent gamblers, such that the characteristics of this group of gamblers may have been different during the pandemic than in the months prior to that.

TABLE 2 | Reporting of any past-year gambling (past 30 days or past-year prior to past 30 days), and past-30-day gambling, for all gambling types (*N* = 997).

	Total, any past-year gambling (past-year or past 30 days), percent of all study participants, n (%)	Past-30-day gambling, n	Past-30-day gambling, proportion of all past-year gamblers (past-30-day gambling + other past-year gambling), %
Sports live betting	474 (48)	277	58
Sports non-live betting	495 (50)	279	56
Total: Any sports betting	*619 (62)*	*400*	*65*
Online casino	381 (38)	310	81
Land-based casino	81 (8)	21	26
Online horse betting	646 (65)	584	90
Land-based horse betting	291 (29)	123	42
Online poker	178 (18)	131	74
Land-based poker	87 (9)	45	52
Land-based electronic gambling machines	113 (11)	52	46
Online bingo	220 (22)	159	72
Gambling within video games	78 (8)	67	86

TABLE 3 | Comparison of recent (past-30-month) gamblers and past-year (non-recent) gamblers for each gambling type (*N* = 997), chi-square analyses.

	Moderate-risk or problem gambling			Male gender		
	Past-30-day gamblers (%)	Non-30-day (but past-year) gamblers (%)	*p*-value	Past-30-day gamblers (%)	Non-30-day (but past-year) gamblers (%)	*p*-value
Sports live betting	36	22	0.001	83	84	0.76
Sports non-live betting	28	22	0.12	87	83	0.19
Total: Any sports betting	*30*	*20*	*<0.01*	*84*	*80*	*0.23*
Online casino	49	41	0.21	55	76	0.001
Land-based casino	81	47	<0.01	57	67	0.43
Online horse betting	23	35	0.03	80	68	0.03
Land-based horse betting	28	24	0.53	78	82	0.46
Online poker	50	38	0.18	73	81	0.26
Land-based poker	58	43	0.16	64	83	<0.05
Land-based electronic gambling machines	69	41	0.003	62	69	0.42
Online bingo	51	46	0.50	53	51	0.73
Gambling within video games	58	73	0.36	63	55	0.61

In the current study carried out during the COVID-19 pandemic, the rates of 30-day gambling in the present study can be compared to the findings of a previous study with the same methods for recruitment, carried out in 2018 (Håkansson and Widinghoff, 2020). In that study, the gender distribution was virtually the same as here (78% men in the previous study), whereas in the present study, participants tended to be older; in the previous study, 4% were in the youngest age group (1% here), and 14 and 8% were in the two oldest age groups (22 and 16% here). In the present study, past-30-day gambling was comparable to the previous study for online casino (31 vs. 34% in the previous study) and online bingo (16% in both studies), whereas gambling types which were lower in the present study include land-based casino gambling (2 vs. 9% in the previous study), land-based horse betting (12 vs. 22%), live sports betting (28 vs. 54% in the previous study) and non-live sports betting (28 vs. 60% in the previous study), land-based electronic gambling machine gambling (5 vs. 10% in the previous study), and online poker (13 vs. 18% in the previous study). Instead, past-30-day gambling in the present study was higher for online horse betting (59 vs. 40% in the previous study). While respondents in the present study tended to be older, the data still describe clearly that land-based gambling types were markedly lower this time, whereas the percentages for online casino and online bingo appeared to be unchanged during the COVID-19 situation. Thus, although movements between gambling types cannot be analyzed here, the present data confirm the hypothesis that during the pandemic, some gambling types are more likely maintained than others, in line with the reported changes to the gambling market during the pandemic, whereas other types are more likely affected. For example, a low reporting of land-based casino gambling was far from surprising, as the major official casinos were closed during the study period, although smaller restaurant-based casinos may still be operating in many places in the country. This is consistent with the description of a relatively substantial migration of gamblers from land-based gambling

opportunities to online gambling during casino lockdown in Ontario, Canada (Price, 2020).

The higher degree of gambling problems and indebtedness in past-month gamblers were consistent with the hypothesis that in times where gambling of some types is scarce, those who still engage in that gambling type differ from those who do not. In this context; in times when sports betting is scarce, those who still bet on the reduced amount of sports are likely to have more severe gambling problems. In a recent general population study, a minority of respondents reported that the reduced sports betting opportunities made them gamble on other sports events than they usually do (Håkansson, 2020). In the present study, land-based gambling options, such as casino and gaming machine gambling in the land-based modality, also displayed the same pattern. Thus, even though this was a sample recruited for their online gambling patterns; those who did report recent gambling on the markedly reduced land-based gambling types, had more severe gambling problems. In COVID-19 and potential future similar crises, preventive efforts and interventions should address individuals who maintain gambling behaviors which are abandoned by a majority due to physical and legal restrictions.

Sports betting was far from inexistent even during the weeks when the global restrictions from COVID-19 were the largest, such as during confinement in many countries. Here, it should be borne in mind that individuals were recruited based on their past-year gambling online on 10 occasions or more, i.e., they are likely to be a high-risk sample with respect to online involvement and intense gambling patterns, as supported by a previous study using the same recruitment strategy (Håkansson and Widinghoff, 2020). Thus, the present study may capture a group with particularly pronounced involvement in gambling and low tendencies to give up gambling completely. Also, it is clear that despite the nearly total lock-down of well-established sports world-wide, some sports events still did occur. For example, there have been reports of low-tier soccer games receiving disproportional attention on betting sites, which has been highlighted mainly in the context of fears of fraud (match-fixing). However, besides this type of amateur-level sports events still happening (SBC News, 2020), some nations' soccer leagues, otherwise unseen in the global media, continued; the Belarus soccer league, for example, received some attention as it remained available for legal sports betting (The Guardian,, 2020). Therefore, again, despite a very large decrease in sports-related gambling opportunities world-wide, individuals who stick to the few gambling options left on the market may be a group presenting particularly high risk of gambling problems.

It has been discussed whether specific other gambling types would attract new users because of the COVID-19, with the fear that some gambling types would put ex-bettors into more addictive gambling because of turning to other than the preferred gambling type. In the present study, for most gambling types, the past-30-day gamblers either did not differ from past-year gamblers, or had a higher degree of gambling problems, such as for sports betting (as discussed above), land-based electronic gambling machines, or land-based casino. It is difficult to know whether the enhanced gambling problems in these recent gamblers are due to a recent increase because of the pandemic, or simply because frequent gamblers are more likely to report recent gambling compared to a person who gambles only occasionally, and therefore likely with a lower degree of problems.

Interestingly, however, one specific gambling type demonstrates the opposite trend; online horse bettors had significantly less gambling problems if they reported past-30-day use, compared to past-year users with no recent use of that type. Although this was measured in a limited sample and can be subject to confounding factors unknown here, it can be hypothesized that this specific gambling type has attracted individuals during the pandemic who have less gambling problems and who typically do not engage in horse race betting, such as if a move had happened from other more pandemic-influenced gambling types to this one. The relatively high reporting of online horse betting (and higher than in our previous study from the same setting) is in line with media reports of a sharp increase in horse wagering during the crisis (Financial Times, 2020), and with the previous reporting from the general population in Sweden that the ratio of individuals increasing/decreasing their horse wagering was unsurprisingly higher than for sports betting which was largely canceled (Håkansson, 2020).

In contrast to the association with gambling problems (and indebtedness), it is interesting to note that employment status, or living alone, were factors unrelated to the reporting of recent sports betting; thus, this study gives no support to the idea that living conditions or a labor situation affected by the crisis may change gambling patterns. However, this issue would require more research, including more detailed and in-depth analyses including longitudinal study designs, and likely would merit from a longer time frame to study than only the weeks of crisis preceding this study.

The present sub-analysis, describing sports betting and other gambling behaviors in online gamblers during a unique change to the society and to the gambling market, may have implications in immediate association with the COVID-19 crisis. For the remainder of the acute and sub-acute phases of the pandemic, those who bet even on a scarce betting market may be more likely to have gambling problems and should be particularly approached by responsible gambling strategies. Likewise, both in the short and long run, the present findings call for more research following gamblers over time during and after the pandemic, and particularly interventions research testing methods to prevent excessive gambling in the context of this crisis. Such interventions may involve legal constraints on gambling types perceived to be particularly hazardous, in particular rapid online games, such as the limitation of advertisements or deposit limits suggested by policy makers in some settings (Reuters, 2020; SBC News, 2020). The actual effect of such interventions remains to be studied. Interventions may also involve an increased awareness in mental health care or social support settings, where hazardous gambling patterns can be screened for in times of a financial crisis. Although the world has never seen a crisis similar to the

present one, study implications may also be relevant to other crises of a magnitude affecting many parts of society, including the world of sports and gambling. Also, again, it puts attention to the importance to address the role of gambling in sports; for example, previous research has shown that elite athletes (Grall-Bronnec et al., 2016) may have a higher risk of being problem gamblers.

In the present study, problem gambling was more common in women. While this may be a surprising finding in relation to most previous research, where a majority of problem gamblers are male (Tavares et al., 2001; Díez et al., 2014; Calado and Griffiths, 2016; Edgren et al., 2017). However, in the present setting, female problem gambling may have increased in recent years (Svensson and Romild, 2014; BBC, 2019), and the gender distribution of the whole sample and the sub-sample with moderate-risk or problem gambling is consistent with the previous study using the same methodology (Håkansson and Widinghoff, 2020).

The present study has limitations; it relies on self-report data collected through a market survey company, which may limit the preciseness of reported data. The present study had the intention to include online gamblers, i.e., individuals with a certain degree of online gambling behavior (ten or more occasions during the past-year), given the high prevalence of online gambling and in order to provide a new measure to compare to a previous online gambling study carried out in the present setting (Håkansson and Widinghoff, 2020). Therefore, the present findings cannot be readily generalizable to samples of typical land-based gamblers (but also was not intended to do so), and were studied in only one country (where online gambling is common in problem gamblers, Håkansson et al., 2017), and may not be generalizable to settings where online gamblers represent a smaller proportion of the overall population gamblers. While some key figures were comparable to the previous study in online gamblers in Sweden, the study can only claim to be representative of web panel-recruited online gamblers, and not to represent the whole population of land-based gamblers as well. While lock-down decisions due to the COVID-19 pandemic clearly affected other types of land-based gambling that gambling related to sports, the sample assessed here was included because of their past-year online gambling, making conclusions more difficult to draw conclusions about populations who may have had only a land-based casino gambling, for example.

Likewise, data rely on self-report rather than on objective measures of actual gambling, which, however, would have been difficult given the large number of gambling operators available in the area. It is also not possible to establish, from the present data, whether an individual's recent gambling represents an initiation or an increase in gambling, or even an individual's typical pattern of irregular or rare gambling which happened to occur during the past 30 days prior to taking the survey. Related to this, another limitation is the cross-sectional study design, i.e., the lack of a possibility to follow each individual's changing gambling pattern over time. However, the present analyses aimed to assess the gambling patterns in online gambling during the most acute phases of the pandemic in the present setting, but future follow-up studies are planned using the same type of recruitment, and can provide new measures of how gambling behaviors may alter in post-acute phases of the pandemic. Overall, the results of the present study call for new data collections in this and other geographical settings, and in different pandemic phases. Despite these limitations, the present sub-study from a structured web survey dataset of online gamblers, is one of the first and one of the few studies reporting gambling involvement actually happening during the COVID-19 crisis.

In conclusion, the present study has implications of relevance to stakeholders in the gambling policy area and in preventive and treatment work in problem gambling. People reporting sports betting in times when the world of sports is dramatically altered due to the pandemic may be at higher risk of problem gambling than other sports bettors, and should be a group to address for prevention and intervention. Online casino and bingo gambling appear to less affected by the COVID-19 crisis, while land-based gambling in these online gamblers appeared to be more scarce, and online horse betting was the only gambling type more commonly reported than in a corresponding previous dataset. The present findings add to the knowledge about online gambling, and to the need to address online gambling as one of the potential health hazards in the aftermath of the COVID-19 pandemic.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Swedish Ethical Review Authority. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AH was the sole author of the present manuscript, and the responsible of the research idea, the planning and ethics application of the study, as well as statistical analyses and writing of the manuscript.

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frontiers in Psychology

BRIEF RESEARCH REPORT
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Psychological Behavior of Frontline Medical Staff in the Use of Preventive Medication for COVID-19: A Cross-Sectional Study

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Purpose: To understand the current pandemic, levels of anxiety in frontline staff, and whether they have been using medication to prevent COVID-19.

Methods: Between January 10 and March 10, 2020, 290 frontline staff completed a questionnaire incorporating the Generalized Anxiety Disorder Scale 7 (GAD-7) to indicate their psychological behavior in the use of preventive medication.

Results: Of those who participated in the study, 77.6% used preventive medication, with 47.5, 40.9, and 11.6% using these as part of routine preventive treatment, to fight infection after it was contracted, and after occupational exposure, respectively. There was a statistically significant relationship between the anxiety scale scores and the frequency of medication use ($P < 0.05$). Comparative analyses revealed that the scores of those in the group taking medication after occupational exposure (to respiratory and blood-borne pathogens) were significantly different from other groups. The proportion of participants choosing Western medicine, traditional Chinese medicine, and integrated Chinese and Western medicine was 24.4, 28.0, and 47.6%, respectively. Additionally, the relationship between the anxiety scale scores and the three types of medication was statistically significant ($P < 0.05$), as was the difference between Western medicine and other groups. According to Multinomial logistic regression based on the adjustment to gender, age, educational level, marital status, current workplace, and profession, participants with moderate to severe anxiety, had higher odds (*OR* = 10.331, 95%CI:1.453–73.429) of using Western medicine than participants with no anxiety. Participants with moderate anxiety were 6.399 times more likely to use an integrated combination of traditional Chinese and Western medicine compared to those with no anxiety (*OR* = 6.399, 95%CI:1.007–40.658). Furthermore, those with mild anxiety were 2.656 times more likely to use integrated traditional Chinese and Western medicine than those with no anxiety (*OR* = 2.657, 95%CI:1.075–6.570). The probability that frontline medical staff with moderate anxiety took preventive medication after occupational exposure to COVID-19 was 8.066 times (*OR* = 8.066, 95%CI:1.043–62.353) higher than that of staff without anxiety.

Discussion: This study revealed that there was more anxiety among frontline medical staff who took medication after unexpected occupational exposure. There was less anxiety among those using an integrated course of Chinese and Western medicine than Western medicine alone. It was also observed that anxiety affects the types and frequency of the preventive medication taken. Frontline medical staff who suffer from anxiety are also more likely to use medication to prevent COVID-19.

Keywords: COVID-19, preventive medication, combined Chinese and Western medicine treatment, psychological, medical staff in fighting against COVID-19

INTRODUCTION

Coronavirus disease (COVID-19) is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It was first identified in December 2019 in Wuhan, China. A worldwide pandemic ensued, and a global state of emergency has been declared, with over 200,000 COVID-19 cases confirmed in 166 countries and regions by March 18, 2020 (World Health Organization, 2020a). Like many other countries worldwide, China has undertaken concerted efforts to develop medical treatments, scientific research, public health responses, and other methods for tackling the prevention and control of infection as a matter of urgency, and frontline medical staff are the core force in progressing the treatment of patients with COVID-19.

At present, there are no antiviral drugs or vaccines, or preventive medicine specific to COVID-19: treatment consists of symptomatic therapy only. The preventive measures usually implemented for SARS-CoV-2 include strict disinfection and isolation procedures, enhanced occupational exposure risk management, and enhanced immunity, however, these cannot offer frontline staff the required protection under these increased pressures and taking into account infection risk, and stress in their current working environment. Consequently, it is vital to ensure the safety of these staff and prevent their infection by COVID-19 (World Health Organization, 2020b). In the absence of clear medical guidelines, some frontline medical staff are turning to medications to prevent or control the risk of contracting COVID-19, or when displaying respiratory symptoms. The correlation between anxiety and the use of preventive medication among frontline medical staff, and how it influences their efforts to stay healthy, is still unknown (Kang et al., 2020). Therefore, this study investigates the current situation of COVID-19 prevention and provides a theoretical basis for more specific pandemic prevention and control measures.

METHODS

Study Design and Data Collection

Between January 10 and March 10, 2020, a cross-sectional survey was conducted in three Chinese COVID-19-designated hospitals. Through simple random sampling, 290 frontline clinical, medical, and public health staff from Hunan, Guangdong, and Hubei Provinces agreed to participate. In this study, frontline medical staff are defined as those in contact with new confirmed or suspected COVID-19 cases or samples. The researchers first introduced the purpose and significance of the survey after obtaining their consent and guided the participants to complete the specially designed online questionnaire, which took 3–5 min. All 290 questionnaires were submitted, a rate of 100% completion and effective recovery.

Demographic Variables and Work Characteristics

The self-reported attributes collected for each participant included: gender; age, grouped as <30, 30–40, or >40; educational level, ranked as Up to junior college, College, or Graduate or higher; marital status, categorized as Unmarried, Married, or Other; and profession, identified as Clinician, Nurse, Laboratory Technician, and Public Health Worker.

Use of Preventive Medication Among Frontline Medical Staff

The use of preventive medication was assessed through seven items that were specially designed following a literature review and pilot survey of frontline medical staff. The first three items requested: the name of any medication used; when they were used; and how often they were used to prevent contracting COVID-19. The frequency of use could be indicated by either: In accordance with the instructions; Used when an infection suspected; or Used after occupational exposure. The final four items investigated the attitude of frontline medical staff toward preventive medication by measuring: the level of risk from COVID-19 at which they considered themselves to be; the extent of their concern over their health; and the effectiveness they believed the medication to have in preventing infection. These were measured as Low; Medium; High; Very High; and whether they were worried about the side effects of the medication.

Anxiety Levels Among Frontline Medical Staff

Anxiety levels among frontline medical staff were measured using Spitzer et al.'s (2006) Generalized Anxiety Disorder Scale 7 (GAD-7) since it is widely used for screening clinical anxiety and considered reliable due to its Cronbach α coefficient of 0.898. Reflecting on their feelings over the previous 2 weeks, respondents reported their degree of fear for seven items: Not

Abbreviations: COVID-19, Coronavirus disease 2019; GAD-7, Generalized Anxiety Disorder Scale 7.

at all (0); Several days (1); More than half of the days (2); or Almost every day (3). The values of each item were totaled to produce an overall score ranging from 0 to 21, indicating anxiety levels as follows: No anxiety (0–4); Mild anxiety (5–9); Moderate anxiety (10–13); Moderate to severe anxiety (14–18); and Severe anxiety (19–21).

Statistical Methods

All the statistical analyses were performed using IBM® SPSS® Statistics 23.0, and a two-tailed probability value of <0.05 was considered statistically significant. The current situation of preventive medication of frontline medical staff was statistically described. A one-way analysis of variance (ANOVA) was undertaken to compare the differences in scores for each of the scale item groups, including those for the frequency of medication use and types of medicine. *Post-hoc* tests were performed, comparing anxiety levels under different circumstances: LSD test was used in homogeneity variances, and Tamhane's T2 test was used in non-homogeneity variances. Multinomial logistic regression was undertaken to explore the anxiety levels affecting the use of preventive medication under the control of socio-demographic variables.

RESULTS

General Attributes of Frontline Medical Staff

The average age of the 186 female and 104 male respondents, aged between 22 and 52, is 31 years old. As shown in **Table 1**, the majority have completed a college or higher education (90.7%) and worked as clinicians or nurses (85.9%), while over two-thirds of the respondents work in Hunan Province (70.7%).

TABLE 1 | General attributes of frontline medical staff.

Variable	Group	N	Proportion (%)
Gender	Male	104	35.9
	Female	186	64.1
Age	<30	126	43.4
	30–40	140	48.3
	>40	24	8.3
Educational level	Up to junior college or lower	27	9.3
	College	195	67.2
	Graduate or higher	68	23.5
Marital status	Unmarried	116	40
	Married	169	58.3
	Other	5	1.7
Current workplace	Hunan Province	205	70.7
	Hubei Province	15	5.2
	Guangdong Province	70	24.1
Profession	Clinician	76	26.2
	Nurse	173	59.7
	Laboratory technician	12	4.1
	Public health worker	29	10

TABLE 2 | Types and names of preventive medications used by frontline medical staff.

Type	Drug function and name
Western medicine	Immunomodulator: thymalfasin, pidotimod, immunoglobulins, Siqikang
	Antivirals:oseltamivir, arbidol
Traditional Chinese medicine	Antivirals: radix isatidis, bupleurum, Lianhua Qingwen capsules, Chinese medicine prescription
Integrated Chinese and western medicine	Immunomodulator with traditional Chinese antiviral (and/or) western antiviral

Current Use of Preventive Medication Among Frontline Medical Staff

Table 2 shows the types and names of preventive medications and **Figure 1** shows the medication used and reveals that the majority of participants used integrated Chinese and Western medicine. However, the second most-used medication is traditional Chinese medicine among frontline medical staff that have either displayed respiratory symptoms or been exposed to the virus while working, Western medicine is used among those choosing to take preventive medication.

Comparison of Anxiety Levels Among Medical Staff Under Different Circumstances

The scores from the GAD-7 were assigned as follows: 0 scores for No anxiety symptoms; 1 score for Low anxiety; 2 scores for Moderate anxiety; 3 scores for Moderate to severe anxiety; and 4 scores for Severe anxiety. The results of the one-way ANOVA for the use of preventive medication compared to anxiety levels among frontline staff are shown in **Table 3**.

The anxiety level scores for the different frequencies of use indicate a statistically significant difference ($P = 0.041$) in groups. A comparison of the two groups by LSD showed that the anxiety level scores for use after occupational exposure are higher than with no medicine group ($P = 0.010$), which is in accordance with results from the instruction group ($P = 0.029$), and use when an infection suspected group ($P = 0.006$). The anxiety level scores for use after occupational exposure are higher than in the other groups. Similarly, the anxiety level scores for the different types of medication are significantly different statistically ($P = 0.002$), with those in the Western medicine group being higher. Comparisons between every two groups by Tamhane's T2 showed that the anxiety level scores for use of Western medicine groups are higher than the no medicine group ($P = 0.045$), Chinese medicine group ($P = 0.007$), and Integrated Chinese and Western medicine group ($P = 0.031$). Furthermore, Compared with Western medicine, the use of Integrated Chinese and Western medicine may relieve anxiety among frontline medical staff who work directly with COVID-19 patients and samples.

Analysis of Anxiety Levels and Preventive Medication in Adjusted Socio-Demographic Variables

In **Table 4**, a Multinomial logistic regression was established by taking the types of medicine as the dependent variable,

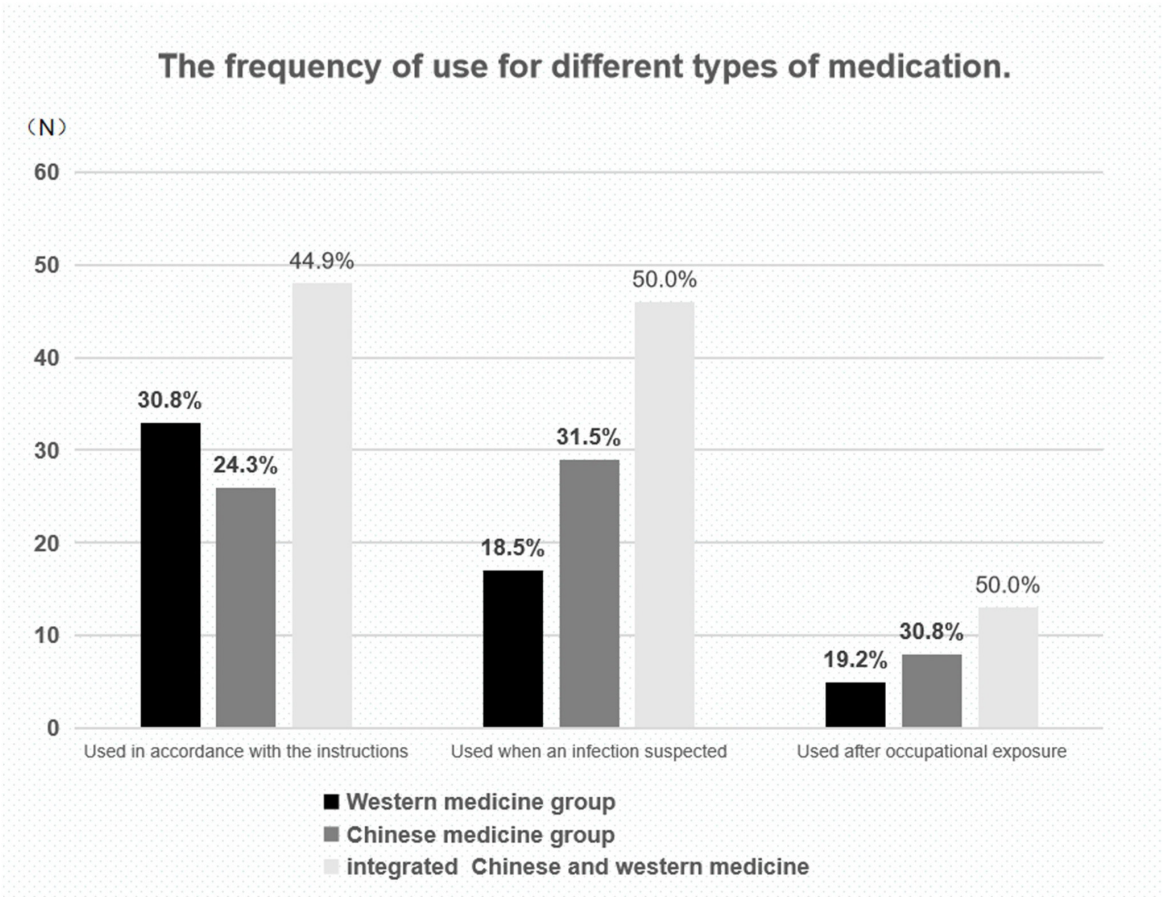

FIGURE 1 | Types of medication and frequency of use.

TABLE 3 | Comparison of anxiety levels under different circumstances.

Category	Group	N	Anxiety score ($\bar{x} \pm s$)	*F*	*P*
	No medicine	65	0.75 ± 0.94^a		
Frequency of medicine use	Used in accordance with the instructions	107	0.87 ± 0.93^a	2.792	0.041
	Used when an infection suspected	92	0.75 ± 0.79^a		
	Used after occupational exposure	26	1.31 ± 1.16		
	No medicine	65	0.75 ± 0.94^b		
Type of medicine	Western medicine group	55	1.29 ± 1.18	5.984	0.001
	Chinese medicine group	63	0.63 ± 0.90^b		
	Integrated Chinese and western medicine	107	0.79 ± 0.68^b		

Following a further least significance difference (LSD) test. [a]Indicates the comparison with the drug used after occupational exposure ($P < 0.05$). [b]Indicates the comparison with Western medicine ($P < 0.05$).

the anxiety levels, and other factors that may affect the results (gender, age, education level, marital status, work location, and occupation) function as the independent variables. Participants with moderate to severe anxiety were merged because of relatively limited cases in each severe anxiety group. Those with moderate to severe anxiety had higher odds (*OR* = 10.331, 95%CI:1.453–73.429) of using Western medicine than participants with no anxiety. Participants with moderate anxiety were 6.399 times more likely to use integrated traditional Chinese and Western medicine, compared to those with no anxiety (*OR* = 6.399, 95%CI:1.007–40.658). Furthermore, those with mild anxiety had the probability of 2.656 that they were likely to use integrated traditional Chinese and Western medicine than those with no anxiety (*OR* = 2.657, 95%CI:1.075–6.570).

Similarly, a Multinomial logistic regression was applied to explore the influence that the anxiety levels may have on the frequency of medication use. It has been shown that the probability that frontline medical staff with moderate anxiety

TABLE 4 | Relationship between the medication and anxiety in Multinomial logistic regression.

Dependent variable†	Anxiety levels OR (95%CI)		
	Mild vs. None	Moderate vs. None	Moderate to severe# vs. None
Type of medication			
No medicine (reference)	–	–	–
Western medicine group	1.596 (0.562–4.534)	4.836 (0710–32.936)	10.331 (1.453–73.429)*
Chinese medicine group	0.724 (0.290–1.807)	1.283 (0.182–9.025)	2.121 (0.299–15.048)
Integrated Chinese and western medicine	2.657 (1.075–6.570)*	6.399 (1.007–40.658)*	1.282 (0.121–13.650)
Frequency of medication			
No medicine (reference)	–	–	–
Used in accordance with the instructions	1.432 (0.608–3.371)	2.301 (0.403–13.147)	5.394 (0.835–34.839)
Used when an infection suspected	1.196 (0.505–2.834)	2.789 (0.501–15.517)	0.862 (0.093–7.969)
Used after occupational exposure	2.302 (0.639–8.298)	8.066 (1.043–62.353)*	7.993 (0.821–77.779)

*#The cases of moderate to severe group and severe group were merged in Multinomial logistic regression. †Adjusted for gender, age, educational level, marital status, current workplace, and profession. *Statistically significant at $\alpha = 0.05$.*

took preventive medication after occupational exposure was 8.066 (*OR* = 8.066, 95%CI:1.043–62.353) times more than that of staff without anxiety.

DISCUSSION

Current Use of Preventive Medication by Frontline Medical Staff

This study investigated the current use of preventive medication against COVID-19 among frontline medical staff facing different risks. Of the 290 participants from Hunan, Guangdong, and Hubei Provinces, 225 took preventive medication, with 47.5% taking medication according to the instructions, 40.9% when they were facing a suspected infection, and 11.6% after occupational exposure. The medications listed by the frontline medical staff included bot intravenous (immunomodulators) and oral drugs (antivirals). The main reason for using preventive medication was the fact that no vaccine is currently available for COVID-19 (Lu, 2020), meaning that even when staff wore personal protective equipment (PPE), the threat of infection remains.

Both doctors and nurses come into close contact with COVID-19 patients, for example when taking sputum samples, establishing artificial airways, and performing bronchoscopy (World Health Organization, 2020b). Public health workers are also helpful for screening procedures and supporting those in isolation, such as undertaking epidemiological investigations, disinfecting contaminated areas, and performing nucleic acid detection tests. Thus, because they are in direct contact with confirmed and suspected cases of COVID-19 and samples, frontline medical staff are more likely to be exposed, are at high risk of infection in the workplace, and subject to the medical observation period.

In the absence of specific drugs and vaccines, the guidelines for Chinese Novel Coronavirus Pneumonia do recommend some traditional Chinese medicines for those in the medical observation period (National Health Commission, 2020). This study found that not only traditional Chinese medicine (e.g., Lianhua Qingwen capsules, Chinese medicine prescriptions) but also Western medicine (e.g., Thymalfasin, Arbidol) were used. Of the 225 participants who took preventive medication, 24.4% chose Western medicine, 28.0% traditional Chinese medicine, and 47.6% integrated Chinese and Western medicine. Moreover, 72.4% of the drugs were prescribed by doctors and dispensed by the hospitals in which they worked. Scholars have simultaneously suggested the rational use of drugs and close observation for any reactions (Jiao et al., 2020). Indeed, the frontline medical staff in this study reported some adverse reactions, including diarrhea, nausea, and dizziness, with 50.4% worried it would affect their fitness to work. Of these, 35.8% had high confidence that preventive medications can help the body fight COVID-19.

Anxiety Levels Among Frontline Medical Staff Taking Medications After Occupational Exposure

The findings of this study showed that 85% of frontline medical staff were highly concerned about their health and 41.1% thought that their risk of COVID-19 infection was high. Sixty percentage of frontline medical staff experienced anxiety and other negative emotions, such as fear and worry. Among the 225 using preventive medications, 11.6% reported taking immunomodulators and antivirals after unexpected occupational exposure. This occurred following accidental incidents, such as damage to PPE or a needle-stick injury, leading to direct contact with or inhalation of droplets and secretions containing pathogens. Once this happens, staff are required to temporarily stop work and enter the 14-day medical observation period. At present, there is no consensus on a contingency plan among medical institutions, with each formulating schemes according to specific situations: providing emergency treatment to wounds, spraying exposed parts with alcohol, leaving the contaminated area, reporting the incident, and giving preventive medication after exposure. The traumatic experience and acute stress caused by these incidents may explain the higher anxiety levels among

those in this study who used medication after occupational exposure. This tendency reflects the fact that most frontline medical staff are encountering a serious epidemic situation in which they suffer considerable stress in a short period of time (National Health Commission of the People's Republic of China, 2020).

Anxiety Levels Among Frontline Medical Staff Taking Integrated Chinese and Western Medicine

Historically, the use of traditional Chinese medicine to treat infections is based on principles such as strengthening the body's resistance to eliminate pathogenic factors, and syndrome differentiation and treatment. Thus, it often involves improving immunity and individual symptomatic treatment. To date, China has achieved good results by combining traditional Chinese with Western medicine (Luo et al., 2020; Ni et al., 2020; Wang et al., 2020): using traditional Chinese medicine and strict isolation procedures has greatly helped with the prevention and control of COVID-19 for frontline medical staff and others who have had close contact with the virus (Ling, 2020). In addition, the *COVID-19 Prevention and Treatment Program* in Hubei Province recommends integrated Chinese and Western medicine to treat COVID-19. Chinese medicine prescriptions for those at high risk are: astragalus, 15 g; fried atractylodes, 9 g; wind, 9 g; cyrtomium rhizome, 6 g; jin yin hua, 9 g; dried tangerine or orange peel, 6; and perrin, 9 g (Ba et al., 2020). Both traditional Chinese and Western medicines are uniquely beneficial in the treatment of diseases, but the effectiveness of their combined use requires further research. Nevertheless, anxiety levels among those who chose both in this study were lower than those using only Western medicine; however, this may be due to the effectiveness of the individual's belief in its benefits. Moreover, no cases of COVID-19 have been reported among this group of frontline medical staff to date.

Influences on the Use of Preventive Medication Caused by Anxiety

According to the Multinomial logistic regression based on the adjustment to gender, age, educational level, marital status, current workplace, and profession, when suffering from anxiety symptoms, frontline medical staff tended to use medication to prevent the COVID-19. Furthermore, with occupational exposure and moderate anxiety symptoms, they were more likely to use preventive medication to prevent COVID-19 than those with no anxiety. Anxiety symptoms were a risk factor in the use of preventive medication among the frontline medical staff. This is possibly due to worries about the high-risk of COVID-19 infection in the designated hospitals. For some frontline medical staff who took part in fighting against COVID-19, this was the first time that faced a serious public health emergency, which posed several challenges on their professional skills, occupational protection, and psychological tolerance (Lai et al., 2020). Thus, their body and mind are full of stress (Trotman et al., 2018). Faced with working stress, they were suffering from fatigue, headache, insomnia, sweating, palpitations, and other physical symptoms. As a result, they reported self-doubt about the symptoms of COVID-19, and this could have led to their increased use of preventive medication. When the frontline medical staff reported self-doubt about the symptoms of COVID-19, physicians tended to prescribe the use of Western medicines or integrated Chinese and Western medicine as pre-exposure medications.

This prediction model reminds us that more attention should be paid to the frontline medical staff with occupational exposure. If staff met with occupational exposure, they are more likely to have symptoms of serve anxiety and tend to use preventive medication.

This discovery reminds hospital managers that the relevant functional department can relieve frontline medical staff from their anxiety and stress in the following aspects: an increase in environmental safety, rational team management, and professional psychological intervention (Tang et al., 2020). Meanwhile, it is suggested that a contingency plan for occupational exposure should be established and preventive medication should be more standardized in medical institutions.

Limitation

This study is limited because of the size of the sample population and the inclusion of only three of China's major cities. Therefore, the conclusions, reliability, and generalizations of the study are yet to be tested. Further research is required to verify the effectiveness of integrated Chinese and Western medicine in the prevention and treatment of COVID-19.

CONCLUSION

This study revealed more anxiety among frontline medical staff taking medication after unexpected occupational exposure and less among those using integrated Chinese and Western medicine than Western medicine alone. When suffering the symptoms of anxiety, frontline medical staff tend to use medication to prevent COVID-19. Furthermore, when they had symptoms of occupational exposure and moderate anxiety, they were more likely to use preventive medication to prevent COVID-19 than those with no anxiety. These further problems related to preventing the COVID-19 epidemic still need to be addressed and it is important to support and maintaining the physical and mental health of frontline medical staff, whilst also reducing the likelihood of frontline staff contracting the virus.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of Xiangya School of Public Health of Central South University. The patients/participants

provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

XY, YL, HX, XZ, and MZ contributed to the study design and data collection. YL conducted the data analysis. XY, LT, and YL drafted the manuscript. YZ and LD revised the manuscript. All authors contributed to editing the manuscript and approved the final version for publication.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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OPINION
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Consequences for the Elderly After COVID-19 Isolation: FEaR (Frail Elderly amid Restrictions)

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THE NEW STRAIN SARS-COV-2 MEETS A FRAILTY ENDEMICS

Older adults rank in the most at-risk segment of the population because the basal functional resilience, meant as the ability to cope with physical trauma and psychological stressors, is fading (Cesari et al., 2017). Aging is physiologically associated with cognitive decline and impaired stress response (Bishop et al., 2010), with the spinal circuitry degeneration leading to progressive alterations of motor performance (Borzuola et al., 2020). This reduced resilience and cognitive impairment intimately coexist in the rampant -definitely endemics- frailty syndrome (Ofori-Asenso et al., 2019), which is known to be associated with disability, traumatic falls, and hospital admission (Eeles et al., 2012). Regrettably, the wearisome settings of hospital wards provide poor incitements to the oldest minds and often oversee the abilities of individuals, who cope with progressive restlessness, dietary impoverishment, and nutrition-related or activity-related sarcopenia (Eeles et al., 2012; Ligthart-Melis et al., 2020). Multidisciplinary interventions, such as the HEPAS approach (Healthy Eating, Physical Activity, and Sleep), are models for dealing with multiple issues simultaneously (Briguglio et al., 2020c). Despite this knowledge, contemporary society, and health services put the older adults in the background. From the most complex digitization of services to the simplest use of public transport, there is "No Country for Old Men" (Ethan and Joel Coen, 2007). It is therefore not surprising that when the new strain coronavirus SARS-CoV-2 (Severe Acute Respiratory Syndrome-Coronavirus of 2019) spilled out to infect humans found not only fertile ground -a population of old people- but also countries ready to choose treating people with more life expectancy. After the outbreak of viral pneumonia in Wuhan, China, (December 2019), SARS-CoV-2 spread rapidly in Europe. Italy resulted among the worst-hit countries with 214.457 infected and 29.684 deaths (May 7, 2020, WHO situation report 108). The northern region of Lombardy accounted for the overall 52.3% of the deaths (May 7, 2020, Italian SARS-CoV-2 Surveillance Group), with the older adults suffering from chronic cardiovascular diseases and malnutrition counting the highest case-fatality ratio (Briguglio et al., 2020b). Considering that the region counted 128.528 subjects over 60 years of age at the beginning of the past year (Annual Italian Census of 2019), we can say that the north of Italy lost over 10% of its older population. This rapid increase of infected severe cases led to a rapid saturation of health facilities in March-April 2020 and public health interventions focused on social isolation, travel restraints, and at-home confinement. Containment measures have been applied with different degrees of restriction in different Italian

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regions, but the northern regions -the worst-hit- have suffered the most severe lockdown measures. In Lombardy, almost 100.000 older adult residents locked themselves up in the house.

PUBLIC HEALTH INTERVENTIONS AMID COVID-19: LOCKING UP IN FEAR PANDEMIC

Leaving the house was permitted, but only for proven health or job reasons. Interregional travel was also banned. Most commercial activities were shut down, few have been minimized. Buying necessities was allowed, but only one individual per family wearing masks and gloves. To respect social distancing, supermarkets regulated the entrances eventually forming long queues, with people possibly waiting for hours. Priority tickets could be booked online, as well as masks that were sold out by pharmacies but available on various web sites at inflated prices. Eventually, these measures contributed to reduce the impact on health services and the risk of severe illness (Steffens, 2020). Although reasonable and essential, the social lockdown has affected both the bourgeois and the less well-off classes of the population. However, are the vulnerable groups -the older adults- who will be carrying the worse future debt of disability? In the pre-COVID-19 era, over 50% of older adults were known to be at risk of loneliness (with associated morbid events) (Fakoya et al., 2020) and this feature fused with reduced health care capacity during the pandemic. In the COVID-19 era, most medical clinics closed or adhered to special hours and the reorganization of the health system led to a significant reduction in clinical and surgical assistance. These restrictions prevented the older adults from having a continuity of care for their co-existing chronic conditions. The decline in social relations combined with reduced support increase the disability debt, with the reaching of the "social frailty." Results from a Chinese -another worst-hit country- online survey proved over 50% of respondents rating the psychological impact of COVID-19 moderate-to-severe, with depressive and anxiety symptoms being prevalent (Wang et al., 2020). Dramatic events, such as the loss of a kin, but also anxiety from the fear of being infected and the inability to do something can further compromise the mental health. On one hand, the Italian daily newscast informed the public about the disease severity, reporting hundreds of daily deaths. On the other hand, the indirect fear inherent in those who were watching has been a major side effect. Frailty therefore acquired a mental nature, becoming "psychological frailty" (Gobbens et al., 2012). Older adults require increasing cognitive demand to perform any motor task (Seidler et al., 2010). The COVID-19 restrictions have been not only associated with psychological derangements, but also with an increasing "bed-kitchen-sofa" lifestyle. Low environmental information-processing was consequently prevalent during daytime, with further impairment of age-associated spatial disorientation, proprioception, disequilibrium, and incoordination (Dunsky, 2019). At-home confinement easily led to sarcopenia. The sedentary lifestyle associated with constant stress that decreased the desire to eat. Either reduced food security or food supply reduced energy intake, leading to nutritional deficits (Briguglio et al., 2020b). Sarcopenia easily became osteosarcopenia. After 2 months (end of March, April, and early May) of confinement, the perceived loss of balance inherits the fear of falling. The "physical frailty" reaches its peak.

END OF ISOLATION: LOOKING UP FOR FEAR CONSEQUENCES

The easing of COVID-19 lockdown on the older population has possibly brought effects comparable to the hospital-associated deconditioning. The disability debt earned during the lockdown will require an augmented need for care for older individuals suffering from the abovementioned geriatric conditions -functional disability- and psychosocial disorders, mainly isolation. The surviving older individuals who have not been infected with SARS-CoV-2 are definitely more fragile, malnourished, and more ill than the pre-COVID-19 era. Those who have been infected will encounter permanent disabilities, such as pulmonary fibrosis and impaired liver function. Indeed, reduced respiratory capacity has been observed for the survivors after SARS-CoV-1 (Ngai et al., 2010). Permanent affections could be also mental, with long-term neuropsychiatric consequences being characteristics of neurotrophic coronaviruses (Briguglio et al., 2020a; De Felice et al., 2020). We expect the frail older adults to be exposed to an increased risk of traumatic events amid restrictions (Clegg et al., 2013). This worsening of the three-dimension frailty may therefore transduce into more hospital admissions. Frail older adults encounter a 1.2- to 2.8-fold risk for falls and fractures and 1.2- to 1.8-fold risk for hospitalization (Vermeiren et al., 2016). Even though COVID-19-associated admissions are known to be flattening, it is also known that most fractures occur in the home and the prolonged restrictions may expose orthopedic hospitals to a different kind of saturation post-COVID-19. During the pandemic, the choice of operating older adult subjects who have suffered a falling trauma was a matter of debate. In the worst-hit countries, the experience of Chinese (Mi et al., 2020) and Spanish (Munoz Vives et al., 2020) authors would suggest delaying the surgical treatment of fractured patients with SARS-CoV-2 as they have observed excessive mortality rates. The Italian experience would suggest instead to treating the fracture as soon as possible in order to stabilize the patient (Catellani et al., 2020). Anyhow, it is a fact that elective orthopedic surgery has been delayed, but there may be also a debt of traumatic fractures that must be bridged. It is also possible that many lonely seniors who fell into the house during the restricted period have not yet been established: fall not reported? While there was over a halving of emergency room accesses for high energy fractures in Italy during the pandemic (Fojut, 2020; Magro et al., 2020), on the other hand, low energy/fragility fractures did not substantially reduce (Benazzo et al., 2020; Jain et al., 2020). This highlights the lack of home prevention measures for the elderly that certainly has exposed them to an increased risk of risk of hospital-acquired SARS-CoV-2 infection.

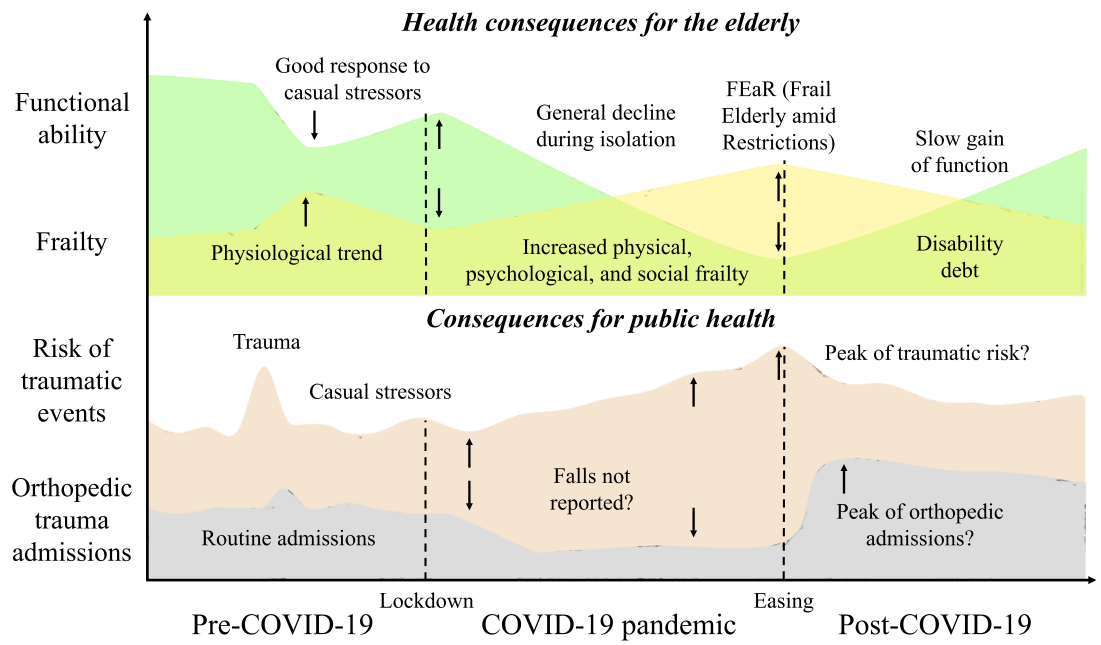

FIGURE 1 | Tendencies of the consequences of the COVID-19 pandemic on the health of the elderly and the risk of hospital admissions after lockdown easing. The severe acute respiratory syndrome coronavirus that was discovered in Hubei province, China at the end of December 2019 (SARS-CoV-2) burst a pandemic that shut down the world. Under normal circumstances, the older adults must deal with a diminished functional ability and progressive establishment of geriatric fragility. If a healthy status is present, recovery from any trauma is discreet even if it is not associated with full pre-trauma functionality. Although restrictive measures were necessary for public health during the pandemic, they have exposed older individuals to confinement that has worsened their physical and mental health. Upon easing of the lockdown, the older person will suffer a disability debt, which will make him highly vulnerable to the risk of falling. Orthopedic hospitals that recorded a halving of traumatic admissions could contrariwise encounter a surge in accesses for traumas amid lockdown easing.

DISCUSSION

In the post-COVID-19 era, the saturation of health services may only be the tip of the iceberg in relation to the restriction-derived burden of frailty. During confinement, the diminished state of resilience in elderly people may have worsened all age-associated conditions, such as a mild high blood pressure, glucose intolerance, basal immune dysfunction, inflammaging, and mental liability with anxiety-depressive traits. The dynamics of "frailty" renders its transition to a worse level more common than improvement (Morley et al., 2013), and this COVID-19 pandemic may have spin the loop of a decline of decreasing functional ability, increasing frailty, greater risk of traumatic falls, and higher hospital admissions for fragility fractures in the near future (**Figure 1**). Since it is difficult to predict when SARS-CoV-2 will become a secondary problem, it is also important to ponder the possibility of a second wave of infections since this prolonged social isolation has created a population with fewer anti-viral immune defenses (Cole et al., 2015). Homeless and people with disabilities should also be a matter of concern (Mesa Vieira et al., 2020). It is therefore mandatory to get prepared for pandemic consequences with appropriate interventions, being both public health-oriented and patient-oriented. This pandemic has not only underlined the public health challenges to guarantee that older population can access the services they need, but it has also shown new opportunities to be seized, such as an expanded workforce specialized in aging (Morrow-Howell et al., 2020), a promotion of intergenerational solidarity (Brooke and Jackson, 2020), or practical community participations, such as the dropping off of groceries (Fraser et al., 2020). In clinical settings, the confronting with a fast-growing geriatric population suffering from multiple comorbidities needs a multidisciplinary approach like the orthogeriatric co-management model of care, with orthopedic doctors and geriatricians prioritizing the patients' needs and aiming at clinical as well as cost-benefit advantages for older adults (Gosch et al., 2016). Valuable and tailored patient-oriented solutions have been proposed after COVID-19 pandemic restriction-associated isolation to cope with social, psychological, and physical frailty. Both the procurement of health care assistance and the reduction of loneliness to older adults that who have suffered from isolation should be a priority for social frailty handling. For instance, remote interventions via online systems may be valuable (Patel and Clark-Ginsberg, 2020) but an appropriate utility assessment and training in the use of technological services should be provided. Psychological frailty should be counteracted through older adult engagement and

motivation, possibly via phone contact with health professionals (Armitage and Nellums, 2020) or by broadcasting television entertaining with premeditated programs (Jawaid, 2020). Also, symptoms such as fear and sleeping disturbances should be properly identified and addressed (Berg-Weger and Morley, 2020). Physical frailty can be resolved through educational videos and recorded physical activity sessions (Angulo et al., 2020). Actually, online technologies are the most valuable support systems, but have to be appropriately planned for older minds (Meinert et al., 2020). Of note, prioritized interventions should be established for low and middle income countries where family dynamics are different, a large number of older adults are illiterate, and proper health care assistance is limited (Lloyd-Sherlock et al., 2020).

To conclude, we can say that:

- The new coronavirus SARS-CoV-2 met a population of frail elderly
- The restrictions due to the COVID-19 pandemic generated a more fragile class of older adults
- The health system should re-organize for efficiently managing the surge of frailty fractures
- Long-term psychological consequences amid COVID-19 pandemic and associated restrictions should be considered, especially for the oldest fragile minds.

AUTHOR CONTRIBUTIONS

MB formulated the hypothesis and wrote the first draft of the manuscript together with RG. BD, MC, MP, FL, GB, and GMP revised the first draft and contributed to manuscript sections. All authors contributed to manuscript revision, read and approved the submitted version.

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REVIEW
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For the Greater Good? The Devastating Ripple Effects of the Covid-19 Crisis

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As the crisis around Covid-19 evolves, it becomes clear that there are numerous negative side-effects of the lockdown strategies implemented by many countries. Currently, more evidence becomes available that the lockdowns may have more negative effects than positive effects. For instance, many measures taken in a lockdown aimed at protecting human life may compromise the immune system, and purpose in life, especially of vulnerable groups. This leads to the paradoxical situation of compromising the immune system and physical and mental health of many people, including the ones we aim to protect. Also, it is expected that hundreds of millions of people will die from hunger and postponed medical treatments. Other side effects include financial insecurity of billions of people, physical and mental health problems, and increased inequalities. The economic and health repercussions of the crisis will be falling disproportionately on young workers, low-income families and women, and thus exacerbate existing inequalities. As the virus outbreak and media coverage spread fear and anxiety, superstition, cognitive dissonance reduction and conspiracy theories are ways to find meaning and reduce anxiety. These behavioral aspects may play a role in the continuance of lockdown decisions. Based on theories regarding agnotology (i.e., the ways ignorance or doubt about certain topics is created by means of withholding or presenting information in a certain way), social influence, superstition and stress and coping, I seek to explain the social and behavioral aspects of human behavior in times of crises. Both the Covid-19 crisis itself as well as the resulting economic and (mental) health crisis are global problems that may require global solutions. I present a model of drivers and outcomes of lockdown behaviors and offer suggestions and a tool to counteract the negative psychological effects by means of online life crafting therapeutic writing interventions.

Keywords: Covid-19 crisis, disrupted supply chains, conspiracy theories, social influence, life crafting, increased inequalities, coping, agnotology

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INTRODUCTION

'A sad soul can kill you quicker than a germ'

– John Steinbeck in his novel Travels with Charley. In search of America (1962)

Humankind is currently facing an unprecedented global crisis. The decisions we make today will shape the worlds for years to come. As a massive public health campaign was launched aimed

at slowing the spread of the COVID-19 virus, scholars have outlined social and behavioral evidence that help shape policies aimed at influencing human behavior such as social distancing, staying at home, and handwashing (Bavel et al., 2020). Many countries have taken lockdown measures to enforce this behavior (Ren, 2020). At the same time, it now becomes clear that many of the measures taken, are causing an immense humanitarian disaster and the cure seems to be much worse than the disease (Rojas et al., 2020; Zhang et al., 2020). The myopic attendance to Covid-19/SARS-CoV-2[1] and disease control, has led to many consequences that affect people's mental and physical health and safety (Holmes et al., 2020). For instance, early on in the crisis it was already estimated that at least 100 million people will die from hunger due to the lockdowns (Zetzsche, 2020), and as the lockdowns continue or even renewed in the upcoming times, the costs in terms the socio economics could be very high.

Several authors have commented on the harms of non-evidence-based measures that many countries have taken, on the basis of failed predictions on the severity of the problem (Ioannidis, 2020; Ioannidis et al., 2020). This has led some authors to suggest that agnotology, or the culturally induced ignorance or doubt, particularly the publication of inaccurate or misleading scientific data, might be at play in the current crisis with respect to the side effects of the lockdowns (Lee, 2020). Agnotology is described as more than just ignorance or the absence of knowledge. It is often the outcome of cultural and political struggles (Proctor and Schiebinger, 2008). An historical example is the tobacco industry trying to hide the negative effects of smoking from the general public and shows "how institutions and individuals work hard to confuse and cloud any evidence that might show us what is actually happening in particular places" (Slater, 2019, p. 24). According to Srivatsa and Stewart (2020): "Epidemic response strategies typically involve infection control, health systems strengthening, and other disease containment strategies. However, intense focus on pathogen transmission can lead responders to overlook trauma and psychosocial damage to individuals and communities during and following an epidemic." Indeed, Brooks et al. (2020) showed that in previous, more localized lockdowns for related viruses the psychological damage was quite severe, and they conclude that "the potential benefits of mandatory mass quarantine need to be weighed carefully against the possible psychological costs." (Brooks et al., 2020, p. 912). In addition to psychological costs, other negative consequences stem from the fact that many medical procedures have been postponed, and from people staying away from medical care out of fear from Covid-19. Consequently, the toll on non-Covid patients will be much greater than Covid deaths (Maringe et al., 2020; Rosenbaum, 2020). Moreover, as many businesses are closed and supply chains blocked, the socio-economic effects are beyond comprehension (cf. Fernandes, 2020; Ivanov, 2020). As many countries are in some form of lockdown, or just coming out of a lockdown, it becomes clear that this has negative side effects for the general population, in terms of mental and physical health, as well as on the economic side (Ren, 2020; VanderWeele, 2020; See **Table 1** for a non-exhaustic overview of side and ripple effects). Although the consequences of the lockdowns are currently hard to assess fully as the situation is still unfolding, and some countries may decide to renew lockdowns in the upcoming time, the severity of these ripple effects can hardly be overestimated at this point in time.

In the current review, I aim to elucidate mechanisms that explain the attitudes and behaviors of people in general as well as behavioral mechanisms in the current situation (See **Figure 1**). I will describe the processes through which the decisions for the lockdowns in many countries are internalized and upheld through a process of framing, social influence and superstition. I will focus on the effects that the lockdowns have on the general population, rather than on the effects on individual patients and caregivers, which I deem to be a special group but that has been given attention elsewhere (Lin et al., 2007; Lee et al., 2018; Kim et al., 2019). I will describe how the framing of the situation by political leaders and in the popular press influences mortality salience, and stress and anxiety, and in turn drives cognition and behavior (i.e., cognitive dissonance, conformity and obedience). Many of the lockdown measures however are paradoxically related to a weakened immune system, stemming from a loss of purpose in life, social isolation and related mental health issues, leading to outcomes such as excess mortality, increased suicide rates, and an increase in non-Covid related diseases (cf. Torales et al., 2020; Zhou et al., 2020). Since these effects are stronger for vulnerable groups, this will widen the existing inequalities (Holmes et al., 2020). I will give attention to this paradox that, as a society, we seem to be compromising the immune system and economic security of the majority of people in the lockdown situation. The effects will in part be moderated by the effectiveness of the coping styles used by individuals (See **Figure 1**). Due to space constraints, I will give a brief summary of each topic, and also briefly describe how they are related and influence each other. In this review, I do by no means try to be exhaustive, but will limit myself to the main drivers of human behaviors, and the expected consequences. The model may act as recommendation for future research, as the model, although based on prior research, has not been tested yet. Since other researchers already suggested policy considerations in order to help decision-makers prevent the most horrifying scenario such as a scenario of excess mortality from extreme hunger and famine (e.g., Hevia and Pablo Andrés, 2020; Schippers and Martins Van Jaarsveld, 2020; Zetzsche, 2020), I will not repeat that here. Below. I start with the explaining that the way the situations is framed result I adherence to lockdown measures. Following I explain the right side of the model, the results and negative side effects, before discussing the remainder of the model (See **Figure 1** and **Table 1**, supplementary material). I will end with recommendations for interventions that may be used to mitigate the negative effects of the lockdown on the general population.

[1]The virus at the center of this crisis is called SARS-CoV-2, while the disease caused by this virus is COVID-19. As many authors have started using the term 'COVID-19 crisis', we will use it throughout this paper to refer to the crisis for the sake of simplicity, and readability.

TABLE 1 | Non-exhaustive overview of the side and ripple effects of the pandemic and related lockdown measures, including references.

Physical Health	
Side Effect	**References**
Estimated 100 million casualties in low and middle-income countries, as an indirect effect of the virus, and the lockdown measures (early estimate).	Zetzsche, 2020
138 million people face starvation as economies and livelihoods are interrupted by the pandemic (updated estimate).	Kennedy et al., 2020
COVID-19 likely to lead to increased maternal and child mortality indirectly, via disrupted healthcare, decreased food access, health system and economic collapse.	Roberton et al., 2020
Access to other forms of healthcare may be limited, as doctors are redirected, and people fear seeking care, leading to worse health outcomes in the long run. Risk of many deaths from health problems not related to covid-19.	Heath, 2020 Gorvett, 2020
There has been a significant increase in the number of major amputations during lockdown as patients wait longer to seek medical care for non-covid-19 illnesses.	Schuivens et al., 2020
Quarantine stress increases the risk of cardiovascular health problems.	Mattioli et al., 2020
Access to reproductive healthcare during lockdowns is limited which leaves some women without access to care they need.	Quell, 2020 Kibira, 2020
Global condom shortage may be looming as manufacturing is shut down, which is likely to result in increase in sexually transmitted infections and unplanned pregnancies, especially in poorer countries.	Chin, 2020
Mental Health	
The pandemic could lead to a significant rise in suicide mortality in the coming months.	Mark et al., 2020 Lennon, 2020
Worsening mental health concerns as stress, depression, and anxiety increases.	Fiorillo and Gorwood, 2020
Current decrease in access to mental healthcare may result in worsening mental health of the general population, with people with existing conditions being most at risk.	Torales et al., 2020
Those with pre-existing mental health conditions are most at risk of having increased mental health issues due to the pandemic.	Druss, 2020
Pandemic triples anxiety and depression symptoms in new mothers.	Davenport et al., 2020
A significant increase in rates of insomnia may worsen stress, anxiety, and other existing mental health issues, especially in frontline workers.	Lin et al., 2020 Morin and Carrier, 2020
Mandatory lockdowns or quarantines may have an especially large negative effect on individuals suffering from social anxiety.	Zheng et al., 2020
Economic Effects	
The total worldwide economic cost of the pandemic could reach $8.8 trillion.	Takagawa, 2020
The pandemic coupled with government relief packages being put into place could result in a worldwide deficit of $30 trillion by 2030.	Assi et al., 2020
Half of world's workers 'at immediate risk of losing livelihood due to coronavirus'.	Inman, 2020
Despite efforts to minimize layoffs, 60 million EU jobs are at risk, and mass layoffs are predicted for the near future.	Riley, 2020 Alderman, 2020
Over 54 million Americans have applied for unemployment aid for the first time.	Jones C., 2020
The lockdown is likely to have a disproportionately large effect on young workers, who make up the majority of industries highly affected by layoffs (service industry etc.).	Kochhar, 2020
Social Effects	
The physical and mental health of frontline workers like healthcare workers, and those working in food distribution may be at risk.	Kang et al., 2020 Greenberg et al., 2020
Domestic violence deaths have more than doubled from this period in previous years.	Grierson, 2020 Bradbury-Jones and Isham, 2020
Homeless and refuge population left at risk as lockdown limits access to help resources, and leaves them unable to shelter in place.	Sharma, 2020 Limam, 2020
Increase in gun purchases and gun violence in the USA since the beginning of the pandemic.	Schleimer et al., 2020
The pandemic will likely result in an additional 30 years to close the gender pay gap in Britain.	Hunt, 2020
Effects on Children	
Unicef warns 1.2 million children could die malaria, pneumonia, and diarrhea during the lockdowns in developing countries.	Newey, 2020
The pandemic is likely to leave a lasting influence of the mental health of children and adolescents.	Fegert et al., 2020
368 Million children missing out on meals at school and school closures overly affects children from poorer communities.	de Jong, 2020 Van Lancker and Parolin, 2020
Children from pooper communities likely to suffer the most as education moves online for many communities, and nearly half the world still doesn't have ready access to the internet.	COVID-19's Devastating Impact on Children, 2020

FRAMING OF THE SITUATION AND LOCKDOWN MEASURES

As half of the world is in some kind of lockdown, this is arguably the largest psychological experiment ever (van Hoof, 2020), with ripple effects on every aspect of human life (Bavel et al., 2020; Nicola et al., 2020). As the virus spreads, and the government and media stipulates this, so does the spread of fear. The way the crisis is framed may be key to how people's behavior is shaped under lockdown conditions (Bavel et al., 2020). In general, people have a stronger tendency to act when a problem is framed as death-preventing (losses)

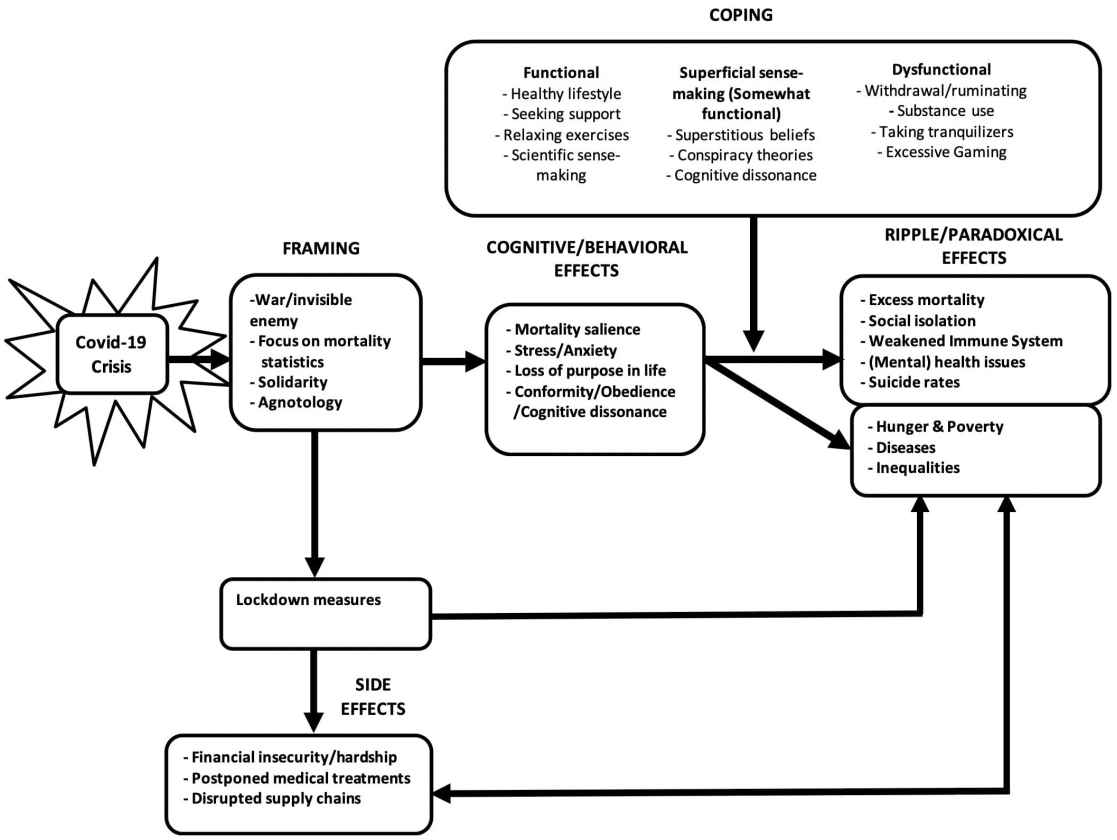

FIGURE 1 | Theoretical model of the consequences of the Covid-19 crisis, including mediating and moderating variables.

than life-saving (gain) (Chou and Murnighan, 2013; Bavel et al., 2020; Schippers and Martins Van Jaarsveld, 2020). The groundwork for these kind of framing effects was laid by prospect theory, which suggests that the pain of losing is about twice as strong as gaining the same amount, and people are more motivated to avoid losses than to achieve gains. For instance, when a call for blood donations was described as death-preventing (losses), rather than life-saving (gains), and as being urgent, this boosted donations (Chou and Murnighan, 2013). In terms of goal framing, if a message is framed as avoiding negative consequences (loss frame), this will generally have a stronger impact on human behavior than when it is framed as having positive consequences (gain frame; Krishnamurthy et al., 2001). In the current situation, the focus is on death-prevention and on preventing from infection with the Corona virus, which can in part explain the sheer one-sided focus and news coverage on this perspective. Prior research has focused on the persuasive effectiveness of messages, especially for promoting health behaviors (Rothman et al., 1993; Levin et al., 1998), and willingness to sacrifice for the greater good (Bilandzic et al., 2017). This mechanism will also be sustained by mortality salience. Terror management theory postulates that people confronted with reminders of death increase striving to maintain faith in one 's cultural worldview, self-esteem, and attachment security (Pyszczynski et al., 2015). Research on social dilemmas (i.e., a conflict between immediate self-interest and longer-term collective interests), shows that under certain conditions people are more inclined to forego their own interests in the interest of the collective longer-term goal of survival. This research gives insight into the ways in which cooperation occurs (for a review see van Lange et al., 2013). As the situation is also oftentimes presented as a social dilemma, and even as a false dilemma (e.g., choice between security and health), this may amplify adherence to lockdown rules, despite the fact that many measures taken are not evidence-based (Ioannidis, 2020). The framing of the disease as a threat to humans, has made sure that most people adhere to the recommendations (Bavel et al., 2020). The way behavior is maintained is by social influence, forces that are often indirect, subtle and unconscious (Cialdini and Goldstein, 2004). Even so many countries have opted to regulate behavior by rules, regulations and enforcement. Besides, many media outlets have opted to present information in a biased manner, possibly in order to create a uniform narrative inducing people to follow guidelines issued by governments and health organizations.

RESULTS: CATASTROPHIC SIDE EFFECTS

The lockdown in many countries can have quite severe side effects on the physical and mental health of people (Brooks et al., 2020;

for reviews see Jeong et al., 2016; Torales et al., 2020; Wang C. et al., 2020). The side effects so far seem to outweigh the positive effects and a recent historical overview of outbreaks concludes that: "History suggests that we are actually at much greater risk of exaggerated fears and misplaced priorities" (Jones D. S., 2020; p. 1683). The main side effects are: Excess mortality from causes other such as hunger, delayed health care, increase in effects mental health issues, suicide, increase in diseases such as measles, and increased inequalities due to school closures and job loss. These have ripple effects throughout society. In many countries emergency admissions, e.g., for cardiac chest pain and transient ischemic attacks, are decreased by about 50%, as people are avoiding hospital visits, which eventually will lead to higher death rates from other causes, such as heart attack and strokes (Sarner, 2020). Also, many medical treatments such as chemotherapy have not been given and were postponed (Sud et al., 2020). In terms of mental health effects, vulnerable groups, such as people with prior mental health issues might be at especially high risk (Jeong et al., 2016). Indeed, a survey by Young Minds revealed that up to 80% of young people with a history of mental health issues reported a worsening of their condition as a result of the pandemic and lockdown measures (Sarner, 2020). The mental health effects arguably affect the general population as a whole, and it has been suggested that this will be a global catastrophe (Izaguirre-Torres and Siche, 2020). During the lockdowns, mental health care is limited or not available at all, and the psychological effects can be devastating. Many people are likely to develop a wide range of mental health issues due to being quarantined, and/or as a result of job loss, such as low mood, insomnia, irritability, depression and posttraumatic stress disorder (Holmes et al., 2020; van Hoof, 2020). Not only is there fear and anxiety for oneself or loved ones becoming infected, there is also fear of financial hardship and uncertainty about what the future may bring. It is expected that there will be an enormous increase in hunger and poverty, in part due to distortions in many supply chains around the world (Boone et al., 2020; Buheji et al., 2020). This will be especially so in developing countries with prior challenges of socio-economic and livelihood issues (Buheji et al., 2020), which will more directly be related to excess mortality (Kalu, 2020; Zetzsche, 2020). Even so, the fact that the lockdowns have a lot of side-effects gets relatively little attention (Holmes et al., 2020), although some authors have recommended on when to release the lockdown (Layard et al., 2020). As some lockdowns endure or will be renewed in the upcoming time, the numbers and results presented here may prove to be quite conservative (cf. Mandel and Veetil, 2020), and public health initiatives are needed to reverse some of these devastating side effects (cf. de Jong et al., 2020; Guessoum et al., 2020; VanderWeele, 2020).

AGNOTOLOGY INDUCED CONFORMITY, OBEDIENCE AND COGNITIVE DISSONANCE

As the Covid-19 crisis had been framed as a "war against an invisible enemy" and the nurses and physicians are named 'soldiers' or 'warriors' in 'the front line' many biases and errors that humans tend to have, have become visible. During the crisis, media attention has been used to highlight information about the virus and spread of the virus, while being relatively ignorant to the fact that many measures have severe side effects such as hunger, job loss and increased inequalities. Governments and governmental institutions have been involved in making sure information is presented in a certain way, probably in an effort to ensure public commitment to the measures taken (Betsch et al., 2020). Moreover, this was often done in terms of false dilemma's presenting the problem as a choice between for instance lives and livelihood (Prasad et al., 2020) and ignoring the fact that the costs of the measures fall on the global poor (Broadbent et al., 2020). In spite of this, the measures and framing have led not only to commitment to the measures, but also to agnotology by means of censorship, putting weight of facts differently as well as being inattentive to the severe side effects of the measures (Zhong et al., 2020).

The effects of framing on the extent to which people obey authorities, even if the orders given are against their better (moral) judgment has been under investigation for decades. Three famous experiments show the intricacies of social influence, which have become known as the Asch conformity experiment, the Milgram obedience experiment, and the Stanford Prison experiment. In the Asch experiment, it was shown that even in a very unambiguous situation, with one clear right answer, 75% of people could be persuaded to give the wrong answer as long as the "stooges", hired by the experimenter, also gave one clear but false answer (Asch, 1951). In this experiment people had to judge which line was the same length as three comparison lines. In the context of the covid-19 crisis, individuals with doubts about the lockdown may be less likely to voice them when faced with a social circle who outwardly supports the measures. The public narrative in support of the lockdown may make people reluctant to raise differing opinions, rather choosing to conform to society as a whole, and their own social circles (cf. Whiten, 2019). In the Milgram obedience experiment, it was shown that people were prepared to potentially harm another person by giving an electric shock to a "learner". This experiment showed that ordinary people could be persuaded to harm other people, if an authority figure asked this, in this case, giving gradually higher shocks, that gradually went up the more "wrong" answers a student gave (Milgram, 1963). Two-thirds of the participants continued to the highest level of volts, which were potentially deadly. These experiments showed the majority of ordinary people are prepared to follow orders given by an authority figure, even if it involved killing innocent human beings. The Stanford Prison experiments sought to find out if ordinary students were randomly assigned to play guard or prisoner as social roles, and concluded that people are willing to do so, especially in stereotyped roles. These experiments have been repeated many times and influence research even today (Haslam and Reicher, 2017), even though the Stanford Prison experiment had some fatal flaws in design and carrying out of the experiment (le Texier, 2019). In general, the studies show

that conformity and obedience are very common, and people have an innate tendency to follow the group and/or a leader (Cialdini and Goldstein, 2004).

Although in many instances conformity and obedience are functional, in these experiments and in some instances in real life, conformity and obedience can become dysfunctional and even harmful. A review by Cialdini and Goldstein (2004, p. 61) argued that people are in general "motivated to form accurate perceptions of reality and react accordingly, to develop and preserve meaningful social relationships, and to maintain a favorable self-concept." In general, compared to conformity, obedience seems to induce greater cognitive conflict (Xie et al., 2016). Social influence theory postulates that attitudes, beliefs and action are influenced through the processes of compliance, identification and internalization (Kelman, 1958). This concerns not only behaviors that are asked from the general public by the government, such as social distancing, but also for instance cases where family members are denied access to a dying parent in a care home. As many of the measures are not evidence-based, the public could have demanded proof for the extent to which the measures were evidence-based and proportional and/or opt for civil disobedience (cf. Ioannidis, 2020). However, because many psychological tactics (Andrews et al., 2020; Bavel et al., 2020), along with agnotology and rules and regulations have been used to influence behavior (cf. Cohen and Kupferschmidt, 2020). The extent to which people do conform and go along with the measures, this will enhance the negative side effects. Unfortunately, both fear of Covid-19 itself as well as the negative side effects of the measures may cause high levels of stress and anxiety, and in turn a compromised immune system. This will be described below.

PARADOXICAL EFFECTS OF THE LOCKDOWN: STRESS AND ANXIETY CAUSED BY FRAMING AND LOCKDOWN MEASURES NEGATIVELY IMPACT THE IMMUNE SYSTEM AND HEALTH OUTCOMES

Stress occurs often when people face challenging or difficult situations (i.e., stressors) resulting in physiological and psychological responses (stress responses). One of bodily systems reacting to these stressors is our immune system. In acute stress the body reacts to stress with the increase of pro-inflammatory cytokines. The body is prepared for a fight or flight response. Acute stress in a healthy human is quite harmless, but stress that last for days, weeks, months or years can be harmful (Azza et al., 2019). It can result in a state of chronic systemic inflammation which in turn results in the development of chronic diseases. For example, it is well known that chronic stress increase susceptibility to some types of cancer by suppressing Type 1 cytokines and protective T-cells. Chronic stress exacerbates all kinds of pathological immune responses, resulting is diseases and premature death (Dhabhar, 2014). Especially people with prior childhood trauma may be at risk (Azza et al., 2019). As people age, they face a significant lower ability to face stressors with an appropriate immune response. This includes physical stress, but also psychological stress (Morey et al., 2015; Prenderville et al., 2015). In the current situation, the framing of the situation and lockdown measures create stress and anxiety due to a variety of causes (See **Figure 1**). Furthermore, the stress associated with this and the massive number of job losses also translates into a shorter life span (Roelfs et al., 2011), as stress is involved in the development, maintenance, or exacerbation of many mental and physical health conditions and is also related to accelerated biological aging and premature mortality (Slavich, 2016). So while a lockdown on a small scale may make sense (a small number of people in quarantine, their health and immune system gets compromised) are we now doing this for both the people we aim to protect as well as the people that are expected to have relatively mild symptoms once infected (healthy young people). Paradoxically then, the measures aimed at protecting the vulnerable, compromise the immune systems of both healthy young people, as well as vulnerable people, such as older people with one or more underlying diseases. Many countries have chosen to put vulnerable elderly people in complete social and physical isolation from their relatives and from society, in the hope to protect them from infection and so saving their lives and preventing death. But this forced social and physical isolation is a serious stressor with well-known detrimental effects on physical and psychological health (Brooks et al., 2020). Chronic stress in advanced age will accelerate aging and dysfunction of the immune system. Chronic stress shortens our telomeres and the shortening of telomeres is linked with all kind of diseases and death (Holt-Lunstad et al., 2010). It is found that the influence of the social relationships on these factors is comparable with well-established risk factors as smoking and arterial hypertension (Holt-Lunstad et al., 2010).

The duration of the social and physical isolation is of importance. During the SARS outbreak people that were isolated for more than 10 days showed significantly higher post-traumatic stress syndrome than those who were isolated less than 10 days (Hawryluck et al., 2004). In many countries under present corona lockdown elderly people are isolated up to a few months. Social and physical isolation is commonly associated with loneliness. This is especially the case in forced isolation in old age (for a meta-analysis see Holt-Lunstad et al., 2015) where loneliness is strongly associated with increased mortality (Eng et al., 2002; Giles et al., 2005; Pantell et al., 2013). In contrast, a study by Cohen et al. (1997) concluded that having more diverse social networks is associated with a greater resistance to upper respiratory illness. So depriving people from their liberty and normal psycho-social interactions in the need to prevent infection and death and for the good of the society is contentious. Paradoxically, instead of preventing disease and death it can also induce disease and death. Therefore, it is important to know how people can cope with the current situation. Some of the negative side effects can be moderated by the coping styles, ranging from functional to dysfunctional (Veer et al., 2020).

COPING STYLES CAN ALLEVIATE OR EXACERBATE SOME OF THE SIDE EFFECTS

Although the Covid-19 outbreak has caused a tremendous amount of stress on the general population (Zhang et al., 2020), prior research has identified stable psychological traits, and several circumstances that predict perceived stress under these circumstances (Flesia et al., 2020). People can react to prolonged stress with coping, which can range from functional, such as a healthy lifestyle and seeking support to more dysfunctional, such as withdrawal and substance use (See **Figure 1**). The negative effects of stress related outcomes can (in part) be counteracted by functional coping styles (Yu et al., 2020). Functional coping styles and several interventions have been related to better resilience, emotion regulation and health outcomes (Santarnecchi et al., 2018; Ho et al., 2020; Polizzi et al., 2020). These strategies can diminish the effects and over time (in part) counteract the negative consequences of the lockdown. Unfortunately, the lockdowns and related increase in anxiety, depression, and PTSD (Guessoum et al., 2020), and as many sports facilities were closed this related to changes in life style such as eating more, and sporting less (Di Renzo et al., 2020; Górnicka et al., 2020; Pellegrini et al., 2020). Paradoxically, *functional coping styles* in order to offset some of these negative effects have been blocked in some ways due to the measures and this may have led to downward spirals in terms of (mental) health (Ibrahimagić et al., 2020). These include: a healthy lifestyle, such as eating healthy, seeking support and relaxing exercises. Unfortunately, due to the lockdowns, many people have starting snacking more and gained weight (Di Renzo et al., 2020), as well as reduced daily physical activity, even though the practice of physically active lifestyles is recommended to counteract (mental) health consequences of the lockdowns and COVID-19 pandemic (Lim and Pranata, 2020). Seeking social support, while helpful in reducing stress, was also harder, as people experienced social isolation. Relaxing exercises could have been done at home, but the question is how much these were done by people to relieve stress. On the other hand, people may try to make sense of the situation and may seek out other sources of information than the ones readily presented to them. The central aim of science is to make sense of the world, and systematic and focused scientific sense-making may help people understand better what is going on. In that sense, it could be quite functional (Passmore et al., 2014). This may at the same time help fight the negative effect of agnotology induced doubt and confusion.

Dysfunctional Coping Strategies

Dysfunctional coping strategies, such as withdrawal/ruminating, substance use, taking tranquilizers and excessive gaming can exacerbate the negative effects of the lockdown measures (cf. Wang H. et al., 2020), and it seems that another paradox is created by the fact that the people experiencing a higher level of psychological distress, also had more dysfunctional coping styles (Wang H. et al., 2020). In turn, people with substance use disorder, have a higher risk of contracting Covid-19, and the increase in substance use may be observed for years after the lockdown (Mallet et al., 2020). In going forward, it is important to try to make sure that this group of people adopts more functional coping styles (Yu et al., 2020; Zhang et al., 2020).

Sense Making

Sense making may be a third, hitherto unexplored way of coping. In uncertain times like these, people may try to cope by making sense of the situation (e.g., Stephens et al., 2020). Scientific sense making in terms of trying to make sense of what is going on could be quite functional (Passmore et al., 2014). However, in uncertain time superstitious beliefs, conspiracy theories, and cognitive dissonance reduction represent ways in which people try to make sense and cognize an ambiguous situation that seems beyond comprehension. As many people are forced by governments into behaviors they would normally not adhere to, cognitive dissonance and superstitious beliefs can also explain why people will persist in certain behaviors, even when it becomes known that the majority of these are not helpful or evidence-based (Ioannidis, 2020). In general, people strive for consistency between cognition and behavior, and have a need to see a relation between behavior and outcomes, even if this relation is not there (Tsang, 2004). For instance, people may maintain behaviors, even after some lockdown measures have been lifted and for instance call in sick for work out of fear to become infected. Moreover, many people will think that the more sacrifices they make, the more helpful it must be (cf. Elliot and Devine, 1994). Also governments may believe they need to take decisive action and may resort to non-evidence based lockdown measures that do more harm than good (Ioannidis, 2020), and adhering to those may represent a form of superstitious bias that action is better than non-action (cf. Schippers et al., 2014), and the relation between the behavior and outcome is spurious, or not as strong as one believes (Schippers and van Lange, 2006). Superstition is widespread in most human societies, even today (Tsang, 2004; Vyse, 2013). Especially in times of uncertainty, there is a need for humans to rely on superstitious behaviors and/or beliefs (Schippers and van Lange, 2006). These beliefs are held by many people, also people we regard as intelligent (for a review see Brooks et al., 2016). Prior research has shown that superstitious beliefs and behaviors can reduce uncertainty-induced anxiety (Schippers and van Lange, 2006; Brooks et al., 2016). In the case of today's uncertainty, where the stakes are high, and mortality salience is excessively heightened by the constant media coverage of the number of deaths as a result of Covid-19, as well as uncertainty about just how contagious and deadly the virus is, governments and individuals alike will resort to superstitious beliefs and behaviors in order to reduce anxiety. Although most definitions have some element of the belief in magic as part of the definition, early research suggests that merely seeing a connection between an action and an outcome that is not really there is also a form of superstition (Skinner, 1948). Acting on it, this performing rituals as ways to reduce anxiety, is referred to as superstitious rituals (Schippers and van Lange, 2006; Brooks et al., 2016). Although this is a form of bias, recent research suggests that oftentimes, even though people recognize it as a form of superstition, they choose to hold on to it "just in case". This

suggests that even if people detect the error, and may admit that this is a form of superstition, they may choose not to correct it. This process has been referred to as acquiescence (Brooks et al., 2016). The behaviors asked from people are in part superstitious, and may have an adaptive function (Markle, 2010), but also have relations with obsessive-compulsive behavior (OCD). As not all behaviors are necessary (e.g., staying indoors when healthy; (Born et al., 2020), some of these are more OCD like and superstitious (Moulding and Kyrios, 2006; Spears, 2014). Although people have various behaviors to counteract stress and possibly exert control over situations (Moulding and Kyrios, 2006), many people still experience mounting stress, not only by the threat of the virus, but also by the way the situation is framed, as well as the effect of the lockdown itself. This type of framing helps in sustaining the behavior, sometimes even when disconfirming information is presented (Russell and Jones, 1980). Even so, and even though people are confronted with conflicting information, this adds to the stress and anxiety they are seeking to reduce. At the same time, many people feel that there are too many uncertainties in current situation to be able to conclude what is the 'right' way of acting, even though it becomes clear that the ripple effects of the current action are quite severe in the long run (Zetzsche, 2020).

Cognitive dissonance will create tension between the belief that the sacrifices people make are necessary and the belief that some of these behaviors may be causing more harm than good in terms of mental health (McGrath, 2017). The unpleasant tension stemming from conflicting beliefs then leads people to decide that the lockdown must be useful, and people also try to get doubters to reconsider their position, even in the face of clear evidence of overwhelming negative side effects. Ironically, the term "cognitive dissonance" is based on research into a religious sect that believed the world would end (Festinger, 1957). They sold all their belongings and waited for a flying saucer to come and pick them up. When that subsequently (of course) didn't happen, that was no reason to change their beliefs. They now stated that they had saved the world and that God had decided to spare it due to their actions. In this way, they did not have to adjust their core beliefs, instead changing their view of the facts to fit into their existing narrative (Festinger, 1957). This may also happen, as people believe there is a strong relation between performing behaviors recommended (e.g., social and physical distancing, and forced isolation) and they see that it works, as the spread of the disease seem to be contained. However, several studies have indicated that the disease may play itself out after a certain period of time, independent of the measures taken (Ben-Israel, 2020; Ederer, 2020). Also, people seek for an explanation, and they feel the need to explain large events with proportionally large causes (Leman and Cinnirella, 2007), and as they note that the side-effects of the response to Covid-19 are quite severe, many resort to conspiracy theories (Smallman, 2015; Bavel et al., 2020). Unfortunately, although it may be related to decreased anxiety, conspiracy theories are in general more appealing than satisfying (Douglas et al., 2017). Prior work has found that a lack of control increases conspiracy thoughts and superstitious beliefs (Huang and Whitson, 2020).

Coping strategies such as cognitive dissonance reduction, superstitious beliefs and rituals, as well sense making through conspiracy theories, although somewhat functional in terms of reducing anxiety, are not satisfying key psychological needs in the long run (cf. Douglas et al., 2017) Nevertheless, in the short run, stress and anxiety are high and people are motivated to reduce these emotions, via a variety of behaviors and coping mechanisms (See **Figure 1**).

ACCELERATING FUNCTIONAL COPING PROCESSES THROUGH LIFE CRAFTING

The current crisis has increased the need for functional coping with traumatic experiences and negative emotions. While many people experience a downward trend in terms of emotions, depression and trauma, broaden-and-built theory offers insights in how to reverse those processes (Fredrickson, 2001). As it will be hard to stop the negative side effects, such as job loss and prolonged fear, from playing out, it is imperative to at least try to minimize the negative mental health effects. Broaden-and-built theory postulates that thinking about an idealized future will be associated with positive thought about that future. The theory and findings suggest that the capacity to experience positive emotions is related to the human capacity to bounce back from negative experiences and is related to human flourishing (Fredrickson, 2001). Specifically, functional coping processes and the experience of positive emotions can be accelerated by a process of expressive writing about one's ideal life (for reviews see Schippers and Ziegler, 2019; de Jong et al., 2020). Prior research in a student population has shown that a brief, 4–6 h written and staged goal-setting intervention, that includes both writing about ideal life and goals, with goal achievement plans, improved academic performance (Morisano et al., 2010; Schippers et al., 2020), and has been shown to close the gender and ethnic minority achievement gap (Schippers et al., 2015). As it seems that for many people their purpose in life needs to be redefined, for instance as a result of job loss, life crafting offers a way to find (renewed) purpose and meaning (Schippers and Ziegler, 2019; de Jong et al., 2020). Meaning in life has been associated with numerous positive physical and mental health outcomes, such as (mental) health, adaptive coping, and decreased mortality (Heintzelman et al., 2013), and is a protective mechanism against mortality salience and existential anxiety (for a meta-analysis see Burke et al., 2010). Life crafting is based on techniques that originally were designed for expressive writing about emotional and traumatic experiences (Pennebaker, 1997) and coping processes (Pennebaker et al., 1990). This work showed that writing about emotional experiences is related to significant physical and mental health improvements (Pennebaker, 1997). A variation of the writing paradigm, writing about the best possible future self, was both less upsetting than writing about trauma, but had similar effects in terms of significant increased subjective well-being (King, 2001). Even 2-min writing exercise for 2 days showed reduced health complaints at follow-up (Burton and King, 2008). The life crafting intervention has three main elements: (1) discovering values and passion (2) writing about goals and goal achievement plans, and (3) public commitment to goals. During the writing exercise, people write

about what they like to do, competencies they would like to acquire, relationships at home, work and in leisure time, possible future career, as well as their ideal versus less ideal imagined future. On the basis of this, people formulate concrete goals, order these in terms of importance and write detailed plans including goal monitoring and "if-then" plans. The third part then is about making a photo with a statement communicating their goals to the world, be it friends, or co-workers (for reviews see Schippers and Ziegler, 2019; de Jong et al., 2020). Using this online intervention, I hypothesize that people will experience accelerated functional coping and this may serve as a way to restore well-being.

DISCUSSION

The current review focused on the psychological and behavioral consequences of the lockdown and suggested that the negative effects are serious and may very well outweigh the possible positive effects of the lockdown for the general population (Izaguirre-Torres and Siche, 2020). As Brooks et al. (2020, p. 919) noted: ". . ..there can be long-term consequences that affect not just the people quarantined but also the health-care system that administered the quarantine and the politicians and public health officials who mandated it." Indeed, the measures create a paradoxical situation, where not only people getting ill are negatively affected, but also the healthy people in the lockdown situation (Liang et al., 2020; Zhang et al., 2020). The current paper falls necessarily short in listing all negative side and ripple effects, because (a) the situation is still unfolding, and (b) many of these effects are still unknown or (c) could be counteracted if governments make this a priority. The current paradoxical situation, could be addressed by (1) evidence-based optimized decision making by governments (2) making use of information and scientific findings in an unbiased manner (3) stating clear goals for what we are trying to achieve with the measures and (4) an evidence-based way of public health measures that avoid or counteract the negative side effects (Horesh and Brown, 2020). Medium and longer term planning is needed to rebuild the economy as well as a mental health care system aimed at reversing the side effects of the measures. As several studies have suggested ways forward from here in terms of the economic impact (Boone et al., 2020; Zetzsche, 2020), as well as ways to boost the human immune system in order to prevent people from getting sick (Nilashi et al., 2020; Taghizadeh-Hesary and Akbari, 2020). In order to make sure that some of the negative mental health effects are counteracted, this calls for effective evidence-based interventions (Wilson, 2011; Figueroa and Aguilera, 2020), that can be made available online and are scalable (Schippers and Ziegler, 2019; de Jong et al., 2020). Although tele-health and video consultation can alleviate the immediate problems associated with the lock-down, (Barsom et al., 2020; Zhou et al., 2020), there may not be enough staff to effectively treat all people that will need mental health care in the aftermath of the global lockdown (Figueroa and Aguilera, 2020; Torales et al., 2020). Next to giving the public more information about effective coping styles (Ibrahimagić et al., 2020), an interesting avenue is to make writing interventions available to the wider public, that have proven to have many (mental) health benefits (Lepore and Smyth, 2002; Schippers et al., 2015), as well as performance benefits (Schippers and Ziegler, 2019; de Jong et al., 2020; Schippers et al., 2020). This type of care could even be delivered by a life crafting chatbot (Dekker et al., 2020). Life crafting, or the process of reflecting and writing about present and ideal future life, also including making plans and changes accordingly, can help to restore and improve both meaning in life and psychological and physical health (Schippers and Ziegler, 2019). This may be now more needed than ever (de Jong et al., 2020; Figueroa and Aguilera, 2020). Digital mental health tools are a way forward in counteracting the negative mental health effects in the wake of the Covid-19 crisis and investing in making these available for large groups of people in need is key (Figueroa and Aguilera, 2020). As we are arguably facing the largest humanitarian disaster in the history of mankind, caused by the lockdown measures, it is my hope that the negative side effects will, to some extent, be counteracted via smart interventions and community care.

AUTHOR CONTRIBUTIONS

MS played the primary role in the conceptual conception of the manuscript, and wrote, reviewed, and revised the manuscript.

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Changes in Sexuality and Quality of Couple Relationship During the COVID-19 Lockdown

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The COVID-19 pandemic is heavily influencing people's general well-being worldwide. Since its outbreak, many studies have explored the population's general psychological well-being, while only a few studies have addressed how the COVID-19 pandemic and the lockdown are affecting sexuality. Sexual health, an important aspect of general well-being, has relevant consequences on people's daily lives. Although it is well known that distress can affect sexuality, and it is possible to speculate that the outbreak's psychological outcomes are affecting the population's sexual life; recent literature does not explore couples' sexuality and their relationship quality during the lockdown. The present preliminary research aimed to understand if the Italian population's sexuality has changed, and if so, how it had changed since the spread of COVID-19, and which variables were influencing couples' relationship quality during the COVID-19 lockdown. A questionnaire reserved especially for cohabiting couples was designed and distributed online from April 11 to May 5, 2020, the 5th and 8th weeks, respectively, after the start of the lockdown. Of the 124 respondents who completed the online survey, 73% were females. Despite the pandemic's psychological consequences, when asked directly, most couples responded that they did not perceive any differences in their sexuality. However, some female participants did report a decrease in pleasure, satisfaction, desire, and arousal. The main reasons behind the changes in sexuality in women, therefore, appear to be worry, lack of privacy, and stress. Even when participants seemed to show high levels of resilience, the negative aspects of lockdown could affect their quality of sexual life. This study needs to be completed using qualitative data from online focus groups that have investigated how sexual life has changed and the main needs of couples. All the same, our results will serve to better address population needs and experiences, and provide *ad hoc* interventions during this unprecedented time of crisis.

Keywords: sexuality, COVID-19, couples, anxiety, fear, psychological distress

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INTRODUCTION

The COVID-19 pandemic is highly affecting people's general well-being worldwide (Cao et al., 2020; Wang et al., 2020; White and Van Der Boor, 2020). Recent literature has shown that the uncertainties about health and work, combined with social distancing and homeschooling connected to the forced lockdown, have had an impact on psychological adjustment, influencing

anxiety and depression levels, sleep and eating patterns, and somatic symptomatology (Ahmed et al., 2020; Cellini et al., 2020; Fernández-Aranda et al., 2020; Huang and Zhao, 2020; Tian et al., 2020; Zhang et al., 2020). Negative emotional responses have been found both in the general adult population and medical care staff, as well as in children and adolescents, especially after the announcement of the COVID-19 pandemic. This is coherent with previous research that found that such public emergencies concerning health usually trigger a series of stressful emotional responses characterized by high levels of anxiety and generally negative emotions, along with a decrease in positive feelings during the same time period (Brooks et al., 2020; Li S. et al., 2020). Similar or the same results were found in Italy: depressive symptoms, anxiety, and stress were increased in women, people between 30 and 34 years, and people with previous medical problems (Ferrucci et al., 2020; Mazza et al., 2020; Rossi et al., 2020); sleep quality has worsened, especially for those living in Northern Italy, the most affected by COVID-19 (Casagrande et al., 2020; Rossi et al., 2020); the psychological impact of the lockdown was much higher in northern regions than in the central-southern ones, and the most frequent fears were those about the economic crisis, getting the infection, and dying (Ferrucci et al., 2020). While many studies are exploring the population's general psychological well-being, a few studies are addressing how COVID-19 and the lockdown are affecting sexuality. Sexual health is an important aspect of general well-being, with important consequences on the population's daily lives (Ford et al., 2019), from different points of view. In particular, it is not clear whether sexual behaviors among married couples have changed during the lockdown (Arafat et al., 2020), as well as the role played by psychological and personal variables, in this process. Due to these reasons, this preliminary study aims at understanding the main changes that people are facing in their sexual lives as well as identifying the main core issues based on the online focus groups' incoming data on sexual well-being during this period of crisis. While it is well known that distress can impair sexuality (Montesi et al., 2013; Leavitt and Willoughby, 2015; Rokach, 2019), and it is possible to speculate that at present, the psychological outcomes of COVID-19 are affecting the population's sexual life, recent literature does not explore couple sexuality and the quality of relationships during the lockdown. In Italy, for example, when the government decided on a sudden lockdown during the second week of March, some couples were separated, while others were forced to live together in the same home. Besides, due to the pandemic's psychological outcomes, some couples' daily personal lives have been drastically overturned. On the one hand, partners have lost their privacy due to the constant presence of children or other family members, whereas on the other hand, forced lockdown can exacerbate existing relationship problems. Fear of being infected also drastically reduced physical contact in couples: a decrease in vaginal sex was found in United States couples (Hensel et al., 2020), while in the United Kingdom, 60.1% of the participants did not engage in sexual activity during the self-isolation period, while the remaining 39.9% had sex at least once a week, where being male, young, and married was associated with an increase in sexual activity, and a prolonged period of quarantine was associated with an increase in sexual activity, probably due to reduced stress and anxiety or as a diversion to deal with boring days (Jacob et al., 2020). In another study, 43.5% of the participants from several countries reported a decline in sexual quality along with a severe reduction in the frequency of intercourse during lockdown compared to the previous year, even if many people living with the partner have experimented new sexual positions, BDSM, and acted out some sexual fantasies, while those who did not live with the partner tried new activities such as sexting (Lehmiller et al., 2020).

The problem of forced prolonged cohabitation has an impact not only on couple sexuality but also on autoerotic sexuality, which comprises an important aspect of self-regulation and sexual well-being. A recent online survey conducted between March and April 2020 in both England and Spain reported that 10% of the participants masturbated more than usual during quarantine (Ibarra et al., 2020). In another study conducted online in China from May 1–10, 2020, 30% of the participants declared an increase in masturbation and pornography use (Li G. et al., 2020). During the lockdown period, PornHub noticed a worldwide increase in pornography; for example, in the states where PornHub gave free access to its premium services, the increase observed was 57% in Italy, 38% in France, and 61% in Spain (Pornhub Insights, n.d.). Similar patterns were also found in the United States and some Asian jurisdictions (Mestre-Bach et al., 2020). A possible explanation for this increase in the use of pornographic material during the lockdown could be trying to manage the stress due to the changes in daily life that occurred during the quarantine and a short-term method of relief or to compensate the sense of loneliness (Uzieblo and Prescott, 2020). Autoerotic and dyadic sexuality, which play a significant role in sexual self-regulation, especially during crisis situations such as the COVID-19 pandemic should attract the attention of professionals because very few studies have assessed the quality of sexual life after a prolonged period of both forced cohabitation and social distancing.

In the light of these considerations, the present preliminary research aimed to understand if the Italian population's sexuality had changed since the spread of the COVID-19 infection, and if so, how it had changed, as well as to examine the variables influencing the couples' relationship quality during the COVID-19 lockdown.

MATERIALS AND METHODS

Participants and Procedure

Participants (124; 73.4% female) took part in the survey, aged between 23 and 60 years old ($M = 34.01$, SD = 8.71). The inclusion criteria comprised being at least 18 years old and living with a partner during the lockdown, and speak and understand the Italian language. The characteristics of the sample are reported in **Table 1**.

The questionnaire was designed for online completion to expedite data gathering during the COVID-19 lockdown. People were invited to take part in the study via social media. The procedure involved agreeing to an online consent form. All

TABLE 1 | Demographic characteristic of the sample.

	N	%
Gender		
Male	33	26.6
Female	91	73.4
Age category		
≤34	75	61.5
35–50	38	31.1
≥50	9	7.4
Living with		
Only partner	72	58.1
Partner and children	41	33.1
Partner and other family members	6	4.8
Partner and other people	5	4.0
Living in		
North Italy	96	77.4
Center Italy	6	4.8
South Italy	17	13.7
Work		
Do not work	46	37.4
Outside the home	28	22.8
Partly at home, partly outside	12	9.8
At home	37	30.1
Sexual orientation		
Heterosexual	116	94.4
Bisexual	5	4.0
Homosexual	2	1.6

data were confidential and were stored in a password-protected electronic format.

The questionnaire link was sent to individuals as well as to associations and clubs through Facebook and Whatsapp groups, with a request to forward the information within their groups, nationally. The initial invitation to participate was sent on April 11, 2020 (the 5th week of the lockdown). The survey remained open until May 5, 2020 (the 8th week of the lockdown), and the date of completion was recorded with each respondent's data. This period was chosen to study the effects of the lockdown starting from 1 month after the beginning of the lockdown and ending when restrictions began to loosen. The protocol for this study was reviewed and approved by the ethics committee of the Psychological Research Area 17 of Padua University.

Measures

Participants were administered a demographic and part of five standardized questionnaires, along with a set of *ad hoc* questions investigating possible changes in their sexual life during the lockdown as well as the reasons for these changes, to give them the freedom to express their beliefs and opinions.

With regard to the Brief Index of Sexual Functioning for Women (BISF-W) (Taylor et al., 1994), its Italian validation (Panzeri et al., 2009), and the Italian version of the Brief Index of Sexual Functioning for Men (BISF-M) (Panzeri and Raoli, 2010), we used two factors: couple sexuality (21 items, alpha = 0.95 for women and alpha = 0.94 for men) and autoeroticism (6 items, alpha = 0.85 for women and alpha = 0.89 for men) plus 14 items that explored sexual satisfaction and sexual problems. Items were arranged in a Likert-type format, ranging from 5 to 7 points, to rate the frequency of the occurrence of sexual desires, arousal, orgasm, or satisfaction.

We used two factors of the Sexual Desire Inventory (SDI) (Spector et al., 1996): dyadic sexual desire (six items, alpha = 0.80 for women and alpha = 0.80 for men) and solitaire sexual desire (four items, alpha = 0.88 for women and alpha = 0.93 for men) (Moyano et al., 2017).

We used the three factors of the Depression Anxiety Stress Scales-21 (DASS-21) (Henry and Crawford, 2005; Italian validation by Bottesi et al., 2015): depression (7 items, alpha = 0.82), anxiety (7 items, alpha = 0.74), stress (7 items, alpha = 0.85), and the total score (21 items, alpha = 0.90).

The total score of the Patient Health Questionnaire (PHQ-15) (Kroenke et al., 2002) was used to assess 15 somatic symptoms. Each symptom was scored from 0 ("not bothered at all") to 2 ("bothered a lot"). Cronbach's alpha for the present research was alpha = 0.72.

The Quality of Marriage Index (QMI) (Norton, 1983) is a six-item measure of global perceptions of couple relationship satisfaction, in which higher scores indicate higher levels of satisfaction (alpha = 0.96).

Statistical Analysis

Descriptive statistics were used to calculate categorical variables. The percentage of responses was calculated according to the number of responses in each category divided by the total number of respondents to a question. A cluster analysis, using TwoStep cluster analysis for binary data, was performed to divide the sample according to the changes in their sexuality (desire, frequency, satisfaction, orgasm, pleasure, excitation, and importance). The analysis returned two groups, based on whether sexual life has been changed during the COVID-19 lockdown, allowing *t*-test analysis and Chi-square analysis to assess the differences in the study variables between the two groups.

We performed logistic regression using the SPSS program version 25 with age, DASS factors, as well as the total score, BISF factors, QMI, and PHQ as the independent variables, and sexuality changes and quality of marriage as the dependent variables.

RESULTS

Changes in Sexuality During the COVID-19 Lockdown

Among the participants, 12.1% men and 18.7% women perceived an increase in sexual desire during the lockdown, while 18.2% men and 26.4% women perceived a decrease in sexual desire (**Figure 1**). Men (15.2%) and women (20.9%) observed an increase in arousal during the lockdown, while 12.1% men and 20.9% women observed a decrease in arousal during the same period. Moreover, the women experienced more difficulty in reaching orgasm than the men (6.1% men, 17.6% women), while in comparison with the pre-lockdown period, men reported

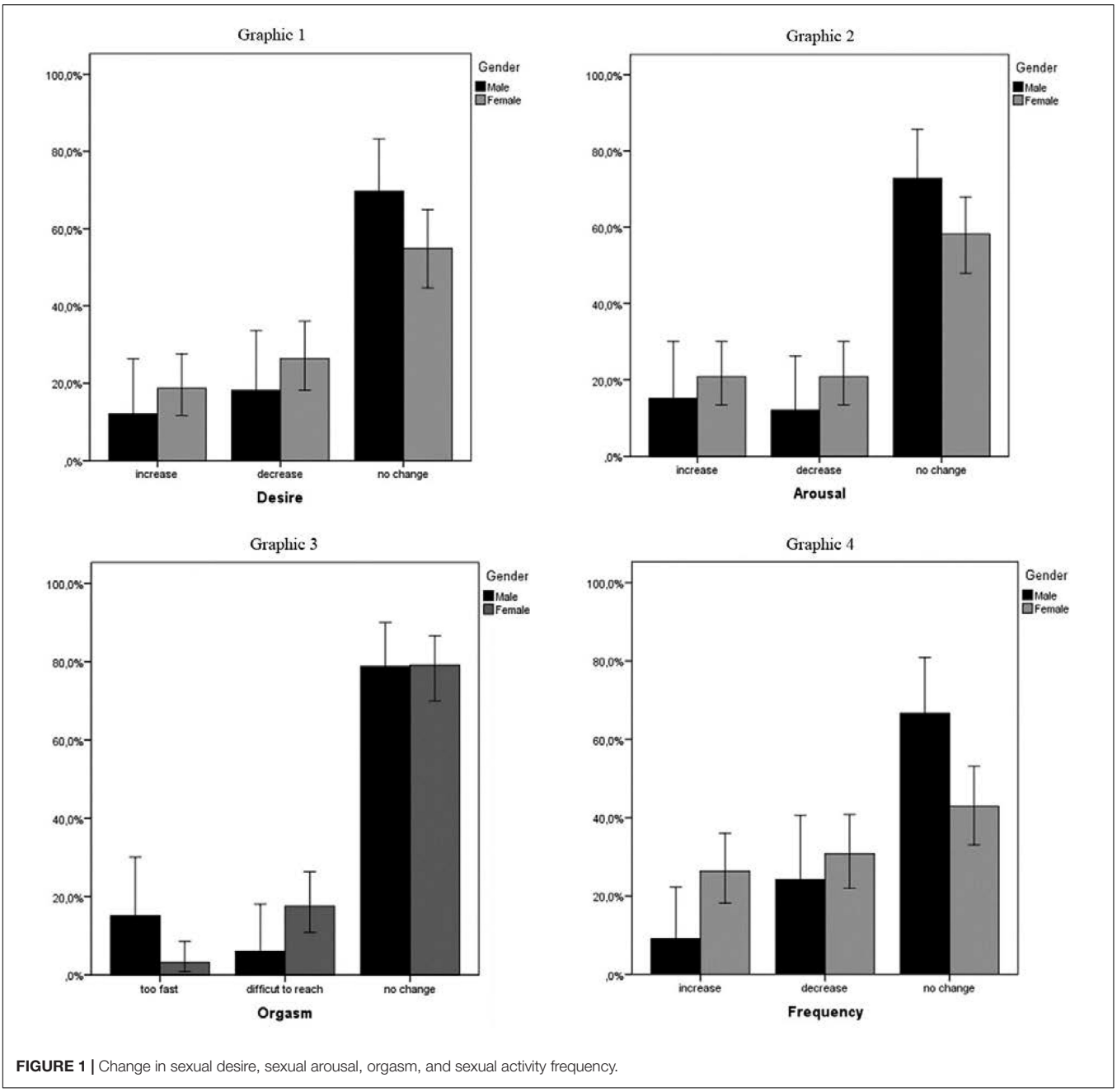

FIGURE 1 | Change in sexual desire, sexual arousal, orgasm, and sexual activity frequency.

reaching orgasms faster and more frequently than women (15.2% men, 3.3% women).

In relation to the three main areas of research (sexual desire, arousal, and orgasm), most of the participants reported no changes with respect to the pre-lockdown period. For both sexual desire (69.7% men, 54.9% women) and arousal (72.7% men, 58.2% women), it was mostly the men who said that they did not notice any difference, while for orgasm, there was hardly any difference between the genders (78.8% men, 79.1% women). Finally, 9.1% of the men and 26.4% of the women declared that their frequency of sexual intercourse had increased during the lockdown, whereas 24.2% of the men and 30.8% of the women reported a decrease in frequency. These results show that there may be gender differences in the way the lockdown influenced the frequency of sexual intercourse, seemingly because that aspect of sexuality is more easily influenced in women. These conclusions are further confirmed by the fact that more men than women answered that they perceived no differences at all (76.7% men, 42.9% women), as depicted in **Figure 1**. With regard to the increase in sexual desire, arousal, orgasm, and frequency, the answers were very much similar for all these items and can be summarized in some macro-categories, such as more free time, more time with the partner, less stress, and boredom. Some examples of the received answers are: "more

serenity, less stress and more time to think about oneself," "availability of more free-time," "more rest and consequently more energy," "boredom and greater closeness to the partner," "desire to be together and take advantage of the time for doing something pleasurable," and "we both felt less stressed working from home and therefore, more serene and open to our relationship." In relation to the decrease in the aforementioned items, the summarized macrocategories are more stress, forced coliving, routine, anxiety and preoccupation about the job, anxious and worrisome feelings about the situation, feeling the partner's distance, and absence of privacy. Some examples of the collected answers are "seeing each other 24 × 7," "feeling of forced imprisonment and absence of freedom," "absence of privacy," "excessive workload," "constant intimacy," "not being able to relax," and "the transition from living separately to always being together."

This study also investigated the other aspects of a couple's sexuality such as pleasure, the importance of sexuality, satisfaction, perception of the partner's satisfaction, and reaction to the partner's sexual advances. Regarding sexual satisfaction, 3% of the men and 13.3% of the women indicated an increase, while 6.1% of the men and 15.4% of the women reported a decrease. For the item about the perception of the partner's satisfaction, 3% men and 16.5% women reported an increase in this perception, while 6.1% men and 15.4% women indicated a decrease. It is notable that for almost all the men, there were no changes in any of the aspects considered, while there were some changes for women. This finding was true for all the areas mentioned previously, and in particular, 90.9% of the men and 71.4% of the women reported no change in sexual satisfaction, whereas 90.9% of the men and 68.1% of the women reported no change in the perception of their partner's satisfaction.

Moreover, regarding their reaction to their partner's sexual advances, none of the men reported a change, but 25.3% of the women reported a change. With the aim of giving participants some space to freely express themselves, they were again given the opportunity to answer an open-ended question about what changes they experienced while reacting to their partner's advances. In response to the question, *"Why has sexuality changed?"* some of the participants indicated that there was an increase in acceptance of the advances, while the others reported a decrease.

At the end of the questionnaire, there were two open-ended questions about the changes in sexuality that participants may have experienced during the lockdown and the reasons behind these changes. The macrocategories identified to summarize these findings are the same ones that were previously used to report changes in sexual desire, arousal, orgasm, and frequency, as reported above. Some examples of the answers received are "more free time and better physical contact," "stress and too much closeness 24 × 7," "Although I feel that my desires have increased and my partner's have decreased because of stress and routine, we talk about it freely and have sex almost every day," "difficulty in diverting thoughts from anxieties and worries," "more time to dedicate to sexuality as well as physical and emotional closeness as a couple," "the children are always present and my wife is worried," and "fear of contagion and stress related to the new restrictions." According to the perceptions reported by the research participants, the lack of privacy and the constant closeness impacted sexual habits negatively, whereas participants who spent only a few hours together prior to the lockdown were enjoying the closeness and had seen an improvement in their sexual lives.

A cluster analysis based on the mentioned changes in sexuality has been performed. The analysis provided two groups: Cluster 1 ($N = 57$) is characterized by the higher number of changes in sexual life during COVID-19, Cluster 2 ($N = 67$), on the contrary, includes the participants who have perceived very few or no differences in sexuality. Cluster 1 was almost totally composed by women, as it significantly encompassed less men ($N = 9$, 27%; $\chi^2 = 6.32$, $p < 0.01$) than Cluster 2 ($N = 24$, 73%). **Table 2** reports differences in the study variables between Cluster 1 and Cluster 2. The two clusters differed only for the personal variables, where participants in Cluster 1 showed higher feelings of depression ($t = 2.60$, $p < 0.01$), anxiety ($t = 2.05$, $p < 0.05$), and stress ($t = 2.86$, $p < 0.01$).

Table 3 shows the results of logistic regression analysis on the couples' quality of marriage during the lockdown in the research study. The model is significant for $\chi^2 = 16.60$ ($p < 0.05$) and being older and feeling more anxiety predicts a decrease in the

TABLE 2 | Mean scores, standard deviation, and differences between clusters in the study variables.

	Cluster 1 ($N = 57$)		Cluster 2 ($N = 67$)			
	M	SD	*M*	SD	*t*	*p*
Age	33.04	8.39	34.86	8.50	−1.16	ns
DASS total score	17.61	11.05	12.54	8.76	2.85	<0.01
DASS depression	6.18	4.08	4.27	4.05	2.60	<0.01
DASS anxiety	3.26	3.47	2.24	2.15	2.05	<0.05
DASS stress	8.18	4.59	6.03	3.75	2.86	<0.01
SDI total score	46.70	12.67	4.66	2.89	−0.87	ns
SDI dyadic	32.12	7.29	32.96	7.99	−0.60	ns
SDI solitary	14.58	8.32	15.69	8.21	−0.74	ns
BISF autoerotism	2.55	1.39	2.90	1.33	−1.43	ns
BISF couple sexuality	3.44	1.10	3.55	0.72	−0.67	ns
PHQ15	5.00	3.87	4.66	2.89	0.57	ns
QMI	39.61	6.83	38.42	7.57	0.92	ns

TABLE 3 | Binary logistic regression analysis results with dependent variable Quality of Marriage Index cutoffs.

	B	SE	Wald	*p*	OR	95% C.I.	
						Low	High
Age	0.060	0.026	5.202	0.023	1.062	1.008	1.118
Gender	−0.381	0.488	0.608	0.436	0.683	0.262	1.779
DASS depression	0.146	0.086	2.900	0.089	1.157	0.978	1.368
DASS anxiety	−0.203	0.103	3.865	0.049	0.816	0.667	0.999
DASS stress	0.047	0.083	0.313	0.576	1.048	0.890	1.233
PHQ15	0.085	0.072	1.402	0.236	1.088	0.946	1.252

overall perceived quality of marriage. During the lockdown, the participating couples had not perceived significant differences relating to the frequency, importance, and satisfaction of sexual intercourse. Nonetheless, small differences were perceived in relation to orgasm and desire. The most changes in sexual desire were influenced by the DASS general score [$\chi^2 = 9.33$, $p < 0.01$; $B = 0.136$ SE = 0.048, $OR = 1.14$ (1.044–1.26)], while changes in the quality of orgasm were influenced by somatic symptoms [PHQ-15, $\chi^2 = 9.50$, $p < 0.01$; $B = 0.189$ SE = 0.09, $OR = 1.21$ (1.060–1.37)].

DISCUSSION

The present research aims at assessing preliminary changes in couple sexuality during the first few weeks of the COVID-19 lockdown in Italy. Following the suggestion of Ahmed et al. (2020), we administered an online survey to investigate possible changes in couples' sex lives. Our first result was unexpected but very interesting: despite the psychological consequences of this challenging situation, when asked directly, most of the couples did not perceive any differences in their sexuality. Other studies on sexuality during the lockdown considered the frequency of sexual activity or sexual intercourses. In the United Kingdom and Spain, respectively, only 41 and 39% of the participants had maintained the same frequency (Ibarra et al., 2020); decrease in sexual intercourse frequency was found in 60% of United Kingdom participants (Jacob et al., 2020), and a decrease in sexual activity was found in 37% of the Chinese participants (Li G. et al., 2020). In three south-east Asian countries, nearly 70% of the participants engaged in sexual activity with their partner one to five times a week or more, with a considerable increase from before the lockdown (Arafat et al., 2020); similar results were found in Turkish women (Yuksel and Ozgor, 2020). A study on 1,515 young Italians found that, although most of the participants experienced an increase in sexual desire and arousal, this did not translate into an increase in the frequency of sexual intercourse (Cocci et al., 2020).

In our study, some female participants reported a decrease in pleasure, satisfaction, desire, and arousal (**Figure 1**). According to their open-ended answers, worry, lack of privacy, and stress appear to be the main reasons for the changes in women's sexuality, especially the decrease in their excitation and quality of pleasure. These data are in line with various studies, such as that of Li S. et al. (2020), in which 39% of the women reported a decrease in sexual satisfaction and the quality of sexual activity; that of Cocci et al. (2020), where 53.3% of the participants perceived less satisfaction in sexual relations compared to the pre-quarantine period; and Yuksel and Ozgor's (2020) study that reported a significant decrease in arousal, satisfaction, and difficulty in reaching orgasm. Moreover, although male and female participants reported few differences in their sexual life during the COVID-19 lockdown, gender differences were confirmed by the cluster analysis, showing that the group reporting the more changes was mostly composed by women. In addition, as reported in **Table 2**, based on the changes in sexuality, a part of the sample (Cluster 1) was more subject to modifications than the other. The *t*-test analysis showed that participants in Cluster 1 experienced more negative feelings, such as anxiety, depression, and stress. It can be argued that personal emotions and psychological difficulties during the lockdown had an impact on participants' sexual life, more than specific aspects related to the couple's relationship. Moreover, previous studies indicated that stress, anxiety, and depression have a negative impact, especially on women's sexuality (Dèttore et al., 2013; Kalmbach et al., 2014). In our sample, the decrease in sexual desire is mostly influenced by the DASS total score based on anxiety, stress, and depressive symptoms; also, Cocci's study confirmed that women, more frequently than men, experienced anxiety and depressive symptoms (Cocci et al., 2020). These data are in line with previous literature suggesting that a pattern of negative emotional symptoms can lead to a lower level of sexual desire (Rosen et al., 2009; Worsley et al., 2017).

Finally, aging and anxiety are also responsible for decreasing relationship satisfaction (**Table 3**). This result can be explained by the answers given by the participants themselves: on the one hand, for older participants, spending all the time with children and family can result in a lack of privacy with fewer moments of intimacy with the partner. On the other hand, fear of COVID-19 infection and the prolonged lockdown have generated higher levels of anxiety in participants, leading to worsening of their relationship satisfaction. Another possible explanation is that older participants not only are concerned for their safety but also the safety of their offspring, and they are carrying the burden of children management and homeschooling. Additionally, the lockdown has forced couples to social isolation, and parents had to face their daily life without the help of nannies and grandparents. The anxiety connected to these specific aspects, as well as the uncertainty for the future, negatively affected the couple's relationship, since the partner was the most probable and only person with whom to confront and lean on. Future studies should assess the outcomes of persistent somatic symptoms due to the COVID-19 lockdown on sexuality, after the emergency period.

LIMITATIONS

The present research has a few limitations that need to be addressed. In the first place, the number of participants was quite low due to the taboos and difficulties to source people who would be willing to divulge about their sexual life, especially during a time of stress. Second, since the cross-sectional methodology does not allow causal connections between the study variables, longitudinal studies should be carried out. Finally, our sample was composed mainly of heterosexual participants, whereas a convenience sample of LGBTQA+ (lesbian, gay, bisexual, transgender, intersex, queer/questioning, asexual, and many other terms such as non-binary and pansexual) should also be investigated to assess the relation between COVID-19 lockdown and sexuality, and to provide more specific results.

CONCLUSION

These preliminary data suggest that even if participants seem to show higher levels of resilience, the negative aspects of lockdown, such as anxiety, lack of privacy, fear of health conditions, and psychosomatic symptoms, can affect the quality of sexual life. The implications of these results are both clinical and research-related. In the first place, the main emotional and relational problems emerging from the survey will be used to conduct online focus groups on sexuality during the COVID-19 lockdown, with the purpose of addressing in a positive, warm, and non-judgmental environment how couples' sexual life has changed and their main needs. Moreover, to better address patients' needs and experiences, and provide *ad hoc* interventions, future clinical therapeutic approaches should take into consideration what has already emerged and what will eventually emerge from this research, on sexual well-being during this unprecedented time of crisis.

DATA AVAILABILITY STATEMENT

All datasets presented in this study are included in the article/**Supplementary Material**.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of Psychological Research Area 17 of Padua University. The patients/participants provided their online explicite informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MP and LF involved in all aspects of the research project: design, conducting the research, data handling, statistical analysis, drafting, and editing the manuscript. AC and RF assisted with the design of the study, in data collection and handling, and editing of the manuscript. All authors contributed to the article and approved the submitted version.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.565823/full#supplementary-material

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Stay at Home and Teach: A Comparative Study of Psychosocial Risks Between Spain and Mexico During the Pandemic

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Context: The emergency situation caused by coronavirus disease 2019 (COVID-19) has affected different facets of society. Although much of the attention is focused on the health sector, other sectors such as education have also experienced profound transformations and impacts. This sector is usually highly affected by psychosocial risks, and this could be aggravated during the current health emergency. Psychosocial risks may cause health problems, lack of motivation, and a decrease of effectiveness at work, which in turn affect the quality of teaching. Despite their importance, there are hardly any studies that analyze psychosocial risks of non-university teachers during a health emergency such as that caused by COVID-19.

Objectives: The aim of this study was to analyze the perception of COVID-19 and the psychosocial risks of non-university teachers comparing Spain and Mexico during the state of alarm caused by COVID-19.

Methods: Data were collected from 421 non-university teachers (80.2% women; 56.3% from Mexico, 43.7% from Spain) aged 24–60 (M = 39.32, SD = 10.21) *via* a self-completed questionnaire during the pandemic from March to April 2020.

Results: Data analysis suggests that inequity is the most important risk, followed by work overload. Teachers appear to be moderately satisfied with the information on COVID-19 and the measures taken, while their satisfaction with the available resources is lower. When comparing the two countries, significant differences can be observed in every risk considered except for social support, with lower levels in Mexican teachers compared to Spanish ones. In the case of the perception of COVID-19 and its impact, the perception in general of levels of information, measures, and resources is better among Mexican teachers than among Spanish ones, who present higher scores of the impact of the health emergency.

Conclusion: The results underline the importance of the professional's perception of resources during a health emergency, which could prevent to some extent burnout and possible alterations associated with it. The measures taken by the responsible entities and the provision of information do affect teachers not only directly but also indirectly by making them more vulnerable to psychosocial risks that could affect their health and professional performance, thus affecting students as well.

Keywords: psychosocial risks, teachers, coronavirus disease 2019 (COVID-19), Spain, Mexico, pandemic (COVID-19)

INTRODUCTION

Coronavirus Disease 2019 Pandemic

On January 09, 2020, the China Center for Disease Control and Prevention (China CDC) reported that a novel coronavirus had been detected as the causative agent for 15 of the 59 cases of pneumonia (European Centre for Disease Prevention and Control, 2020c; Holmes, 2020). On January 30, 2020, the World Health Organization (WHO) declared this first outbreak of novel coronavirus a "public health emergency of international concern" (World Health Organization, 2020a). On March 11, 2020, the Director General of the WHO declared coronavirus disease 2019 (COVID-19) a global pandemic (European Centre for Disease Prevention and Control, 2020d; World Health Organization, 2020b). As of March 25, 2020, all European Union (EU)/European Economic Area (EEA) countries and more than 150 countries worldwide are affected (World Health Organization, 2020a,World Health Organization, 2020b). As of April 15, 2020, many EU/EEA countries started to adjust their response measures (i.e., gradual opening of school, small shops, and other businesses, etc.) (European Centre for Disease Prevention and Control, 2020a).

Data from the EU/EEA show that around 20–30% of diagnosed COVID-19 cases are hospitalized, and 4% have severe illness. Hospitalization rates are higher for those aged 60 years and above and for those with other underlying health conditions (European Centre for Disease Prevention and Control, 2020b).

Since December 31, 2019, and as of May 23, 2020, 5,175,476 cases of COVID-19 have been reported, including 338,039 deaths (European Centre for Disease Prevention and Control, 2020b). As this is a new virus, no vaccine is currently available; it may be many months or even more than a year before a vaccine has been tested and is ready for use in humans (European Centre for Disease Prevention and Control, 2020d).

Main global data on cases and death are shown in **Table 1**.

As can be seen in **Table 1**, Spain and Mexico are among the most affected countries, with Spain ranking third in Europe in terms of deaths reported by COVID-19, and Mexico ranking third in terms of deaths reported by COVID-19 in the Americas.

On one hand, in Spain, the situation has been particularly complicated. As of May 23, 2020, there have been 234,824 confirmed cases in Spain, and 28,628 have died according to official data from the European Centre for Disease Prevention and Control (ECDC) (European Centre for Disease Prevention and Control, 2020d). The first positive diagnosis was confirmed on January 31, 2020 (Linde, 2020), while the first death occurred on February 13 in the city of Valencia (Caparrós, 2020). In view of the rapid spread of the virus, since March 14, the Spanish government has decreed a state of alarm (Boletín Oficial del Estado, 2020), restricting the mobility of citizens to certain cases, such as the purchase of food and medicines or visits to medical centers or the workplace. All face-to-face teaching activities have been interrupted in Spain since March 16, after the state of alarm was decreed (Boletín Oficial del Estado, 2020), although some communities such as Madrid or La Rioja imposed this measure on their schools a few days earlier. In total, some 10 million students from all educational stages are currently following their academic year at a distance (Faro de Vigo, 2020). A large number of teachers took on the tasks of distance teaching without being previously trained for them, nor having specific resources for all this in many cases.

This whole situation of stress caused by the pandemic, together with changes in the usual working conditions, could negatively affect not only the psychosocial risks of teachers but also its main consequences such as burnout.

On the other hand, in the case of Mexico, the first positive diagnosis was confirmed on February 27 in Mexico City (British Broadcasting Corporation, 2020), almost a month after in Spain. On March 30, a "health emergency due to force majeure" was declared as a result of the evolution of confirmed cases and deaths from the disease in the country, which led to the implementation of additional actions for its prevention and control (Secretaría de Salud, Gobierno de México, 2020). Currently, there have been 62,527 cases, of which 42,725 have been discharged and 6,989 have died, according to official data from the Mexican government and ECDC (European Centre for Disease Prevention and Control, 2020d; Secretaría de Salud, Gobierno de México, 2020).

Despite the fact that Spain is one of the countries most affected by the pandemic in Europe, and Mexico in America, we could say that the phase in which both countries are in this sense is different, since at the moment, it seems that Spain has reached its peak long before Mexico, with the former being in a phase of decreasing new cases, while the latter seems to be in the middle of a phase of increasing new cases. Of the total number of cases of COVID-19 in Spain (234,824), only 10,863 have been recorded in the last 14 days, while of the total number of cases in Mexico (62,527), 31,005 have been recorded in the last 14 days, i.e., the

TABLE 1 | Data on main countries affected by COVID-19 around the world.

Continent	Total cases	Total deaths	Countries with more cases	Cases by country	Countries with more deaths	Deaths per country
Africa	103,801	3,183	South Africa	20,125	Egypt	707
			Egypt	15,786	Algeria	582
			Algeria	7,918	South Africa	397
			Morocco	7,332	Nigeria	221
			Nigeria	7,261	Morocco	197
Asia	903,105	26,567	Turkey	154,500	Iran	7,300
			Iran	131,652	China	4,638
			India	125,101	Turkey	4,276
			China	84,081	India	3,720
			Saudi Arabia	67,719	Indonesia	1,326
America	2,365,427	139,960	United States	1,601,434	United States	96,007
			Brazil	330,890	Brazil	21,048
			Peru	111,698	Mexico	6,989
			Canada	82,469	Canada	6,250
			Mexico	62,527	Peru	3,244
Europe	1,793,907	168,193	Russia	326,448	United Kingdom	36,393
			United Kingdom	254,195	Italy	32,616
			Spain	234,824	Spain	28,628
			Italy	228,658	France	28,289
			Germany	177,850	Belgium	9,212
Oceania	8,540	129	Australia	7,095	Australia	101
			New Zealand	1,154	New Zealand	21
			Guam	165	Guam	5
			FP	60	NMI	2
			NMI	22	FP	0

FP, French Polynesia; NMI, Northern Mariana Islands.

figure has practically doubled in the last 2 weeks (as of May 23, 2020) (European Centre for Disease Prevention and Control, 2020d).

The pandemic caused by COVID-19 generates a series of impacts in all spheres of society, posing a challenge in practically all areas. During the pandemic, the population has had to adapt to a number of situations where uncertainty, fear, and, in many cases, pain have been present. These effects may translate into a range of emotional reactions (such as distress or psychiatric conditions), unhealthy behaviors (such as excessive substance use), and non-compliance with public health directives (such as home confinement and vaccination) in people who contract the disease and in the general population (Pfefferbaum, 2020). One of the many sectors that has had to adapt to this new situation and the demands that it entails is that of education. Teachers at all levels of education have tried to maintain their fundamental role and continue to carry out their teaching duties, despite the uncertainty of the situation, the difficulties related to their own health and that of their loved ones, the lack of resources (material and knowledge), and the huge amount of extra work that adaptation to teach from home entails, including helping their students to cope to this situation. In particular, non-university teachers (primary and secondary education), aware of the fundamental importance of learning for the development and future school performance of their students, have faced this situation by providing, in most cases, distance education, even if resources were often not available and uncertainty about the situation has always been present. In this context, the factors that are normally important for the good professional performance and well-being of teachers become even more relevant. Among them are the so-called psychosocial risks.

Psychosocial Risks

Cox and Griffiths (2005) define psychosocial risks at work as aspects regarding work design as well as the social, organizational, and management contexts of work that could potentially cause physical or psychological harm. Psychosocial risks and work-related stress are among the most challenging issues in occupational safety and health, impacting significantly on the health of individuals, organizations, and national economies (Bailey et al., 2015; Bergh et al., 2018). Psychosocial risks arise from poor work design, organization, and management, as well as a poor social context of work, and they may result in negative psychological, physical, and social outcomes such as work-related stress, burnout, or depression (European Centre for Disease Prevention and Control, 2020d). More specifically, psychosocial risks have been shown to be related to low job satisfaction (Guadix et al., 2015), health problems (Bergh et al., 2018), work accidents (Fornell et al., 2018), work-related stress (Junne et al., 2018), and burnout (Maslach et al., 2001; Elshaer et al., 2018). Psychosocial risks are closely related to work-related stress, which has been associated with a reduction in social interaction and the ability to concentrate at work, an increase in physiological pain and cardiovascular problems, and a higher incidence of

mental illness such as depression and anxiety (Nielsen et al., 2020). In this same vein, the right management of psychosocial risk helps to prevent accidents and absenteeism (Maslach, 2017), to increase productivity (Bakker and Demerouti, 2017; Bakker and Wang, 2019) and to promote well-being at the workplace (Hammer et al., 2019).

Among the different theoretical models that exist to explain the appearance of occupational stress, Karasek (1979) model is the one with the most theoretical and empirical support and it is the one that currently has the most influence and attention. It explains work-related stress according to the imbalance between psychological demands at work (e.g., workload, role conflicts, interpersonal conflicts, job insecurity,. . .) and the control level or resources that the employee has. According to this model, the employee health or well-being depends on the balance of the work demands and the resources that the employees have. When the demands are higher than the resources, it can create a feeling of work-related stress in the employee. In addition, the chronic work-related stress can cause burnout syndrome, being able to appear as several physical or psychosomatic symptomatology. Thus, an excess of demands will produce a negative consequence in the employee, as higher burnout; however, having enough resources benefits the employee, decreasing the probability of having higher burnout (Hatch et al., 2018).

Among the different psychosocial risks, the following stand out because of their importance in relation to the crisis situation and the theoretical reference model: (a) Role conflict: this is the situation in which a worker cannot simultaneously satisfy the contradictory role expectations in which he or she is involved. There is role conflict when a worker is being given work tasks without enough resources to complete them and receiving contradictory requests from different people. Previous research has shown that problematic levels of distress were 53% more likely for workers reporting role conflict (Johannessen et al., 2013). Having to teach from your own home often can bring some role conflict, since familiar conciliation might get more challenging for those teachers who also have to perform other roles, such as being parents, partners, and caregivers in general. (b) Lack of organizational justice: Lack of organizational justice refers to the extent to which employees perceive they are treated unfairly in their workplace and the perception of the absence of reciprocity in social exchanges (Moorman, 1991; Kobayashi and Kondo, 2019). Low organizational justice is known to be a potential risk factor for poor physical and psychological health among employees (Fujishiro and Heaney, 2009; Kobayashi and Kondo, 2019). (c) Workload: It assesses quantitative and qualitative workload. Quantitative workload refers to the amount of activities to be performed in a given period of time, while qualitative workload refers to the difficulty of the task and the volume of information to be processed in relation to the time available (Gil-Monte, 2016). A high workload has been associated with low levels of well-being and higher risks of health problems (Pace et al., 2019). In general, the adaptation to the current pandemic situation requires an extra load of work that teachers (and family and students) have to deal with. (d) Interpersonal conflicts: It assesses the frequency with which workers perceive conflicts coming from the school management, colleagues, students, or relatives of the students. Interpersonal conflicts have been associated to health problems, particularly to depression (Kubik et al., 2018). In the context of the COVID-19 pandemic, uncertainty has often made it difficult to reach an agreement between school, families, students, and teachers about the best way to proceed, which new measures to take in order to adapt, and for how long this measures should be maintained. (e) Emotional work: It refers to the effort, planning, and control necessary to express the organizationally desirable emotions during interpersonal transactions (Morris and Feldman, 1996; Ortiz et al., 2012). Previous research has shown that problematic levels of distress were 38% more likely for workers reporting high emotional work (Johannessen et al., 2013). In the context of a pandemic, an extra burden of negative emotions in teachers (such as worry, uncertainty, and fear) would be expected. (f) Job insecurity: the perceived threat of losing one's current job in the near future (Heaney et al., 1994), or that the employer did not comply with his or her obligations or promises (breach of psychological contract) (Vander Elst et al., 2016), can have equally serious consequences as actual job loss (De Witte, 1999). Particularly, job insecurity is considered a stressor that affects negatively the physical, psychological, and social health of the employee (Cheng and Chan, 2008; De Witte et al., 2015; De Witte et al., 2016; Selenko et al., 2017).

On the other hand, as the Karasek model points out, one of the most important resources to cope with psychosocial risk factors is the *Social support at work*. Social support at work is defined as the social climate in the work context involving the relationship between the supervisor and coworkers (Karasek and Theorell, 1990). It involves both social–emotional and instrumental support. The former refers to the degree of social and emotional integration between coworkers and the supervisor, while instrumental support refers to the collaboration between coworkers and the supervisor to carry out work tasks (Martín-Arribas, 2007).

An important potential source of social support is the emotional support of family, friends, and colleagues, which is particularly difficult to have on a confinement situation such as that originated by the COVID-19 pandemic. Social support and resilience protect individuals from threats to their mental and physical health by reducing or balancing the negative effects of the stressful events they experience in life (Woodhead et al., 2016; Sun et al., 2017).

As previously stated, a large number of demands and low resources produce a series of negative consequences for workers (Karasek, 1979), of which psychosomatic health problems and burnout syndrome are the most important due to their prevalence and associated consequences.

Psychosomatic Health Problems

The term psychosomatic refers to all those alterations in which mental processes influence areas of the organism (Montiel et al., 2016). Among the most common are various types of symptoms affecting multiple organs and systems.

Examples of these are back pain, tension headaches, sleep problems, chronic fatigue, heartburn, tension diarrhea, or heart palpitations (Jaradat et al., 2016).

Burnout Syndrome

Burnout syndrome is defined as a prolonged response to chronic emotional and interpersonal stressors at work and is defined by the three dimensions of burnout, cynicism, and inefficiency (Maslach et al., 2001).

The prevalence of burnout in education oscillates between 11 and 35.5% depending on the country and the study considered (Ratto et al., 2015; Villaverde et al., 2019). A Eurofound study (Aumayr-Pintar et al., 2020) showed that, in Portugal, 15% of educational professionals had a moderate risk of burnout, and the employees with burnout syndrome increased from 8 to 15% between 2008 and 2013. In addition, their study (King et al., 2018) with school counselors in Australia found that 45% of the sample experiences burnout.

Given this prevalence in recent years, the study of burnout in the education sector has become increasingly important (Kim and Burić, 2019; McLean et al., 2019a; Schonfeld et al., 2019). Most researches pointed out the importance of burnout on teachers (Kaur and Singh, 2014; Yerdelen et al., 2016; Schonfeld et al., 2019), considering it as a risk for teachers that can negatively affect effective teaching (Travers, 2017), their interaction with their students (Travers, 2017), and their motivation for the job (McLean et al., 2019b), resulting in absenteeism (Makhdoom et al., 2019), depression (Martínez-Monteagudo et al., 2019), insomnia (Gu et al., 2020), or a decrease in the capacity to give support to the students (Zapf et al., 1999; Jennings and Greenberg, 2009).

Despite the impact of pandemics on the health and well-being of citizens, and more specifically of workers, and their clear influence on working conditions, or more specifically on their psychosocial risks, there are hardly any studies that have addressed the effect of a pandemic on psychosocial risks. There are even fewer studies comparing these types of factors during a pandemic in Spanish-speaking countries. Although there are studies carried out within the framework of different crises, allowing for contextualization of stress situations, these do not focus on the specific case of a pandemic like the one we are facing due to COVID-19. This situation is even more limited if we consider the impact on teachers. Likewise, the few studies traditionally available have been carried out retrospectively, ignoring their perception of the pandemic, as well as the associated psychosocial risks during the times of greatest severity.

After conducting a review of the literature, we were unable to observe any studies focused on teachers that analyzed the psychosocial risks of this group and their perception of the pandemic comparing two Spanish-speaking countries at different phases or moments of the pandemic. Therefore, the study presented here aims to fill this gap in the literature by offering a first approach to the perception of COVID-19 by teachers and its relationship with psychosocial risks, comparing data from Spain and Mexico.

Aims

The main aim of this study was to analyze the perception of non-university teachers regarding measures and resources implemented by institutions and governments and its impact on their daily work. Also, to analyze the psychosocial risks of these professionals and its relation to the sanitary emergency caused by COVID-19 comparing two Spanish-speaking countries, Spain and Mexico, at a moment where the two countries were at different phases of the pandemic.

MATERIALS AND METHODS

Design, Procedure, and Participants

Data were collected from a sample of 421 non-university teachers (80.2% women and 19.8% men; 56.3% from Mexico and 43.7% from Spain) aged 24–60 years (M = 39.32, SD = 10.21) *via* a self-completed questionnaire during the COVID-19 pandemic from March to April 2020. From Spain, participants were aged 24–60 (M = 40.17, SD = 8.46), 71.1% of whom were women and 28.9% were men. From Mexico, participants were aged 20–64 (M = 38.72, SD = 811.28), 86.6% of whom were women and 13.4% were men. At the beginning of the study, the research team contacted different associations and institutions of education in order to reach non-university teachers and invite them *via* e-mail to participate in the study. In the online invitation, teachers were informed about the purpose of the study and also about how their anonymity and confidentiality were guaranteed. The time cost of completing the questionnaire was 35 min.

The eligibility criteria for participants were as follows.

Inclusion criteria:

(a) To be a teacher in an institution other than university.
(b) To be actively working during the moment of assessment.
(c) To have signed the informed consent document and confidentiality agreement within the framework of the principles of the Declaration of Helsinki.

Outcome Measures

The research included the variables and measurement instruments:

Psychosocial Risks

Different questionnaires were used to measure demands, resources, and consequences: The UNIPSICO Battery (Gil-Monte, 2016), the Burnout Assessment Tool (BAT) (Schaufeli et al., 2019), and The Job Insecurity Scale (Vander Elst et al., 2014).

The demand factors include:

Role conflict

Taken from UNIPSICO Battery (Gil-Monte, 2016). Role conflict is the situation in which a worker cannot simultaneously satisfy the contradictory role expectations in which he or she is involved. The scale is composed of five items (e.g., "I receive incompatible demands from two or more people"). Participants are asked to score the frequency with which they have experienced the

situation described in each statement on a Likert-type scale from 0 to 4 (0 = Never; 4 = Very frequently: every day), with higher scores indicating higher levels of Role conflict (scores above 1.6 are considered high, whereas scores equal to or below 0.81 are considered low). The scale has obtained adequate psychometric properties in previous studies and in the present research (total sample: α = 0.84; Mexico: α = 0.80; Spain: α = 0.84).

Lack of organizational justice

Extracted from UNIPSICO Battery (Gil-Monte, 2016). Lack of organizational justice is defined as the perception of the absence of reciprocity in social exchanges. The scale is made up of five items (e.g., "I give up my skin at work compared to what I receive in return"). The response format is on a Likert-type scale from 0 to 4 (0 = Never; 4 = Very frequently: every day), with higher scores indicating higher lack of organizational justice (scores above 2.4 are considered high, whereas scores equal to or below 1.6 are considered low). The scale has obtained adequate psychometric properties in previous studies and in the present research (total sample: α = 0.83; Mexico: α = 0.74; Spain: α = 0.89).

Workload

Taken from UNIPSICO Battery (Gil-Monte, 2016). It assesses quantitative and qualitative workload on a Likert-type scale from 0 to 4 (0 = Never; 4 = Very frequently: every day). Quantitative workload refers to the amount of activities to be performed in a given period of time, while qualitative workload refers to the difficulty of the task and the volume of information to be processed in relation to the time available. It consists of six items, three quantitative (e.g., "Is it possible for you to work at a relaxed pace?") and three qualitative (e.g., "When you are working, do you encounter particularly hard situations?"), with higher scores indicating higher Workload (scores above 2.17 are considered high, whereas scores equal to or below 1.51 are considered low). The scale has obtained adequate psychometric properties in previous studies and in the present research (total sample: α = 0.76; Mexico: α = 0.62; Spain: α = 0.80).

Interpersonal conflicts

Extracted from UNIPSICO Battery (Gil-Monte, 2016). It assesses the frequency (0 = Never; 4 = Very frequently: every day) that workers perceive conflicts coming from the hospital management, colleagues, patients, and relatives of the patient. The scale consists of six items (e.g., "How often do you have conflicts with your colleagues?"), with higher scores indicating higher Interpersonal conflicts (scores above 1 are considered high, whereas scores equal to or below 0.6 are considered low). The scale has obtained adequate psychometric properties in previous studies and in the present research (total sample: α = 0.60; Mexico: α = 0.58; Spain: α = 0.57).

Job insecurity

It was measured using the Job Insecurity Scale (Vander Elst et al., 2014). It consists of five items (e.g., "I feel insecure about the future of my job") designed to measure quantitative job insecurity (i.e., insecurity to lose the job as such). Respondents were asked to rate these items on a 5-point Likert-type scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree"), with higher scores indicating higher levels of job insecurity. The scale has obtained adequate psychometric properties in previous studies and in the present research (total sample: α = 0.87; Mexico: α = 0.76; Spain: α = 0.91).

The resource factors include:

Social support at work

Extracted from UNIPSICO Battery (Gil-Monte, 2016). This is defined as the availability of help from other people. It evaluates the social support offered by your head of studies, the management of the center, and by your colleagues, in all cases in the form of emotional support and technical support. It consists of six items (e.g., "How often do your colleagues help you when problems arise at work?"). This was answered on a 4-pont Likert-type scale (0 = Never; 4 = Very frequently: every day), with higher scores indicating higher Social support at work (scores above 2.83 are considered high, whereas scores equal to or below 2 are considered low). The scale has obtained adequate psychometric properties in previous studies and in the present research (total sample: α = 0.88; Mexico: α = 0.88; Spain: α = 0.89).

The consequence factors include:

Psychosomatic problems

Included in the UNIPSICO battery (Gil-Monte, 2016). It assesses the frequency of occurrence of psychosomatic problems related to the perception of sources of stress at work. It consists of nine items related to different systems of the organism (e.g., "Have you been worried that, without making any effort, your breathing would be cut off?"). It was answered on a 4-pont Likert-type scale (0 = Never; 4 = Very frequently: every day), with higher scores indicating higher Psychosomatic problems (scores above 1.67 are considered high, whereas scores equal to or below 0.89 are considered low). The scale has obtained adequate psychometric properties in previous studies and in the present research (total sample: α = 0.90; Mexico: α = 0.90; Spain: α = 0.90).

Burnout

It was assessed using the reduced version of the BAT (Schaufeli et al., 2019). It consists of 12 items that evaluate four scales: (European Centre for Disease Prevention and Control, 2020c) exhaustion (e.g., "At work, I feel mentally exhausted"), mental distance (e.g., "At work, I have trouble staying focused"), emotional impairment (e.g., "I don't recognize myself in the way I react emotionally at work"), and cognitive impairment (e.g., "I make mistakes in my work because I have my mind on other things"). Participants are asked to score the frequency that they have experienced the situation described in each statement on a Likert-type scale from 0 to 4 (0 = Never; 4 = Very frequently: every day), with higher scores indicating higher levels of Burnout. The instrument has obtained adequate psychometric properties in previous studies and in the present research (total sample: α = 0.91; Mexico: α = 0.89; Spain: α = 0.91).

Coronavirus Disease 2019-Related Measures

This is an *ad hoc* questionnaire of 13 items constructed to measure different aspects related to the health emergency caused by the COVID-19. The aspects considered are: Available resources (provided by the health center, regional government,

and national government, e.g., "I feel that my center has put sufficient resources to deal with COVID-19 in my daily work"), information {provided by the health center, regional government, and national government, e.g., "I consider that from the regional government [e.g., state of Sinaloa (Mexico)/or Autonomous Community (Spain)] I have been given enough information to deal with COVID-19 in my daily work"}, measures (taken by the health center, regional government, and national government, e.g., "I believe that sufficient measures have been taken by the national government to address COVID-19 in my daily work"), and impact on work (workload, labor conflicts, work-related stress, and work-related concerns and fears, e.g., "The COVID-19 has increased my workload"). The subjects score on a Likert-type scale his or her level of agreement or disagreement with the statements (1 = totally disagree, 5 = totally agree). Scores range from 1 to 5, with higher levels indicating greater satisfaction with the resources available, information, and measures taken, as well as higher levels of impact on work. The scale has obtained adequate psychometric properties (total sample: available resources $\alpha = 0.90$, information $\alpha = 0.94$, measures $\alpha = 0.94$, impact on work $\alpha = 0.78$; Mexico: available resources $\alpha = 0.86$, information $\alpha = 0.93$, measures $\alpha = 0.91$, impact on work $\alpha = 0.78$; Spain: available resources $\alpha = 0.87$, information $\alpha = 0.89$, measures $\alpha = 0.90$, impact on work $\alpha = 0.78$).

Data Analyses

A descriptive statistical analysis was performed for all study variables, as well as correlations and mean comparison analysis. All analyses were carried out using the statistical package SPSS (Statistical Package for the Social Sciences, Version 25, Armonk, NY, United States: IBM Corp.).

RESULTS

Descriptive Analysis

Sociodemographic

From the total sample of 421 non-university teachers, 237 were from Mexico and 184 from Spain. The great majority worked in a public institute (84.8%); 32% taught in kindergarten, 39.5% in primary school, and 28.5% in high school. The educational level of the teachers was 65.3% university degree, 23.9% master, and 10.8% doctorate. From the participants, 7.8% had a temporary contract, whereas 92.2% had a permanent contract.

TABLE 3 | Descriptive data on COVID-19-related measures on teachers in Spain and Mexico.

		Resources	Information	Measures	Impact
Spain	Mean	2.10	2.31	2.11	2.59
	SD	1.12	1.18	1.15	1.11
	Range	1–5	1–5	1–5	1–5
Mexico	Mean	3.32	3.84	3.65	2.35
	SD	1.32	1.23	1.20	1.07
	Range	1–5	1–5	1–5	1–5

SD, standard deviation.

Psychosocial Risks

As it can be seen in **Table 2**, regarding psychosocial risks, that teachers in Spain present medium levels on all of the psychosocial risks, whereas teachers in Mexico present medium levels on lack of organizational justices and of social support and low levels on the rest of psychosocial risks.

Coronavirus Disease 2019-Related Measures

As it can be seen in **Table 3**, during the pandemic, teachers in Spain rated the resources, information available, and measures taken by the government and the hospital below the mean value of the answer scale, which points to a tendency to consider resources, information, and measures as insufficient. The highest scores from teachers in Spain are regarding the impact of COVID-19 on their jobs, although the scores in this case are also below the medium value of the answer scale. Teachers in Mexico, on the other hand, rated the resources and information available and the measures taken by government and the hospital above the mean value of the answer scale, which points to a tendency to consider resources, information, and measures as sufficient. The lowest score for teachers in Mexico is the impact of COVID-19 on their jobs.

TABLE 2 | Descriptive data on psychosocial risks of teachers in Spain and Mexico.

		Role conflict	Lack of organizational justice	Workload	Interpersonal conflicts	Job insecurity	Psychosomatic problems	Burnout	Social support
Spain	Mean	1.07	2.04	1.76	0.72	1.90	0.92	1.14	2.40
	SD	0.69	1.05	0.76	0.61	1.14	0.60	0.67	1.00
	Range	0–4	0–4	0–4	0–4	1–5	0–4	0–4	0–4
	Level of risk	Medium	Medium	Medium	Medium	–	Medium	–	Medium
Mexico	Mean	0.66	1.65	1.17	0.37	1.42	0.76	0.68	2.50
	SD	0.57	0.82	0.57	0.47	0.71	0.56	0.51	0.94
	Range	0–4	0–3.83	0–4	0–4	1–5	0–4	0–4	0–4
	Level of risk	Low	Medium	Low	Low	–	Low	–	Medium

SD, standard deviation; –, no available scale ranges for severity of this variables in teachers' population.

TABLE 4 | Means, SDs, effect sizes, mean comparison.

	Teachers in Spain	Teachers in Mexico	Cohen's *d*	Test *t*	
	M (SD)	*M (SD)*		*t*	*p*
Role conflict	1.07(0.69)	0.66(0.57)	0.65	−6.37	0.000
Lack of organizational justice	2.04(1.05)	1.65(0.82)	0.48	−4.15	0.000
Workload	1.76(0.76)	1.17(0.57)	0.88	−8.81	0.000
Interpersonal conflicts	0.72(0.61)	0.37(0.47)	0.64	−6.42	0.000
Job insecurity	1.90(1.14)	1.42(0.71)	0.51	−4.97	0.000
Psychosomatic problems	0.92(0.60)	0.76(0.56)	0.28	−2.77	0.006
Burnout	1.14(0.67)	0.68(0.51)	0.77	−7.71	0.000
Social support	2.40(1.00)	2.50(0.94)	–	1.10	0.274
COVID19 resources	2.10(1.12)	3.32(1.32)	0.99	10.15	0.000
COVID19 information	2.31(1.18)	3.84(1.23)	1.27	12.78	0.000
COVID19 measures	2.11(1.15)	3.65(1.20)	1.31	13.24	0.000
COVID19 impact	2.59(1.11)	2.35(1.07)	0.22	−3.06	0.024

M, mean; SD, standard deviation; Cohen's d, effect size; p, probability.

TABLE 5 | Correlations among all the variables of the study.

	RC	LOJ	WL	IC	JI	PP	B	SS	R	INF	M	IMP
Role conflict	1											
Lack of organizational justice	0.46**	1										
Workload	0.71**	0.53**	1									
Interpersonal conflicts	0.65**	0.32**	0.57**	1								
Job insecurity	0.21**	0.16**	0.22**	0.14**	1							
Psychosomatic problems	0.61**	0.42**	0.64**	0.54**	0.15**	1						
Burnout	0.71**	0.46**	0.76**	0.55**	0.23**	0.68**	1					
Social support	−0.35**	−0.27**	−0.22**	−0.27**	−0.18**	−0.26**	−0.31**	1				
COVID-19: resources	−0.36**	−0.31**	−0.38**	−0.26**	−0.17**	−0.33**	−0.40**	0.25**	1			
Information	−0.41**	−0.31**	−0.41**	−0.32**	−0.16**	−0.35**	−0.44**	0.25**	0.80**	1		
Measures	−0.36**	−0.31**	−0.41**	−0.29**	−0.20**	−0.31**	−0.41**	0.24**	0.86**	0.85**	1	
Impact	0.27**	0.23**	0.31**	0.24**	0.11*	0.34**	0.32**	−0.05	−0.20**	−0.21**	−0.19**	1

*RC, role conflict; LOJ, lack of organizational justice; WL, workload; IC, interpersonal conflicts; JI, job insecurity; PP, psychosomatic problems; B, burnout; SS, social support; R, resources; M, measures; INF, information; IMP, impact; *p < 0.05, **p < 0.01.*

TABLE 6 | Correlations among all the variables of study in Spain (upper diagonal) and in Mexico (lower diagonal).

	RC	LOJ	WL	IC	JI	PP	B	SS	R	INF	M	IMP
Role conflict	1	0.53**	0.72**	0.67**	0.11	0.65**	0.71**	−0.37**	−0.19**	−0.29**	−0.20**	0.28**
Lack of organizational justice	0.31**	1	0.55**	0.37**	0.08	0.51**	0.49**	−0.41**	−0.31**	−0.38**	−0.32**	0.20**
Workload	0.62**	0.43**	1	0.58**	0.11	0.69**	0.73**	−0.26**	−0.19**	−0.23**	−0.20**	0.29**
Interpersonal conflicts	0.56**	0.15*	0.41**	1	0.04	0.61**	0.60**	−0.37**	−0.16*	−0.21**	−0.14	0.23**
Job insecurity	0.19**	0.16*	0.15*	0.11	1	0.09	0.10	−0.13	−0.03	0.05	−0.04	0.02
Psychosomatic problems	0.56**	0.28**	0.60**	0.44**	0.18**	1	0.70**	−0.30**	−0.25**	−0.30**	−0.24**	0.43**
Burnout	0.64**	0.32**	0.59**	0.37**	0.24**	0.69**	1	−0.35**	−0.21**	−0.28**	−0.21**	0.32**
Social support	−0.33**	−0.12	−0.18**	−0.18**	−0.24**	−0.21**	−0.27**	1	0.27**	0.28**	0.25**	−0.03
COVID-19:												
Resources	−0.34**	−0.21**	−0.31**	−0.14*	−0.13	−0.35**	– – 0.36**	0.24**	1	0.79**	0.92**	−0.13
Information	−0.33**	−0.12	−0.29**	−0.19**	−0.13*	−0.35**	−0.37**	0.25**	0.71**	1	0.79**	−0.18*
Measures	−0.29**	−0.18**	−0.29**	−0.17**	−0.13	−0.33**	−0.34**	0.25**	0.78**	0.80**	1	−0.13
Impact	0.22**	0.23**	0.30**	0.21**	0.17**	0.24**	0.29**	−0.05	−0.19**	−0.16*	−0.16*	1

*RC, role conflict; LOJ, lack of organizational justice; WL, workload; IC, interpersonal conflicts; JI, job insecurity; PP, psychosomatic problems; B, burnout; SS, social support; R, resources; M, measures; INF, information; IMP, impact; *p < 0.05, **p < 0.01.*

Comparison of Mean

Analysis of the mean comparison among the variables of the study was carried out between data from teachers in Spain and Mexico (**Table 4**).

In general, it seems that the pandemic has a greater effect in the case of Spain, since there are statistically significant differences in all dimensions except social support, with higher levels of risk and consequences in the Spanish case. Likewise, there is greater satisfaction with the available information, resources, and measures in the Mexican case than in the Spanish case, and finally, there seems to be a greater impact of the pandemic on the work and life of teachers in the Spanish case in comparison with the Mexican case.

Analysis of Relations

The results of the correlation analysis among the variables are shown in **Table 5**. As it can be seen, almost all the variables are very strongly related. The only correlation that is not statistically significant is between the Impact of COVID-19 in the workplace and Social support.

When focusing on correlations among the variables in teachers from Spain and Mexico separately, the situation slightly changes (**Table 6**). In the case of teachers in Spain, many of the psychosocial risks correlate between them, except for Job insecurity that does not appear related to any of the resting variables. Also, from the COVID-19-related measures, Information and Measures are related with a higher number of psychosocial risks, whereas Impact is less related to the rest of the variables (psychosocial risks as well as the resting COVID-19-related measures). On the other hand, in the case of teachers in Mexico, variables are also very strongly related between them, although Lack of organizational justice and Job insecurity are less related to the rest of the variables. Also, in contrast with the case of Spain, Impact appears related with the rest of the COVID-19-related measures.

DISCUSSION AND CONCLUSION

The current crisis caused by the coronavirus is a challenge not only in the health field but also in all spheres of society. In this context, professionals at all levels have had to adapt to new working conditions, in addition to dealing with the pandemic in their personal lives and as members of the community. Among them, teachers of preschool and primary and secondary education have had to assume their important role in the best possible way, with limited means and resources and with the uncertainty of the moment and with the enormous responsibility that comes with educating and training children and adolescents, helping them to cope with the crisis and often providing relief as much as possible with homework and how to take school home (Boletín Oficial del Estado, 2020; Faro de Vigo, 2020). Considering that teachers are vulnerable to burnout and job stress (Zapf et al., 1999; Jennings and Greenberg, 2009; Kaur and Singh, 2014; Yerdelen et al., 2016; Travers, 2017; Makhdoom et al., 2019; Martínez-Monteagudo et al., 2019; McLean et al., 2019b; Schonfeld et al., 2019; Gu et al., 2020), and therefore the negative consequences these can have on their health and professional performance (Bergh et al., 2018; Fornell et al., 2018; Junne et al., 2018; European Centre for Disease Prevention and Control, 2020d), it is essential to study how psychosocial risks affect this group at a time of such vulnerability and general demand as the present. The literature on social risks to teachers in a pandemic context is extremely limited; however, it is critical to study the extent to which factors related to teachers' well-being may be affected during a health crisis such as the current one in order to ensure the well-being of teachers and, in turn, the children and adolescents in their care.

This study has sought to explore the extent to which teachers are affected by psychosocial risks during the pandemic and how these risks relate to teachers' perceptions of the pandemic in terms of resources, measures, information, and impact. At the same time, it compares data of teachers in Mexico with data of teachers in Spain, two countries heavily affected by the pandemic and yet at very different stages of its development: Spain in the midst of a drop in cases, Mexico in the midst of a rise (European Centre for Disease Prevention and Control, 2020d).

At the time of collecting the data, the coronavirus crisis was at its peak in Spain, while in Mexico, it was in a more initial phase. This facilitates the interpretation of some of the data found.

The main results of the study show, on the one hand, that teachers in Spain as well as teachers in Mexico inform about perceiving lack of organizational justice during the pandemic but, at the same time, to perceive social support. Teachers in Spain, however, also inform about role conflict, workload, interpersonal conflict, psychosomatic problems, and burnout. These data go in line with previous literature about the social risks that teachers are exposed to (Zapf et al., 1999; Jennings and Greenberg, 2009; Kaur and Singh, 2014; Yerdelen et al., 2016; Travers, 2017; Makhdoom et al., 2019; Martínez-Monteagudo et al., 2019; McLean et al., 2019b; Schonfeld et al., 2019; Gu et al., 2020). Regarding resources and information available about COVID-19, the impact of COVID-19 on their jobs, as well as measures taken by responsible entities (national and regional government, as well as work center), data from teachers in Spain point to a perception of insufficient resources, information, and measures and to a perception of a moderate–high impact of COVID-19 on their jobs. Regarding teachers in Mexico, data point to a perception of sufficient resources, information, and measures taken by responsible entities, as well as to a perception of a moderate impact of COVID-19 on their jobs.

When specifically comparing data from teachers in Spain and Mexico, the results highlight a difference between teachers in both countries: Spanish teachers present more role conflict, lack of organizational justice, workload, interpersonal conflicts, job insecurity, psychosomatic problems, and burnout than teachers in Mexico. At the same time, teachers in Spain inform about less resources, information, and measures than teachers in Mexico, but also about a bigger impact of COVID-19 on their jobs, than teachers in Mexico. The fact that teachers in Spain are more affected by psychosocial risks during the pandemic and are more

burned out by work could be due, on the one hand, to the phase of the pandemic at the time of data collection, as the pandemic situation was more severe in Spain at the time that the study was conducted. However, it could also be due to the fact that teachers in Spain perceive fewer resources, information, and measures taken by responsible institutions, which could in turn worsen some of the psychosocial risks and even be a direct risk factor for burnout. Specifically, in terms of the relationship between psychosocial risk factors and COVID-19-related measures, these appear to be closely related, although it is true that in the case of teachers in Spain, the relationship between COVID-19-related measures and social risks is clearer than in the case of teachers in Mexico. Of the COVID-19-related measures, the least related to psychosocial risks is the impact of COVID-19 on work, while of the psychosocial risks, the least related to the rest of the psychosocial risks and to COVID-19-related measures is Job insecurity. These data indicate that teachers' perception of the measures taken by the responsible entities, as well as the perception of sufficient information and resources, could influence the psychosocial risks to which these professionals are exposed. As mentioned above, some of the differences are due, on the one hand, to the phase of the pandemic in which both countries were and, on the other hand, to the perception of resources by teachers to face the pandemic and the challenges it poses in their professional life.

One of the main limitations of this study is that it presents an analysis of relationships between variables that does not allow for the establishment of causal relationships between them. Furthermore, it is a cross-sectional study that does not allow for observing the evolution of the data as the pandemic caused by COVID-19 progresses. Future studies could make new measurements of the variables when the different phases of the pandemic have passed, which would allow the comparison of the variables taking into account the evolution of the health crisis, as well as the evolution of the psychosocial risks of teachers and the possible development of pathologies that, based on the scientific literature, have been related to the burnout and psychosocial risks described here.

Despite its limitations, this study shows data collected in a context never before seen, where data on psychosocial risks are not collected *a posteriori* but in the midst of a pandemic crisis. Our data speak of a greater general attrition of teachers in Spain, which indicates that the pandemic may indeed be related to greater sources of stress and psychosocial risks. At the same time, data from the present study underline the importance of the perception of resources by professionals, which could prevent to some extent the burnout and the possible alterations associated with it.

It is difficult to carry out this type of study in these contexts for a number of reasons, but we believe that it is important to have data to support the fact that the measures taken by the responsible entities and the provision of information affect teachers not only directly but also indirectly by making them more vulnerable to psychosocial risks that could affect their health and professional performance, thus affecting students as well. If this is important in any context, it becomes even more important in a context where the emotional toll on society is more evident than ever.

Some of the main practical applications of this research would be to know the psychosocial risks during a pandemic in non-university teachers to discover the perception of resources, information, and measures adopted by the different public and private entities to deal with COVID-19, as well as to know the impact that this perception has had on the daily work of non-university teachers. These results can help make a difference between building resilience and developing burnout. Any data that can clarify the relationships between the variables will be data that will benefit teachers, their students, and society in general. The results obtained in the present study allow to advance and consolidate the research on psychosocial risks during a pandemic while enabling the development of policies for action to improve teachers' coping with a pandemic and occupational health, which in turn will impact the outcomes of their work and society as a whole.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

VP-G made a substantial contribution to the concept and design of the work, as well as on analysis and interpretation of data, drafted the article and revised it critically for important intellectual content, approved the version to be published, and participated sufficiently in the work to take public responsibility for appropriate portions of the content. MG-D made a substantial contribution to the concept of the work and acquisition of data, revised the article, approved the version to be published, and participated sufficiently in the work to take public responsibility for appropriate portions of the content. AS-R made a substantial contribution to the concept or design of the work and on interpretation of data, drafted the article and revised it critically for important intellectual content, approved the version to be published, and participated sufficiently in the work to take public responsibility for appropriate portions of the content. LD-R made a substantial contribution to the design of the work and the acquisition of data, revised the article critically for important intellectual content, approved the version to be published, and participated sufficiently in the work to take public responsibility for

appropriate portions of the content. DN-M made a substantial contribution to the concept and design of the work and acquisition of data, drafted the article and revised it critically for important intellectual content, approved the version to be published, and participated sufficiently in the work to take public responsibility for appropriate portions of the content. All authors contributed to the article and approved the submitted version.

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Public Perceptions of COVID-19 in Australia: Perceived Risk, Knowledge, Health-Protective Behaviors, and Vaccine Intentions

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Widespread and sustained engagement with health-protective behaviors (i.e., hygiene and distancing) is critical to successfully managing the COVID-19 pandemic. Evidence from previous emerging infectious disease outbreaks points to the role of perceived risk, worry, media coverage, and knowledge in shaping engagement with health-protective behaviors and vaccination intentions. The aim of the current study was to examine the role of these factors in predicting recommended health-protective behaviors early in the pandemic. A secondary aim was to assess uncertainty and misconceptions about COVID-19. An online survey of 2,174 Australian residents was completed between March 2 and 9, 2020, at an early stage of the COVID-19 outbreak in Australia. Results revealed that two-thirds of respondents were at least moderately worried about a widespread COVID-19 outbreak. Worry about the outbreak and closely following media coverage were consistent predictors of greater engagement with health-protective behaviors and higher vaccination intentions. Uncertainty and misconceptions about COVID-19 were common, including uncertainty about whether people are likely to have natural or existing immunity to the virus. There was also uncertainty around whether specific home remedies (e.g., vitamins and saline rinses) would offer protection and whether the virus was human-made and deliberately released. Such misconceptions are likely to cause concern for members of the public. The findings also highlight psychological and demographic factors associated with lower engagement with health-protective behaviors, including male gender, younger age, and low levels of worry about the outbreak. These findings offer potential pathways and targets for interventions to encourage health-protective behaviors. The results relating to uncertainty and misconceptions about COVID-19 point to areas that could be usefully targeted by public information campaigns.

Keywords: COVID-19, emerging infectious disease, health behaviors, perceived risk, worry, knowledge, uncertainty, misinformation

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INTRODUCTION

On December 31, 2019, the first report of a "pneumonia of unknown cause" was made to the World Health Organization (WHO) Country Office (World Health Organization, 2020c). The report came from Wuhan, China. On January 10, 2020, WHO issued its first guidance on the "novel coronavirus," with similarities to other coronaviruses such as SARS (Severe Acute Respiratory Syndrome) and MERS (Middle East Respiratory Syndrome). By the end of January 2020, the novel coronavirus had spread to countries around the world, and the outbreak was declared a Public Emergency of International Concern. The first cases of COVID-19 in Australia were identified on January 25, 2020 (Minister for Health, 2020). As of March 7, there were 63 confirmed cases, including two deaths (Australian Government Department of Health, 2020b).

Public engagement with health-protective behaviors, including social distancing and hygiene behaviors, has been highlighted as one of the most important strategies for reducing the transmission of COVID-19 (Bonell et al., 2020). Social distancing refers to minimizing the number of times people come into close contact with one another. Hygiene behaviors are those aimed at cleaning hands, surfaces, or objects that may have come into contact with potentially infectious respiratory droplets (Michie et al., 2020). Understanding the cognitive and affective factors that predict engagement with these health-protective behaviors can help inform public health strategies to encourage people to increase and sustain these behaviors.

A number of cognitive factors contribute to engagement with health-protective behaviors during disease outbreaks. Perceived risk, or perceived susceptibility to a threat, has emerged as a consistent predictor of such behaviors (Weinstein, 1988; Petrie et al., 2016). For example, higher perceived likelihood and severity of influenza A/H1N1 (swine flu), influenza H5N1 (bird flu), and SARS were associated with increased heath-protective behaviors in general population samples (Tang and Wong, 2003; Lau et al., 2007; Rubin et al., 2009). Other cognitive factors identified include more accurate knowledge about how a virus is spread (Petrie et al., 2016) and the perception that behaviors will be effective in reducing the risk of infection (Bish and Michie, 2010).

Affective factors also appear to play a role in increasing health-protective behaviors (Slovic et al., 2007). The COVID-19 pandemic has generated substantial public anxiety, uncertainty, and distrust (Asmundson and Taylor, 2020). Both heightened anxiety and trust in information provided by authorities have been shown to predict health-protective behaviors during infectious disease outbreaks (Bish and Michie, 2010).

Substantial media coverage and misinformation have been generated by the COVID-19 pandemic (Asmundson and Taylor, 2020). Media coverage about a health threat can heighten both perceived risk and anxiety (Paek and Hove, 2017). Misinformation and conspiracy theories regarding COVID-19 are also widespread and evolving (Wikipedia, 2020; World Health Organization, 2020a). Such misinformation can have lasting impacts, including reduced engagement with health-protective behaviors including vaccination, once it becomes available (Zimet et al., 2013).

The current study investigated the Australian public's perception of risk (i.e., likelihood and severity) and worry about COVID-19, viewing of media coverage, accuracy of current knowledge (and conversely, misinformation) about the virus, and health-protective behaviors. Insight into how perceptions of emerging infectious diseases influence the adoption of health-protective behaviors is important in understanding the potential health, social, and economic impact of such outbreaks and may contribute to targeting public health messaging to encourage appropriate health behaviors.

MATERIALS AND METHODS

Recruitment

Members of the Australian general population were recruited for the online survey by the use of Facebook advertisements. Advertisements were targeted at all users with current country of residence listed as Australia and age listed as 18 or above. Users meeting these criteria were shown the advertisement on their Facebook page "timeline." In addition, the advertisement was posted on the timeline of one university webpage, so that those individuals who followed this page could view the post on their timeline. Facebook users who viewed the advertisement were able to click on an embedded link that took them to the survey (hosted on Qualtrics). Advertising and data collection ran for 7 days from 4 pm Monday, March 2, to 4 pm Monday, March 9, 2020. In total, the ad was displayed to 66,210 individual accounts, with 4,353 clicks. Each response came from a unique Internet Protocol (IP) address, indicating that each response came from a separate device.

Ethical Approval

The study was approved by the UNSW Human Research Ethics Advisory Panel (File 3309), and all participants provided electronic informed consent to participate.

COVID-19 in Australia

During the week that the study was conducted, the COVID-19 virus was already in Australia, but infections were limited and were predominantly cases where individuals had contracted the virus overseas (Australian Government Department of Health, 2020a; Worldometer, 2020). At the end of day 1 (March 2), there were 33 confirmed cases; the first death from the virus occurred on this day, as did the first reported community transmissions. This number had risen to 93 by March 9, with three deaths and 18 cases that were likely to be community transmissions (no history of recent travel).

Participants

In total, 3,086 people viewed the participant information statement and consent form. Of these, 854 either did not consent or completed only some of the survey questions before discontinuing, and 2,232 submitted the survey. Nine responses were excluded because participants reported that they did not

live in Australia, and 49 responses were incomplete (48 missing demographic information, one with less than half of all responses completed). This resulted in a final sample of 2,174 participants.

Measures

See **Table 1** for survey questions and response options.

Information

Participants were asked how closely they had been following news about the outbreak, sources of information about the outbreak, and the extent to which they believe that scientists and other medical and health experts understand COVID-19 (to assess perceived scientific understanding).

Perceived Risk and Worry

Participants were asked five questions relating to their perceived risk and worry about COVID-19. The first question assessed how concerned or worried respondents were feeling about the possibility of a widespread outbreak in Australia (i.e., the virus spreading from person to person more like a typical cold or flu virus). Perceived likelihood of an outbreak, perceived likelihood of the individual catching the virus if there was an outbreak, perceived behavioral control, and perceived severity were also assessed.

Knowledge

To assess knowledge (and possible misinformation), participants were asked to respond to a series of statements about the COVID-19 coronavirus and whether (to the best of their knowledge) these statements were true or false or they were unsure of the answer. See **Table 3** for items and their correct answers (based on the state of knowledge at the time of the study). Correctly answered items were summed to generate a general virus knowledge subscale score.

Participants were asked to identify the most common symptoms of COVID-19 infection (see **Table 4**), based on information provided to the Australian public at the time: fever, cough, sore throat, and shortness of breath (Australian Government Department of Health, 2020c). More recent information includes fatigue or tiredness, which were not included in the survey. Three uncommon symptoms were included: diarrhea, vomiting, and nausea (Guan et al., 2020). The number of correctly answered items was summed to generate a symptoms knowledge subscale score.

Transmission knowledge items asked about the ways the virus can potentially be spread (see **Table 4**), including droplets spread through coughing or sneezing, touching or shaking hands with someone who is infected, and touching surfaces that have come into contact with the virus. Three other sources, which did not appear to be transmission mechanisms, were also included: water, mosquitoes, and airborne spread (Centers for Disease Control and Prevention, 2020; World Health Organization, 2020a,b). As above, the number of correctly answered items was summed to generate a transmission knowledge subscale score.

One item assessed knowledge of recommended face mask use, with advice to the public at that time being that only people who were sick should be wearing masks to stop them spreading the virus (Australian Government Department of Health, 2020c). Another item assessed knowledge of the approximate mortality rate, which at the time was estimated to be 3.4% (World Health Organization, 2020d). Responses were deemed correct if they were between 1 and 5%. A total COVID-19 knowledge

TABLE 1 | Survey questions and response options.

Survey question	Response options
Information	
How closely have you been following news about the recent outbreak of COVID-19 coronavirus?	11-point scale from 0, *not at all*, to 10, *very closely*
How have you been getting information about the COVID-19 coronavirus outbreak?	Select all that apply: news media, social media, official government websites, family members, friends or colleagues, none of the above, other (text entry)
To what extent do you believe that scientists and other medical and health experts understand the COVID-19 coronavirus?	11-point scale from 0, *don't understand at all*, to 10, *understand very clearly*
Perceived risk and worry	
How concerned or worried are you that there will be a large outbreak of COVID-19 coronavirus in Australia within the next 12 months?	5-point scale: not at all concerned, a little concerned, moderately concerned, very concerned, extremely concerned
How likely do you think it is that there will be an outbreak of COVID-19 coronavirus in Australia?	Visual analogue scale (VAS) from 0, *not at all likely*, to 100, *extremely likely*
If there is an outbreak of COVID-19 coronavirus in Australia, how likely is it that you, personally, will catch the coronavirus?	VAS from 0, *not at all likely*, to 100, *extremely likely*
If there was a COVID-19 coronavirus outbreak in Australia, how much could you personally do to protect yourself from catching the virus?	VAS from 0, *couldn't do anything*, to 100, *could do a lot*
If you did catch COVID-19 coronavirus, how serious do you think your symptoms would be?	6-point scale: no symptoms, mild symptoms, moderate symptoms, severe symptoms, severe symptoms requiring hospitalization, and severe symptoms leading to death
Knowledge	
General virus knowledge, symptoms knowledge, and transmission knowledge	See **Tables 3**, **4**
To minimize the transmission of the COVID-19 coronavirus, who should be wearing a face mask?	Four response options: sick people—to stop them spreading the virus, healthy people—to prevent infection, everyone, no one
To your knowledge, approximately what percentage of people who have been infected with coronavirus (COVID-19) have died from the virus?	VAS from 0% to 100%
Health-protective behaviors	
Distancing and hygiene behaviors	See **Table 5**
If there was a safe and effective vaccine developed for the COVID-19 coronavirus, how likely is it that you would choose to have this vaccination?	5-point scale: would definitely not get the vaccine, would probably not get the vaccine, unsure if I would get the vaccine or not, would probably get the vaccine, would definitely get the vaccine

TABLE 2 | Demographic characteristics of the sample with number (percentage) of respondents.

Demographic variables	Total *N* (%)
Gender	
Male	503 (23.1)
Female	1635 (75.2)
Non-binary, different identity, or prefer not to say	36 (1.7)
State	
New South Wales	934 (43.0)
Victoria	312 (14.4)
Queensland	387 (17.8)
South Australia	122 (5.6)
Western Australia	261 (12.0)
Tasmania	87 (4.0)
Australian Capital Territory	52 (2.4)
Northern Territory	19 (0.9)
Age group	
18–29	489 (22.5)
30–49	857 (39.4)
50–59	487 (22.4)
60+	303 (13.9)
Not stated	38 (1.7)
Ethnicity	
Caucasian (White/European)	1,639 (75.4)
Australian Aboriginal or Torres Strait Islander	178 (8.2)
Asian	173 (8.0)
Other or prefer not to say	184 (8.5)
Highest Education	
High school only: completed (Year 12) or not completed (Year 11 or below)	534 (24.6)
Trade certificate, diploma, or advance diploma	528 (24.3)
Bachelor's degree	562 (25.9)
Graduate diploma, graduate certificate, or postgraduate degree	543 (25.0)
Not stated	7 (0.3)

score was calculated as the number of correct responses to all items assessing various aspects of knowledge about COVID-19, potentially ranging from 0 to 34.

Health-Protective Behaviors

To assess distancing and hygiene behaviors, participants were asked whether they had engaged in 13 behaviors during the previous month (see **Table 4**). Response options were *yes*, *no*, *unsure*, and *not applicable*. Items were generated based on previous research (Rubin et al., 2009; Bults et al., 2015; Petrie et al., 2016; Simpson et al., 2019) and recommended behaviors (Australian Government Department of Health, 2020c). Health-protective behavior sum scores (number of "yes" responses) were calculated, with possible scores ranging from 0 to 13.

Participants were asked to complete a single item asking about how likely it is that they would choose to have a COVID-19 vaccination. Responses were scored such that higher scores indicated higher vaccine intentions.

Demographics and Health Information

Information was collected on participants' age group, gender, ethnicity, highest level of education, and region of residence within Australia (see **Table 2**). Participants were also asked to complete three questions relating to their health. First was a single-item measure assessing their self-rated heath (Idler and Benyamini, 1997), with responses on a five-point scale from *poor* to *excellent*. Second was an item assessing whether they had received a flu vaccine in the previous year (*yes*, *no*, *unsure*). For the purposes of analysis, *no* and *unsure* responses were combined to form a dichotomous measure. Finally, participants were asked whether they, or any family members or friends, had caught COVID-19 (*yes*, *no*, and *unsure*). Only nine respondents said "yes" to this question, and these responses were included in the analysis.

RESULTS

Demographics

Demographic characteristics of the sample can be seen in **Table 2**. A large proportion of respondents were from the state of New South Wales (NSW).

Health-Related Characteristics

Respondents' mean self-rated health was 3.21 (SD = 0.98). The majority of participants rated their health as good (38.7%) or very good (29.5%). Approximately half of the sample (52.9%) reported having had a flu vaccine in the past year. Only nine respondents (0.4%) reported that they themselves, or their friends or family, had caught COVID-19. The majority had not (95.3%).

Information

Participants reported following news about COVID-19 closely (M = 7.3, SD = 2.1). Information about COVID-19 came from the news media (85.2%), official government websites (72.2%), social media (68.5%), colleagues or friends (22.7%), and family members (22.7%). Only 0.3% of respondents reported not getting information from any of these sources. Perceived scientific understanding was moderate (M = 6.1, SD = 2.0).

Perceived Risk

Concern about the possibility of a widespread outbreak in Australia was moderate (M = 3.2, SD = 1.1; scale from 1 to 5). A small proportion reported being not at all concerned (6.1%), while 24% reported being a little concerned, 31.1% were moderately concerned, 21.7% were very concerned, and 14.9% were extremely concerned. Respondents' ratings of the perceived likelihood of an outbreak of COVID-19 in Australia were relatively high (M = 71.8, SD = 24.9; scale from 0 to 100), and perceived likelihood that they would catch the virus in the case of an outbreak was moderate (M = 54.9, SD = 24.7). Perceived behavioral control was relatively high (M = 68.2, SD = 21.6).

With regard to perceived severity of symptoms in the case of infection, only 0.3% of respondents indicated that they would experience no symptoms; mild (27.5%) and moderate (46.7%) symptoms were most commonly anticipated. One in

TABLE 3 | Percentage of true, false, and unsure responses to general knowledge items, with correct answers in bold font.

	True	False	Unsure
Currently there is no vaccine to protect against COVID-19 coronavirus [T]	**95.0**	1.6	3.3
There is an effective medicine available for treating COVID-19 coronavirus [F]	5.1	**79.2**	15.6
There are ways to help slow the spread of COVID-19 coronavirus [T]	**89.7**	4.0	6.2
If COVID-19 coronavirus breaks out in Australia, it is likely that some people will have natural immunity to it [F]	29.5	**34.1**	36.3
The ordinary flu vaccine will protect me from COVID-19 coronavirus [F]	0.6	**92.7**	6.6
To date, no one in Australia has died from COVID-19 coronavirus [F*]	4.5	**91.8**	3.6
To date, no one in Australia who was infected with COVID-19 coronavirus passed it on to infect another person [F*]	4.1	**84.9**	10.9
There are other strains of coronaviruses that can infect humans, including those that cause the common cold [T]	**80.2**	4.7	15.0
The health effects of COVID-19 coronavirus appear to be more severe for people who already have a serious medical condition [T]	**97.7**	0.8	1.4
Antibiotics are an effective treatment for COVID-19 coronavirus [F]	3.4	**81.9**	14.5
Packages or letters from China can spread the virus [F]	6.8	**67.8**	25.3
Taking vitamin C or other vitamins will protect you from the COVID-19 coronavirus [F]	5.9	**74.1**	19.7
There is no evidence that vaccines against pneumonia will protect you against the COVID-19 coronavirus [T]	**67.0**	5.5	27.4
Regularly rinsing your nose with saline will protect you against the COVID-19 coronavirus [F]	2.7	**77.6**	19.6
There is no evidence that eating garlic will protect you against the COVID-19 coronavirus [T]	**82.6**	6.7	10.6
Putting sesame oil on your body will block the COVID-19 coronavirus from entering your body [F]	0.3	**95.4**	4.2
Hand dryers are effective in killing the COVID-19 coronavirus [F]	2.8	**80.2**	17.0
The virus was genetically engineered as part of a biological weapons program [F]	10.2	**57.6**	32.0
The virus was human-made and deliberately released [F]	10.2	**57.8**	31.9

**True during study design, false at data collection. Missing data from one to five respondents for each item; percentages do not always total 100.*

four respondents perceived the illness severity to be high, with 14.1% indicating they thought they would experience severe symptoms, severe symptoms requiring hospitalization (8.8%), or severe symptoms leading to death (2.3%).

Knowledge

Participants were asked to respond to a series of true–false questions to assess their more general knowledge of COVID-19. The percentage of true, false, and unsure responses (with correct answers in bold font) can be seen in **Table 3**. Total general virus knowledge subscale scores ranged from 0 (1 respondent) to 19 (129 respondents), with a mean of 14.9 (*SD* = 2.8).

Knowledge questions were also asked relating to most common symptoms and routes of transmission (see **Table 4**). Respondents were more accurate in recognizing the symptoms that have been linked with COVID-19 and less certain of whether the other symptoms (nausea, vomiting, and diarrhea) were indicative of illness. Symptoms knowledge subscale scores ranged from 0 to 7, with 32.6% of respondents correctly answering every item. The mean subscale score was 5.5 (*SD* = 1.4), indicating good recognition of the symptoms commonly mentioned in public health information provided to the Australian public at this time. Respondents typically recognized transmission routes associated with droplet spread but were less certain of whether the virus can also spread via air, water, or mosquitoes (evidence at the time indicated that these routes were unlikely). Transmission knowledge subscale scores ranged from 0 to 6, with a mean of 4.6 (*SD* = 1.0). Only 17.8% of respondents correctly answered every item.

Most respondents (79.7%) correctly identified that it was recommended (at the time) that people who were sick wear masks to stop them spreading the virus. In addition, 15.9% reported that "everyone"—both sick and healthy—should be wearing masks, and 1.3% responded that only healthy people should be wearing masks. Knowledge of the approximate mortality rate was good: 69.2% of respondents gave answers between 1% and 5%, which were deemed accurate. Percentage estimates ranged from 0 (0.5%) to 100 (0.3%), with a mean of 7.84% (*SD* = 12.31). A total COVID-19 knowledge score was calculated from responses to general, symptoms, and transmission subscales, as well as individual items about mask use and mortality. Scores ranged

TABLE 4 | Percentage of yes, no, and unsure responses to symptoms and transmission knowledge items, with correct answers in bold font.

	Yes (%)	No (%)	Unsure (%)
Symptoms			
Fever	**97.5**	0.9	1.5
Cough	**96.7**	1.1	2.0
Sore throat	**86.1**	4.0	9.7
Shortness of breath	**90.4**	2.7	6.9
Nausea	20.9	**50.4**	28.4
Vomiting	8.5	**64.4**	26.8
Diarrhea	13.9	**66.0**	19.7
Transmission			
Droplets spread through coughing or sneezing	**98.8**	0.3	0.9
Surfaces recently touched by someone who is sick	**91.2**	3.1	5.7
Touching or shaking hands with a person who is sick	**94.8**	2.1	3.1
Airborne	56.1	**28.1**	15.8
Waterborne	8.0	**64.4**	27.3
Mosquitoes	1.7	**80.0**	18.0

from 7 to 34 (out of a possible 34), with a mean of 26.48 (*SD* = 4.10).

Health-Protective Behaviors

The percentage of respondents who reported having engaged in a range of distancing and hygiene behaviors during the past month can be seen in **Table 5**. Hygiene behaviors (handwashing, using hand sanitizing gel, and cleaning and disinfecting surfaces) were the most commonly reported behaviors. The number of behaviors endorsed was summed, and scores ranged from 0 (16%) to 13 (0.3%), with most (80.5%) respondents reporting five behaviors or fewer, with a mean score of 3.29 (*SD* = 2.89).

Four in five respondents indicated that they would definitely (60.4%) or probably (20.8%) get a vaccination if one became available. Only 12.3% reported being unsure, 3.7% said that they would probably not get the vaccine, and 2.8% said that they would definitely not get vaccinated.

Predictors of Health-Protective Behaviors

Negative binomial regression with maximum likelihood estimation was conducted to assess the influence of information, perceived risk, and knowledge-related predictors on engagement with health-protective behaviors, while controlling for demographic factors and self-rated health. Negative binomial regression was chosen because it is appropriate for over-dispersed count data. The health-behavior outcome score is a count of the number of behaviors endorsed and is over-dispersed, as the variance of measures exceeds the mean score.

Demographic Predictors

To assess demographic differences in health-protective behaviors, each demographic predictor variable was entered individually into a separate negative binomial regression model. The mean (standard error) number of behaviors across demographics can be seen in **Table 6**. Demographic differences in health-protective behaviors were seen by gender ($p < 0.001$), state of residence ($p = 0.002$), age group ($p = 0.001$), and ethnicity ($p < 0.001$). Female respondents reported engaging in more health-protective behaviors than their male counterparts, and those in the youngest age group (18–29) engaged in fewer behaviors than older respondents. Behavior differences by ethnicity were also seen, with non-Caucasian respondents reporting more health-protective behaviors. Respondents from Queensland reported engaging in more behaviors than those from the category of NSW (reference category). There was not a significant effect of education level ($p = 0.339$).

Psychological Predictors of Health-Protective Behaviors During the Past Month

To assess the influence of psychological predictors on engagement with health-protective behaviors, all relevant variables were entered into a single model (see **Table 7**), controlling for demographic variables and self-rated health. The Pearson Chi-Square Goodness of Fit statistic (1.084) indicated

TABLE 5 | Percentage of yes responses relating to health-protective behaviors during the past month.

	Yes (%)
Reduce or avoid going to work or university	6.3
Reduce or avoid using public transport	18.5
Reduce or avoid flying domestically	16.5
Reduce or avoid flying internationally	22.3
Reduce or avoid going to public events such as movies, sporting events, or concerts	25.4
Reduce or avoid going to hospitals or going to the doctor unless absolutely necessary	26.5
Reduce or avoid going into shops	18.2
Reduce or avoid staying in hotels, hostels, or Airbnb	13.8
Reduce or avoid sending your children to school or childcare	3.0
Clean or disinfect things you might touch (such as doorknobs or hard surfaces) more often than usual	39.1
Use sanitizing hand gel to clean your hands more often than usual	58.3
Wash your hands thoroughly more often than usual	76.3
Wear a face mask when going out in public	5.0

TABLE 6 | Demographic differences in the mean (SE) number of health-protective behaviors over the past month.

Demographic variables	Health-protective behaviors M (SE)
Gender	
Male (RC)	2.83 (0.12)
Female	3.45 (0.08)*
Non-binary, different identity, or prefer not to say	2.75 (0.43)
State	
New South Wales (RC)	3.15 (0.09)
Victoria	3.08 (0.16)
Queensland	3.86 (0.17)*
South Australia	2.70 (0.23)
Western Australia	3.40 (0.19)
Tasmania	3.47 (0.33)
Australian Capital Territory	3.38 (0.42)
Northern Territory	3.58 (0.73)
Age group	
18–29 (RC)	2.86 (0.12)
30–49	3.52 (0.11)*
50–59	3.25 (0.13)*
60+	3.32 (0.17)*
Ethnicity	
Caucasian (White/European; RC)	3.03 (0.07)
Australian Aboriginal or Torres Strait Islander	3.85 (0.25)*
Asian	4.74 (0.30)*
Other or prefer not to say	3.69 (0.24)*
Highest education	
High school only: completed (Year 12) or not completed (Year 11 or below; RC)	3.43 (0.13)
Trade certificate, diploma, or advance diploma	3.39 (0.13)
Bachelor's degree	3.16 (0.12)
Graduate diploma, graduate certificate, or postgraduate degree	3.19 (0.12)

*RC, reference category. *Significantly different from the RC at 0.05.*

TABLE 7 | Predictors of the number of health-protective behaviors during the past month.

				95% Wald CI for Exp(B)		
Variable	***B***	***SE***	***Exp(B)***	***Lower***	***Upper***	***p***
(Intercept)	−0.294	0.163	0.745	0.542	1.025	0.071
Gender						
Male (RC)	0	–	1	–	–	–
Female	0.091	0.040	1.096	1.013	1.185	0.022
Other	−0.066	0.143	0.936	0.707	1.238	0.642
Age						
18 to 29 (RC)	0	–	1	–	–	–
30 to 49	−0.037	0.044	0.964	0.883	1.051	0.404
50 to 59	−0.160	0.052	0.852	0.770	0.943	0.002
60 and over	−0.132	0.058	0.877	0.782	0.983	0.024
Ethnicity						
Caucasian (RC)	0	–	1	–	–	–
Australian Aboriginal and/or Torres Strait Islander	0.058	0.057	1.060	0.948	1.184	0.308
Asian	0.406	0.057	1.501	1.342	1.680	<0.001
Other/not stated	0.202	0.057	1.223	1.095	1.367	<0.001
Education						
High school only (RC)	0	–	1	–	–	–
Trade certificate or diploma	0.011	0.045	1.011	0.926	1.105	0.804
Bachelor's degree	−0.046	0.047	0.955	0.871	1.048	0.333
Graduate diploma or postgraduate degree	−0.023	0.048	0.977	0.890	1.073	0.630
State						
New South Wales (RC)	0	–	1	–	–	–
Victoria	−0.018	0.049	0.982	0.892	1.081	0.716
Queensland	0.109	0.043	1.115	1.024	1.214	0.012
South Australia	−0.171	0.075	0.843	0.728	0.976	0.022
Western Australia	−0.027	0.051	0.973	0.881	1.075	0.594
Tasmania	0.035	0.082	1.036	0.882	1.216	0.670
Australian Capital Territory	−0.017	0.102	0.983	0.805	1.201	0.868
Northern Territory	−0.010	0.173	0.990	0.705	1.391	0.956
Self-rated health	−0.022	0.018	0.978	0.944	1.014	0.227
Exposure to media coverage	0.084	0.009	1.088	1.068	1.108	<0.001
Concern/worry about outbreak	0.295	0.020	1.343	1.292	1.395	<0.001
Science understands illness	−0.021	0.008	0.979	0.963	0.995	0.011
Confidence in government	−0.033	0.007	0.968	0.955	0.980	<0.001
Likelihood of outbreak	0.001	0.001	1.001	1.000	1.003	0.152
Severity of illness	0.046	0.018	1.047	1.010	1.085	0.012
Perceived effectiveness	0.003	0.001	1.003	1.001	1.004	0.001
Knowledge about illness	−0.010	0.004	0.990	0.982	0.998	0.018

B, unstandardized coefficient; SE, standard error; Exp(B), exponentiated regression coefficient.

that the model fit the data well. The omnibus test results indicate that the model was a significant improvement over a null model, $\chi^2 = 940.41$ ($df = 2$), $p < 0.001$.

More closely following media coverage, heightened worry or concern about an outbreak, higher perceived personal severity of COVID-19, and higher perceived effectiveness of health-protective behaviors were significant predictors of greater engagement with distancing and hygiene behaviors during the previous month. In contrast, stronger beliefs in scientific and medical understanding of the virus, confidence in government information, and higher COVID-19 knowledge scores predicted reduced engagement with health-protective behaviors.

Predictors of Vaccination Intentions

Respondents were asked how likely they were to get vaccinated against COVID-19. This outcome did not approximate a normal distribution; thus, ordinal logistic regression was used to assess the influence of information, perceived risk, and knowledge-related predictors on vaccination intentions, while controlling for demographic factors and self-rated health.

Demographic Predictors

To assess demographic differences in vaccine intentions, each demographic predictor variable was entered individually into a separate ordinal logistic regression model. There were

TABLE 8 | Number and percent of respondents in each age group reporting that they would definitely not, would probably not, were unsure if they would, probably would, or definitely would get a COVID-19 vaccine, if available.

	N (% of age group)				
	18–29	**30–49**	**50–59**	**60+**	**Total**
Definitely not	6 (1.2)	24 (2.8)	17 (3.5)	13 (4.3)	60 (2.8)
Probably not	14 (2.9)	31 (3.6)	22 (4.5)	11 (3.6)	78 (3.7)
Unsure	44 (9.0)	118 (13.8)	76 (15.6)	28 (9.2)	266 (12.5)
Probably would	133 (27.2)	190 (22.2)	74 (15.2)	42 (13.9)	439 (20.6)
Definitely would	292 (59.7)	494 (57.6)	297 (61.1)	209 (69.0)	1,292 (60.5)

no demographic differences in vaccine intentions by gender ($p = 0.429$), state of residence ($p = 0.832$), ethnicity ($p = 0.461$), or level of education ($p = 0.129$). Respondents did differ in their vaccine intentions by age group ($p = 0.019$). Compared to the 60-plus age group, being in the 30–49 (*ExpB* = 0.662, 95% CI [0.503 to 0.871], $p = 0.003$) or 50–59 (*ExpB* = 0.695, 95% CI [0.515 to 0.938], $p = 0.017$) age group was associated with a lower likelihood of intending to get a vaccination (see **Table 8** for percent of responses in each category by age group).

Psychological Predictors of Vaccination Intentions

Predictors entered into the full model were the same as in the previous analysis, with the addition of a dichotomous variable reflecting whether respondents had received a flu vaccine in the previous year or had not/were unsure. All variables were entered into a single model (see **Table 9**). The Pearson Chi-Square Goodness of Fit statistic (0.921) indicated good model fit. The omnibus test results indicate that the model is a significant improvement over a null model, $\chi^2 = 557.23$ ($df = 28$), $p < 0.001$.

Having received a seasonal flu vaccine in the past year predicted increased intentions to get a COVID-19 vaccine if it becomes available. With regard to psychological predictors and in line with previous results, both increased exposure to media coverage and heightened worry or concern about the outbreak predicted increased vaccination intentions. In contrast to results relating to health-protective behaviors, perceptions of greater scientific and medical understanding of the virus, confidence in government information, and higher knowledge scores predicted greater vaccination intentions.

DISCUSSION

The results of the survey provide information on public knowledge, perceived risk and worry, and health-protective behaviors in the early period of the COVID-19 pandemic in Australia. A large proportion (two-thirds) of participants were at least moderately worried about the possibility of a widespread outbreak. These rates are commensurate with past pandemics such as SARS (Bults et al., 2011; Wheaton et al., 2012). Consistent with previous findings, higher worry about outbreaks was associated with greater health-protective behaviors (e.g., handwashing; Bults et al., 2011). Recent research from China indicates that engaging in hand hygiene and other health-protective behaviors was associated with reduced psychological impact of the COVID-19 outbreak, including lower stress and anxiety (Wang et al., 2020). These findings highlight the importance of encouraging the public to engage with such behaviors not only to reduce the risk of infection but also to reduce anxiety associated with COVID-19.

This study provided important insights into what participants *expected* in terms of how serious the symptoms of coronavirus would be, should they contract COVID-19. There is a clear discrepancy between respondents' perceived severity of symptoms and current data on rates of asymptomatic infection. Only 0.3% of respondents believed that they would experience no symptoms. In contrast, emerging evidence from groups with widespread testing for the SARS-CoV-2 virus (e.g., cruise ships, repatriation flights, and overseas arrivals) indicates that between 2 and 8 out of every 10 infections may be asymptomatic (Day, 2020; Mizumoto et al., 2020; Nishiura et al., 2020). Despite being asymptomatic, those infected are still able to transmit the virus to others (Bai et al., 2020; Zou et al., 2020). In addition, people appear to be infectious and asymptomatic during the incubation period (Lauer et al., 2020). People commonly rely on symptoms to indicate illness and assume that the absence of symptoms means they are well (Diefenbach and Leventhal, 1996). Such assumptions in the COVID-19 pandemic could have serious consequences, in terms of both community transmission and reduced health-protective behaviors. Therefore, public health communication campaigns about COVID-19 need to address these misconceptions.

The results also provide insights into where Australian residents are seeking their information about COVID-19 and their level of knowledge about the virus and is transmission. While it was promising to see that 72% sourced information from official and government websites, mainstream news media was the most popular, and social media use was also high. The high usage of news media is concerning given the potential for alarming, sensationalist portrayals of the pandemic (Klemm et al., 2016). In addition, myths, rumors and misinformation can quickly spread online, particularly via social media (Vosoughi et al., 2018). Reliance on social media might have contributed to uncertainty around COVID-19, for example, about whether people have natural immunity and whether specific home remedies (garlic, vitamins, and rinsing noses with saline) help protect against coronavirus. It may also explain some uncertainty around whether the virus was human-made and deliberately released. Uncertainty and rapidly changing information may have contributed to increased worry about the virus (Han et al., 2006). These findings speak to the importance of distributing accurate health information about COVID-19 through a variety of sources (news, social media, and government websites) to reach the general population and correct misinformation.

Given the rapidly evolving situation with COVID-19 globally, the findings from this study may not be reflective of behaviors now that greater restrictions have been put in place and significant widespread messaging around social distancing, handwashing, and self-isolation has been disseminated. However,

TABLE 9 | Predictors of likelihood of getting vaccinated against COVID-19 if a vaccine becomes available.

				95% Wald CI for Exp(B)		
Variable	***B***	***SE***	***Exp(B)***	***Lower***	***Upper***	***p***
Gender						
Male (RC)	0	–	1	–	–	–
Female	−0.451	0.119	0.637	0.505	0.803	<0.001
Other	0.197	0.397	1.218	0.560	2.650	0.619
Age						
18 to 29 (RC)	0	–	1	–	–	–
30 to 49	−0.722	0.131	0.486	0.375	0.628	<0.001
50 to 59	−0.866	0.155	0.420	0.310	0.570	<0.001
60 and over	−0.567	0.183	0.567	0.396	0.812	0.002
Ethnicity						
Caucasian (RC)	0	–	1	–	–	–
Australian Aboriginal and/or Torres Strait Islander	0.349	0.183	1.418	0.990	2.031	0.057
Asian	−0.210	0.181	0.810	0.569	1.155	0.245
Other/not stated	−0.049	0.175	0.952	0.676	1.343	0.781
Education						
High school only (RC)	0	–	1	–	–	–
Trade certificate or diploma	0.065	0.136	1.068	0.819	1.392	0.629
Bachelor's degree	0.027	0.140	1.027	0.781	1.350	0.849
Graduate diploma or postgraduate degree	−0.192	0.142	0.825	0.625	1.089	0.175
State						
New South Wales (RC)	0	–	1	–	–	–
Victoria	−0.083	0.144	0.920	0.694	1.220	0.563
Queensland	−0.050	0.136	0.951	0.728	1.241	0.711
South Australia	−0.231	0.210	0.794	0.526	1.199	0.272
Western Australia	−0.183	0.152	0.833	0.618	1.122	0.229
Tasmania	0.391	0.272	1.479	0.868	2.519	0.150
Australian Capital Territory	−0.508	0.312	0.602	0.326	1.110	0.104
Northern Territory	−0.205	0.476	0.814	0.320	2.069	0.666
Seasonal flu vaccine in past year						
Yes (RC)	0	–	1	–	–	–
No or unsure	−1.719	0.102	0.179	0.147	0.219	<0.001
Self-rated health	−0.074	0.054	0.929	0.835	1.033	0.172
Exposure to media coverage	0.061	0.026	1.062	1.010	1.117	0.019
Concern/worry about outbreak	0.317	0.055	1.372	1.233	1.527	<0.001
Science understands illness	0.090	0.026	1.094	1.039	1.152	<0.001
Confidence in government	0.093	0.021	1.098	1.054	1.143	<0.001
Likelihood of infection	0.004	0.002	1.004	1.000	1.009	0.049
Severity of illness	0.108	0.061	1.115	0.989	1.256	0.076
Perceived effectiveness	−0.002	0.002	0.998	0.994	1.003	0.443
Knowledge about illness	0.050	0.012	1.051	1.027	1.076	<0.001

our findings provide insights into the demographic and psychological predictors of health-protective behaviors in the early stages of a pandemic disease outbreak. The most powerful predictors were demographic factors including age, female gender, and being of non-Caucasian ethnicity, as well as risk perceptions (greater worry about outbreak and perceived severity of illness) and higher media exposure. The effect of media exposure may be related to the provision of important health information about the pandemic. Although media exposure early in the outbreak appears to have facilitated health-protective behaviors, media fatigue—where people become desensitized to ongoing messaging—may reduce this effect as the pandemic continues (Collinson et al., 2015). Repeated media exposure may also lead to heightened stress and anxiety, which can have longer-term health effects, as well as contributing to excessive or misplaced health-protective behaviors such as presenting for diagnostic testing when actual risk of exposure is low (Garfin et al., 2020).

The results of this study shed light on how many participants plan to get a COVID-19 vaccine if available. Concern about

the outbreak, greater media exposure, and higher knowledge predicted vaccination intentions. These findings are in line with previous research showing that concern and knowledge were associated with increased Ebola vaccine intentions (Petrie et al., 2016). In contrast to previous research, perceived likelihood and severity of infection were only marginally associated with intentions to get a vaccine (Weinstein et al., 2007; Bish and Michie, 2010). Previous research has typically focused on personal risk. In the case of COVID-19, the personal risk to most individuals is low, and behavior may be driven primarily by perceived risk to others, which was not assessed in the current study.

The current study is strengthened by a large sample size and a good representation of participants from different educational backgrounds. However, Caucasian women were overrepresented, as were those from NSW and those aged under 50 years. Participants were recruited through Facebook and as such are not representative of the general population. The pattern of results may not generalize to the broader population. To maximize convenience sampling, we used solely self-report measures, which may lead to biased effects. While the results of the regression analyses provide interesting starting points to identify the demographic and risk variables that predict health behaviors and vaccine intentions, they cannot establish causality and must be interpreted with caution. Given the large sample, the relationships between some of the significant predictors are likely to be small and may not be clinically meaningful.

The current results provide information on the Australian public responses to the COVID-19 pandemic, including information sources and engagement, knowledge, and perceived risk in the early stages of the outbreak in Australia, and their relationship with health-protective behaviors and vaccine intentions. The findings show that there was a critical mismatch between expected severity of symptoms versus data on how COVID-19 is experienced, which needs to be addressed in government education campaigns. Health-protective behavior was relatively low at the start of the outbreak, and these behaviors and vaccination intentions were consistently predicted by greater exposure to media and worry about outbreaks. Finally, our questions revealed significant uncertainty and misinformation, which needs to be corrected.

Without a vaccine currently available, encouraging widespread and sustained engagement with hygiene and distancing behaviors is critical to successfully manage the COVID-19 pandemic, flatten the curve of infections, and protect vulnerable individuals and overburdened healthcare systems. The results of the current study provide important insights into psychological and behavioral responses early in the outbreak of this novel coronavirus. The findings point to types of information that may be particularly effective and groups that may benefit from clear and targeted messaging to promote engagement with health-protective behaviors.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the UNSW HREAP-C (Behavioral Sciences) File 3309. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

KF and JN were responsible for the concept and design of the study, interpretation of results, and writing and critical review of the manuscript. KF was responsible for data collection and analysis. Both authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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frontiers in Public Health

BRIEF RESEARCH REPORT
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Relationship Between Psychological Responses and the Appraisal of Risk Communication During the Early Phase of the COVID-19 Pandemic: A Two-Wave Study of Community Residents in China

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The novel coronavirus disease (COVID-19) has affected hundreds of millions of people worldwide. Data collection in the ascending phase is crucial to address a rapidly evolving crisis by helping us understand the uncertain relationship between risk communication and psychological responses. Data were collected from 26 January 26, 2020, until February 17, 2020, with a mean test–retest interval of 16 days. A total of 846 adults from four residential communities in high-risk areas (Wuhan city) and low-risk areas (Zhengzhou city) were invited to complete a set of Internet-based questionnaires measuring the adoption of preventive behaviors, appraisal of risk communication, anxiety level, and susceptibility to emotional contagion. At the baseline assessment (Wave 1), 58 withdrew from the study, and 788 (433 females) completed the questionnaires. At the Wave 2 survey, 318 (185 females) adults from Wave 1 were retained. The results from cross-lagged models demonstrated reciprocal negative associations between anxiety and risk communication and between the appraisal of risk communication and the adoption of preventive behaviors. In addition, a higher appraisal of risk communication in the initial period of the outbreak mitigated the respondents' susceptibility to emotional contagion later on. Susceptibility to emotional contagion was positively associated with preventive behaviors taken. Furthermore, multiple-group structural equation modeling suggested that risk communication was more likely to affect the susceptibility to emotional contagion of people on the frontline of the outbreak than people living in low-risk areas. This study demonstrated the importance of risk communication aimed at encouraging appropriate countermeasures against virus outbreaks.

Keywords: COVID-19, emotion, anxiety, preventive measures, risk communication, risk perception, mental health, longitudinal data

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INTRODUCTION

On March 11, 2020, the World Health Organization declared coronavirus disease 2019 (COVID-19) a pandemic. As of March 28, 2020, a total of 571,678 confirmed COVID-19 cases, and 26,494 deaths had been reported worldwide. Medical interest in COVID-19 has been considerable [e.g., (1)]. Mental health issues that coincide with emerging epidemics and the appropriate behaviors to adopt to avoid infection are rarely examined (2).

Viral disease infections usually come from ordinary contact with people, and outbreaks can trigger severe public panic. In particular, novel, exotic threats raise anxiety levels higher than more familiar threats do (3, 4). Studies during the severe acute respiratory syndrome (SARS) epidemic in 2003 showed that diagnosed patients, suspected patients, and normal people experienced intense fear or nervousness about the event, and their anxiety increased significantly (5). Moreover, emotions are extremely vulnerable during public health emergencies (6), and the fear of a vague and terrifying new illness might spiral into dangerous skepticism through emotional contagion, which refers to the phenomenon of having one person's emotions directly trigger similar emotions in other people [c.f., (7)]. It was predicted in 2018 that the next major outbreak might not be due to a lack of preventive technologies but to emotional contagion, which could erode trust in government, causing serious economic and social disruption (8).

Although many studies have pointed out that high risk perception may lead to excessive preventive behavior and bring more emotional problems (9), in the early stages of major public health emergencies, increasing the level of risk perception is still a necessary means to combat viral spread. A recent study estimates that improving the rates of handwashing by travelers passing through only 10 of the world's leading airports could significantly slow a global disease by 69% (10). It is noteworthy that preventive behavior is also affected by emotional state. A survey of earthquake victims indicated that preparedness behavior could be predicted by fear and anxiety (11). Leung et al., studying public health emergencies, reached a consistent conclusion, finding that anxiety level is positively correlated with preventive measures taken (12, 13). It may be that individuals with higher levels of anxiety hold higher risk perceptions (14), so they take preventive measures as a means of coping with anxiety in risk events (15). Similarly, individuals with high susceptibility to emotional contagion are also more likely to be affected by risk information (16), thereby alleviating emotional problems through preventive measures (17).

Risk communication refers to the exchange of real-time information, advice, and opinions between experts and people facing threats to their physiological, economic, or social well-being. On the one hand, effective, timely and credible risk communication is essential to containing fear and public threats (18) as well as promoting preventive behaviors, especially in the early phase of risk events, because this increases perceived risk (19). On the other hand, psychological traits may in turn give rise to bias against the local crisis management system. For example, people with higher levels of anxiety may be more likely to overreact to policies (20). Individuals who are susceptible to negative emotions may more easily hold beliefs that conflict with government advice or regulations, thus jeopardizing public health measures [e.g., (7)]. Governments have the hard job of explaining dangers and advising people how to act without raising alarm, and the uncertain relationship between risk communication and psychological response needs to be investigated.

Some recent studies have also discussed the relationship between anxiety and emotional contagion. Anxious individuals tend to catch emotions from others, and emotional susceptibility has the unfavorable effect of making the person more anxious [e.g., (21); for review, (22)]. In summary, the existing research cannot accurately explain the interaction between multiple factors and their multidimensional causality. COVID-19 is an unprecedented experience for many people. Therefore, in the early stage of the epidemic, public emotions and behaviors in response to the epidemic may change rapidly with the exponential growth rate of the outbreak while being influenced by risk communication. What is the public reaction to epidemic outbreaks in the early phase? How does the effective exchange of real-time risk information impact them over time? What are the characteristics of these effects under different risk intensities? The present study examined the temporal relationships among behavioral and emotional responses to COVID-19 and the attitudinal responses to risk communication. A 2-way design was employed. We hypothesized that the adoption of preventive behaviors, emotional anxiety, and susceptibility to catch emotions were associated with the appraisal of risk communication as the pandemic developed.

MATERIALS AND METHODS

Sampling and Data Collection

Three research assistants and five residential community staff members participated in the survey distribution. Invitations containing links to this Internet-based survey and quick response codes were sent to local communities in Wuhan and Zhengzhou via messenger apps with the group function. Data were collected from January 26, 2020 (at which time 30 provinces launched their first-level response to this major public health emergency in China, and 20 cases had been confirmed in Zhengzhou, China, making it a low-risk area, while 63 deaths and 698 cases had been confirmed in Wuhan, China, making it a high-risk area), with 4-day duration until February 17, 2020 (154 cases had been confirmed in Zhengzhou; 1,381 deaths and 42,752 cases had been confirmed in Wuhan), with 3-day duration. The mean test–retest interval was 16 days ($SD = .82$), with a range of 14 to 18 days. The data collected by these surveys thus covered the ascending phase of the outbreak (23).

A total of 846 adults from four residential communities (i.e., two communities in Hanyang, which is an urban administrative district of Wuhan, and two communities in Erqi and Zhongyuan, which are also the main administrative districts of Zhengzhou) were invited to complete a set of questionnaires. Wuhan and Zhengzhou, as the China national central cities, are at a similar level in terms of leading, developing, and performing tasks in

politics, economics, and culture (24). Sociodemographic data were collected on sex, age, education, current health status, diagnosis with COVID-19, suspicion of COVID-19, having contact with a confirmed patient, and having contact with a suspected patient.

The questionnaires used a forced response mode that required respondents to answer all the questions before proceeding, but respondents could withdraw from the study at any time. Participants completed the questionnaires after giving online informed consent. The last six digits of the participant's phone number were used as their unique ID. We used the phone numbers, IP addresses recorded by the network server, and manual verification as the means of data matching. To ensure participant confidentiality, we purposely analyzed the data only in aggregate and did not perform individual program analyses.

At the baseline assessment (Wave 1), 58 withdrew from the study, and 788 (433 females, $\text{mean}_{\text{age}} = 34.66$; $SD = 7.34$, 500 from Zhengzhou and 288 from Wuhan) completed the questionnaires. At the Wave 2 survey, 318 adults from Wave 1 were retained. Of these respondents, four participants gave arbitrary answers on age in both waves (e.g., 888), which were treated as missing data and handled by mean imputation. The final samples of Zhengzhou and Wuhan were different in age, $t\,(316) = -5.31$, $p < 0.01$; and education, $\chi^2(4) = 38.99, p < 0.01$. This is mainly manifested in the fact that the Wuhan group is older and the Zhengzhou group has more people with a master's degree or above. In addition, a suspected case was reported in Wuhan (**Table 1**). Those who we were unable to retrospectively follow up fell into attrition. In many longitudinal studies, observations across waves can be missing for various reasons, and the attrition rate for web-based surveys is especially high (25). Another reason for our high attrition rate may be that we use the forced response mode; people will stop working on the survey if they are asked questions they do not wish to answer (26), although some of our questions included a "no answer" option.

Several analyses were performed to test whether there was a systemic pattern to the participant loss. The chi-square test showed a significant linear-by-linear association ($p < 0.001$), suggesting that the attrition rate decreased with increasing education level. Attrition at Wave 2 was lower among the younger participants, $t(624) = -7.65$, $p < 0.01$ [Levene's test indicated unequal variances ($F = 9.09$, $p = 0.003$), so the degrees of freedom were adjusted from 786 to 624]. Higher age may be regarded as a predictor of withdrawal due to less frequent Internet usage [(27); c.f., (28)]. The difference between the attrition and retained proportions by sex, $\chi^2(1) = 2.42$, $p > 0.05$, current health status, $\chi^2(4) = 1.92$, $p > 0.05$, and all other studied variables did not reach statistical significance, $ps > 0.05$ for all.

TABLE 1 | Sociodemographic characteristics of participants at baseline.

Baseline characteristic	Respondents from Zhengzhou *N = 175*	Respondents from Wuhan *N = 143*
Age	yr. 30.28 ± 7.52	yr. 34.63 ± 6.94
Education level		
Under high school	1	3
High school	4	3
College or B.A.	109	128
M.A.	44	8
Ph.D.	17	1
Current health status		
Excellent	58	40
Good	96	78
Average	9	10
Fair	6	9
Poor	6	6
Confirmed case [a]		
No	173	135
Do not answer	2	8
Suspected case		
Yes	0	1
No	172	139
Do not answer	3	3
Having contact with diagnosed case		
Yes	0	0
No	156	135
Do not answer	19	8
Having contact with suspected case [a]		
No	173	137
Do not answer	2	6

[a] *Reflects no "Yes" respondent to this question.*

Measures

Adoption of Preventive Behaviors (APB)

Eight questions based on recommendations from the China Center for Disease Control and Prevention (CDC) guidelines were developed. Sample items of preventive measures included "Did you wash your hands after sneezing, coughing, or cleaning your nose in the past three days?" All eight behavior items were rated on a four-point scale, ranging from 1 "Not at all" to 4 "Always." The total frequency of APB was calculated by summing the scores of all 8 items. APB had Cronbach's alpha values of 0.75 and 0.81 for the Wave 1 and Wave 2 data, respectively.

Appraisal of Risk Communication (RMC)

A six-item scale was used to assess appraisal of risk communication. It was designed to reflect opinions on information distribution and openness of information [(29), e.g., "With regard to the distribution of information by the health authorities to the public in your country, do you agree or disagree that it has generally been sufficient?" Or "Do you agree or disagree that you have had the chance to express your personal views and concerns to the authorities if you wanted to?"]. The items are scored on a six-point scale, with higher scores indicating more positive appraisal (based on these replies: "strongly disagree," "disagree," "not sure but probably disagree," "not sure but probably agree," "agree," "strongly agree"). The questionnaire was shown to have acceptable validity and high internal consistency. Cronbach alpha values in our sample were 0.87 for both waves.

Anxiety Level

Anxiety were assessed using the Zung Self-Rating Anxiety Scale (SAS) (30), which consists of 20 items. Questions 1–5 represent the emotional symptoms of anxiety of which question 5 is a reverse-scored item, while questions 6–20 represent the physical symptoms of anxiety [e.g., (31)]. Responses to each item range from 1 ("a little of the time") to 4 ("most of the time"), with higher scores indicating increased levels of anxiety. Emotional symptoms of anxiety were the main concern in this study (e.g., "I feel more nervous and anxious than usual"). Reliability coefficients were good for both Wave 1 (Cronbach $\alpha = 0.82$) and Wave 2 (Cronbach $\alpha = 0.83$) samples in the current study.

Susceptibility to Emotional Contagion (SEC)

The Emotional Contagion Scale for Public Emergency (ECS-PE) (32) is a self-report scale for assessing the susceptibility to catch emotions, especially generated in public emergency events (e.g., When public emergency happens, I panic if others around me panic). It is a revised version of the Emotional Contagion Scale (33) and consists of 15 items that a person endorses on a five-point scale (ranging from 1 "strongly disagree" to 5 "strongly agree"). Scores are generated by adding the item scores. This scale had Cronbach α values of 0.90 and 0.91 for the Wave 1 and Wave 2 data, respectively.

PLAN OF ANALYSIS

Repeated-measures analyses of variance (ANOVAs) were conducted to determine time and risk effects over the two waves of the study. We also computed descriptive statistics for all study variables and bivariate correlations among them using SPSS 20.0. Then, cross-lagged models were tested by structural equation models with the robust maximum likelihood estimation using MPlus version 7 (34). Finally, to additionally assess whether the cross-lagged associations varied by group (i.e., Zhengzhou vs. Wuhan, which represents risk level), we ran multigroup structural equation models. The following steps were conducted: (1) unconstrained multiple-group model, in which the same correlation of paths was tested without constraints across groups; and (2) constrained multiple-group model, where correlation paths were constrained to be equal across groups.

Model fit was examined by the chi-square statistic (χ^2), the comparative fit index (*CFI*), the Tucker–Lewis Index (*TLI*), the root mean square error of approximation (*RMSEA*), and the standardized root mean square residual (*SRMR*). Good model fit is indicated by a nonsignificant χ^2 (35), a *CFI* and/or *TLI* between.90 and 1.00 (36), an RMSEA of.10 or lower (37), and an SRMR of.10 or lower (35).

RESULTS

Descriptive Statistics and Bivariate Correlations

Inspection of Mahalanobis d^2 values indicated that there were six outliers in our sample. Omitting the outliers gave the same results as not. Repeated-measures ANOVA revealed a significant main effect of time on APBs, $F_{(1, 316)} = 48.67$, $p < 0.001$, $\eta_p^2 = 0.13$, and a significant main effect of risk level (i.e., Zhengzhou vs. Wuhan) on APBs, $F_{(1, 316)} = 10.83$, $p < 0.01$, $\eta_p^2 = 0.03$, and on anxiety level, $F_{(1, 316)} = 31.94$, $p < 0.001$, $\eta_p^2 = 0.10$. A significant risk × time interaction on susceptibility to emotional contagion (SEC) was found, $F_{(1, 316)} = 7.26$, $p < 0.01$, $\eta_p^2 = 0.02$. Simple effect analyses revealed that SEC decreased significantly for participants in Zhengzhou, $F_{(1, 317)} = 4.34$, $p < 0.05$, $\eta_p^2 = 0.02$, but did not change with the development of the epidemic for participants in Wuhan. Although the ANOVA showed that the means were significantly different, the effect size was small to modest. **Table 2** presents bivariate correlations among Wave 1 and Wave 2 variables, which indicated considerable stability in autoregressive correlation between all studied variables, and revealed cross-lagged relations between appraisal of risk communication and anxiety. The cross-sectional intercorrelations among all variables were similar across Wave 1 and Wave 2.

Cross-Lagged Model

The model with full cross-lagged paths demonstrated an acceptable fit to the data. Given the sensitivity of the χ^2 statistic to sample size (35), it was not surprising that the test was significant ($\chi^2 = 39.781, p < 0.001, df = 16$). However, Wheaton et al. (38) maintain that a χ^2/df ratio below five supports a favorable conclusion about fit in large sample models. In this study, this criterion is solidly met, $\chi^2/df = 2.49$, $p < 0.01$; *CFI* = 0.97, *TLI* = 0.92, *RMSEA* (90% CI) = 0.07 (0.04–0.10), *SRMR* = 0.05. The autoregressive paths between Wave 1 and Wave 2 for APB, $\beta = 0.58$, $SE = 0.06$; RCM, $\beta = 0.61$ $SE = 0.05$; anxiety, $\beta = 0.63$, $SE = 0.04$; and SEC, $\beta = 0.81$, $SE = 0.02$, were all significant, $ps < 0.01$. After controlling for demographic variables (i.e., gender, age, education level and health status), one positive pathway from RCM to later APB, $\beta = 0.13$, $SE = 0.05$, and one negative path from Wave 1 RCM to Wave 2 SEC, $\beta = -0.10$, $SE = 0.03$, were revealed. Two reciprocal associations between RCM and anxiety, $\beta s = -0.11$ for both directions, and RCM and ABP, $\beta = 0.10$ and 0.13, for two directions respectively, $ps < 0.05$, were also detected. The whole model accounted for 47.9, 48.1, 49.2, and 67.5% of the total variance in Wave 2 APB, RCM, anxiety, and SEC, respectively. The standardized path coefficients are presented in **Figure 1**. Age and gender have an effect on the susceptibility to emotional contagion (SEC). The older the age, the greater the SEC, $\beta = -0.08$, $SE = 0.03$, and women hold more susceptibility than men, $\beta = -0.07$, SE=0.03.

Multigroup Structural Equation Model

The chi-square of the baseline model (unconstrained) is 0 because it is a saturated model. A significant difference in chi-square indicates non-equivalence across groups, $\Delta\chi^2 = 38.75$, $\Delta df = 22$, $p < 0.05$, suggesting that one or more paths are different across group from areas in different risk level. Further, Wald tests were used to examine differences among the cross-lagged paths between the two groups and revealed that the

TABLE 2 | Descriptive statistics and bivariate correlations between measured variables ($N = 318$).

		T1_APB	T1_RCM	T1_Anxiety	T1_SEC	T2_APB	T2_RCM	T2_Anxiety	T2_SEC
1	T1_APB	1							
2	T1_RCM	.375**	1						
3	T1_Anxiety	−.298**	−.246**	1					
4	T1_SEC	.264**	0.04	−.215**	1				
5	T2_APB	.675**	.371**	−.267**	.269**	1			
6	T2_RCM	.354**	.675**	−.288**	0.075	.394**	1		
7	T2_Anxiety	−.286**	−.278**	.683**	−.223**	−.306**	−.289**	1	
8	T2_SEC	.180**	−.062**	−.154**	.814**	0.275**	−0.005	.−.167**	1
Zhengzhou	*M*	23.47	28.51	10.11	52.37	25.10	28.41	9.75	51.43
	SD	4.50	4.88	3.51	9.66	4.49	4.80	3.65	10.54
Wuhan	*M*	25.17	28.44	12.01	52.88	26.43	27.97	11.80	52.47
	SD	4.71	4.52	3.31	9.76	4.25	5.18	3.08	9.85

*T1, Wave 1; T2, Wave 2. **Correlation is significant at the 0.01 level (two-tailed). APB, adoption of preventive behaviors; RCM, appraisal of risk communication; SEC, susceptibility to emotional contagion.*

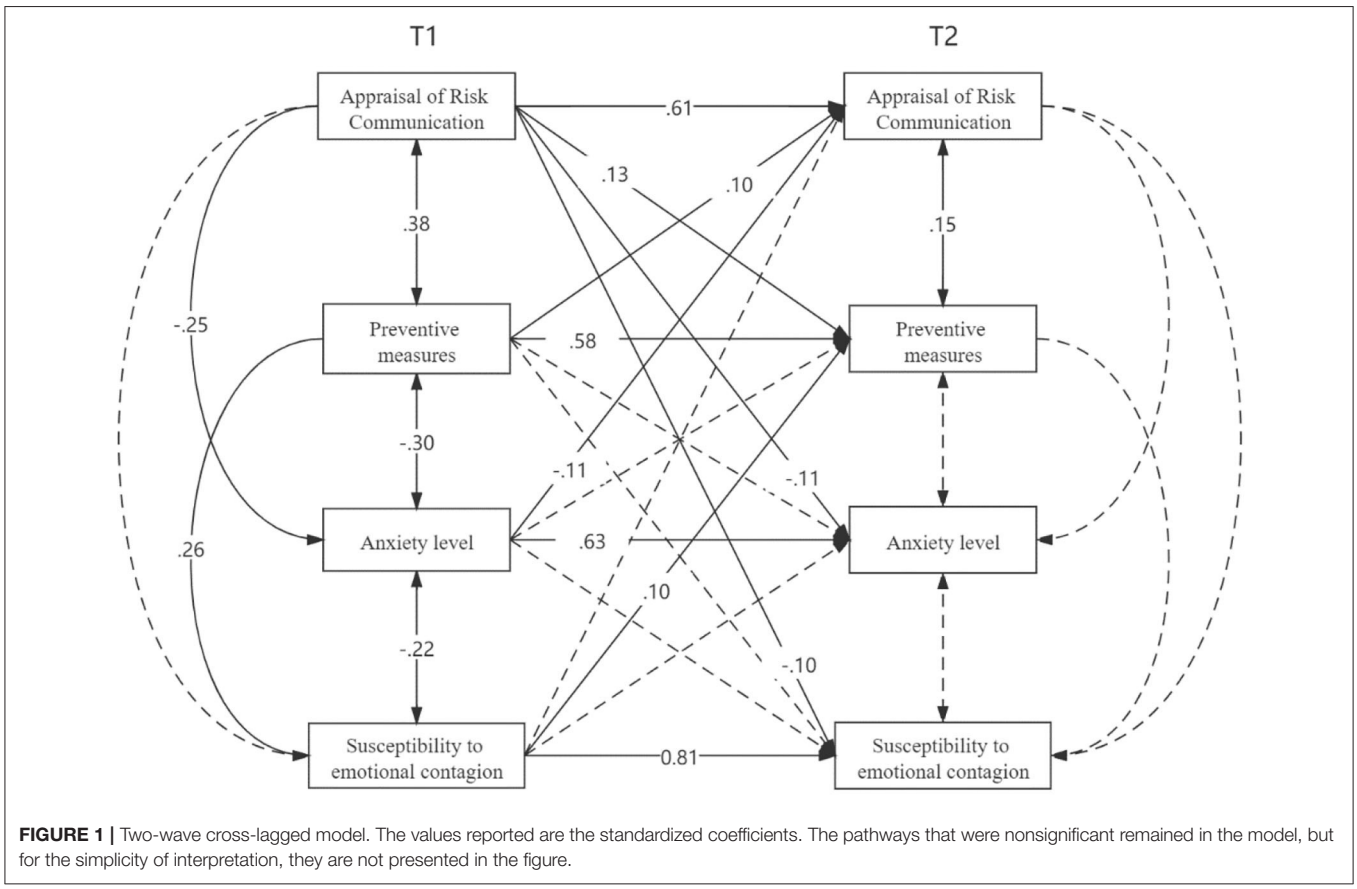

FIGURE 1 | Two-wave cross-lagged model. The values reported are the standardized coefficients. The pathways that were nonsignificant remained in the model, but for the simplicity of interpretation, they are not presented in the figure.

coefficient of the paths from Wave 1 RCM to Wave 2 SEC was significantly higher for Wuhan than those in Zhengzhou, Wald(1) = 7.14, $p < 0.01$. The association of RCM with SEC reached a significant level for Wuhan, $\beta = -0.20$, $p < 0.001$, but not for Zhengzhou, $\beta = -0.05$.

DISCUSSION

This study sought to gather a snapshot of the attitudinal and behavioral responses during the early stages of the COVID-19 epidemic. The results showed that the level of anxiety of people

in high-risk epidemic areas is significantly higher than that in low-risk areas. A virus that is thought to be highly contagious, lockdown control, and disturbances in people's living conditions are all factors that cause mental problems in epidemic areas in the short term. It is not surprising that as the epidemic progressed, respondents adopted more preventive measures, and people in high-risk epidemic areas also took preventive measures to a greater extent, indicating a high-risk perception.

Without information, people may start speculating and "filling in blanks" on their own. This often results in increased susceptibility to emotional contagion (SEC), which is a catalyzer that accelerates the spread of rumors [e.g., (39)]. The finding that the susceptibility was significantly lower in low-risk areas suggests to some extent that the increased susceptibility caused by the emergency was alleviated by the gradually disclosed information, even though participants living in high-risk areas did not change in any way. This suggestion was further verified by cross-lagged panel analysis. The initial appraisal of risk communication was predictive of later susceptibility to emotional contagion, and such an association exhibited a greater impact on people of the frontline of the outbreak (i.e., Wuhan). Previous studies have pointed out that effective risk communication can mitigate susceptibility and is an important means to relieve public anxiety [e.g., (40)]. However, this study demonstrated a reciprocal association between anxiety and risk communication, reflecting that the emotional aspect may create resistance to risk communication.

Some previous research that has focused on responses to other respiratory infectious disease epidemics (RIDEs) has examined factors that motivate people to adopt preventive measures. For example, Lee-Baggley and colleagues found that people high in empathic responsiveness (e.g., listening to others' feelings about SARS) were more likely to take health precautions (41). Consistent with these findings from cross-sectional studies, individuals who were more susceptible to emotional contagion early on were more likely to engage in preventive behaviors later. However, not all mood states affect behavior. Compared with susceptibility, initial anxiety did not predict later adoption of preventive measures. A possible explanation is that in the early stage of an epidemic, when the threat is highly uncertain, cognitive risk responses may be optimal for driving increasingly suitable behavior as the epidemic evolves (42). Emotional contagion occurs at more conscious levels [for review, (43)]. Anxiety generally involves less intense cognitive components than susceptibility to emotional contagion and thereby is less likely to predict behavioral change.

The respondents' appraisal of risk communication predicted the extent to which they would engage in preventive behaviors, which indicates that preventive measures are undoubtedly closely related to the effective and timely transmission of epidemic-related information. The results also revealed the effect of changes in behavior on the changes in the appraisal of risk communication. If an action is believed to reduce risk, people who take the action will lower their perceived risk (19, 44), leading to decreased sensitivity to risk information. We did not find any correlation between anxiety and susceptibility to emotional contagion, although it is evident from various findings that anxious individuals tend to catch negative emotions from others [e.g., (21)]. Given the evidence presented in this study, however, it seems clear that anxiety was unrelated to susceptibility to emotional contagion as measured on a bipolar scale that measures reactions to both positive and negative emotions. In addition, we extracted emotional symptoms of anxiety from the more general Zung Self-Rating Anxiety Scale (SAS) for screening anxiety, which is different from the State Trait Anxiety Inventory (STAI) used in some previous epidemic studies [e.g., (45)]. In line with these studies, the anxiety level remained low throughout the pandemic, suggesting that a low level of anxiety has little effect on behavioral or emotional responses toward COVID-19.

A few limitations to this study are worth noting. First, with regard to the measurements we used, a set of questions measuring the extent to which a respondent adopted preventive behavior may not fully reflect all the preventive measures required to prevent infections. Second, the results may have limited generalizability because this community sample was limited in its diversity, as a majority of the sample consisted of middle-aged and healthy people. Lastly, this study used district (i.e., Wuhan and Zhengzhou) as an indicator of risk. Although some demographic variables were controlled, there are some unobserved heterogeneity (e.g., income and occupation) may limit conclusions of the study. Nevertheless, to our knowledge, these data provide some of the first follow-up data regarding mental health during the COVID-19 outbreak. Data collection in the ascending phase is crucial to deal with a rapidly evolving crisis. More harm is done by officials trying to avoid panic by withholding information or overreassuring the public than is done by the public acting irrationally in a crisis. Precrisis planning should assume that an open and honest flow of information will be established. This study demonstrates the importance of the disclosure of information aimed at encouraging appropriate countermeasures against virus outbreaks.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not publicly available due to the fact they containing sensitive information that could compromise research participant privacy/consent. However, they are available on reasonable request from the corresponding author. Requests to access the datasets should be directed to psychlab@zznu.edu.cn.

ETHICS STATEMENT

The study protocol, including questionnaires, was reviewed by the Ethics Committee of Zhengzhou Normal University (approval no. 2020EM-01) and Institutional Review Boards of University of California at Davis (IRB ID 1561876-1).

AUTHOR CONTRIBUTIONS

ZJ conceived of the presented idea and planned the experiments. ZJ took the lead in writing the manuscript with input from all authors. K-bZ and Y-yX analyzed the data and contributed

equally to this article. Y-MS, R-jC and ZY contributed to sample preparation. GYP provided financial support that are necessary for this study. All authors read and approved the final version of the manuscript.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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REVIEW
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Emotional, Behavioral, and Psychological Impact of the COVID-19 Pandemic

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The emergence of SARS-CoV-2 in December 2019 prompted consternation in many parts of the world. Due to its fast dissemination, the World Health Organization declared a pandemic in March 2020. Aiming to contain the spread of the virus, leaders of many countries restrained social movement, targeting to flatten the curve of contamination with social distancing. This review aimed to analyze how human behavior has changed throughout this period. We also approached the key components of the emotional reaction to the pandemic, how internal and external factors, such as personality traits, gender, the media, the economy and the governmental response, influence the social perception of the pandemic and the psychological outcomes of the current scenario. Moreover, we explored in depth the groups at increased risk of suffering mental health burden secondary to these circumstances. These include the healthcare professionals, elderly individuals, children, college students, black subjects, latin and LGBTQ+ communities, economically disadvantaged groups, the homeless, prisoners, the rural population and psychiatric patients. We also discussed several measures that might minimize the emotional impact derived from this scenario. It is crucial that the health authorities, the government and the population articulate to assist the vulnerable groups and promote emotional and psychological support strategies. Moreover, it is fundamental that the population is provided with accurate information concerning the COVID-19 pandemic.

Keywords: SARS-CoV-2, COVID-19, behavior, psychological changes, social isolation, restricting measures, mental health

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INTRODUCTION

In December 2019, a cluster of pneumonia cases was reported in the province of Hubei, China (Lu et al., 2020). It was then discovered that the infection was caused by a virus, named SARS-CoV-2. Subsequently, the illness caused by this virus was termed Coronavirus disease 2019 (COVID-19). Data from the World Health Organization (WHO) Guidelines indicate that by January 14th 2020, 1 day after the first recorded case outside of China, only 41 cases were confirmed (World Health Organization [WHO], 2020b). At the present, statistics taken from the WHO Coronavirus Disease (COVID-19) Dashboard by September 5th announce 26.5 millions of

confirmed cases worldwide, with over 871 thousand deaths (World Health Organization [WHO], 2020c).

Restricting measures have been implemented in several countries as an attempt to slow down the dissemination of the SARS-CoV-2. China (Wang C. et al., 2020), Italy (Briscese et al., 2020), and the United Kingdom (UK) (Holmes et al., 2020), for example, carried out strict "lockdown" regulations, while other countries, including the United States of America (US) (Imperial College of London, 2020) and Brazil (Simões e Silva et al., 2020), have delivered "stay home" recommendations. In many places, means of transportation were shut down, public spaces were closed and only essential services kept functioning; albeit with restrictions and preventive measures.

However, as the world authorities seem to focus on the infectious aspect of the pandemic, a rise has been observed in mental health disorders (Brooks et al., 2020; Holmes et al., 2020). Indeed, during this ongoing health crisis, those affected by emotional, behavioral and psychiatric disorders tend to be more numerous than those affected by COVID-19. As a matter of fact, the fear of contracting COVID-19 seems not to be as high as concerns about the psychological and social impact of the pandemic, as reported in a United Kingdom survey (Mental health Covid-19, 2020). Particular groups appear to be at higher risk for this kind of mental health impact, including frontline healthcare workers, the elderly, children, college students, the LGBTQ+ community, homeless individuals and those in economic vulnerability, rural community, foreigners and psychiatric patients (Holmes et al., 2020; Khan et al., 2020; Salerno et al., 2020; Wood et al., 2020). Indeed, the emotional stress linked to the current scenario may potentially aggravate previous psychiatric conditions or may precipitate its symptomatology (Yao et al., 2020). A critical aspect of this context is that, due to physical distancing, many elective appointments have been canceled and mental health support systems have been suspended, even though remote assistance is rapidly increasing (Holmes et al., 2020).

This review aims to discuss the impact of COVID-19 for the mental health of the overall world population, in addition to its causes and ramifications. The topics of greater relevance in the scientific literature so far have been included, most of which concern not only the healthcare professionals and authorities, but the entire population as well. Furthermore, some measures that ought to be taken to minimize the emotional burden of the pandemic were debated.

METHODS

Data were obtained independently by six authors, who carried out a comprehensive and non-systematic search in the PubMed, Cochrane, Scopus, SciELO, and Google Scholar databases. Search strategies included terms as: "COVID-19," "SARS-CoV-2," "anxiety," "depression," "psychiatric disorders," "social isolation", "behavior changes", "psychiatric patients", "mental health", "suicide", "media", "racism", "healthcare workers," "elderly," "domestic violence," "sleep," "LGBT community," "homeless," "foreigners," "rural community," "informal settlements." The search was conducted between May 14th and May 26th. This article was subsequently updated between May 26th and September 5th. The search emphasized recent articles, published case series, consensus statements, guidelines, meta-analyses, systematic reviews and prospective cohort studies, critically reviewed and selected by the authors. Research has also been made in informative official website public domains and in the references contained in the previously data collected.

RESTRICTING MEASURES DUE TO THE PANDEMIC

Terminology on Quarantine, Social Isolation, and Social Distancing

In the context of COVID-19 pandemic, the terms "social distancing," "social isolation," and "quarantine" have been used mostly as synonyms in the media, in communication with the public and even in scientific papers (Brooks et al., 2020). However, there are great differences between these designations, even though there is not always an agreement on the terminology. "Quarantine" refers to extreme restrictions of movement of those exposed or potentially contaminated by the virus, in order to minimize the spread of the pathogen. Moreover, the term "quarantine" ought to be used in the context of groups or at community level (Dsouza et al., 2020; Sánchez-Villena and de La Fuente-Figuerola, 2020). "Social isolation" refers to the restriction of social movement of those infected with the disease (Dsouza et al., 2020; Sánchez-Villena and de La Fuente-Figuerola, 2020). Meanwhile, "social distancing" is a preventative measure recommended to the general population to flatten the curve of the contagious disease. In this scenario, people are advised to stay at home and use services as little as possible, as well as to avoid agglomerations, maintain the recommended distance of one meter from each other and take precautionary measures to avoid infection (Covid-19, 2020). Nevertheless, the use and the comprehension of these terms should not be so inflexible. In fact, the term "social isolation" has also been used to express the source of subjective feelings of solitude that may accompany the social distancing measures, especially for those who are already at enhanced risk of suffering from loneliness. Notwithstanding, the term "social disconnection" is used in this review to encompass this framework.

Source of Psychological Impact Related to the Restricting Measures

It is undeniable that the restricting measures imposed to contain the COVID-19 pandemic have a severe impact on the mental health of the population. Nonetheless, it is yet unclear what promotes such negative effects. It is possible that these repercussions derive directly from the restrictive strategies and reduced social mobility (Bavel et al., 2020; Brooks et al., 2020; Pfefferbaum and North, 2020; Wang G. et al., 2020). However, the emotional and psychological outcomes of the pandemic may also be secondary to the intrinsic changes that the restricting measures

cause in lifestyle habits and socioeconomic scenario (Brooks et al., 2020; Zhu et al., 2020).

KEY COMPONENTS OF THE EMOTIONAL AND BEHAVIORAL RESPONSE TO COVID-19 PANDEMIC

The emotional and behavioral response to COVID-19 pandemic is multifactorial. It relies not only on external components, but on personal and innate ones as well. Nonetheless, the reaction to the current circumstances seem to have predominant elements in the overall population. A significant increase in feelings of functional impairment, boredom, stigma, worry, phobia, frustration and anger has been observed (Ahmadi and Ramezani, 2020; Brooks et al., 2020; Pfefferbaum and North, 2020; Restubog et al., 2020; Sher, 2020a; Teufel et al., 2020). In this topic, some selected factors must be discussed thoroughly due to its pivotal influence on the mental health impact of the pandemic.

Fear and Uncertainty

Unlike other virus outbreaks of the 21st century, such as SARS and MERS, which were primarily disseminated in hospital environments (Bai et al., 2004; Cauchemez et al., 2016), COVID-19 is unique in the way that it has spread far beyond health centers' borders. With the entire population at risk, the necessary restricting measures have created an unparalleled scenario, dominated by fear and uncertainty. Even though fear is an essential adaptive mechanism that humans and other species have developed to cope with threats in the environment, it can only be supportive for those who feel capable of dealing with the menaces presented specifically to them. To those who consider themselves as unable to handle such risks, fear can trigger defense responses (Bavel et al., 2020). And so, in a conjuncture where the fear is not only of death but also of the repercussions in a myriad of different spheres, including family organization, schools closure, social isolation and economic consequences, it is vital that close attention is paid to the mental health of the individuals (Ornell et al., 2020). In fact, previous studies showed that fear positively associates with depression, anxiety, perceived infectability and germ aversion (Ahorsu et al., 2020). Furthermore, another detrimental consequence of fear is the stigmatization and discrimination of those infected or exhibiting symptoms of COVID-19 (Ahorsu et al., 2020).

Although fear has several destructive outcomes, one of the most maleficent one is suicide. In the COVID-19 pandemic, there have been numerous reports of suicidal behavior due to fear-related issues, for instance, fear of being infected (Dsouza et al., 2020; Mamun and Ullah, 2020), fear of infecting others (Mamun and Griffiths, 2020), fear of being quarantined (Dsouza et al., 2020) and fear of the mental health impact (Sher, 2020b). A particular illustration of this is a Bangladeshi 40-year old woman who took her own life in a hospital bathroom after being refused medical care due to the staff's fear of SARS-CoV-2 infection (Mamun et al., 2020a).

Finally, it must be observed that the adjustment to the new life of social distancing may differ according to age groups, gender and other variables surrounding the individuals. Therefore, given the importance of fear in the pandemic context, scales addressing this feeling have been developed and might be helpful to the comprehension and management of this emotional component (Ahorsu et al., 2020; Sakib et al., 2020).

Stressors

In the pandemic background, stressors must also be considered in the assessment of the emotional and neuropsychological impact. These mainly include COVID-19-related circumstances, such as potential exposure to the virus and loss of loved ones, as well as secondary adversities due to economic difficulties, unavailability of food, psychosocial effects, disruption of future plans and underlying physical and psychological conditions (Islam et al., 2020; Pfefferbaum and North, 2020).

Economic Factors

The ongoing pandemic caused by COVID-19 has set off a distinguishable economic crisis in considerable domains of work and business, including manufacturing, retail, travel and trade (Restubog et al., 2020). Unemployment is in the rise and even the most stable and former professionals are having their work threatened. The International Labor Organization estimates that there will be 25 million new unemployed individuals by the end of the second quarter of 2020 (Restubog et al., 2020). In addition, surveys with US workers before and after previous economic downturns state that unemployment is not the only possible detrimental outcome, since pay cuts, reduction in work hours, increased work demand and challenging working conditions are possibly part of a contingency plan for this pandemic (Restubog et al., 2020). Financial loss has been profoundly linked to psychological distress and is considered a risk factor for mental health disorders, with long lasting effects. The disruption or even bankruptcy of business, unpaid debts, stress of losing job, poverty, inability to provide support to the family and food insecurity are only a few examples that portray the extremely harsh scenario regarding the financial impact secondary to this pandemic (Bhuiyan et al., 2020; Dsouza et al., 2020; Mamun and Ullah, 2020). Indeed, the lack of basic supplies, including water, food, clothes and accommodation, seems to be a particularly deleterious source of frustration, anxiety and anger (Brooks et al., 2020).

Additionally, a disturbing matter is that the economic impact represents one of the main risk factors for suicidal behavior (Conejero et al., 2020; Vandoros et al., 2019). During the pandemic, cases of suicide due to financial downturns have been reported in several countries, particularly in those experiencing more severe crises than developed countries, such as India (Dsouza et al., 2020; Griffiths and Mamun, 2020), Bangladesh (Bhuiyan et al., 2020; Griffiths and Mamun, 2020) and Pakistan (Mamun and Ullah, 2020). Using the data available in the International Labor Organization's press release in March 2020, a study has estimated that, in the best-case scenario, the rise in unemployment rates will provoke an increase of about 2,135 suicides in a year worldwide (Kawohl and Nordt, 2020).

Therefore, the number of individuals who might seek help from mental health services is expected to substantially increase in the context of the COVID-19 pandemic (Kawohl and Nordt, 2020).

Domestic Violence

As a matter of fact, as the "stay home" recommendations remain, it is crucial to remember that home is not always a safe place for everyone. It can also be a residence for distortion of power and abuse, which is supported by studies that suggest that forced proximity, along with economic stress and disaster-related instability, are risk factors for aggression and domestic violence (Bavel et al., 2020; Usher et al., 2020). Furthermore, distancing measures also represent, for those living in violent places, diminished access to community-based and familial support, with fewer opportunities to ask for help (Usher et al., 2020). Fear of COVID-19 and threats about contamination can even be used as a coercive mechanism to maintain the abuse. As a consequence, for example, those suffering from domestic violence may be less inclined to go to the hospital on account of fear of infection. Ultimately, the social distancing, albeit essential to contain COVID-19, may exacerbate the violence and maintain it less visible (Usher et al., 2020).

Indeed, in the United Kingdom, a domestic abuse organization reported that calls to its domestic violence helpline increased by 25% in the 7 days following the announcement of tighter social distancing and lockdown measures by the government (Bradbury-Jones and Isham, 2020). In Australia, some police departments reported a 5% increase in domestic violence-related calls, while Google announced a 75% growth in internet searches for domestic abuse support (Usher et al., 2020). Additionally, there was a 32–36% increase in domestic violence complaints in France and a 21–35% increase in the US after the implementation of the social distancing measures (Usher et al., 2020). This pattern is equivalent to what has already been observed in previous epidemics (Usher et al., 2020).

Changes in Daily Habits

Analysis on sleep quality during the SARS-CoV-2 pandemic also indicated that there has been a rise in sleep disturbances, a critical condition associated with anxiety, depression, and suicidal behavior (Sher, 2020a). Furthermore, diminished sleep quality promotes short temperament and, as a consequence, complicates family cohabitation (Islam et al., 2020).

Another interesting inquiry was related to news monitoring: a study suggested that higher averages of time ($\geq$ 3 h) spent focusing on the virus outbreak was positively correlated to the development of anxiety symptoms (Huang and Zhao, 2020), but also with social responsibility values and compliance to social distancing recommendations among US adolescents (Oosterhoff et al., 2020). Contrarily, less engagement in risk prevention behaviors was observed in individuals who were apparently prone to "optimism bias," the belief that they are less likely to acquire the disease than others. This principle is also seen in other diseases, including lung cancer (Soofi et al., 2020).

Moreover, an Italian survey performed in April 2020 assessed the changes in eating and lifestyle habits of 3,533 individuals, aged between 12 and 86 years. It was observed that 34.4% of responders had increased appetite during this period, whereas 17.8% had less appetite. As a result, nearly half of the participants of the study perceived weight gain during the pandemic. Additionally, it was observed that although there were no differences in physical activity in the group of individuals who did not play any sports before the COVID-19 lockdown, the training frequency has increased amongst those who were physically active. Around 3% of smokers have quit smoking in this period, probably due to the fear concerning increased risk of respiratory distress and mortality from COVID-19 (Di Renzo et al., 2020).

Individualized Response to Stress

In times of psychological distress, emotional reactivity is deeply influenced by individual differences and stress-mediated contexts. A study with the Italian general population aimed to observe the gender and personality traits that more substantially associated with psychological impact during the COVID-19 pandemic (Moccia et al., 2020). The results showed that individuals with anxious, cyclothymic and/or depressive temperaments are predicted to suffer greater emotional impact secondary to the current scenario. Meanwhile, male gender, as well as secure and avoidant adult attachment style were protective for the risk of higher psychological burden (Moccia et al., 2020).

Moreover, in a different line of research, a Chinese study proposed to understand the differential psychological distress among distinct populations affected by the pandemic. It was observed that individuals who had experienced SARS-CoV-2 infection had significantly increased prevalence of depressed mood, somatic symptoms and anxiety-like behavior (Zhang W.R. et al., 2020). Post-traumatic stress disorder (PTSD) was found to affect 96.2% of hospitalized patients with COVID-19, whereas depression was also higher in COVID-19 patients (Vindegaard and Benros, 2020). Furthermore, having an infected friend or family member has been associated with higher anxiety levels (Duan L. et al., 2020).

PSYCHOLOGICAL DISORDERS SECONDARY TO THE COVID-19 PANDEMIC

The COVID-19 pandemic may intensify psychological disorders or precipitate others, for instance, anxiety, depression, PTSD, alcohol misuse, obsessive-compulsive behaviors, panic and paranoia (Dubey et al., 2020; Islam et al., 2020). A nationwide survey in China with over 52 thousand participants had almost 35% of the respondents experiencing psychological distress due to the SARS-CoV-2 (Qiu et al., 2020). In this study, women appeared to be more vulnerable to stress than men, although this result is not consistent in literature (Huang and Zhao, 2020). Therefore, some of the most cited psychological consequences of the pandemic will be further addressed.

Anxiety and Depression

Anxiety, one of the main evaluated subjects, has been significantly increasing in society during this pandemic (Huang and Zhao, 2020; Li et al., 2020; Qiu et al., 2020; Teufel et al., 2020). A research

group in China analyzed the online posts from about 18,000 Chinese social media users before and after the declaration of COVID-19 in China on January 20, 2020 and found an increase in words that mirror negative emotions including anxiety, depression, and anger (Li et al., 2020). One particular kind of anxiety is worth mentioning: health anxiety. It is characterized mainly by catastrophic misinterpretations of bodily sensations, dysfunctional beliefs about health and illness and maladaptive coping behaviors. Harmful consequences can derive from this condition, including excessive hand washing, social withdrawal, panic purchasing and overspending in resources such as hand sanitizers, medications and protective masks (Asmundson and Taylor, 2020b). In fact, especially for the suspected cases of COVID-19, the development of obsessive-compulsive symptoms may be a consequence of anxiety related to their health status (Dubey et al., 2020). The same rising tendency has been seen for depressive symptoms (Bavel et al., 2020; Pfefferbaum and North, 2020; Restubog et al., 2020; Sher, 2020a). Interestingly, groups with less education seem to be more susceptible to these manifestations in an epidemic context, especially due to unreliable access to information and apprehension to its academic formation (Pfefferbaum and North, 2020).

Post-traumatic Stress Disorder

Another alarming condition that can be expected to increase is post-traumatic stress disorder (PTSD) (Brooks et al., 2020; Dutheil et al., 2020; Gunnell et al., 2020), similar or worse to what happened in previous epidemics, such as H1N1 Influenza and Ebola (Xu et al., 2011; Cénat et al., 2020). The adverse effects of this illness are not manifested immediately and mental health support must be prepared to deal with this issue in a few months. PTSD is more likely to take place after longer periods of social disconnection and it is associated with increased suicide risk by 2–5 times (Thibodeau et al., 2013; Brooks et al., 2020). PTSD patients are also less prone to seek help from authorities, possibly due to few available information about this subject, fear of stigmatization, beliefs that symptoms may disappear over time and concerns about the cost of mental healthcare (Dutheil et al., 2020).

Alcohol Addiction

During the lockdown, some countries also prohibited alcohol sales. The arguments to sustain the restricting conditions included impaired ability of those under the influence of alcohol to implement the preventive measures, the influence of drinking in domestic violence, its impact to the immune system and, finally, the high cost of acute drinking for the emergency services (Nadkarni et al., 2020). Nevertheless, higher numbers of abstinence syndrome appeared as a consequence within patients who suffer from addiction (Narasimha et al., 2020). In a psychiatry emergency service in Bangalore, India, twice the number of severe abstinence syndrome (seizures, delirium tremens, and hallucinations) occurred per day after lockdown (Narasimha et al., 2020). Furthermore, rise of the black marketing of alcohol, consumption of non-consumable alcohol and even suicide in those suffering from addiction have been reported in India (Nadkarni et al., 2020). In fact, it has been suggested that alcohol consumption is an important risk factor for the decompensation of psychiatric disorders and, ultimately, may favor individuals to commit suicide, particularly the fragile and more vulnerable ones (Conejero et al., 2020).

Another complex consequence of such measures concerns those in recovery or wanting to recover from alcohol abuse. Since autonomy is crucial to sustain behavioral changes that result in the discontinuation of drinking, and since the patients have, during this period, restricted access to services such as Alcoholics Anonymous, prohibiting alcohol sales can be detrimental to recovery (Nadkarni et al., 2020). Additionally, the social distancing, the anxiety and the negative thinking that have been exacerbated in the pandemic situation may trigger relapse (Nadkarni et al., 2020). In fact, in other countries where alcohol sales were not prohibited, such as in the United Kingdom, the consumption of alcohol during lockdown significantly increased (Nadkarni et al., 2020). It is important, then, that countries prohibiting alcohol sales carefully address its impact for those who suffer from addiction.

MENTAL HEALTH VULNERABILITY

Several groups are more vulnerable to greater emotional, behavioral and psychological impact of the COVID-19 pandemic. The most cited ones will be addressed in this discussion. Nevertheless, other groups at increased risk for the mental health repercussions of the pandemic include those with pre-existing health conditions, those living in care homes, domestic caregivers and COVID-19 patients and their family members (Dubey et al., 2020; Khan et al., 2020).

Healthcare Professionals

One of the main groups in this category is the one with the healthcare providers during the pandemic, specifically frontline workers. In the alarming context of this health emergency, these professionals are put through different circumstances and afflictions, which include fear of being infected and infecting others, higher workload, significant pressure, pain of losing patients and colleagues, the yet unpredictability nature of the virus, inadequate testing, limited treatment options and disruption of regular routine, along with insufficient personal protective equipment and other medical supplies, especially in developing countries (Chew et al., 2020; Lancet, 2020; Mamun et al., 2020c; Pfefferbaum and North, 2020). Evidence reports that such conditions might make them more vulnerable not only to physical symptoms, including headache and sore throat (Chew et al., 2020), but also to mental health burden, with an increase in rates of anxiety, depression, stress, irritability, insomnia, anger, and frustration (Brooks et al., 2020; El-Hage et al., 2020; Pfefferbaum and North, 2020; Zhang J. et al., 2020). Having an organic disease appeared as an independent risk factor for these outcomes in previous studies (Zhang J. et al., 2020). As an illustration, a study in China concluded that half of the frontline healthcare professionals had symptoms of depression and anxiety, 70% had psychological distress and many also reported insomnia (Mesa Vieira et al., 2020). Previous epidemics

had a similar pattern, as 29% of the healthcare workers may have had emotional distress after the SARS epidemic in 2003 (Holmes et al., 2020). This group is also at risk for the development of PTSD (Dutheil et al., 2020).

Moreover, as the COVID-19 pandemic is currently at the center of the news broadcast, the public gains access to the scientific data practically at the same time that it becomes available to the medical community. Therefore, in the midst of fear and anxiety, there is great pressure on healthcare professionals to be constantly updated on the release of new studies, as well as to prescribe the experimental treatments for their patients, in spite of insufficient high-quality evidence (González-Padilla and Tortolero-Blanco, 2020).

The extent of mental health vulnerability seems to vary amongst different populations within the healthcare staff. It has been reported that young women are at higher risk for adverse psychological repercussions than men (El-Hage et al., 2020; Lai et al., 2020). Moreover, nurses are also more likely to be affected than physicians (El-Hage et al., 2020; Lai et al., 2020; Tsamakis et al., 2020). Interestingly, one study observed that non-frontline nurses were more prone to emotional impact than the frontline group, which seems to be due to their greater working experience and psychological preparation (Ghaffari et al., 2020). Although results from other researches evidenced the opposite (Lai et al., 2020), it brings attention to the importance of providing psychological preparation and assistance to healthcare professionals during the COVID-19 outbreak.

Elderly

As part of an important risk group for COVID-19, the elderly are currently being instructed to remain at home and self-isolate (Armitage and Nellums, 2020). Nonetheless, it has been demonstrated that older adults are at higher risk for anxiety and depression when put in situations of social disconnection (Armitage and Nellums, 2020; Conejero et al., 2020). To those who do not have close family or friends and to those whose only social contact is out of the home, these can be particularly dawning times. Many individuals within this group rely solely on community centers, places of worship, voluntary work and social care, activities which have been severely restrained by the COVID-19 outbreak (Armitage and Nellums, 2020). In addition, many older individuals have smaller access and/or literacy to social networks, which prevents them from maintaining virtual connection with others (Mesa Vieira et al., 2020). Therefore, the psychological and emotional impact is tremendous. The social disconnection causes and aggravates loneliness, neglect, depression and anxiety, all of which can produce long-term health consequences (Banerjee, 2020; Bavel et al., 2020). Moreover, the context of this pandemic might increase suicide behavior amongst older adults. As an example, after the SARS epidemic in 2003, suicide rates among elderly individuals were increased by 30% (Holmes et al., 2020). The solitude in the elderly has also been suggested to be accompanied by biological modifications that make this group more vulnerable to commit suicide, which includes the elevation of inflammatory markers and expansion of peripheral blood mononuclear cells (Conejero et al., 2020). Furthermore, it has also been suggested that social disconnection may worsen neurodegenerative disorders, such as Alzheimer's disease (Conejero et al., 2020; Plagg et al., 2020).

An additional topic of discussion that further elucidates the emotional impact of the pandemic among the elderly is the phenomenon of "ageism". In the early phases of the COVID-19 outbreak, the disease had been predominantly portrayed as an illness that affects almost exclusively the older adults (Ayalon, 2020). At present, this stereotype has been proven erroneous, as age itself is not a reliable criterion to predict the health impact of SARS-CoV-2 infection (Ayalon, 2020). Notwithstanding, albeit the scientific evidence of such a statement, the social marginalization and segregation of the elderly persists throughout the population (Ayalon, 2020; Colenda et al., 2020). Indeed, in some countries, the gradual relaxation of the social distancing recommendations does not seem to apply to the older adults, who are consistently advised to self-isolate (Ayalon, 2020). Moreover, there is a general belief that the safety of this group should be sacrificed for the greater good of society, particularly in detriment to the economy (Ayalon, 2020; Colenda et al., 2020). In this scenario, the aggravation of the intergenerational tension can be observed in social media content. As an illustration, the offensive hashtag #boomerremover appeared in over 4,000 posts in Twitter in a 10-day period following the pandemic declaration of WHO in March (Jimenez-Sotomayor et al., 2020). In this framework, there is a destructive increase in the mental health burden of senior citizens, which must be urgently addressed.

Children

Children, especially the young ones, are also in a position of vulnerability during the pandemic. This happens because, at home, they suffer with limited social connection, crucial for identity and well-being at young ages, reduced physical activity, loneliness and boredom (Fegert et al., 2020; Jiao et al., 2020; Loades et al., 2020), which may result in long-term effects. Indeed, the mental and physical health, as well as productivity in adult life, is deeply rooted in the childhood years (Loades et al., 2020; Wang G. et al., 2020). Data from previous epidemics demonstrate that children who experienced isolation measures were five times more prone to demand mental health services and more inclined to experience PTSD (Loades et al., 2020). It has also been demonstrated that children who are out of school (i.e., weekend and summer holidays) tend to have longer screen times, irregular sleep patterns and less favorable diets (Wang G. et al., 2020), which can be exceptionally harmful in longer periods of time such as the yet unknown duration of this pandemic. Furthermore, the economic recession, the restricting measures and the overall family stress may be accompanied by an increase in domestic violence and child maltreatment, situations that impact the mental health of children (Fegert et al., 2020). Adolescents with previous mental health disorders require particular attention since disruption of school routine can decline their mental health status (Khan et al., 2020). Moreover, the current events have further prompted the expansion of remote work, whereas schools and daycare centers had to interrupt their activities. In this setting, family and work environment have

merged and decreased performance can be seen in both spheres, as stress intensifies (Mental health Covid-19, 2020).

Following the distancing measures, social media has become an important resource to maintain social interaction. Even though its use might alleviate some of the mental health impact of the isolation, it is essential to analyze its negative impact in children and adolescents (Deslandes and Coutinho, 2020; Ni et al., 2020). First, consuming indiscriminate information about the pandemic may trigger stress, anxiety, panic and depression. This effect is even more intense in younger individuals that do not have the discernment to filter information (Deslandes and Coutinho, 2020). Second, the excessive use of the Internet might create an addiction, compromising the development of a healthier routine during the pandemic, which is also composed by study, leisure, and exercise activities (Deslandes and Coutinho, 2020). Third, digital social networks are extremely based in the virtual construction of a self-image and visibility, which, especially for the youngest, might mediate self-esteem through the pursuit of social approval. Simultaneously, social media can be a violent place. As a consequence, its excessive use may contribute to self-harm actions through virtual challenges, in which the participant has assignments related to self-mutilation and even suicide that should be filmed and posted. The online search for the term "challenges online" has increased since the implementation of the restricting measures (Deslandes and Coutinho, 2020). Ultimately, elevated Internet use is associated with behavioral problems such as neglecting personal life, relationship disorders, mood dysfunction and sleep disturbances, as well as increased anxiety and depression levels during the pandemic (Duan L. et al., 2020).

College Students

Since universities have temporarily closed during this world health emergency, college students are also vulnerable to major changes in their routine and, as a consequence, to the psychological impact of the pandemic (Khan et al., 2020). As a matter of fact, having the graduation affected by the pandemic has already been significantly associated with increased depression rates (Duan L. et al., 2020). Factors that may aggravate this situation include living away from family, instability of family income and insufficient access to technology in order to attend online classes (Cao et al., 2020; Khan et al., 2020). In fact, the mental health impact of online classes is a topic that deserves further evaluation, since it might lead to overburden (Dubey et al., 2020). As an extreme example, a suicide pact related to online classes has been reported between a private university student and his mother. Similarly, suicides due to depression after an exam postponement and due to inability to access online classes have also been announced (Mamun et al., 2020b).

LGBTQ+ Community

LGBTQ+ individuals, in general, have worse mental health and well-being compared to non-LGBTQ+ peers, especially for the persons of color (Fish et al., 2020; Salerno et al., 2020). As a consequence, during the COVID-19 pandemic, they face particular stressors that can trigger deleterious psychological outcomes (Fish et al., 2020; Phillips et al., 2020; Salerno et al., 2020).

For the LGBTQ+ youth, for instance, the social distancing measures might lead to confinement in unsupportive homes, increasing their exposure to discrimination, violence and rejection from their family (Fish et al., 2020). Previous researches have demonstrated that one third of the LGBTQ+ youth undergo family rejection and that these individuals are six times more prone to depression and eight times more prone to suicide (Salerno et al., 2020). Simultaneously, the LGBTQ+ youth, during the pandemic, experience less access to essential social connections, identity-based alliances and school-based mental health services (Fish et al., 2020; Salerno et al., 2020). As a result, this group is more vulnerable to anxiety, depression, suicide behavior, PTSD, substance abuse and self-harm (Fish et al., 2020; Salerno et al., 2020). For this reason, online communities have emerged as important support resources for this group (Fish et al., 2020).

Moreover, the LGBTQ+ elders are twice as likely to live alone, four times less prone to have children and more inclined to be segregated from their family (Salerno et al., 2020). Therefore, social distancing measures may exacerbate loneliness and previous mental health conditions (Salerno et al., 2020). Finally, the levels of poverty, lack of health-insurance and unemployment are higher amongst LGBTQ+ individuals, which aggravate the impact of the pandemic in their mental health (Phillips et al., 2020; Salerno et al., 2020).

Black and Latin Communities

Structural racism imposes unequal access to healthcare and protective resources among different racial and ethnic populations. For instance, many individuals of color do not have adequate housing, a main social determinant of health. Additionally, nearly one third of the black Africans and one fourth of Black Caribbean in the United Kingdom are workers in essential services without the possibility of working from home (Farquharson and Thornton, 2020; Liu and Modir, 2020). Furthermore, there is an insufficient amount of well-resourced hospitals in many primarily black and latin communities (Liu and Modir, 2020). As a result, the COVID-19 pandemic has an increased impact on the individuals of color, which may lead to enhanced fear of infection and worse mental health outcomes (Farquharson and Thornton, 2020; Liu and Modir, 2020). In fact, black Americans have the highest COVID-19 mortality rate among the racial groups in the United States and early data reported that 33% of all deaths were of black people, even though this group composes 13% of the United States population (Liu and Modir, 2020).

Furthermore, in the course of the pandemic, the stigmatization of racial minorities exacerbates, causing rejection, social disconnection and physical violence (Farquharson and Thornton, 2020). As an example, the early recommendation to wear face masks in public resulted, for the black community, in increased racial profiling and police violence (Liu and Modir, 2020). Therefore, the narrative "we're all in this together" regarding the COVID-19 outbreak has been proven inaccurate, and the communities

of color are a vulnerable group for the mental health repercussions of the pandemic (Farquharson and Thornton, 2020; Liu and Modir, 2020).

Foreigners

The continuous threat of SARS-CoV-2 has aggravated ethnic prejudice and intolerance toward stigmatized groups, especially toward Chinese people (Asmundson and Taylor, 2020a; Bavel et al., 2020). This is not unprecedented in History: Jewish people were linked to the Black Death, HIV was believed to be disseminated by the LGBTQ+ community and the western African population was discriminated against during the Ebola outbreak (Coates, 2020). In this pandemic, it is likely that the novelty of the virus and the uncertainty surrounding its potential outcomes in several spheres of society have triggered fear and anxiety that endorse the xenophobia behavior (Asmundson and Taylor, 2020a). There have been reports of discrimination within social and political contexts: Chinese restaurants having to shut down due to reduced number of costumers (Asmundson and Taylor, 2020a), Chinese individuals being barred from entering certain establishments and even the United States President referring to COVID-19 as the "Chinese virus" (Devakumar et al., 2020). Moreover, immigrants have decreased access to healthcare services, adequate housing and clean water, especially if undocumented (Liu and Modir, 2020; Mesa Vieira et al., 2020). To manage such reality, multidisciplinary measures are necessary to correctly inform the population on public health risks, to notify discriminatory acts and to support those affected by harmful misconceptions (Rzymski and Nowicki, 2020).

Individuals in Economic Vulnerability

As in natural hazards, the economically disadvantaged people seem to be more susceptible to the threat and more likely to be minced by it (Bavel et al., 2020). For instance, a study has shown that groups with lower income may have been performing less physical exercises during this period, due to less access to Internet and technological tools. This is evidence that, besides the economic impairment, these individuals are also more vulnerable to physical and psychological repercussions of social isolation (Peçanha et al., 2020). Furthermore, there has been correlation between socioeconomic deprivation and ability to adopt preventive measures, enhancing the risk inequality (Atchison et al., 2020).

Those living in informal settlements have particular stressors that decline their mental health. For instance, space constraints, violence and overcrowding implicates in decreased capability to adhere to the social distancing measures and, as a consequence, in increased fear of contamination (Corburn et al., 2020). Furthermore, basic needs such as access to water, waste collection, sewers and adequate housing may not be available. Moreover, most of the individuals living in slums are informal workers and, therefore, are more vulnerable to the economical impact of the pandemic (Corburn et al., 2020). Finally, racism, xenophobia and stigmatization of the poor have raised during the pandemic, which implicates in even worse outcomes regarding the mental health of these populations (Corburn et al., 2020).

Homeless Individuals

Homeless individuals compose another vulnerable group for contracting COVID-19 and for the psychological impact of the pandemic (Hsu et al., 2020; Khan et al., 2020; Mesa Vieira et al., 2020). First, this group faces difficulties in taking preventive measures for COVID-19, such as hand washing and self-isolation. Conversely, they are more prone to risky behaviors such as substance abuse and the sharing of needles (Wood et al., 2020). Second, many individuals have an increased prevalence of comorbidities and chronic diseases compared with people of similar age, including mental health disorders like bipolar disorder and schizophrenia (Khan et al., 2020; Mesa Vieira et al., 2020; Wood et al., 2020). Third, they face enhanced obstacles to receive treatment for previous medical conditions, especially considering their reduced accessibility to telehealth services (Wood et al., 2020).

Prisoners

The vulnerability of the prison population in the COVID-19 pandemic does not seem to be thoroughly explored by the scientific community (Hewson et al., 2020). Notwithstanding, this group of individuals comprise numerous risk factors for worse mental health outcomes secondary to the current circumstances. This magnified emotional impact is a result of several aspects. The frequency of pre-existing psychological disorders, neurodevelopmental health, substance misuse, suicide and self-harm is already increased in this group compared to the rest of the population (Hewson et al., 2020; Kothari et al., 2020). Moreover, as consequences of the COVID-19 pandemic, these individuals have been suffering with diminished social interaction with other inmates and outside visitors, suspension of jury trials and delay of court hearings, and recreational and occupational prison activities (Fovet et al., 2020; Hewson et al., 2020; Tozzo et al., 2020). This group is also more vulnerable to the infection of SARS-CoV-2, as prisons tend to be overcrowded, have poorly ventilated environments and low compliance to hygiene rules (Tozzo et al., 2020). In light of this scenario, prisoners are more likely to suffer from anger, depression, anxiety, irritability, frustration, paranoia, fear of contamination, psychosis, exacerbation of underlying mental illness and suicidal behavior (Fovet et al., 2020; Hewson et al., 2020; Tozzo et al., 2020).

Rural Communities

The individuals living in rural communities experience more loneliness, lack of belonging and perceived burdensomeness than those living in urban centers. They are, therefore, at elevated risk for unsatisfactory mental health and even suicide (Monteith et al., 2020). During the COVID-19 pandemic, the social distancing measures, often not accompanied by virtual connections due to diminished access to the Internet, may exacerbate mental health symptoms and increase suicide behavior in this population (Monteith et al., 2020). Furthermore, intimate partner violence tends to be more intense in rural communities, whereas access to mental healthcare tends to be deficient. All of these circumstances may exacerbate during the pandemic and might result in

poorer mental health outcomes and increased suicide rates (Monteith et al., 2020).

Psychiatric Patients

In psychiatric patients, the COVID-19 pandemic might trigger an even worse outcome regarding mental health. As previously discussed, the uncertainty, fear and social distancing may exacerbate pre-existing psychiatric diseases and precipitate its symptomatology (Holmes et al., 2020; Vindegaard and Benros, 2020; Yao et al., 2020). Added to their higher vulnerability to many stressors (Yao et al., 2020), they face worsen medical follow-up due to the suspension of some elective appointments and redirection of health professionals to face the pandemic (Holmes et al., 2020). Furthermore, they tend to have more severe forms of COVID-19 due to comorbidities, immunosuppression (Fontenelle and Miguel, 2020; Yao et al., 2020) and, possibly, worst access to medical care because of discrimination (Yao et al., 2020).

Depression and Anxiety

When performed several scales to assess the psychological impact of COVID-19 pandemic in China on 76 psychiatric patients (with major depressive disorder, anxiety disorders and mixed anxiety and depressive disorder patients) and 109 healthy controls, the patients group had worst outcomes on almost all variables addressing depression, anxiety, stress and insomnia (Hao et al., 2020). As for other psychiatric symptoms referred during the survey, the patients group had more worries about their physical health, more moderate to severe anger and impulsivity and more suicidal ideation (Hao et al., 2020). However, it is important to mention that the control group was evaluated simultaneously to the patients group. Control group was composed of individuals without psychiatric disorders that were evaluated before COVID-19 pandemic. For this reason, results of the study can be contestable.

Moreover, patients with generalized anxiety have increased health anxiety. As a result, they are more prone to confound normal feelings with COVID-19 symptoms, generating even more anxiety and distress (Dubey et al., 2020).

Obsessive-Compulsive Disorder

Many patients with obsessive-compulsive disorder (OCD) already excessively worry about having a disease or contaminating others. During this world health emergency, these feelings may intensify (Fontenelle and Miguel, 2020). Also, some signs and symptoms of OCD are very similar to important preventive measures for COVID-19, such as compulsive hand washing and avoiding physical contact (Fontenelle and Miguel, 2020). Therefore, this overlap may cause difficulty for physicians to diagnose and treat new cases of OCD. Finally, the stressors associated with the pandemic might increase the number of new OCD patients, especially among those "at risk" for COVID-19 (Fontenelle and Miguel, 2020).

Schizophrenia

In psychiatric patients, excessive attention to media or social networks might precipitate an acute phase of the disease or change its manifestations (Fischer et al., 2020). For example, a 43-year old German patient with schizophrenia had delusions and hallucinations related to the pandemic (Fischer et al., 2020). He believed he contracted the disease through a WhatsApp video from COVID-19 patients in China and started having acoustic hallucinations, anxiety and depressing humor. Therefore, equilibrated communication, based on scientific facts, is essential to minimize this possible damage (Fischer et al., 2020).

Furthermore, schizophrenic patients were less likely to vaccinate, adhere to social distancing, wash their hands and use masks during influenza pandemic (Maguire et al., 2019). This reality is also true for patients with other psychiatric conditions, such as addiction (Narasimha et al., 2020). Therefore, they are a vulnerable group for contracting COVID-19, especially if their mental health is worse than usual (Yao et al., 2020).

Hospitalized Patients

Stress experienced during COVID-19 pandemic is probably even higher for psychiatric patients hospitalized for severe illness. In China, these patients had to stay in closed wards without family visits or electronic equipment (Li and Zhang, 2020). These conditions exacerbated their distress and mental symptomatology (Li and Zhang, 2020). Additionally, the patients in these facilities tend to make group activities, share dining and bathroom spaces, interact closely and practice less preventive measures because of their mental state (Bojdani et al., 2020; Xiang et al., 2020). Therefore, they are more vulnerable to the transmission of SARS-CoV-2 (Bojdani et al., 2020; Xiang et al., 2020).

EXTERNAL INFLUENCE

Culture

As a multi-dimensional psychosocial construct that shapes the perception of the world, culture has the ability to influence several aspects of daily life. In the framework of the pandemic, cultural components affect how the population will perceive, for instance, the implementation of hygienic greetings etiquette, the recognition of health symptoms and the fear of stigmatization (Bruns et al., 2020; Furlong and Finnie, 2020). For this reason, it can be challenging to encourage individuals to comply with some of the necessary precautions, such as avoidance of cultural activities (i.e., worship meetings) and submission to the restricting measures, particularly if these strategies are divergent to the customary social norms (Bruns et al., 2020; Furlong and Finnie, 2020). For example, in Asia, where the COVID-19 outbreak started, discipline is highly valued in society, as well as punishments for deviance. Therefore, the sense of community can be vital in motivating individuals to comply and respect the measures imposed. Contrarily, countries who value freedom and individual expression, including the United States, Italy, and Brazil, may exhibit more difficulties in renouncing personal desires in order to oblige to a common good (Bavel et al., 2020). As a result, the mental health outcomes derived from

this pandemic rely deeply on the level of cultural impact in the community (Furlong and Finnie, 2020).

Media and Access to Information

As a worldwide unprecedented health issue, COVID-19 pandemic has drawn massive attention from the media. Nonetheless, the supply of information regarding the disease has heavily surpassed the demand from the population (Liu and Liu, 2020). This phenomenon has two main repercussions in respect to the mental health impact.

First, the manner by which media vehicles have been portraying the current situation to the community might be causing great harm in terms of psychological implications. This can be easily translated as an analogy with vicarious traumatization, a process suffered by the health staff in command when listening to the victims' narration of traumatic events they experienced (Liu and Liu, 2020). Similarly, the negative exposure of individuals to ruthless details concerning the COVID-19 pandemic has the potential to promote great psychological distress in the society. During these times, pessimistic reports have prevailed in the correspondence with the public, including daily updates on the number of those infected and number of deaths, economic impact and uncertainty about the future. This consequently increases negative emotions throughout the community and makes people more susceptible to panic. An illustration of this matter is the display of images of empty shelves and panicked shoppers during the first months of the pandemic. Even though this may have been used as a critic, it induced viewers to look out after themselves and foster individuality and competitiveness (Bavel et al., 2020).

Secondly, as information travels at an uncontrollable speed, it is virtually impossible to control the accuracy and authenticity of the majority of news in circulation. As expressed by the Director-General of the WHO, in addition to the fight to the SARS-CoV-2 virus, the world is currently facing an "infodemic" (Dubey et al., 2020; Zarocostas, 2020). It is characterized not only by the massive frequency of fake and inaccurate news (Irwin, 2020), but also conspiracy theories and misinformation, which puts the public through the distress of having to distinguish between scientific evidence and unreliable information (Depoux et al., 2020). The repercussions of this phenomenon are numerous and deleterious, particularly to the mental health of the population, given it is a potential source of anxiety, phobia, panic, depression, obsession, irritability, and COVID-19-related paranoia (Dubey et al., 2020).

Social Network

In this topic, social networks present twofold effects. On one hand, it is one of the main vehicles of the misinformation and inaccurate information reported. Moreover, people can be adversely influenced by what they see in social networks, which may alter risk perceptions, encourage unhealthy behaviors and reassure the non-compliance with preventative measures (Gao et al., 2020). On the other hand, as the current situation demands physical distancing, remote communication has become an indispensable resource to have social connection (Bergman et al., 2020), as well as to find inspiration on healthy habits and behaviors (Brooks et al., 2020; Gao et al., 2020). In fact, particularly in the scenario of this unprecedented crisis, social networks have been suggested to play a fundamental role in social support, tension release and emotional catharsis (Liu and Liu, 2020).

Government

In the midst of the pandemic disarray, the government of each country is in the position to guide the population and to execute the necessary interventions to minimize the propagation of the virus. Some strategies consisted of school closures, limited commercial activities, requests that individuals work from home and reduced freedom to use public spaces (Briscese et al., 2020). This kind of leadership has powerful repercussions, with surveys indicating that trust in the government increased from the day the restrictive measures were implemented (Teufel et al., 2020) and that positive behavioral changes were made in response to authorities' guidance (Atchison et al., 2020). Indeed, it has been demonstrated that government's interventions of disease prevention and control have significantly increased the likelihood of adoption of protective measures (Duan T. et al., 2020). Moreover, a study showed that, in the United Kingdom, the inclusion of altruism in government's health messages possibly had a positive effect on wellbeing compared with compulsory orders to stay at home (Holmes et al., 2020).

Nonetheless, in regard to the governments' strategy to mitigate the emotional and behavioral impact of the pandemic, the results may not be as optimistic. During health crises, there seems to be a special focus from authorities in epidemiological and biomedical data (Atlani-Duault et al., 2020). Indeed, a Chinese study investigated the government's communication with the public through social media and observed an overall inadequate responsiveness to the public's concerns. The majority of posts consisted of reports on the epidemic situation, disease-related questions, guidelines and prevention advice. Although these are tremendously relevant topics, there seemed to be insufficient instrumental and emotional support for the community (Liao et al., 2020).

Moreover, an interesting phenomenon is the "heroization" process (Atlani-Duault et al., 2020; Liao et al., 2020). It can be illustrated by the fact that, in any disaster, there seems to be a social need for attribution of blame, in which certain groups or individuals may be considered heroic figures (Liao et al., 2020). Therefore, in order to balance the complex geographies of hope and blame (Atlani-Duault et al., 2020), the government must be aware of this phenomenon in order to modulate the community's emotional response to the pandemic, as well as to counteract fake news and misinformation (Atlani-Duault et al., 2020).

Another key component to examine in the government's influence over the population is the establishment of deadlines to the end or the loosening of restricting measures. While the lack of an end date to protective efforts may increase the perceived severity of the situation, which, in turn, may build up compliance to such measures, it is also possible that the absence of a deadline might increase anxiety and other psychological complications over the uncertainty of the future (Briscese et al., 2020). The opposite may also apply: a deadline

may also create the impression that the emergency is limited in time and not particularly serious. In addition to that, deadlines may develop expectations in the population that, if not met, might reduce people's acceptance to the necessary procedures, trust in authorities and compliance to social distancing, a result which is called "social isolation fatigue" (Briscese et al., 2020).

MEASURES ADOPTED TO MINIMIZE BEHAVIORAL AND PSYCHOLOGICAL CONDITIONS FACING COVID-19 PANDEMIC

In light of all the harmful ramifications that derive from the current COVID-19 pandemic, it is essential that the government, the health authorities and the population articulate to endorse preventive and supportive measures, not only for the transmission of the disease, but also for emotional, behavioral and psychological impact. In this context, it is important to include mental health professionals managing the pandemic more broadly (Sani et al., 2020). Their knowledge and experience are crucial to monitor the situation and to coordinate supportive measures in order to prevent an even higher increase in psychological disorders, including panic, OCD, addiction and PTSD (Fiorillo and Gorwood, 2020; Sani et al., 2020). Finally, considering that poor mental health is associated with lower adherence to preventive measures for SARS-CoV-2, improving well-being might even decrease the rates of infection (Adhanom Ghebreyesus, 2020).

Telepsychology Services

As mentioned, worse medical follow-up is one of the most important features to understand the mental health impact of COVID-19 pandemic to mentally ill patients. Demand for telepsychology services, therefore, has increased markedly during the pandemic, and managers have accordingly tried to keep up with this abnormally high demand (Perrin et al., 2020). In fact, psychologists performed 7.07% of their work through telecommunication technologies before the COVID-19 pandemic, whereas, during the pandemic, this number increased to 85.53%, with 67.32% of the mental health professionals executing their work solely via telepsychology (Pierce et al., 2020). The United States government has pursued some actions to enlarge the role of telepsychology, such as allowing the possibility of some drugs to be prescribed in appointments via the Internet, and the expansion of Medicare and Medicaid to cover telepsychology and telemedicine consultations (Perrin et al., 2020; Pierce et al., 2020). Furthermore, online training with experienced trainers, along with tools and resources prepared by psychology organizations, are available in order to instruct the professionals for this new demand (Pierce et al., 2020). These learning opportunities are remarkably important, since lack of self-efficacy is one of the main reasons that explain the small use of telepsychology preceding the pandemic (Pierce et al., 2020).

Concerning its efficacy, Internet-delivered therapy, such as cognitive behavior therapy (CBT), was not less effective than face-to-face CBT in health anxiety disorders, while resulting in lower treatment costs in previous studies (Axelsson et al., 2020). Therefore, even though the evidence base is still limited, these therapeutic modalities may have an important role for facing mental health issues during COVID-19 pandemic (Bilder et al., 2020; Fegert et al., 2020). Nevertheless, telepsychology uptake in more complex cases with severe symptomatology, such as antisocial personality disorder, behavioral issues and bipolar disorder, had a lower increase during the pandemic, indicating difficulty to treat the conditions via the internet or insufficient specialized training for psychologists. The same pattern was observed with testing and evaluation, which could signal insufficient tests adapted for telepsychology (Pierce et al., 2020). Furthermore, technology issues are among the main barriers to the implementation of telehealth. For instance, the elderly may lack familiarity with the platforms, while those from a lower socioeconomic background or those living in rural areas may deal with deficiency of technological devices or Internet connections (Bilder et al., 2020; Monteith et al., 2020).

Finally, mental health professionals should be prepared to address some particularities of minority groups, such as the LGBTQ+, black and latin communities, with cultural responsiveness (Liu and Modir, 2020; Phillips et al., 2020). For the black community, psychologists can use racial socialization in order to enhance awareness about the reality of racism and to promote coping mechanisms (Liu and Modir, 2020).

Hotlines

It has been recommended that people under quarantine should have access to hotlines with trained healthcare providers to receive guidance regarding possible symptoms or doubts. Such communication channels would reassure and comfort distressed people, providing a sensation that they have not been forgotten. Online support groups for people who are quarantined at home might also be helpful in reducing levels of fear and anxiety (Brooks et al., 2020).

People with suicidal tendencies or previous mental illnesses need special support. Some of them will search for help, and, in this case, it is necessary to increase the volunteer team and to prepare individuals to deal with the situation, including resources through the Internet or phone call. For those who will not search for help, it is important to be attentive to their signs, such as social disconnection and humor flows (Gunnell et al., 2020). Monitoring the mental status of the population is crucial to guide new interventions and improve the overall wellbeing (Holmes et al., 2020).

Digital Technology Monitoring and Assistance

The global issue of misinformation and social media panic is a crucial topic to be addressed during this pandemic. In order to avoid misleading media reports, the main news outlets should assign professionals to moderate the information that is passed on to the public, in the interest of verifying if it is in line with the current guidelines and scientific evidence (Gunnell et al., 2020). Furthermore, news broadcasts should use simple

language when communicating with the public, which means avoiding complex and scientific terms. It is also recommended that they offer practical and specific advice instead of vague or complex guidance (Lakhani et al., 2020; Mesa Vieira et al., 2020). This facilitates the comprehension of the information and also promotes social inclusion of the more vulnerable groups (Mesa Vieira et al., 2020).

Moreover, there is a serious need for online platforms that clarify the available data concerning COVID-19, as well as demystify the fake and inaccurate news in circulation (Depoux et al., 2020). An illustration of this strategy is the "Mythbusters" dashboard in the WHO website, which carries this exact purpose (World Health Organization [WHO], 2020a). Additionally, the use of social media must be conducted with responsibility. The users should avoid the sharing of information that it is either not followed by a reliable source or that may cause panic or anxiety. Medical advice ought to be provided solely if it is backed by evidence (González-Padilla and Tortolero-Blanco, 2020).

Moreover, as the Internet has become an indispensable tool to foster social connections and perform numerous activities, online access, as well as reliable connection, is imperative and must be provided particularly for the vulnerable groups (Bavel et al., 2020). For instance, in order to nurture belonging, webinars, meetings and virtual extracurricular activities can be implemented for the black, latin and LGBTQ+ communities (Liu and Modir, 2020; Salerno et al., 2020). Furthermore, those with limited literacy concerning the use of digital technologies ought to receive special consideration.

Financial Support

As for the financial stress experienced during the COVID-19 pandemic, the government of each country should offer financial support for the vulnerable population in this context, including the self-employed and those with lower income. It is also crucial to prepare an economical plan during and after the quarantine, in order to reduce stress about the uncertainty of the future (Gunnell et al., 2020). Moreover, aiming to alleviate the economic burden faced particularly by numerous groups throughout the community, medical expenses of COVID-19 confirmed and suspected patients should be subsidized by the government. This strategy may also ensure that individuals seek medical care and, therefore, promotes health equity and disease control amongst the more vulnerable groups (Wang and Tang, 2020).

Personal Strategies to Improve Mental Health

In light of this difficult scenario, there are ways in which individuals may personally attempt to improve their well-being. Undoubtedly, maintaining interest and motivation is difficult for those suffering from mental health disorders or for those struggling financially (Mental health Covid-19, 2020). Nonetheless, studies have suggested that nourishing adaptive mindsets regarding stress may exert positive effects on how people deal with their emotions. It may also reduce adverse physical symptoms and boost physiological functioning under acute stress (Bavel et al., 2020). In fact, stress and loss of life satisfaction have been associated with higher levels of inflammation, which increases the odds of contracting the disease (Mesa Vieira et al., 2020).

Moreover, a study with employed students observed that there are multiple emotion regulation strategies that might be helpful during this period. They include seeking and reaching out to social connection, such as friends or family, or even volunteering, as reducing the feeling of loneliness and enhancing belongingness is crucial to prevent suicide (Holmes et al., 2020). Keeping oneself committed to other things (i.e., hobbies, music, reading, film, and television and home improvements) and engaging in enjoyable activities to improve one's mood have also been suggested (Restubog et al., 2020). As complex and multicomponent activities, arts and crafts have been highly associated with diminished risk of developing mental health disorders (Conejero et al., 2020). It is suspected that they modulate several neurotransmitters, as well as cortisol levels, and stimulate neuroplasticity. Therefore, they offer the possibility of emotional expression and regulation (Conejero et al., 2020).

As the COVID-19 outbreak severely restricted people's movement, outdoor activities have been limited, which does not mean, however, that physical activity needs to be limited as well. Physical exercises have been strongly associated with positive effects regarding mental and physical health (Jiménez-Pavón et al., 2020; Lyons et al., 2020). Therefore, exercising at home is an accessible and easy alternative, which includes not only walking and running, but also several online and free classes of different sport modalities (Chen et al., 2020; Jiménez-Pavón et al., 2020; Mental health Covid-19, 2020).

Several other strategies can contribute to improve the mental health status during the current situation. They include mediation, faith, prayers, playing and listening to music, cooking and baking, caring for a pet or gardening (Lades et al., 2020; Lyons et al., 2020; Mental health Covid-19, 2020). The importance of maintaining a routine or daily plan has also been emphasized (Lyons et al., 2020; Mental health Covid-19, 2020). The management of information intake, keeping news monitoring to a minimum in order to reduce levels of anxiety (Holmes et al., 2020; Mesa Vieira et al., 2020) or simply following official guidelines to stay safe and to respect social distancing are also fundamental strategies to diminish the stress response (Mental health Covid-19, 2020). Furthermore, sleep has a significant impact in mental health and stress response and the population should be constantly informed of its importance, particularly during the COVID-19 pandemic (Holmes et al., 2020).

Specific Measures for Certain Vulnerable Groups

Healthcare Professionals

Considering the emotional and psychiatric risk that healthcare workers are exposed to, actions must also be taken to protect and support this group. Healthcare managers should offer proactive steps to help their workers deal with this situation, reinforcing teams as needed, being honest about the situation and monitoring their staff more closely (Greenberg et al., 2020).

Support measures such as psychologists and psychiatrists' appointments, psychological assistance hotline, support groups and reading materials illustrating coping mechanisms to deal with stressors should also be provided without stigma (Santarone et al., 2020; Zaka et al., 2020). Since many professionals are afraid of going home and infecting their families, it is important to inform them about the safety measures that can minimize the chances of infection (Mamun et al., 2020c). Hospitals can also provide a place where the workers can rest and, if possible, record their hospital routine in order to share with their family (Zaka et al., 2020). Furthermore, the family members of the healthcare professionals should receive special access to testing and treatment, if necessary (Dutheil et al., 2020; Mamun et al., 2020c).

Moreover, an adequate work environment is essential to diminish the mental health impact of the pandemic in healthcare professionals. In that matter, there should be sufficient PPE availability and detailed rules about its use, limited hours in each shift, dissemination of medical information through multiple platforms and languages, education about skills to deal with the patients psychological concerns, delaying of elective appointments and surgeries and, if possible, assembly of a backup force composed of capable retired workers and college students about to graduate for the times of higher patient volume (Dutheil et al., 2020; Santarone et al., 2020; Zaka et al., 2020). Special attention must be paid to preventive strategies of PTSD and its related risk of suicide in the upcoming months (Dutheil et al., 2020).

Finally, it is important to acknowledge that targeting the psychological impact of the pandemic in healthcare professionals is also important to control the COVID-19 itself, since impaired mental health affects their attention, understanding and decision-making (Zaka et al., 2020).

Elderly

Considering the particularly detrimental consequences of social disconnection among the elderly, the benefits and damage of such restriction must be thoroughly and continuously weighed (Plagg et al., 2020). In institutions and nursing homes, this group should be allowed the visit of healthy relatives and friends, as long as the hygienic measures are adequately taken. If possible, these relatives and friends might be tested for SARS-CoV-2 infection (Mesa Vieira et al., 2020; Plagg et al., 2020).

Moreover, the family should be encouraged to contact these individuals more frequently, as well as voluntary organizations and community projects should provide similar support for this group (Armitage and Nellums, 2020). Indeed, the phone call outreach program promoted by the Northwestern University in Chicago, Seniors Overcoming Social Isolation, has been developed with the purpose of minimizing social disconnection among the elderly and providing significant engagement with the community (Office et al., 2020). Older adults must also be stimulated to leave their room or even perform outdoor activities when possible (Plagg et al., 2020). Online cognitive behavioral exercises and therapy should also be provided (Armitage and Nellums, 2020).

At last, the community should be encouraged to not comply with ageist content and to recognize the immense value and contribution of the senior citizens to the society (Jimenez-Sotomayor et al., 2020). Furthermore, intergenerational contact ought to be stimulated, as it promotes mental health benefits for both the parties involved (Jimenez-Sotomayor et al., 2020; Office et al., 2020).

Children

It has been recommended that the children maintain a healthy routine with adequate sleep cycle and physical activity, and videos can be used to encourage them to exercise and to play (Deslandes and Coutinho, 2020; Wang G. et al., 2020). In order to prevent loneliness, families might seize the opportunity to establish better bonds with their kids, providing them a sense of belonging in the family (Loades et al., 2020). Additionally, social networks should be used to allow interaction with their peers (Loades et al., 2020). Nevertheless, it is suggested that the parents monitor and control the screen time and the content visualized in the Internet (Deslandes and Coutinho, 2020). Parents should always talk to children about the current circumstances clearly and directly, in order to minimize the negative feelings and to help the kids better comprehend the pandemic and the information received from the Internet (Deslandes and Coutinho, 2020; Dubey et al., 2020; Wang C. et al., 2020). Interestingly, an effort that has already been made is the creation of the book *My Hero is You* (Storybook for Children on Covid-19, 2020) by the United Nation in conjunction with other agencies. This book was designed to help children aged 6 to 11 coping with the stress and anxiety generated by the pandemic. Furthermore, online services provided by psychologists can be useful, especially due to domestic conflicts, harassment, abuse and other types of violence (Wang C. et al., 2020).

Domestic Violence

Domestic violence is a complex issue with strong cultural components (Gunnell et al., 2020). Therefore, it requires a combination of multiple measures in order to protect the victims (Gulati and Kelly, 2020).

To improve the reporting of domestic violence, it is important to ensure constant availability of hotlines and digital reporting systems (Sacco et al., 2020; Sharma and Borah, 2020). However, since the victims may be isolated with their perpetrators, other alternatives must be adopted. For instance, family, friends and neighbors have an essential role revealing domestic violence, and advertising campaigns should encourage the community to report the cases (Marques et al., 2020; Sacco et al., 2020; Sharma and Borah, 2020; Usher et al., 2020). A positive message, focusing on solutions, is more effective in these circumstances (Sharma and Borah, 2020). Furthermore, code-based systems to report abuse situations could be implemented in pharmacies, supermarkets or even with toll-free phone numbers (Sacco et al., 2020; Usher et al., 2020). Finally, healthcare workers should be aware of the signs of domestic violence and of the risk factors involved, such as substance misuse by family members (Gulati and Kelly, 2020).

After reporting, the speed of the response is critical, especially since the victims and their perpetrators are probably

sharing spaces during the pandemic (Sharma and Borah, 2020). Accordingly, domestic violence must be included in the policymaker's response to the pandemic, guaranteeing financial funding, human resources and protective measures for the victims (Marques et al., 2020; Sharma and Borah, 2020). Moreover, the population should be communicated about the speed of the arrest, since it increases the chances of the victim and bystanders to report the crime (Sharma and Borah, 2020). Finally, encouraging initiatives to provide social support, advocacy and psychological and physical healthcare for the victims is crucial (Gulati and Kelly, 2020; Marques et al., 2020).

Some victims will not report the domestic violence for several reasons, such as fear, economic dependency and protection of the perpetrator. In these cases, friends and family assistance and support groups are especially important to reduce the mental health impact of the abuse (Sharma and Borah, 2020).

Informal Settlements and Homeless Individuals

For those living in informal settlements and for the homeless, it is essential that the police avoid top-down forced directives and that committees are created in order to improve communication between the population and the government. Along with financial support, food assistance and adequate water, sanitation and hygiene should be provided for this population (Corburn et al., 2020; Dubey et al., 2020). In this context, non-governmental organizations such as community-based organizations and faith-based groups are also extremely important (Corburn et al., 2020; Dubey et al., 2020). Furthermore, shelters can be created in sports installations, closed universities and military lands to shelter the homeless or to the de-densification of the settlements (Corburn et al., 2020). It is also crucial that psychologists and psychiatrists are available for those demanding specific support (Dubey et al., 2020). Ultimately, all individuals require their basic rights protected to diminish the mental health impact of the pandemic.

Prisoners

In light of the increased risk for worse mental health outcomes due to the pandemic, prisoners must receive special consideration and support. Prison management should explore the development of strategies that promote the well-being among the incarcerated community. It has been recommended that the inmates should receive telehealth support, substitute recreational activities, for instance, puzzles, coloring and playing cards, as well as other communication methods, such as writing letters and obtaining increased access to telephone landlines and social networks (Fovet et al., 2020; Hewson et al., 2020; Kothari et al., 2020). They must also be encouraged to practice physical exercise, even if it is inside the cell (Fovet et al., 2020; Hewson et al., 2020). Although access to hygiene measures can be difficult, the prisoners should be constantly informed about the social distancing precautions and provided with accurate information about the pandemic, in order to reduce anxiety and improve adherence to the restricting measures (Hewson et al., 2020; Tozzo et al., 2020).

CONCLUDING REMARKS

COVID-19 pandemic brings novel challenges to human beings. Not only virus' spread and disease mortality for risk groups, but also emotional, behavioral and psychological impact to the population. Measures to contain disease transmission, including quarantine, social isolation and social distancing may affect the population's behavior and may lead to psychological disorders. Several emotional and psychological conditions including fear, anxiety, depression, and suicide ideation are triggered by the pandemic itself as well as by the adopted preventive measures. Special attention should be paid to vulnerable groups both in regard to prevent harmful emotional repercussions of the pandemic, but also to provide the necessary assistance. The health authorities and the governments should strategize to alleviate the mental burden of COVID-19 pandemic by providing emotional support to the entire population, but particularly to the vulnerable individuals.

AUTHOR CONTRIBUTIONS

ALP and LB equally contributed to this article as first authors, both authors made the literature revision and selection of main articles for this review, defined the topics of this review, and wrote the first draft. ACFF, MLBC, RGBC, and SBCSB helped in writing specific topics of the review and helped in search and analysis of clinical trials included in this review. ACSS conceptualized the study, made general supervision, revised the manuscript, and submitted the final version of the manuscript, which is approved by all authors.

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All We Need Is Trust: How the COVID-19 Outbreak Reconfigured Trust in Italian Public Institutions

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The central focus of this research is the fast and crucial impact of the COVID-19 pandemic on a crucial psychological, relational, and political construct: trust. We investigate how the consequences of the pandemic, in terms of healthcare, state intervention and impositions, and daily life and habits, have affected trust in public institutions in Italy, at the time when the contagion was rapidly spreading in the country (early March 2020). In this survey, addressed to 4260 Italian citizens, we analyzed and measured such impact, focusing on various aspects of trust. This attention to multiple dimensions of trust constitutes the key conceptual advantage of this research, since trust is a complex and layered construct, with its own internal dynamics. In particular, the analysis focuses on how citizens attribute trust to Public Authorities, in relation to the management of the health crisis: with regard to the measures and guidelines adopted, the purposes pursued, the motivations that determine them, their capacity for involvement, and their effectiveness for the containment of the virus itself. A pandemic creates a bilateral need for trust, both in Public Authorities (they have to rely on citizens' compliance and must try to promote and maintain their trust in order to be effective) and in citizens, since they need to feel that somebody can do something, can (has the power to) protect them, to act at the needed collective level. We are interested to explore how this need for trust affects the attributional process, regarding both attitudes and the corresponding decisions and actions. The most striking result of this survey is the very high level of institutional trust expressed by respondents: 75% of them trust Italian public authorities to be able to deal with the COVID-19 emergency. This is in sharp contrast with the relatively low levels of institutional trust characteristic of Italy, both historically and in recent surveys. Moreover, the survey allowed the discrimination of several potential predictors for trust, thus emphasizing factors that, during this crisis, are exhibiting an anomalous impact on trust.

Keywords: COVID-19, trust, public authorities, risk management, social norms, socio-cognitive dynamics

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INTRODUCTION

The great societal challenge presented by the COVID-19 pandemic has prompted extraordinary efforts to meet such a challenge, from public authorities, civil society, and the scientific community. Extreme policies for containment, mitigation, and co-existence with the virus have been implemented by the governments of most afflicted countries, as well as by relevant international institutions (e.g., the WHO and the EU). At the same time, scientific research worldwide has focused on tackling the many facets of this dramatic phenomenon, including its impact on social relationships and psychological well-being, as well as the key socio-cognitive factors in promoting effectiveness of the proposed countermeasures. Several of these studies have highlighted the crucial and complex role of trust in dealing with the COVID-19 pandemic.

Llewellyn (2020) puts it very succinctly and effectively: "in times of crisis, trust is the most important thing to consider if you want to communicate health advice." This blanket pronouncement is well-supported by previous evidence: in their systematic review on the importance of trust when preparing for and during a pandemic, Siegrist and Zingg (2014) found confirmation that "trust in health agencies positively influenced people's willingness to adopt recommended behavior." In addition, among the five recommendations for crisis communication highlighted by the authors' survey, two directly concern trust management: "the focus should be not only on trust but also on confidence, and establishing trust in health authorities before a pandemic occurs is important." This latter point is also stressed by Lewnard and Lo (2020), with reference to the current pandemic: "The effectiveness and societal impact of quarantine and social distancing will depend on the credibility of public health authorities, political leaders, and institutions. It is important that policy makers maintain the public's trust through use of evidence-based interventions and fully transparent, fact-based communication." It is worth noting that this emphasis on evidence and transparency, albeit crucial, describes only part of the relevant socio-cognitive dynamics that affect trust in public institutions: in particular, it collapses trust to confidence in information sources and their credibility, while a crucial problem is also trust in the institution's power to intervene, as well as trust in collective compliance with the proposed measures. Finally, in specific circumstances, interesting inversions in cognitive cause–effect relationships can occur, as widely studied in cognitive sciences and social psychology (e.g., Festinger, 1957; Koller, 1988; Kunda, 1990; Epley and Gilovich, 2016).

In fact, the relevance of trust for dealing with health emergencies is also linked to the limits of direct enforcement of the required behavioral change: without the active cooperation of the population, any drastic intervention is doomed to fail, because the desired behaviors (e.g., frequently sanitizing one's hands, wearing a facemask, and keeping a safe distance from others) cannot be effectively monitored on the required scale and with sufficient frequency. In a broad and comprehensive survey of social and behavioral results to support COVID-19 pandemic response, Van Bavel et al. (2020) highlight how most measures needed to contain an epidemic are, by their very nature, difficult to enforce directly: this, in turn, makes trust in public authorities all the more relevant. Based on scientific evidence gathered during previous outbreaks, Van Bavel et al. (2020) argue that "trust in institutions and governments (. . .) may play an important role." For example, trust in the Liberian government was correlated with decisions to abide by mandated social distancing policies and utilizing clinics for care during the Ebola outbreak. Trust was also related to decisions to adopt preventive measures such as Ebola vaccinations in the DRC. Conversely, a lack of trust in public health officials may lead to negative effects on utilization of health services. Reliable information and public health messages are needed from national leaders and central health officials. However, local voices can amplify these messages and help build the trust that is needed to spur behavioral change (Van Bavel et al., 2020).

These expectations on the positive role of trust in promoting adherence and compliance with preventive regulations and guidance are finding ample confirmation also in recent studies on the ongoing crisis, both within and across various countries. In a nationally representative survey conducted in Denmark during the COVID-19 pandemic (N = 1782), Olsen and Hjorth (2020) measured the respondents' willingness to apply social distancing in order to reduce contagion: they found that both lower levels of political trust and lower generalized social trust are negatively associated with willingness to distance and that younger male respondents with the lowest levels of education and least political trust report lower willingness to distance. In a nationally representative survey of Italian adults (N = 3452) conducted between the 18th and 20th of March 2020, Barari et al. (2020) observed high levels of understanding and self-reported compliance with containment measures, and noted that "even those who do not trust the government, or think the government has been untruthful about the crisis believe the messaging and claim to be acting in accordance."

Trust acts as a precious commodity both for institutions and for scientists, both of which are crucial actors in the public response to the COVID-19 pandemic. In a large-scale background analysis of European Social Survey data on 25 European countries (N = 47,802) focused on the COVID-19 epidemic from January 22 to April 14, 2020, Oksanen et al. (2020) found that institutional trust acts as a protective factor: countries with low levels of institutional trust prior to the outbreak (including Italy) experienced significantly higher mortality rates during the crisis; moreover, their governments introduced restrictions against contagion later than countries with higher levels of institutional trust (calculated as the delta between the date when the restrictions came into effect and when the first confirmed COVID-19 death was reported in that nation), which in turn contributed to the severity of their death toll. These results on the relevance of trust as a protective factor are in line with previous studies on other epidemics, e.g., Ebola, showing how people with higher institutional trust are more likely to follow the advice and guidelines given by the health authorities (Blair et al., 2017; Vinck et al., 2019), as well as investigating the interplay between scientific and non-scientific sources in modulating people's trust in healthcare information (Falade and Coultas, 2017). As for trust in science,

its role has been highlighted in a recent study by Plohl and Musil (2020): using structural equation modeling (SEM) on a sample of 525 international, English-speaking respondents, the authors investigated whether and how risk perception and norm compliance for the COVID-19 pandemic may be affected by several constructs, i.e., religious orthodoxy, conspiracy ideation, intellectual curiosity, and trust in science, all measured with validated scales. Their results indicate that trust in science is by far the most important factor in producing appropriate risk assessment and high level of norm compliance. At the same time, trust in science, as opposed to the tendency to believe in alternative non-official sources, has been observed to be deeply affected by polarization and homophily (Bessi et al., 2016).

Looking at the specifics of the COVID-19 pandemic, so far the most insidious threat posed by the virus has been the combination of the rapidity of its spread with the high number of patients requiring treatment in intensive care, resulting in unprecedented strain on the healthcare system of affected countries. This in turn has prompted an increasing number of national governments to adopt extreme measures to limit the spread of the virus, often imposing very demanding limitations on citizens' basic rights (e.g., social isolation, lockdown, and quarantine) and with dire socio-economic consequences (e.g., job insecurity, rising unemployment, loss of revenues, and inequalities). In such a unique scenario, the relevance of studying citizens' trust in public institutions is manifold: on the one hand, the effectiveness of these measures and the collective ability to overcome their costs is conditional on the compliance of the population, which in turn is affected by trust in institutions; for this same reason, institutions actively seek to promote citizens' trust, as a means to achieve their prevention goals; on the other hand, the very nature of the current crisis is likely to affect and shape how citizens conceptualize trust, and such socio-cognitive impact of the COVID-19 pandemic needs to be understood. Indeed, the current crisis acts as a magnifying glass in highlighting the essential role of trust in our societies (trust as "vinculum societatis," the bond of society, to borrow John Locke's famous expression), both for the psychological well-being of individuals and for the effective functioning of institutions.

The study presented in this paper contributes to this fast-growing body of knowledge on the interplay between trust in institutions and the COVID-19 pandemic, by discussing the results of a large scale survey (N = 4260) conducted on Italian citizens between March 9 and March 14, 2020. At that time, Italy had the most active outbreak of the virus worldwide, and its death count was growing at alarming rates; at the same time, extreme prevention measures were still relatively recent and rapidly changing in nature, sometimes from day to day (e.g., on March 11 new restrictions were introduced by the Government, closing public places such as restaurants, pubs, and most shops). Thus, our data offer insight into a time window in which the phenomenon was already in its acute phase in medical terms, yet still novel and unexpected for the population: this offers a privileged vantage point to observe how a pre-existing construct, trust in institutions, was affected by a sudden and profound change in the everyday functioning of the whole country, by a complete (albeit hopefully temporary) re-representation of one's role in society and in personal relationships, as well as in the relationship between citizens and institutions.

The survey was theoretically inspired by the socio-cognitive model of trust developed by Castelfranchi and Falcone (2010): we chose this theoretical framework because it provides a rich and nuanced description of various *reasons for trust*, thus allowing us to probe not only the degree by which Italian citizens expressed trust toward the relevant public authorities engaged in the response to COVID-19 but also on what grounds such attitude was based. Our purpose, however, was not to look for direct validation of the theoretical model, but rather to collect as many detailed data as possible on the rapidly evolving Italian response to the COVID-19 emergency, from the standpoint of institutional trust: in this sense, this study was mostly intended as explorative. In particular, we wanted to compare our results with the well-documented low levels of trust in institutions exhibited by Italians before the onset of the crisis, which some have associated with tardiness in responding to the COVID-19 emergency across various European countries (Oksanen et al., 2020): we intended to see whether such widespread distrust toward public institutions would be confirmed or subverted during the initial stages of the COVID-19 outbreak in Italy and to offer some insights and suggestions regarding the original and peculiar nature of any discontinuity in institutional trust that may be associated with the current pandemic.

Moreover, we intended to take a closer look at the cognitive and social factors responsible for trust toward public institutions in the face of pandemic threats: the survey was designed both to discriminate several potential predictors for trust, so that subsequent analysis would allow us to individuate the most relevant ones, and to facilitate comparison with the underlying theoretical model, thus emphasizing factors that, during this crisis, are exhibiting an anomalous impact on trust—either because they determine trust more intensely than usual (overcharged factors) or because their impact is minimal or non-existent (anesthetized factors). Indeed, a key hypothesis that we wanted to test concerns the impact of COVID-19 on the very nature of the institutional trust construct: not only the overall trust in public institutions is affected by the pandemic and how these institutions respond to it, but also *the determinants of trust in institutions change and adapt to this crisis*, in comparison with other situations. Desperate times require desperate measures, and desperate measures induce a drastic reconfiguration of the cognitive underpinnings of trust in institutions. Our survey was designed to collect data on such paradigm shift in how institutional trust was conceptualized by Italian citizens during the early stages of the national response to the COVID-19 pandemic.

MATERIALS AND METHODS

Sample

We used a snowball sampling method to determine the respondents: we collected a large sample (N = 4260, 57% women, mean age = 46 years, range = 18–85 years, SD = 13.42),

relatively well-balanced in terms of geographical provenance (33% Northern Italy, 39% Central Italy, and 28% Southern Italy and main islands), with a significant portion of respondents (30%) residing in the regions most affected by COVID-19 at that time (Lombardy, Veneto, Emilia-Romagna, Marche, and Piedmont). The relatively uniform geographical distribution of the sample among the three macro-areas of Italy, as well as the significant proportion of respondents from highly affected regions, allows interesting comparisons based on participants' residence. Moreover, the introduction of more drastic restrictions by the Italian Government at the end of March 11, 2020, invites considering also this temporal dimension in analyzing the data: in this respect, it is important that a fairly large set of participants (N = 829) completed the survey after those new restrictions had been introduced. Finally, it should be noted that the mean educational level of participants is very high: almost three quarters of respondents have a degree (38%) or post-graduate specialization (34%). The main characteristics of the sample are synthetized in **Table 1**.

Survey Structure

Data were collected with a 57-item questionnaire, using a five-point Likert scale for most items: an English translation of the whole questionnaire is available in the **Supplementary Materials**. The questionnaire was based on the socio-cognitive model of trust developed by Castelfranchi and Falcone (2010) and explored participants' opinions on five main dimensions, in relation to the current COVID-19 crisis in Italy:

1. The *competence* of public authorities, both in implementing the appropriate safety measures and in issuing behavioral guidelines for their citizens;
2. The *intentions* of public authorities regarding the containment of the Coronavirus, by means of both security measures and behavioral guidelines;
3. The *purposes and effectiveness* of the safety measures implemented by PAs; the perceived impact of safety norms on the participant's life, and his/her perception of other citizens' compliance to the norms;
4. The participant's *overall trust toward public authorities* and their motivations, the factors that determine the participant's trust; the sources of information he/she most uses and their perceived trustworthiness;
5. The participant's *expectations on the crisis' long-term effects on trust*, i.e., citizens' trust toward public authorities, scientists, and modern societies' development model, as well as trust between peer citizens.

The questionnaire was administered online using the Google Forms platform. The questionnaire fully complied with ethical guidelines for human subject research and participation was conditional on the preliminary approval of an informed consent by each subject; the compilation took an average time of 10 min. Data analysis was performed using the SPSS (version 22) statistical software: the collected data were first analyzed through correlation analyses (given the asymmetric distribution of most variables, we considered Spearman correlation values); secondly, given the high number of items in the questionnaire, we conducted a principal component analysis (PCA) on each sub-section of the questionnaire prior to running regression analyses on the aggregated data.

TABLE 1 | Sample characteristics.

	Regions most affected % (30%)	Regions less affected % (70%)	Total %
Gender			
Male	45	42	43
Female	55	58	57
Total	100	100	100
Age (Mean = 46)			
18 – 29	19	11	13
30–39	23	18	19
40–49	23	24	24
50–59	21	28	26
60–69	11	15	14
>70	3	4	4
Total	100	100	100
Educational level			
Middle school	3	2	2
High school	24	27	26
University degree	41	36	38
Post-graduate specialization	32	35	34
Total	100	100	100
Geographical provenance			
Northern Italy	96	7	33
Central Italy	4	53	39
Southern Italy/islands	0	40	28
Total	100	100	100

RESULTS

Descriptive Statistics

Full details on descriptive statistics for each item in the questionnaire are included in the **Supplementary Materials**, differentiating also based on geographical factors (Northern, Central, and Southern Italy; more affected vs. less affected regions) and temporal boundaries (before vs. after the March 11 announcement of new restrictions by the National Government). Here, we report only the most relevant findings, prior to more in-depth analysis, and only in terms of aggregate data, since no significant differences emerged at this level between different areas and different dates (albeit some interesting patterns were detected via regression analysis, see Section "Regression Analyses").

Relevant Public Authority

When asked to indicate which public authority is the most adequate to take decisions concerning the COVID-19 emergency (item 14 in the questionnaire), 72.8% indicated the National Government, 13.3% indicated the Civil Protection, 4.2%

indicated the Presidency of the Republic, 3.6% indicated the Regional Government, 0.9% indicated the municipal authority, and 5.2% indicated others. Hence, the overwhelming majority (90.3%) of respondents consider pandemics as a matter of national concern, which should be primarily addressed by national authorities. This should be taken into account while interpreting all other results, since most of the attitudes expressed by participants regarding features of public authorities (competence, intentionality, trust, etc.) should be understood with reference to national institutions, unless otherwise specified. Moreover, it is remarkable that the Presidency of the Republic, which is mostly a moral authority, is seen as having a greater role than Regional Governments, in spite of their leading role in the healthcare system, which in Italy is organized on a regional basis. Equally significant is the fact that only 0.1% of respondents (within the broader category "Others") indicated any kind of international entity, including the European Union, as having a primary role in facing a pandemic outbreak. In short, at this stage of the COVID-19 emergency, Italian citizens strongly believed that this pandemic was not to be prominently addressed by either regional or international authorities, but was rather mostly a matter of national concern.

Institutional Trust

When asked to rank their overall trust in public authorities for the management of the COVID-19 emergency (item 33 in the questionnaire), 75% of respondents manifested either extreme (23.8%) or high (51.2%) levels of trust, 17.7% were non-committal, and only 7.3% expressed distrust (see **Figure 1**, left panel). As we will see in the section "Discussion and Conclusions," these numbers are in sharp contrast, to say the least, with the average institutional trust reported for Italian citizens prior to the COVID-19 crisis, especially considering that the main target of this newfound trust was national public authorities (see above).

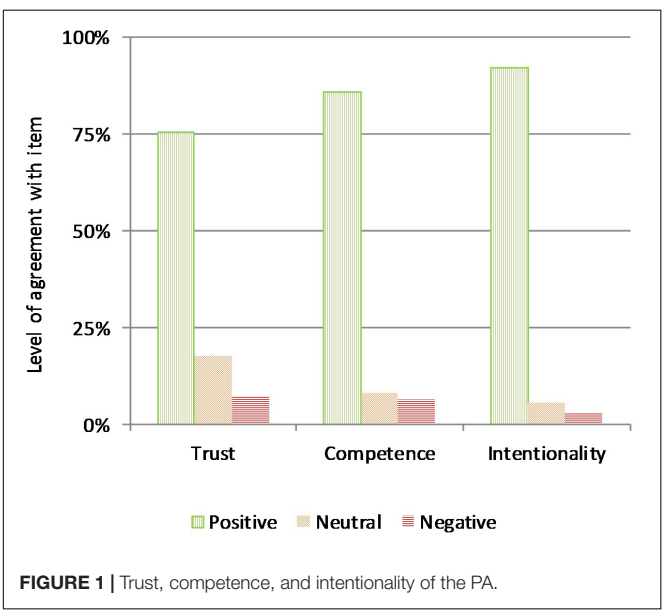

FIGURE 1 | Trust, competence, and intentionality of the PA.

Competence

The competence of public authorities was assessed as their ability in planning both the right prescriptive measures (e.g., lockdown) and the appropriate behavioral guidelines (e.g., personal hygiene recommendations). On both counts, the majority of respondents expressed a positive belief in the public authorities' competence (79.3% for measures, 82.7% for guidelines), whereas only a relatively small minority was either undecided (14.4% for measures, 11.4% for guidelines) or skeptical (6.3% for measures, 5.8% for guidelines). Moreover, correlational analysis indicates that competence scores for measures and guidelines are strongly and positively related ($R = 0.738$, $p < 0.0001$), suggesting that respondents did not really discriminate between prescriptive measures and behavioral guidelines, at least with respect to trust in public institutions: for this reason, in subsequent analyses, we collapsed these two items into a single competence value, calculated as the mean response for each subject to items 2 (competence on measures) and 3 (competence on guidelines) of the questionnaire (these are also the data reported in **Figure 1**, central panel). Other items in this section of the survey were designed to investigate the reasons behind participants' beliefs on the public authorities' competence: in summary, the overwhelming majority of the sample (91.8%) believed that it was the public authorities' proper prerogative to take action and issue containment measures against the pandemic (item 4), and most respondents (71.7%) positively evaluated the use of experts' advice by the public authorities during the COVID-19 crisis (item 5); there was instead less confidence in the organizational capacity demonstrated by public authorities in the early stages of the emergency (item 7: 44.8% expressed a positive evaluation, 33.6% were undecided, and 21.6% were critical), and the majority of the sample (54.3%) agreed that institutional communication on the COVID-19 presented some contradictions, either between different authorities or over time (item 6). In spite of these partial concerns, a significant majority of the sample (63.3%) did not express any skepticism on the competence of the public authorities in handling the emergency (item 8).

Intentionality

As for the competence, we inquired on the intentionality of public institutions separately for prescriptive measures and behavioral guidelines, asking participants whether they believed either type of intervention was both actively and honestly aimed at containing the COVID-19 pandemic. Again, respondents expressed an overwhelmingly positive belief in the good faith of public institutions, both in promulgating prescriptive measures (90.2%) and in issuing behavioral guidelines (89.1%): only a small minority was either undecided (7.1% for measures, 8.1% for guidelines) or skeptical (2.7% for measures, 2.8% for guidelines). Correlational analysis reveals again that intentionality scores for measures and guidelines are strongly and positively related ($R = 0.794$, $p < 0.0001$), further confirming that respondents did not really discriminate between prescriptive measures and behavioral guidelines, when it comes to assessing the public authorities' trustworthiness in this emergency: hence, these two items on intentionality were collapsed into a unique intentionality value in subsequent analyses, using the mean

response for each subject to items 9 (intentionality on measures) and 10 (intentionality on guidelines). Other items in this section of the survey were designed to investigate the reasons behind participants' confidence, or lack thereof, in the nature of the public authorities' intentions: in summary, we found confirmation of the fact that most respondents (72.1%) did not doubt that the intentions of the public authorities were consistent with their public statements (item 13), whereas a smaller majority (55.9%) considered the economic investment mobilized by the Italian public authorities sufficient to fight the pandemic (item 11: notice that only 16.4% considered it insufficient, with a significant portion of the sample, 27.7%, remaining undecided). Finally, asked whether other interests, e.g., political or economic, were at stake (item 12), the larger part of the sample (43.1%) answered in the negative, whereas 34.1% acknowledged the presence of such ulterior motives and 22.7% were unsure: as we will discuss further on, this question was probably easy to interpret in two markedly different senses—either negatively, as an accusation of having some hidden and problematic agenda, or positively, as the capacity to take into account all the key ramifications of the COVID-19 crisis, including its political and socio-economic aftermath. Overall, we registered strong confidence in the good faith of the intentions manifested by public institutions (**Figure 1**, right panel): this parallels the belief in the public authorities' competence, and together, these attitudes support the high levels of institutional trust expressed by this sample.

Purposes and Effectiveness of the Public Authorities' Intervention

Part of the survey was focused on the measures issued by public authorities as a response to the COVID-19 pandemic, in order to estimate both their perceived usefulness and the goal attributed to these interventions by the participants. The vast majority of our sample (85%) perceived these measures as being either useful (38.5%) or very useful (46.5%) in fighting the pandemic, whereas only a tiny minority was skeptical (2.6%), with the remaining 12.3% being undecided (item 15). When asked to assess the adequacy of the public authorities' intervention (item 32), a more abstract notion involving a counterfactual comparison with alternative strategies, the majority rated current measures as adequate (53.8%), 33.2% were undecided, and only 13% considered them inadequate. In terms of the motivations associated with these measures, we asked participants to express agreement on three potential, non-mutually exclusive aims: reassuring the population (item 16), curbing the spread of COVID-19 (item 17), and creating unmotivated alarm (item 18). The vast majority (89%) agreed that the rationale of the public authorities' intervention is indeed to contain the pandemic, whereas only 16.9% attributed to the public authorities the goal of reassuring citizens, and even fewer respondents (6%) regarded the proposed measures as a way of spreading unnecessary panic.

Impact of Containment and Beliefs on Compliance

When rating the personal burden of the proposed restrictions on their own lives (item 19), 39% of participants expressed to feel a high level of impact, whereas 29.6% indicated little discomfort for the current situation and the remaining 31.4% reported medium levels of distress. However, regardless of the perceived impact on the public authorities' intervention, the overwhelming majority of respondents agreed that such sacrifices were crucially beneficial for themselves and their families (item 20, 92.7% of agreement), for the society as a whole (item 21, 95.3%), and for both (item 22, 94.7%). Moreover, when asked to assess the usefulness of one's personal contribution to these preventive measures, since they were intended for the whole population (item 23, a question aimed at implicitly measuring any "free-riding inclination" in our sample), as many as 96.6% of the participants considered their personal role relevant for the collective effort. Taken together, these data show that, albeit different people suffered more or less because of the containment measures, almost all agreed on their usefulness and on the necessity of personal sacrifice to deal with the pandemic: this suggests a mindset in which the shared goal of public safety trumps any individual concern, including personal discomfort, fear, and anxiety (an interpretation later confirmed by regression analysis, see section "Regression Analyses"). In terms of expectations on compliance with the sanitary restrictions by other fellow citizens (items 24–27), we observe a fairly varied pattern of response (see **Figure 2**): the most widespread belief (48.6% of agreement) is that enough Italian citizens, albeit not all, will comply with the regulations, thus making them effective (item 25); in contrast, there is skepticism both on the most optimistic scenario, i.e., full compliance (item 24, 36.9% of disagreement), and on the bleakest outcome, i.e., insufficient compliance (item 27, 56.9% of disagreement), although it is worth noting that pessimism is rejected much more strongly than optimism. The possibility that only few people will comply, and yet their efforts will be useful (item 26), is also rejected by the relative majority of the sample (46.9% of disagreement), yet interpreting this result requires caution, since it could either express skepticism on

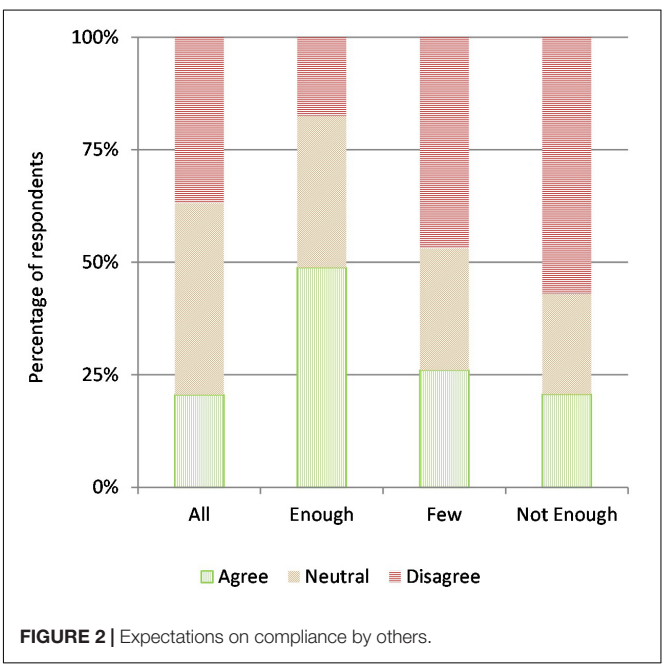

FIGURE 2 | Expectations on compliance by others.

how many people will comply, or on the chances that limited compliance may indeed be useful. Regarding the motivations useful to induce compliance, we asked participants to express agreement on four possible motivational triggers: the expectation that everybody else will follow the new regulations (item 28), a personal concern for dangers (item 29), a spirit of collaboration in the face of the emergency (item 30), and trust in the fact that public authorities are doing everything in their power (item 31). All four motivations engendered significant levels of agreement, with the highest being the feeling of a common cause against a shared threat (90%), followed by trust in maximum effort by the public authorities (83.8%), concern for the associated risks (80.6%), and expecting others to comply as well (79.2%). It is interesting to note that a motivation tied to the collaborative dimension of trust in civil society, i.e., being united in pursuing a common goal, shows more than 10 percentage points of distance from a motivation inspired instead by the sanctioning view of trust, i.e., being able to monitor compliance by others, possibly to punish free-riders, as well as from fear of personal harm: this suggests that emphasizing collaborative motives (a strategy employed quite consistently by the Italian Government in its public communications during the early stage of the COVID-19 outbreak) may be more effective in promoting compliance than stressing individualistic goals.

Reasons for Trusting Public Authorities

This section of the survey asked respondents to provide a meta-cognitive evaluation of the most relevant factors promoting their trust in how public institutions are handling the COVID-19 crisis. Of the eight factors explored, the type of measures adopted by the authorities was the most frequently cited as important (item 41, 80.2%), followed by the information received on the crisis (item 36, 71.4%), the capacity of public authorities to actually enforce protective measures (item 35, 52.2%), the respondent's profession (item 37, 46.9%) and his/her health condition (item 38, 40.6%), the opinions expressed by social relations such as friends and relatives (item 40, 37.3%) or colleagues (item 39, 35.9%), and the political connotation of the relevant authorities (item 34, 18.4%). Later on, we will use regression analysis to investigate the extent by which these self-reported data correspond to the relative weight of the actual factors affecting participants' trust in institutions. For now, it appears that participants self-describe their theory of trust in fairly objective terms, giving priority to the factual nature of the proposed measures, the information they gathered (apparently with the exception of social channels; see below), and the extent by which public authority is able to enforce their recommendations; in contrast, relatively little weight is given to personal factors and social networks, and none at all to political partisanship. This last result suggests that the public response to the COVID-19 crisis was initially perceived as a matter of shared concern of all political parties, which in turn prompted a temporary truce in the usual partisanship characteristic of Italian politics; moreover, in their efforts to deal with the emergency, public authorities were regarded mostly for their institutional role, with little attention to their political affiliation (even when such authorities were the expression of certain political parties, as it was the case with the National Government). This interpretation also helps to explain the extremely high level of trust in public institutions with respect to the COVID-19 emergency during those few days, in a population well-known for its deep-seated distrust of politicians in general, and of political parties in particular: further analysis of this interesting anomaly will be presented in the section "Discussion and Conclusion."

Information Sources

This section of the survey investigated both frequency of use (items 42–47) and perceived trustworthiness (items 48–52 and 54) of various types of information sources in relation to the COVID-19 pandemic, to get a better sense of what channels were most influential in affecting participants' opinions on this topic; in addition, we collected data on the trustworthiness directly assigned to public institutions as information sources (item 53), which was high for 77.6% of the sample, average for 17.7%, and low only for 4.6% of respondents. With respect to other information channels, the data summarized in **Table 2** highlight four main findings: (i) official online channels, e.g., the website of the Civil Protection, and scientists are both frequently used and considered reliable as information sources; (ii) in contrast, traditional media, albeit often consulted, are regarded as reliable only by less than half of our sample; (iii) family physicians are in general considered trustworthy, yet they are rarely used as information sources; (iv), finally, both social relationships and unofficial online sources, e.g., social media, are neither frequently used, nor widely believed. The result on unofficial online channels is especially surprising: whereas the very low credibility associated to these sources is understandable and even commendable, the fact that only one respondent out of four admits to using them frequently is hard to swallow, especially at a time in which personal contact was severely limited in Italy, thus making social media an even more attractive outlet for users. Besides, recent national statistics on Internet use in Italy do not agree with the picture painted by these data: according to the 2019 Global Digital Report[1], compiled annually by WeAreSocial and Hootsuite, in 2019, 58% of Italian citizens were active social media users (with a growing trend with respect to 2018), and the average time spent on social media every day was a little less than 2 h per person. Besides social desirability effects (respondents may have been reluctant to admit gathering information via unofficial channels on such delicate topics), a possible explanation for this anomaly is in a common misperception of the role of social media as gatekeepers: someone who finds on Facebook a link to an article on a traditional newspaper, or is made aware by a post on Twitter of the latest press release on the official website of the Civil Protection, may be inclined to disregard the role of the social media in bringing these information to the user's attention. Yet, this is how we use social media as information sources, often without even realizing it: we take advantage (or succumb, depending on the circumstances) of their agenda setting algorithms, which allow these platforms to act as powerful information brokers, rather than information producers.

[1]Source: https://wearesocial.com/it/digital-2019-italia

TABLE 2 | Use and reliability of information sources.

Source	Use			Reliability		
	Frequent	Average	Infrequent	Trustworthy	Neutral	Untrustworthy
Traditional media	78.7	11.9	9.2	41.7	38.7	19.6
Official online channels (e.g., institutional websites)	77.8	12.2	10	89.6	8.1	2.3
Unofficial online channels (e.g., social media)	25.6	18	56.5	4.3	17.7	78
Family physicians	24.6	20.1	55.2	63	26.3	10.7
Scientists	70.6	15.6	13.8	92.6	6.2	1.2
Friends, relatives, acquaintances	16.6	29.2	54.2	7.3	33.2	59.5

Expectations on Long-Term Impact on Trust

The final section of the survey intended to probe participants' expectations on the long-term impact of the COVID-19 crisis on trust relationships between citizens and public institutions (item 55), between citizens and the dominant economic model of development (item 56), between citizens and the scientific community (item 57), and among citizens as peers (item 58). Here, the big winner is expected to be science: 72.8% of respondents believe that the current crisis will strengthen the trustworthiness of scientists as public figures. Expectations on the impact of trust toward public institutions and among citizens are less triumphant, yet still positive: 54.4% predict an increase in institutional trust after the COVID-19 pandemic, whereas 57% make the same prediction with respect to social trust, i.e., trust among peers. Finally, on future trust in the dominant model of economic development, our sample is evenly divided: 34% think that we will trust it more than before, 33.6% are undecided, and 32.4% expect an increase in distrust toward that model.

Principal Component Analysis

As a preliminary step before running regression analyses, we used PCA to identify strongly correlated items in the data set and simplify the variables' structure, in order to avoid multicollinearity issues in our regression models. Since the survey was theoretically motivated by the socio-cognitive model of trust (Castelfranchi and Falcone, 2010), we performed separate PCA on 10 subsets of items, to preserve relevant theory-based distinctions in the participants' responses. Item 33, degree of trust toward public authorities in relation to the COVID-19 pandemic, was not included in the PCAs, since it was intended to act as the target of the regression models; we also excluded items 8 (doubts on public authorities' competence) and 13 (doubts on public authorities' intentions), since these were included in the survey merely as control questions for, respectively, items 2–3 and items 9–10; moreover, we kept separate from the PCAs item 19 (personal discomfort associated with public authorities' measures), item 23 (usefulness of one's own personal contribution to the collective effort), and item 32 (overall adequacy of public authorities' measures), since we wanted to test their role as individual predictors in the regression models; finally, item 26 (expectation of very limited yet useful compliance by other citizens) was excluded for the PCA and regression analysis, due to the ambiguity in its interpretation already mentioned in Section "Descriptive Statistics." The remaining 49 items led to the individuation of 21 principal components, as summarized in **Table 3** (full details on the PCAs methods and results are provided in the **Supplementary Materials**). In order to be considered satisfactory, each PCA had to explain at least 50% of the cumulative variance, and further components were added only if they improved by more than 15% the explained variance.

Regression Analyses

In order to test our main hypotheses, we performed a multivariate regression model on raw data using IBM-SPSS 22 software. The dependent variable to be predicted was the overall trust manifested by participants toward public authorities involved in the COVID-19 response, i.e., item 33 in the survey. After some explorative iterations and based on theoretical considerations, we decided to include 22 independent variables in the final model: 15 principal components identified via PCAs (indicated with an asterisk in **Table 3**), 3 individual items that were conceptually independent from the other sections of the survey (personal discomfort associated with public authorities' measures, usefulness of personal contribution to the collective effort, overall adequacy of public authorities' measures), and 4 socio-demographic variables—age (coded as 1 = 18–40, 2 = 41–55, 3 = 56–85 years of age), educational level (coded as 1 = High school diploma or lower, 2 = University degree or higher), region of residence (coded as 1 = most affected regions, i.e., Lombardy, Emilia-Romagna, Veneto, Marche, and Piedmont, 2 = all other regions), and time of data collection (coded as 1 = before, 2 = after the March 11 new restrictions were announced). Preliminary analyses indicated that the respondent's profession did not affect responses, so we excluded it from the model; as for gender, preliminary regressions showed no difference in the predictors of institutional trust between male and female respondents, so we excluded it from the final regression model and performed a separate set of analyses to assess its impact in our data (see Section "Gender Effects").

We first run the regression analysis on the whole sample: the model had a good fit (R = 0.8) and explained 64% of the variance in the overall trust evaluation; 15 out of 22 independent variables were significantly correlated with trust ($p < 0.05$), and the most powerful predictors were positive indicators of competence of public authorities ($\beta = 0.31$, $p < 0.001$), perceived adequacy of the adopted measures ($\beta = 0.174$, $p < 0.001$), trustworthiness of official information sources ($\beta = 0.145$, $p < 0.001$), public authorities' intention to

TABLE 3 | Principal component analysis results: from survey items to principal components.

Section of the survey	*Items considered*	*Principal components identified*
Competence of the PA	2, 3, 4, 5, 6, 7	Positive factors* (2, 3, 4, 5, 7) Negative factors* (6)
Intentionality of the PA	9, 10, 11, 12	Public safety intentions* (9, 10, 11) Other intentions* (12)
Aims of the PA intervention	15, 16, 17, 18	Contain* (15, 17) Reassure* (16) Alarm* (18)
Usefulness of personal sacrifices	20, 21, 22	Usefulness of sacrifices* (20, 21, 22)
Expectations on compliance	24, 25, 27	Universal compliance* (24) Sufficient compliance* (25) Insufficient compliance* (27)
Reasons for compliance	28, 29, 30, 31	Individualistic reasons* (29) Collectivist reasons* (28, 30, 31)
Reasons for trust in the PA	34, 35, 36, 37, 38, 39, 40, 41	Features of the PA (35, 36, 41) Personal and social variables (34, 37, 38, 39, 40)
Information sources: frequency	42, 43, 44, 45, 46, 47	Official sources (42, 43, 45, 46) Unofficial sources (44, 47)
Information sources: trustworthiness	48, 49, 50, 51, 52, 53, 54	Official sources and media* (48, 49, 51, 53, 54) Unofficial sources* (50, 52)
Future scenarios on trust	55, 56, 57, 58	Society (55, 57, 58) Development model (56)

The numbering used for items follows the order of presentation in the survey: the relevant items are from 2 to 58, since item 1 was the informed consent, whereas items 59–63 asked for demographic information. The asterisk (*) indicates principal components that were later used for regressions.

contain the pandemic ($\beta = 0.137$, $p < 0.001$), and perception that public authorities' efforts were focused on public safety, with no other agenda ($\beta = 0.101$, $p < 0.001$). All other significant predictors had an absolute value of β equal to or lower than 0.05. The non-significant predictors were personal discomfort due to the adopted measures, perceived usefulness of personal sacrifice, expectation of sufficient compliance (but notice that expectation of universal compliance was positively correlated with trust, whereas expectation of insufficient compliance was negatively correlated with it, both $p < 0.005$, suggesting an "all or nothing" attitude toward compliance), individualistic reasons for compliance (while collectivist reasons for compliance were strongly and positively associated with trust, $p < 0.001$), educational level, time of data collection, and age (the last one showed a marginally significant negative correlation, $\beta = -0.018$, $p = 0.06$).

We also applied the same regression model to subsets of participants, distinguishing first geographically (most afflicted regions vs. all other regions), then temporally (before and after the announcement of new restrictions by the Italian Government on March 11), in order to detect differences in how trust was processed depending on the severity of the sanitary emergency in various areas, and the strictness of the measures implemented by public authorities while the pandemic was still progressing. We already knew from descriptive statistics that no overall change in trust toward public authorities was observed across these contexts, yet we wanted to probe for more subtle differences, e.g., different predictors of trust, or different contribution of the same predictors, depending on region of residence and time of data submission. All β and *p*-values for the various multiple regressions are reported in **Table 4**; in what follows, we will focus only on the most relevant results.

Applying the model only to participants from the most affected regions in Italy at that time (Lombardy, Emilia-Romagna, Veneto, Marche, and Piedmont) revealed again a good fit ($R = 0.825$), explaining 68.1% of variance in trust assessment; the same model also had a good fit when applied only to participants from all other Italian regions ($R = 0.788$, 62.1% of explained variance). In both cases, the strongest predictors remained the same as in the whole sample, and also their order of importance was identical across regions, regardless of current outbreak severity ($p < 0.001$ for all the following predictors): positive indicators of competence (most affected: $\beta = 0.352$; other regions: $\beta = 0.289$), adequacy of the adopted measures (most affected: $\beta = 0.146$; other regions: $\beta = 0.184$), trustworthiness of official information sources (most affected: $\beta = 0.134$; other regions: $\beta = 0.149$), PA's intention to contain the pandemic (most affected: $\beta = 0.119$; other regions: $\beta = 0.146$), and perception that public authorities' efforts are focused on public safety, with no other agenda (most affected: $\beta = 0.113$; other regions: $\beta = 0.96$). In spite of the substantial similarity in how trust in public authorities was attributed by respondents in different areas of the country, some fine-grained distinctions emerge looking at those factors that were significant in one context but not in the other—and also exercising due caution, since a difference in significance does not necessarily imply a significant difference. In the most affected regions, we observed eight non-significant predictors, whereas there were only six in the other regions: four of these factors were irrelevant across both contexts (personal discomfort, perceived usefulness of the sacrifices, individualistic reasons for compliance, and time of data collection), whereas negative factors

TABLE 4 | Multiple regression analysis: β and *p*-values for the whole sample, for region of residence (most affected vs. others), and for time of data submission (before vs. after new restrictions were announced on March 11).

	All		Most affected		Other regions		Before new restrictions		After new restrictions	
Predictors	β	*p*	β	*p*	β	*p*	β	*p*	β	*p*
Competence, positive factors	0.310	<0.001	0.352	0<.001	0.289	<0.001	0.311	<0.001	0.293	<0.001
Competence, negative factors	−0.048	<0.001	−0.042	0.01	−0.052	<0.001	−0.049	<0.001	−0.048	0.03
Public safety intentions	0.101	<0.001	0.113	<0.001	0.096	<0.001	0.103	<0.001	0.096	0.004
Other intentions	−0.050	<0.001	−0.038	0.03	−0.056	<0.001	−0.048	<0.001	−0.051	0.03
Intention to contain	0.137	<0.001	0.119	<0.001	0.146	<0.001	0.143	<0.001	0.108	0.001
Intention to reassure	0.023	0.02	0.012	0.47	0.029	0.02	0.023	0.03	0.016	0.47
Intention to alarm	−0.038	0.001	−0.049	0.01	−0.033	0.01	−0.040	0.001	−0.021	0.41
Personal discomfort	−0.006	0.54	−0.021	0.20	0.001	0.92	−0.005	0.60	−0.002	0.94
Usefulness of sacrifices	0.003	0.80	0.011	0.61	−0.003	0.86	−0.009	0.50	0.066	0.03
Impact of personal effort	0.030	0.01	0.020	0.34	0.036	0.01	0.023	0.09	0.062	0.03
Universal compliance	0.033	0.003	0.060	0.003	0.024	0.08	0.043	0.001	−0.006	0.81
Sufficient compliance	0.006	0.61	−0.047	0.02	0.026	0.05	0.008	0.54	−0.014	0.59
Insufficient compliance	−0.035	0.002	−0.051	0.01	−0.029	0.03	−0.024	0.04	−0.083	0.001
Individualistic reasons to comply	−0.005	0.62	−0.002	0.88	−0.007	0.55	−0.001	0.95	−0.024	0.30
Collectivistic reasons to comply	0.039	<0.001	0.069	<0.001	0.026	0.05	0.033	0.007	0.074	0.002
Adequacy of intervention	0.174	<0.001	0.146	<0.001	0.184	<0.001	0.171	<0.001	0.183	<0.001
Trustworthiness official sources	0.145	<0.001	0.134	<0.001	0.149	<0.001	0.153	<0.001	0.117	<0.001
Trustworthiness unofficial sources	−0.022	0.02	−0.019	0.25	−0.025	0.04	−0.034	0.002	0.029	0.19
Age	−0.018	0.06	−0.025	0.14	−0.015	0.20	−0.016	0.13	−0.027	0.22
Educational level	−0.007	0.44	0.000	0.98	−0.011	0.33	−0.004	0.73	−0.025	0.24
Time of data submission	−0.003	0.75	−0.017	0.28	0.003	0.78	N.A.	N.A.	N.A.	N.A.
Region of residence	−0.031	0.001	N.A.	N.A.	N.A.	N.A.	−0.035	0.001	−0.010	0.65

Predictors are clustered based on their thematic similarity.

affecting competence of public authorities, intention to downplay the emergency, impact of personal effort, and trustworthiness of unofficial information sources were immaterial for respondents from the most affected areas, whereas they acted as significant predictors (albeit weak ones) for participants from other regions of Italy; in contrast, an expectation of sufficient compliance from other people had a significant negative correlation with trust in the most affected regions ($\beta = -0.047$, $p = 0.02$), whereas it had a marginally significant positive correlation with it elsewhere ($\beta = 0.026$, $p = 0.05$). Taken together, these results suggest that participants living in areas that were currently experiencing very severe outbreaks of COVID-19 had a more focused mindset when deciding whether to trust public authorities to deal with the emergency: less factors were considered relevant, and in particular, it was probably taken for granted that some inconsistency in public communication and intervention may occur, without necessarily jeopardizing trust (negative factors on competence), and that unofficial sources were not to be taken seriously when deciding whom to trust; at the same time, expecting that only a sufficient number of people would comply with the emergency measures had a negative impact on trust in public authorities, probably highlighting the fact that, in those regions, people believed that "enough is not enough"—that is, either everybody cooperates in facing the crisis (universal compliance) or we will not be successful in overcoming it. This extreme mindset is confirmed by the fact that the relevance of one's own personal contribution did not affect trust attribution to public authorities in the most affected regions, whereas it did in other areas: this indicates again that collective compliance, not personal efforts, are perceived as the key to success by people currently facing the worst of the COVID-19 pandemic.

Looking instead for short-term shifts in trust assessment over time, in relation to relevant public events (i.e., the introduction of new measures by the Italian Government on March 11), we divided our sample based on time of data submission: before or after the public press release when the Prime Minister Giuseppe Conte announced the new restrictions to be implemented nationwide, to contain the COVID-19 outbreak. The model performed well across both time windows (before: $R = 0.799$, 63.8% explained variance; after: $R = 0.806$, 64.9% explained variance) and the strongest predictors remained the same, as well as their relative order of importance ($p < 0.001$ for all the following predictors): positive factors affecting competence of public authorities (before: $\beta = 0.311$; after: $\beta = 0.293$), perceived adequacy of the adopted measures (before: $\beta = 0.171$; after: $\beta = 0.183$), trustworthiness of official information sources (before: $\beta = 0.149$; after: $\beta = 0.117$), attributing to public authorities the intention to contain the pandemic (before: $\beta = 0.143$; after: $\beta = 0.108$), and the perception that their efforts were focused on public safety, with no other agenda (before: $\beta = 0.103$; after: $\beta = 0.096$). Again, we observed substantial stability over time in how trust in public authorities was attributed, with minor differences emerging only by comparing the significance and direction of some secondary variables.

In general, the introduction of more severe restrictions had the effect of simplifying the metrics used to assess trust toward public authorities: before the March 11 announcement, only four variables failed to correlate significantly with trust, whereas after it, the number of irrelevant predictors increased to 8, indicating a more narrowly focused mindset in assessing the trustworthiness of the institutions in charge of dealing with the emergency. In particular, intention to downplay the emergency, personal discomfort associated with the proposed measures, and trustworthiness of unofficial information sources became irrelevant for trust in public authorities; unfortunately, the expectation of universal compliance also became equally irrelevant (before: $\beta = 0.043$, $p = 0.001$; after: $\beta = -0.006$, $p = 0.81$), while the negative correlation between expectation of insufficient compliance and trust was much stronger after the March 11 announcement (before: $\beta = -0.024$, $p = 0.04$; after: $\beta = -0.083$, $p = 0.001$). This suggests a turn for the worst in people's expectations: before the new restrictions, trust was positively supported by expectation of universal compliance (the more I believe all others will behave responsibly, the more I trust the authorities), whereas after them, the influence of pessimistic fear became dominant (the more I doubt enough people will comply, the less I trust the authorities). As a possible reaction to this shift, it is worth noting that the positive correlation between impact of personal efforts in the COVID-19 response and trust in public authorities became significant only after March 11 (before: $\beta = 0.023$, $p = 0.09$; after: $\beta = 0.062$, $p = 0.03$), suggesting that the new measures strengthened in Italian citizens a sense of personal responsibility for the collective reaction to the virus. Finally, region of residence was a significant (albeit weak) predictor of trust before, but not after, the announcement of new restrictions by the Italian Government (before: $\beta = -0.035$, $p < 0.001$; after: $\beta = -0.01$, $p = 0.65$): this shows a stronger tendency to trust public authorities in the most affected regions before March 11, whereas this was no longer true after that date. Since overall trust in public authorities did not decrease after March 11 in the whole sample, this indicates a leveling in trust attribution across the country after the introduction of new measures, which in turn could be interpreted as a shift in the perception of the emergency: whereas in early March, a significant part of the Italian population still believed the outbreak to be somehow contained to specific regions, and thus a local problem unlikely to affect everybody in the same way, the nationwide interventions announced on March 11 made it crystal clear to all that COVID-19 was indeed a national concern.

Overall, these regression analyses show that, in Italy, trust in the capacity of public authorities to deal with the COVID-19 emergency was attributed in a fairly consistent manner during the time window of this survey (March 9–14, 2020) across different areas of the country, giving central prominence to positive indicators of competence in public institutions, assessing the adequacy of the proposed measures, verifying that proper intentions supported their application, and paying attention mostly to official information sources. All considered, this suggests a fairly reasonable and well-balanced judgment-making process for trust attribution, while the true anomaly remains the high levels of trust in public authorities recorded during the early stages of this emergency (see Section "Descriptive Statistics"), which are in sharp contrast with both long-term trends and recent surveys on institutional trust in Italy, prior to the COVID-19 pandemic. At a more fine-grained level, region of residence and time of data completion did reveal some interesting shifts in trust assessment, yet these insights should be interpreted carefully, since they concern relatively minor changes in the significance of secondary predictors, within a regression model with a high number of independent variables.

Gender Effects

Comparing male and female respondents, a χ^2 test revealed a small but significant difference ($p = 0.004$) in institutional trust in relation to the COVID-19 emergency: in particular, men were more likely to express high levels of trust toward public authorities involved in contrasting the outbreak (76.1% men vs. 74.3% women), whereas women were more often neutral (19.1% women vs. 15.7% men). Running the regression model described in Section "Regression Analyses" separately on male and female respondents showed that, although the main predictors remained the same (positive indicators of competence, adequacy of the measures, trustworthiness of official information sources, public intention to contain the pandemic, and institutional focus on public safety), age and region of residence were significant predictors only for women and not for men (AGE: women $\beta = -0.026$, $p = 0.05$, men $\beta = -0.009$, $p = 0.516$; REGION: women $\beta = -0.052$, $p < 0.001$, men $\beta = 0.001$, $p = 0.964$). To further investigate this interaction between gender and other socio-demographic factors influencing institutional trust during the COVID-19 emergency, we run a trivariate analysis on, respectively, gender × age × trust and gender × region × trust. The first analysis revealed that gender effects on institutional trust are significant ($p = 0.038$) only in the age range 56–85 years, which is also the most vulnerable to the virus: among respondents in this age range, the majority of those that expressed low levels of institutional trust were male (60%), whereas most of those neutral or highly trustful were female (59.4 and 53.8%, respectively). It is also worth noting that, after performing a bivariate analysis on the impact of age on trust, we found a highly significant effect ($p < 0.001$), with 86.1% of elderly respondents (56–85 years old) expressing high trust in public authorities, whereas this percentage drops to 69.6% for participants in between 18 and 40 years of age: this further confirms the role of vulnerability to the COVID-19 virus in eliciting higher attributions of trust, and it is consistent with previous findings on a negative correlation between age and willingness to comply with social distancing measures during the COVID-19 pandemic (Wirz et al., 2020). The second analysis showed that the relationship between gender and institutional trust is significant ($p = 0.027$) only in those regions that were most affected by the COVID-19 outbreak: in these areas, most of the respondents that manifested distrust in public authorities were men (55.5%), while the majority of the neutral and trustful participants were women (60.1 and 55.4%, respectively). Taken together, these results suggest that, whenever the situation was most critical (i.e., for the most vulnerable age range and in the most affected regions), men were overrepresented in the (small) group of people expressing distrust

toward public authorities, whereas women were overrepresented among those neutral or trustful. Although this may suggest an interesting gender effect on resilience under extreme stress (women seem more likely than men to suspend judgment or look on the bright side, precisely when the situation is the most dire), it is worth noting that, regardless of gender, only a small minority of respondents were expressing distrust toward public authorities, even in the most affected age range (men 6.7%, female 3.8%) and in the most affected regions (men 10.8%, female 7.1%). Thus, these gender effects invite further investigation, but on their own, they do not justify any hasty conclusion on how different genders may react against health emergencies.

DISCUSSION AND CONCLUSION

The most striking result of this survey is the very high level of institutional trust expressed by respondents: 75% of them trust Italian public authorities to be able to deal with the COVID-19 emergency. This is in sharp contrast with the relatively low levels of institutional trust characteristic of Italy, both historically and in recent surveys: according to the DEMOS & PI 22nd annual report on "The Italians and the State"[2], based on a large representative sample (N = 1212) of Italian citizens over 15 years of age interviewed in December 2019, only 22% respondents trusted the State, whereas both Regional Governments (30%), European Union (34%), and municipal authorities (38%) fared better, while political parties were in the worst shape, with only 9 Italians out of 100 willing to trust them; in fact, of the main national institutions, the only one with decent levels of trust was the Presidency of the Republic (55%, still in sharp decline with comparison to 10 years before, in 2009, when it was as high as 70%). Also international estimates indicated relatively low levels of institutional trust: according to the Eurofound report on Eurofound (2018), Italians' trust in the national government has been declining in the last few decades and is now below 20%, while the more recent data of the Eurispes Report–Italy 2020[3], presented in February 2020, indicated trust in institutions at 14.6% (6.2 points lower than in 2019). Institutional trust in Italy in recent years is extremely weak not only in absolute terms but also in relation to other European countries: in their comparison of 25 EU states, based on data from the 2016 European Social Survey, Oksanen et al. (2020) reported very low levels of institutional trust in Italy, measured by respondents' trust in five institutions (Parliament, politicians, political parties, the police, and the legal system); in fact, only Cyprus, Poland, Slovakia, and Bulgaria expressed stronger institutional distrust than Italy.

Moreover, this trend toward widespread distrust of public institutions is not a particularly recent feature of Italian politics: while in recent decades, it developed mostly against the backdrop of increasing tensions between populist movements and traditional political parties (Urbinati, 2019), massive erosion of public confidence in political figures was already ongoing in Italy well before the recent resurgence of populism worldwide—in the last decade of the 20th century, following the corruption scandals of Tangentopoli and its media resonance (Giglioli, 1996; Vannucci, 2009), and with the largely failed shift toward bipolarism during the Berlusconi age (Viroli, 2011). Even before that, a longitudinal analysis reveals that the confidence gap between electors and political institutions, characteristic of many post-WWII democracies, appeared in Italy much earlier than in other countries (Segatti, 2006)—so much so, that already in the 1960s LaPalombara (1965), a highly influential political scientist, described Italians' attitudes toward politics with three emblematic words: alienation, fragmentation, and isolation.

Such a deeply rooted tradition of distrust in public institutions underscores the importance of the opposite trend registered in our survey, i.e., a sudden boost in institutional trust prompted by the COVID-19 crisis—a significant result that is also supported by other data collected in this survey, as seen in the "Results" section. Moreover, insofar as this newfound trust is grounded on trust in the expertise of the scientific authorities involved, it is also at odds with the widespread anti-scientific sentiment considered to be on the rise at the global level, variously stigmatized as "the death of expertise" (Nichols, 2017) and the crisis of epistemic deference (Marconi, 2019).

Surprising as it may be, there are several reasons to consider this finding on trust as reliable:

(i) Internal consistency: as discussed in Section "Results," all other responses to the survey are consistent with a high attribution of trust to public authorities and indeed provide justification for such attribution.

(ii) External validation: just a few days after data collection for this study was concluded, a survey on a representative sample of Italian citizens (N = 1028, 16–17 March 2020) was conducted by the independent research center Demos & Pi[4], providing substantial support to our main results: e.g., 71% trust both the Italian Government and the current Prime Minister, with 94% approval of the adopted measures, strong endorsement for the sanitary system (94%), the Civil Protection (88%), and the National Government (82%), coupled with lower levels of confidence in political parties (none of them above 30% of approval) and a rising skepticism toward the European Union (80% of respondents believe the Italian response to the COVID-19 emergency to be better than that of other EU countries, and only 35% consider the role played by the EU as positive in this crisis).

(iii) Low chances of social desirability effects: as demonstrated by the very low levels of institutional trust recorded in previous surveys, including recent ones, Italians have no qualms expressing public distrust toward public authorities—quite the opposite, in fact. Thus, there is no reason to assume that the current data on trust are inflated by social desirability effects.

[2]Source: http://www.demos.it/2019/pdf/5247itasta2019_20191223.pdf

[3]Source: https://eurispes.eu/news/eurispes-risultati-del-rapporto-italia-2020/

[4]http://www.demos.it/a01705.php

Thus, there is a genuine phenomenon to be explained here: a veridical "trust boom" during the early stages of the COVID-19 crisis in Italy. The socio-cognitive theory of trust (Castelfranchi and Falcone, 2010) that inspired our survey provides the tools needed to craft a tentative interpretation of this remarkable fact, although the questionnaire itself was designed to record such a phenomenon, rather than explain it. Thus, the speculative nature of our interpretation cannot be stressed enough: our study revealed a highly significant and surprising phenomenon, for which now we look for an explanation. The interpretation we favor is the one that, to the best of our knowledge, appears more adequate to account for the pattern of results obtained in this survey; later on, we will contrast it with other alternative explanations and argue in favor of its superiority. Nonetheless, such interpretation remains tentative, and it is intended as a springboard and an inspiration for further studies that may either confirm or falsify it, rather than as something set in stone.

With this in mind, let us focus on the fact that trust, at its cognitive core, entails the decision to delegate to someone else (the trustee) the realization of a goal that is important to the agent who is expressing trust (the trustor). As a result, being able to choose not to trust someone requires either having alternative means to achieve the desired goal (e.g., "I will do it myself" or "I will delegate it to someone else") or being ready to forsake that goal. However, neither of these options are available in the face of a pandemic: the relevant goal is personal and public safety, which is non-negotiable, i.e., it is not something we can decide to forget about, and the only course of action that offers reasonable chances of achieving it is to put our collective trust in public authorities, since there are no other available agencies we might appeal to (indeed, the only choice we have concerns the level of public authority we should confide in, and our sample clearly indicated the national level as the most pertinent one).

In other words, a pandemic like COVID-19 creates the preconditions for a collective case of *necessary trust in public authorities*, or institutional trust by force majeure: not in the sense that we are being manipulated by some hidden power, as some conspiracy theorists may be prone to believe, but because the very nature of the health crisis leaves us with no other option than to put our trust in public authorities (that is why we emphasize a need, a necessity for trust). It is worth noting that these pressures toward trust between citizens and public authorities in times of sanitary crisis are symmetrical: citizens have no alternatives to reliance in the relevant public institutions, yet these institutions themselves cannot help but trust in civic compliance to the proposed regulations, on pain of failure in containing the contagion, due to the limits of enforcement already emphasized in previous studies (Siegrist and Zingg, 2014; Lewnard and Lo, 2020; Olsen and Hjorth, 2020; Van Bavel et al., 2020). Necessary trust is a two-way street in health emergencies, for both citizens and public authorities.

Moreover, this two-way street is often cyclically traveled: in fact, the citizens themselves become fully aware (perceive the request and expectation) of the need for public authorities to receive the right degree of trust from citizens as a tool for achieving the *common* goal, and this awareness becomes one of the reasons for citizens to trust public authorities themselves. In other words, in the best-case scenario, this becomes a trust-based "alliance" toward a supreme common purpose. This civic alliance, or social pact, is grounded in a specific dynamic of trust: the trustor deliberately bestows trust on the trustee, even if partially skeptical of the trustee's qualities, in an attempt of motivating the trustee to "rise to the occasion" and *become* trustworthy. This is the sense in which trust breeds trust, as noted both by trust theorists (e.g., Falcone and Castelfranchi, 2001b) and by political economists (e.g., Feld and Frey, 2002). In the context of the early stages of the COVID-19 pandemic in Italy, we suggest that Italian citizens put their trust in public authorities in charge of facing the crisis as a way of opening up a "trust credit line" and thus putting pressure on such authorities to prove themselves worthy of that credit. Similarly, public authorities frequently manifested full trust in citizens' compliance with regulations (a topos often belabored on public occasions by all institutional actors, including the Prime Minister, the President of the Republic, and representatives of the Civil Protection), precisely for the same reason: by declaring their trust in the common sense and civic responsibility of Italian citizens, they were putting pressure on citizens to actually demonstrate such qualities.

Clearly, the objective need for trust created by a pandemic does not automatically evolve in greater trust toward public institutions. That need may find different outlets, so that other, bleaker outcomes may be equally possible: for instance, an already vulnerable trust relationship between citizens and public authorities may be shattered completely by a sudden crisis, especially if such crisis (or its poor management) are blamed on those authorities, possibly leading to a severe governmental crisis, and maybe even a takeover by authoritarian forces, or, in another scenario, public trust toward central authorities may dissolve, with citizens taking a turn toward tribalism and trying to face the crisis at the local level.[5] While these options are certainly viable in general, our results suggest that neither of these paths was being seriously considered by most Italian citizens in early March 2020: our survey revealed a sudden increase of trust toward public institutions, rather than its collapse or further erosion, and that trust was directed toward national authorities, not toward specific charismatic leaders or local powers. According to our findings, faced with an unexpected need for public trust, the Italian people in early March 2020 opted for putting their trust (at long last) in their elected representatives at the national level, rather than turning to authoritarian figures or local authorities for solutions. Beyond the evidence of our data, how the management of the pandemic unfolded over those weeks provides further support to this interpretation. The Italian Government consistently acted as a mediator between all the social forces affected by the crisis, repeatedly demonstrating high reliance on the indications of the experts in crafting every containment measure: in short, the national authorities acted as the very antithesis of an authoritarian leader. At the same time, local authorities at all levels were relying on the guidance of the National Government for facing the pandemic and, in some cases, were actively asking for its direct intervention to solve a crisis that

[5]We are grateful to one of the reviewers for pointing out the importance of considering also these alternative scenarios.

they were not equipped to deal with; more generally, there was widespread consensus, both in political debate and in the media, on the need for a national response to the COVID-19 emergency (a need well understood by our participants, as seen in the section "Results"). Again, an attitude that stands in sharp contrast with any shift toward tribalism.

Thus, assuming that the need for public trust prompted the high levels of institutional trust manifested by participants, we propose to interpret their other responses within the broad framework of motivated reasoning (Kunda, 1990) and cognitive dissonance theory (Festinger, 1957): as the chosen path to pursue the paramount goal of personal and public safety, trusting public authorities became in turn a necessary instrumental goal, thus coloring all other attitudes expressed by the respondents; more precisely, it prompted them to *actively look for reasons to justify their (unavoidable) trust in public authorities*, in order to minimize cognitive dissonance. Indeed, the need for trust experienced by Italian citizens during the COVID-19 emergency was at odds with their widespread attitude of distrust toward the very same public authorities they now needed to rely upon in the face of the outbreak: this, we argue, produced a massive and sudden shift in their perception of those public authorities, to better accommodate the new reality they had to deal with. In this interpretation, the trust boom observed in the survey was not produced by any collective epiphany on the actual qualities of the public institutions involved, but rather by a cognitive realignment of individual attributions to the current needs citizens were experiencing. All of a sudden, Italian citizens found themselves pressured to rely on some key public authorities in ways and to a degree never experienced before, at least since the worst days of World War II. Regardless of how well these authorities behaved in the first stages of the COVID-19 crisis, Italians opted to re-frame their attributional states in a way that made this novel institutional trust justified, thus flipping the usual causal connection involved in acts of trust: it is not a case of detecting the appropriate qualities in public authorities and therefore deciding to trust them, but rather an instance of having first the need to trust those authorities and then justify such trust by *assuming* that these authorities would manifest the qualities required to warrant that trust. This is also justified and supported by the implicit pact with which public authorities communicated the need for this responsible and trusted attitude toward them as decisive for the achievement of the common purpose.

It is worth noting that our reliance on motivated reasoning to explain some of these survey data is very different from the most common use of this notion in recent studies on public opinion: although originally conceived in much broader terms (Kunda, 1990), motivated reasoning in recent decades has become more and more associated with political ideology, with several studies investigating how partisan affiliations affect and filter our beliefs on matters of public interest (e.g., Redlawsk, 2002; Slothuus and de Vreese, 2010; Kahan, 2013; Bolsen et al., 2014). In fact, the same approach has been applied, with mixed results, to the public reaction to the COVID-19 pandemic, e.g., looking at how political partisanship affected people's ability to discriminate between reliable information and fake news (Pennycook et al., 2020), timeliness in the adoption of restriction measures (Rosenfeld, 2020), health behaviors (Kushner Gadarian et al., 2020), and compliance with social distancing guidelines (Rothgerber et al., 2020) and stay-at-home regulations (Goldstein and Wiedemann, 2020). While the relevance of politically grounded motivated reasoning provides an interesting perspective on public opinion dynamics, other predictors have been found to be more relevant in explaining some of the target phenomena (e.g., fake news vulnerability, see Pennycook and Rand, 2019); more to the point, this is not the type of motivated reasoning we are discussing here. On the contrary, our data show no effect of political partisanship on trust attributions toward Italian public authorities in charge of coordinating the COVID-19 response, including those that did have a clear political connotation, e.g., the National Government. Instead, we appeal to the notion of motivated reasoning in relation to *a manifestly non-partisan goal*, i.e., public safety, and the related need to trust public authorities to be able to ensure such goal: this is the kind of motivated reasoning we argue influenced responses in our sample, independently from the political affiliation of either the survey participants or the relevant public authorities.

Alongside the preservation of consistency in citizens' beliefs toward public authorities, there is also another, more emotional path through which a need for trust may generate broader shifts in public perception. As noted by many trust theorists (Luhmann, 1979; Gambetta, 1988; Batson, 1991; Hardin, 2002) and also described in the socio-cognitive model adopted here (Falcone and Castelfranchi, 2001a; Castelfranchi and Falcone, 2010), a fundamental function of trust is to allow both individuals and groups to face uncertainty, to moderate it and deal with it. Trusting someone or something immediately reduces the perception of risk; in this sense, trust offers the advantage of a subjective sense of safety, before and without being able to reach that safety objectively. It allows us to face the risk and take it, partially by giving us control over part of that risk, since trusting implies actively choosing to expose ourselves to a risk, i.e., the risk of having our trust betrayed (Mayer et al., 1995). This is why Koller (1988) individuated risk as a key determinant of trust, in the sense that a risky situation may bias people toward trustworthiness when assessing potential allies in facing such risk: "To the degree that the individual fears the occurrence of an event of negative valence (...) he exaggerates the subjective probability of an event of positive valence, which implies that he expects the interaction partner to behave promotively" (Koller, 1988, p. 275). This is very much in line with the higher levels of trust we observed in the most vulnerable age groups and in the Italian regions most affected by the COVID-19 outbreak (see Section "Gender Effects"). In the context of a health emergency such as the COVID-19 pandemic, this subjective dimension of trust becomes particularly apparent: consider how physicians and nurses in Italy turned overnight from marginalized workers in a distrusted field to the most revered national heroes. The individual and collective gain of this sudden change of perception is obvious: faced with the danger of contracting a deadly virus, the belief that your life will be in the hands of trusted professionals is incredibly valuable, not only for the unlucky few that will actually have to rely on those professionals, but for everybody,

since it greatly helps in calming down their fear and anxiety. In this perspective, the trust boom recorded in our survey should be considered not only as a merely intellectualistic attitude but also as a response with deep emotional undertones: this is the type of trust that is not only cognitively justified, but also *felt*, insofar as it provides us with the calmness needed to remain productive under the extreme stress of a pandemic.

It is worth noting that emphasizing the motivated nature of institutional trust during a pandemic is not the same as treating this newfound trust in Italian public authorities as a fiction, just a desperate figment of the imagination of a population looking for solace from a terrible crisis. Nothing could be farther from the truth: precisely because this institutional trust was experienced as a matter of necessity by the Italian people, it is also genuinely (and dramatically) authentic. Italian citizens, during those terrible days in early March 2020, truly believed that public authorities would prove themselves worthy of their trust—possibly for the first time after many decades of increasing institutional distrust. Yet, it is a very fragile belief, because it is massively based on assumptions: should the public authorities subsequently fail to prove themselves equal to the task at hand, this huge "trust credit" would come due, producing an even bigger backlash in terms of the gap between citizens and institutions. This would indicate the clear failure of an "alliance" in which citizens have invested their trust in public authorities. On the other hand, an actual demonstration of trustworthiness by the public authorities during the COVID-19 emergency may engender a more durable and long overdue step change in institutional trust in Italy. As the Nobel prize Joseph Stiglitz put it in a recent interview to the Italian newspaper *La Repubblica*[6] (30 April 2020), we should "not waste this crisis," since it opens up genuinely new opportunities for rethinking the fabric of our societies. What is more, respondents in our sample were fairly optimistic on the future of trust relationships with their institutions, with scientists, and among themselves, while expressing reservations on the adequacy of the current economic model (see Section "Descriptive Statistics"). However, optimism is, by its very nature, a delicate thing, so the danger of experiencing a "trust crack" right after the initial trust boom is as real as ever.

Indeed, other ongoing research on the relationship between institutional trust and public response to the COVID-19 emergency may invite a bleaker outlook on how things will unfold: in their comparison of data from 25 European countries, Oksanen et al. (2020) highlighted a negative correlation between institutional trust prior to the crisis and the delay in introducing restrictions to curtail contagion—the less trust was manifested in public authorities before the COVID-19 outbreak, the more time passed after the first confirmed virus-related death and the introduction of containment measures. While we do not dispute the role of institutional trust as a protective factor against virus outbreaks (already well documented with Ebola, see Blair et al., 2017; Vinck et al., 2019), we are skeptical of the particular correlation observed by Oksanen et al. (2020), since it does not take into account the fact that different European countries were affected by the COVID-19 outbreak at different times: in particular, Italy, France, and Spain [all "late intervention countries," according to Oksanen et al. (2020)] were among the first countries to record severe outbreaks, and much of the measures later adopted by other countries were largely based on the evidence coming in from these first, unwilling testbeds for the public response to the virus. This is confirmed by the same data used by Oksanen et al. (2020): in terms of absolute dates, Italy was among the first countries to endorse all the five types of interventions considered in their study, much earlier than many others that are instead regarded as "early adopters." Moreover, the alleged correlation considers only the adoption of some form of interventions, without discriminating between countries that adopted all of them (like Italy) or just a few, sometimes even only one (as in the case of Sweden). This is probably why subsequent data do not seem to support the proposed correlation: for instance, Sweden, one of the countries with one of the highest levels of institutional trust before COVID-19, as of May 11, 2020 has a very high ratio to the number of deaths per million inhabitants (among the top six nations in the world); similarly, Belgium, where containment measures were adopted much more promptly than in Italy according to Oksanen et al. (2020), in early May 2020 had the world's highest number of COVID-19 confirmed deaths per million inhabitants. For all these reasons, we are not persuaded that prior institutional trust was the main factor determining timely adoption of containment measures by public authorities: while early intervention remains critical in facing virus outbreak, in the case of COVID-19, we believe that this was determined mostly by other factors, e.g., where the outbreak manifested sooner in Europe.

Looking at the main predictors of trust highlighted by our regression analyses, respondents exhibited a matter-of-fact, evidence-based attributional strategy toward public authorities: consistently with the socio-cognitive model of Castelfranchi and Falcone (2010), competence, intentionality, trustworthiness as information sources, and the perceived adequacy of the proposed interventions were the most relevant factors in justifying trust in public authorities. The relevance given to the role of public authorities as information sources is also consistent with the significant weight that information has in shaping participants' institutional trust, based both on their own self-report and on regression analysis (see Sections "Descriptive Statistics" and "Regression Analyses"): this highlights the importance of feedback and control for trust. Even when trust on public authorities is perceived as a necessity by citizens, they try to retain a measure of control over it, by monitoring the quality of institutional information channels. Equally suggestive are some of the factors that failed to impact institutional trust in our sample: most notably, the amount of personal sacrifice imposed upon participants by the restrictions introduced by the Government. Significantly, this dimension did not affect citizens' trust in public authorities, contrary to what would be reasonable to expect under different circumstances: this, in turn, provides further support to our interpretation of the observed trust boom as a matter of necessity—insofar as public safety is the paramount goal, the severity of the necessary costs are immaterial

[6]Carofiglio, G. (2020, April 30). *Joseph Stiglitz: "Non sprecate questa crisi."* La Repubblica, Retrieved from https://rep.repubblica.it/pwa/robinson/2020/04/30/news/joseph_stiglitz_non_sprecate_questa_crisi_-255286208/

in modulating institutional trust. This provides a nice illustration of the complex and context-dependent nature of feedback mechanisms on trust attributions: whether or not a certain observable feature of the situation (in this case, personal costs) will affect trust depends on its role within a broader attributional process, which cannot be oversimplified as a single feedback loop (for discussion, see Falcone and Castelfranchi, 2004).

Finally, it is worth stressing that the main predictors of trust remained stable both geographically and temporally: nonetheless, controlling for region of residence allowed us to notice a more focused mindset for trust attribution in the most affected regions, whereas comparing responses before and after the new restrictions introduced in Italy on March 11 highlighted a leveling effect of these measures, which made us realize the national character of the COVID-19 crisis to everybody, including citizens living in areas with only minor outbreaks.

This last point underscores a common pattern to many of our main results: *a shift from the particular to the general* in how institutional trust is granted and justified by citizens, apparently caused by the unique circumstances of the COVID-19 pandemic. As we discussed in section "Results," the responsibility of dealing with this emergency was clearly assigned to the National Government, whereas regional and local authorities were perceived as marginal; moreover, high confidence was granted to public institutions, largely ignoring their political affiliation, unlike what happened in other countries, e.g., the United States (Goldstein and Wiedemann, 2020; Kushner Gadarian et al., 2020), and without concern for any further agenda they might serve (in fact, trust in public authorities was paralleled by distrust in the various political parties, including those currently in power); consistently with this mindset, collectivistic reasons for institutional trust trumped individualistic concerns, and the perception of a common effort toward shared goals overshadowed any personal sacrifice that may be required to individuals and groups (this also relates to the fact that personal health itself obliges to look and reflect primarily on collective health, on which the former strictly depends); finally, confidence in each other's compliance with general rules was high, and the future outlook on trust was positive for public institutions, science, and civic society, not so much for the overall model of development. In short, participants responded to this survey not as individuals calculating trust based on likelihood of personal gains or losses (the standard economic view of trust), but rather as members of a collective subject, jointly engaged in facing a problematic situation.

This tendency to make common cause against a shared concern is one of the most valuable assets any society can leverage to fight a public crisis, so in this sense, our data paint a positive picture of how Italian citizens responded to the COVID-19 emergency, as far as trust in public authorities is concerned. However, as repeatedly stressed above, this asset is also incredibly delicate, especially in a country with a complex and thorny history of institutional distrust, like Italy. Hence, a crucial research priority for future research, both in the short run and in the long term, is to keep monitoring how trust dynamics between citizens and public authorities will be affected by the next stages of the COVID-19 pandemic: in fact, while our data suggest a generally positive reaction in the early phases of the emergency, they provide no guarantee of the fact that such trend will continue in the same direction. On the contrary, as mentioned, things could either turn for the best, as our respondents chose to believe, or turn for the worst, should public authorities fail to live up to their citizens' high expectations.

DATA AVAILABILITY STATEMENT

All datasets generated for this study are included in the article/**Supplementary Material**.

ETHICS STATEMENT

This study complied with all the ethical guidelines and standards for online surveys with human participants, in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study and were free to quit the survey at any time.

AUTHOR CONTRIBUTIONS

RF led the design of the survey. EC, AS, and SF performed data analysis. RF and FP wrote most of the manuscript. All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.561747/full#supplementary-material

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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frontiers in Psychology

ORIGINAL RESEARCH
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Rethinking the Role of Affect in Risk Judgment: What We Have Learned From COVID-19 During the First Week of Quarantine in Italy

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Due to COVID-19 spreading in Italy, on March 11 the Prime Minister of Italy declared a lockdown and imposed severe restrictive measures impacting citizens' freedom at several levels. People were required to stay at home and go out only to satisfy basic needs. Several risk models have postulated a link among online searching behavior, affect, anxiety, and complaints by individuals toward government restrictions (GR), which emerged as also related to an increased perception of knowledge toward risk. However, to date, no study has addressed how these key risk-related aspects (i.e., affect, anxiety, perceived knowledge on risk, and risk dimensions) can act jointly to orient online health information-seeking behavior, and people's complaints toward GR imposed during the lockdown. This study investigated the mechanisms underlying online health information-seeking behavior and people's complaints toward the government's restrictions during a COVID-19 emergency in the Italian population. Drawing from the health belief model (HBM), which postulates a link between sociodemographic variables, risk, and affect dimensions in emergency, we assumed risk factors as predictors of affect and anxiety, which, in turn, were posited as mediators between risk dimensions, online health information-seeking behavior, and complaints toward GR. Participants (1,031) were involved during the first week of the quarantine (March 11–18) and completed an online survey composed of (i) an adapted version of the Italian Risk Perception Questionnaire; (ii) the Italian Positive (PA) and Negative Affect (NA) Schedule (PANAS-10); (iii) the State Anxiety Scale (STAI-Y1); (iv) *ad hoc* personal knowledge measure about novel coronavirus; (v) *ad hoc* item measuring information search behavior regarding the novel coronavirus; (vi) *ad hoc* measure of the complains regarding GR; and (vii) sociodemographic questions. General linear models and structural equation modeling (SEM) were carried out to test the model. Sociodemographic and cognitive factors predicted the participants' affect and anxiety, which, in turn, motivated and fully mediated both information search behavior and complaint toward GR. This research can offer useful suggestions for policy-makers during the COVID-19 emergency, and it advanced the knowledge on the risk–emotion link in emergency situations.

Keywords: emotions, anxiety, quarantine, behavior, SARS-CoV-2

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GENERAL INTRODUCTION

In December 2019, a cluster of pneumonia cases of unknown etiology was detected in the city of Wuhan, Hubei Province, central-eastern China. This initial phenomenon turned into a novel coronavirus (Zhu et al., 2020), which is named SARS-CoV-2 (i.e., Severe Acute Respiratory Syndrome), and which caused a disease named COVID-19 (Qu et al., 2020). Even though symptomatology has been defined clearly, it is still hard to define how long it will last and if a cure is possible (Porcheddu et al., 2020; Wangping et al., 2020). Recently, the infection has caused enough deaths to be considered as a pandemic by the World Health Organization (WHO) (Onder et al., 2020; Sohrabi et al., 2020).

In Italy, the outbreak spread on February 20, and after an *ad hoc* decree of the President of the Council of Ministers (DPCM), a lockdown was imposed on Italians (i.e., 20 days after the first recognized patient). All Italians were required to stay home if they were not involved in jobs or tasks involved in other people's survival. Since March 11 in Italy, restrictive and severe measures have been gradually implemented (from March 11 to 18) (De Giorgio, 2020a,b).

According to the health belief model (HBM) (Janz and Becker, 1984; Carpenter, 2010)—well-established theoretical frameworks in health-related behavior research—often, the psychological counterpart of disease-related emergencies can entail an increased risk perception (Bults et al., 2011) modulated also by sociodemographic variables (e.g., Vaughan, 2011; Clifton et al., 2016). This cognitive perception of risk can have significant implications on individuals' emotional states on the short and on the long-term (Cafagna and Barattucci, 2019). Moreover, it would be closely related to the intention to adopt protective behaviors (Leppin and Aro, 2009; Goodwin et al., 2011) as well as to personal susceptibility (Lin et al., 2020).

However, HBM has never been used to investigate the mechanisms underlying all these variables in a pandemic situation. Moreover, no data on the Italian population's risk perception have been reported yet. Crucially, no studies have investigated the impact of risk cognition and emotional response on research behavior and compliance with government actions.

This last aspect can be far more relevant if considering that cognitive perception of risk is sensitive to peculiar emergency-related environmental factors. For instance, Italians were forced to stay home, thus changing their normal habits related to work and leisure activities. Confined at home, Italians tended to rely more on the Internet to remain up-to-date on pandemic progress in a safe way. Crucially, online information searching regarding health issues is not a neutral task since it can influence people's affective states, especially anxiety (Jutel, 2017).

To investigate the joint impact of cognitive risk dimensions, affect, and anxiety on online searching behavior and compliance toward government restrictions (GR), in the peculiar context of the Italian pandemic emergency, we drew from the HBM to formulate and test a novel explicative model. First, we posed the first day of lockdown (March 11, 2020) as the *trigger* event and the online health information on COVID-19 searching behaviors as the main *outcome*. Then, we built and tested a novel model including sociodemographical factors, risk cognitions, behaviors, and affect as mediators between the trigger event and the main outcome of the online health information searching behaviors (**Figure 1**).

Elucidating this mechanism can be crucial also because information-seeking behaviors can influence the population' general compliance with government decisions (Clifton et al., 2016). Therefore, these data can provide the government with useful indications regarding which online communication strategies would be the most effective in an emergency situation (Liao et al., 2020).

Conceptualization of a New Model of Risk Perception

The term "risk" represents the possibility of suffering damage connected to foreseeable circumstances. In essence, it is consequently a variable connected to the frequency (or probability) of the occurrence of the damage and the magnitude that the latter can cause in the individual (Slovic, 2000). This universally recognized definition may look as reducible to a mere mathematical formula. However, its subjective dimension suggests a deeper complexity. Indeed, a plethora of approaches have been developed to capture all the key aspects related to risk perceptions, as well as its main consequences on people' behavior.

Among the main subjective dimensions of risk, cognitive factors emerged as playing a key role (Slovic, 2000; Leppin and Aro, 2009). Risk perception would be determined by a complex series of cognitive factors: (i) the perceived possibility of having damage to health; (ii) the subjective importance that the damage is more or less possible; (iii) by personal uncertainty associated with the exposure to a specific risk factor (Slovic et al., 2004). In the case of general risk or infection or disease, personal knowledge negatively affects the perception of risk danger (Shook et al., 2019). In turn, risk perception impacts behaviors (Sjöberg, 2000), specifically between different risk dimensions regarding infection, perceived fatality, severity, vulnerability, and uncontrollability, and are proven to have effects on protective conduct (de Zwart et al., 2009). In regard to pandemic-related risk perceptions, two main factors emerged as relevant, that is, vulnerability (a person's subjective perception of the risk of acquiring an illness or disease) and severity (a person's feelings on the seriousness of contracting an illness or disease) of harm (Carpenter, 2010). However, despite that it has been repeatedly shown that risk perception can affect behavior (Brewer et al., 2007; Vaughan, 2011; Shook et al., 2019), the underlying mechanism still needs to be elucidated.

Specifically, antecedents of cognitive dimensions of risk should be still clarified. With this regard, demographic factors/variables emerged as playing a key role in shaping pandemic risk perception and subsequent behaviors (see e.g., Vaughan, 2011). For instance, women resulted as more avoidant, fearful, and vulnerable in terms of pandemic risk perception, with lower risk acceptance scores when compared to men (see e.g., de Zwart et al., 2009). Conversely, age often leads to an increased perception of control on infection risk, lower susceptibility, avoidance, and higher acceptance of risk (see e.g., Clifton et al.,

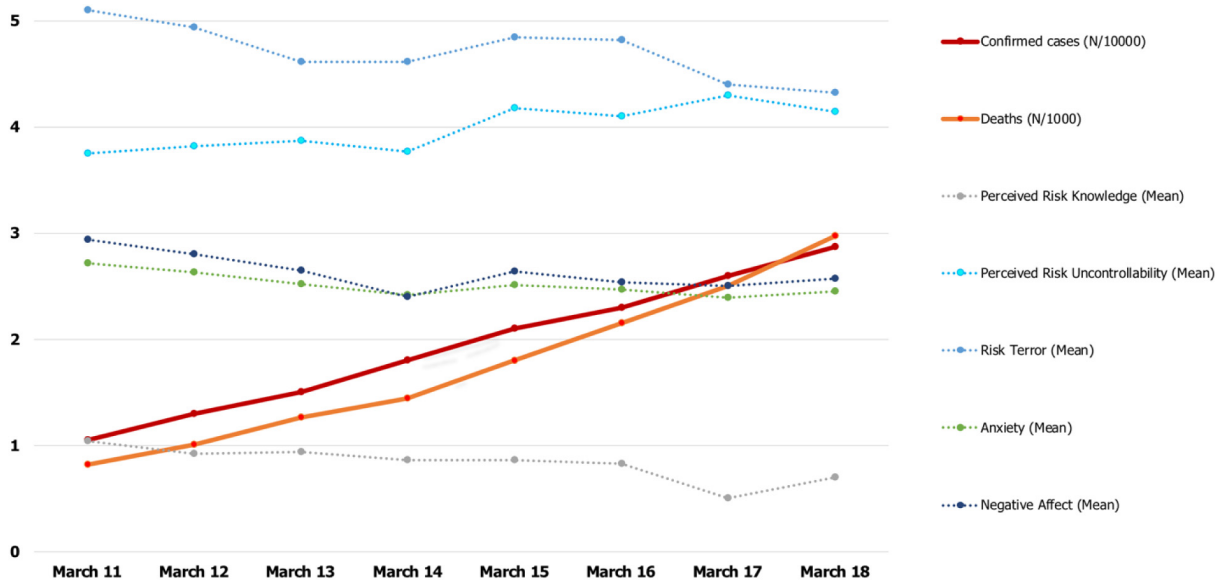

FIGURE 1 | The first week of lockdown in Italy: epidemiological and variable trends. All variables have been standardized. Due to the numerical difference of epidemiological data between Northern and Southern Italy, we divided the real values by 1,000 and have thus reported them in the *y*-axis.

2016). Conversely, the level of education was negatively related to the risk of infection and contagion (i.e., vulnerability) (Gidengil et al., 2012). Lower income and urbanization positively affected vulnerability and perceived infection risk (Brewer et al., 2007; De Zwart et al., 2007; Gidengil et al., 2012).

Another factor, which would act as a mediator, should be included between risk perception and behavior, that is, affect. Affect, such as fear, is related to a general amplification of the perception of the danger of risky events, while anger would be significantly associated with underestimation of dangers (Slovic, 2000; Brown, 2014). Moreover, the degree of emotional involvement in the perceived consequences of different risks, or specific personality dimensions that determine emotional attitudes, is associated with different aspects of risk perception (among all, vulnerability, and severity) (Slovic, 2000; Brown, 2014).

Crucially, among the stimuli triggering emotional states, also online searching information should be included, which could also lead to a phenomenon of large-scale emotional contagion (Hatfield et al., 1993). Emotions expressed via the Internet, and mainly through social media, can lead to a long-term psychological impact (Arapakis et al., 2008; Fowler and Christakis, 2008; Coviello et al., 2014; Kramer et al., 2014; Ferrara and Yang, 2015; Mui et al., 2018) including also a simple health information search (Gadahad et al., 2013). Specifically, both general and specific discrete emotional states can orient people's online search for information on health issues (Wissow, 2007; Myrick and Willoughby, 2019). Emotions and affect act as motivators of specific survival behaviors (Frijda et al., 1989), and this definition could hardly be more appropriate than in this worldwide emergency. In this case, one key survival behavior motivated by affect could consist of online health information seeking or avoidance (Savolainen, 2014). While positive affect (PA) resulted in determining people's attitudes toward information avoidance, negative affect (NA) predicted individuals' attitudes toward information seeking (Yang and Kahlor, 2013).

On the other hand, searching for information about symptoms or specific illnesses can increase people's distress and anxiety about their health (Graffigna et al., 2017). Crucially, NA and anxiety have often resulted in closely positively intertwined affective states (Crawford and Henry, 2004), even though they can be considered as clear, distinguishable constructs (Watson and Kendall, 1989; Clark and Watson, 1991). According to the Tripartite model of anxiety and depression, high levels of NA underlie both anxiety and depression, while NA would act as a central risk factor of anxiety (Clark and Watson, 1991). NA has also often been considered an early predictor of anxiety in several domains (Crawford and Henry, 2004; Cisler et al., 2010). During the lockdown, the Internet became one of the most important sources of health-related information; thus, it would be crucial to analyze antecedents of this behavior as well as its potential impact on compliance with GR.

To date, the literature regarding risk perception and behavior on worldwide pandemics has focused mainly on general population's or on healthcare workers' punctual psychological responses immediately after the end of isolation (Wilder-Smith and Freedman, 2020). Acute stress/posttraumatic disorders, as well as higher propensity to live state anxiety, emerged as serious issues (Leppin and Aro, 2009). Crucially, no data on the Italian population's risk perception have been reported yet. Moreover, no studies have investigated the role of risk cognition and emotional response to research behavior and compliance with government actions.

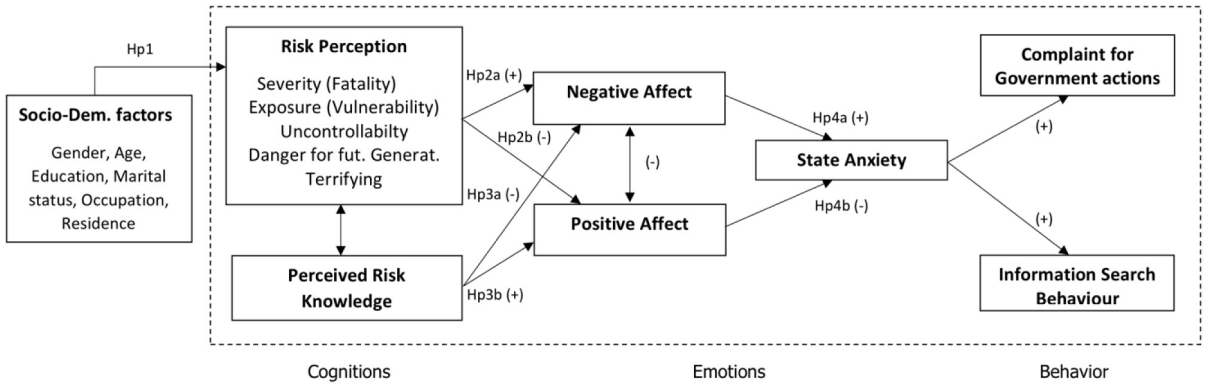

FIGURE 2 | Research model and hypotheses.

In this study, we aimed to advance previous studies on COVID-19 at two levels. First, we elucidated the link between cognitive and emotional risk dimensions in a pandemic, then, we built and tested a novel model linking cognitive, emotional, and sociodemographic factors to a peculiar behavior enacted in this emergency, which would be probably increasingly adopted in the future, that is, online searching behavior of health-related information. Moreover, we also used the HBM, for the first time, as a general explicative framework in a pandemic situation.

Health belief model posits a cognitive appraisal framework, in which perception of the risk for individual health affects emotions and protective behavior (Roseman, 1996). More specifically, when referring to the HBM framework (Janz and Becker, 1984) and adapting recent theoretical models (Watson and Spence, 2007; Keller et al., 2012; Lemée et al., 2019), the present research model considers sociodemographics as antecedents of risk cognition and emotion as a buffering factor between risk perception and behavior (**Figure 2**).

This novel model proposes that two different risk cognition aspects have independent effects on PA and NA. Perceptions regarding specific pandemic and perceived knowledge of risk (Champion and Skinner, 2008; Carpenter, 2010) can act differently on contingent affect, which can have an impact on both information search behavior and complaints regarding government action. In a situation of physical and social constraint, i.e., quarantine, the sudden perceptions of the risk would depend mainly on mass media, social media, and word of mouth information (Jung et al., 2015). This growing information impacting the emotional state can, in turn, act as both a search trigger for further infection information and a facilitator of compliance with the government's restrictions (Goodwin et al., 2011; Rolison and Hanoch, 2015).

In line with HBM and literature, major evidence linking cognitive risk dimensions and affect (de Zwart et al., 2009; Keller et al., 2012), this study aimed to explore the following hypotheses: sociodemographic factors have an impact on risk perception and perceived risk knowledge (Hp1); more precisely, the research expects that age (Hp1a) and education (Hp1b) will negatively affect risk perception and positively risk knowledge; thus, it is hypothesized that women will have a worse perception of pandemics and less perceived knowledge compared to men (Hp1c). The research assumed that risk perception would positively impact on NA (Hp2a) and negatively on PA (Hp2b); on the contrary, it expected that risk knowledge would negatively impact on NA (Hp3a) and positively on PA (Hp3b). Moreover, the research intends to elucidate whether the differential effect of NA (Hp4a) and PA (Hp4b) on search behavior and a complaint is mediated by state anxiety (Hp4). In order to test all the mentioned hypotheses thoroughly, we tested this novel model by means of structural equation modeling (SEM) (**Figure 2**).

MATERIALS AND METHODS

Participants

One thousand thirty-one participants from Italy voluntarily took part to this study (mean age = 38.34; SD = 13.02, range = 18–82). After removing the data of the participants who did not answer all the survey questions, we analyzed 998 participants, of which 739 were females (mean age = 37.01; SD = 12.39) and 259 were males (mean age = 42.15; SD = 14). Their marital status was as follows: 37.68% were engaged in a relationship, 32.57% were married, 23.75% were single, 5.42% were divorced, 0.6% were widowed; 23.75% reported living in central big city areas, 20.4% were living in the suburb of a big city, 36.07% reported living in a small town (i.e., less than 50,000 inhabitants), and 20.14% reported living in the countryside; 57.52% resided in Northern Italy, 17.33% resided in central Italy, 17.64% resided in South Italy, and 7.52% resided in the Islands; 20.44% were students, 2.51% were retired, 25.35% were freelance, 11.72% were temporary workers, and 30.96% were full-time employees with a permanent position; and 52.93% reported having no children, 17.13% reported having two children, 16.43% reported having one child, and 0.6% reported having more than three children.

Regarding schooling, 3.71% reported having a middle school diploma, 31.16% declared having a high school degree, 18.84% reported having a bachelor's degree, 24.15% reported having a master's degree, and 21.64% reported having a Ph.D.

This study was conducted in accordance with APA ethical standards and with the Declaration of Helsinki. Participants:

(i) were fully informed in regard to institutional affiliations of the researchers and research scope; (ii) continued the survey only if they were adult (>18 years old); (iii) gave information that could not allow their identification; (iv) had the right to refuse to participate in the study and withdraw at any time; (v) filled an anonymous questionnaire and confirmed the understanding of instructions and voluntary participation.

Procedures and Materials

Participants completed an online survey between March 11, the first day of quarantine and national lockdown, and March 18. The research design relied on snowball sampling (chain referral process). Participants were recruited through flyers, social networks, and by word of mouth. The questionnaire answering began in the evening (March 11) when the DPCM decree was issued. First, participants completed the part of the questionnaire created to gather sociodemographic information. Second, the following questionnaires were then completed:

1. *Italian Risk Perception Questionnaire* (Cafagna and Barattucci, 2019): originally developed by Savadori et al. (1998). Based on literature indications (Keller et al., 2012), the study deduced that the pandemic risk could generally be identified as terrifying, uncontrollable, fatal, and dangerous for future generations, and widespread in terms of exposure. Hereupon, the researchers built a tool that measures five single-item dimensions of risk infection, on a seven-point scale ranging from 1 to 7: severity, vulnerability, uncontrollability, terror, and danger for future generation (item examples: "Considering the scale below (1 'not fatal' to 7 'fatal'): in your opinion, when the virus infects a subject, how likely are the consequences of being fatal?" "Considering the scale below (1 'not exposed' to 7 'totally exposed'), in your opinion, to what extent do you think you are exposed to the coronavirus risk?"
2. *Italian short version of the Positive and Negative Affect Schedule* (Terraciano et al., 2003): a 10-item self-report scale on a five-point Likert scale, which captures the two main clusters of the current affective experience, i.e., positive (five adjectives; Cronbach's alpha = 0.790) and negative affect (five adjectives; Cronbach's alpha = 0.940).
3. *State Anxiety Scale (STAI-Y1)*: a 20-item self-report questionnaire on a four-point Likert scale (from 1 "not at all" to 4 "very much so"; original Cronbach's alpha = 0.954) to assess participants' current state of anxiety.
4. *Ad hoc* measure about *Novel coronavirus personal knowledge*, which tests how people know the disease: "Do you know exactly the difference between COVID-19 and SARS-CoV-2?" This measurement tool consists of a three-level ordinal scale: (i) Yes, I know it perfectly. (ii) Yes, I know generally. (iii) No.
5. *Ad hoc Information search behavior* item regarding novel coronavirus: "Thinking about the last week, how many times did you search on the Internet (Google, news, articles on social networks, etc.) for information on COVID-19, SARS-CoV-2, or Coronavirus?" This measurement tool consists of a four-level ordinal scale: (i) never, (ii) sometimes, (iii) several times, (iv) often, and (v) everyday.
6. *Ad hoc Complaint regarding government actions* item: "The Government has acted late to contain the spread of the virus." This measurement tool consists of a four-level ordinal scale of accordance with the phrase: (i) I totally disagree. (ii) I disagree a little. (iii) I mostly agree. (iv) I totally agree.

Data Analysis

A Kolmogorov–Smirnov test for each of the variables involved in this study was carried out to test their distribution. We found that all target variables (i.e., anxiety, NA, risk dimensions, online health information searching behavior, and the complaint about government measures) were normally distributed. To test the causal relationship between all demographical variables (i.e., marital status, job position, age, gender, residence area, and residence area in Italy) and each target variable, a generalized linear model (GLM) for categorical and ordinal data was carried out with SPSS Ver. 21.0 (IBM Co., Armonk, NY, United States) statistical program. The GML is robust to the violation of sphericity as it does not necessarily assume a normal distribution of variables (Agresti and Kateri, 2011). Moreover, regarding the residence area, we operationalized the "residence area" into two different variables. The former "residence area" refers to how far from the city center a person lives: (i) city center; (ii) suburb of a city; (iii) town; (vi) countryside, and (v) the latter, "residence area in Italy" refers to a zone of residence from the north to the south of Italy and islands, which also coincides with the distance from the first epidemic center of diffusion (i.e., Codogno) in Northern Italy. A comprehensive structural equation model with AMOS22 was used to test the proposed theoretical model and the main hypotheses. Commonly reported fit statistics were: comparative fit index (CFI), Tucker–Lewis index (TLI), normed fit index (NFI), goodness of fit index (GFI), incremental fit index (IFI), root mean square error of approximation (RMSEA), plus standardized root mean square residual (SRM) for measurement model fit. Research has sought to reduce response bias and common-method variance problems utilizing suggested methods (Podsakoff et al., 2012): scales were visually divided, and different formats and endpoints were used for each different measure.

RESULTS

Sociodemographic Variables and Psychological Impact on Anxiety, Negative Affect, Risk Dimensions, and Search Behavior

All factors are reported in **Table 1** with significant regression coefficients and Wald statistics. All Omnibus models were

TABLE 1 | Generalized linear model multiple regressions with gender, marital status, education, number of children, residency, residency in Italy and age as predictors and anxiety, positive affect, negative affect, search behavior, knowledge of COVID-19, vulnerability, control, severity, risk as terrifying, risk as damage for future generations, and complaint to Government's measures as predicted variables.

		Predicted variables										
Predictors	**Statistics**	**Anxiety**	**PA**	**NA**	**SB**	**KNW**	**VUL[a]**	**CON**	**SEV**	**TER**	**DFG**	**COM**
Gender: female	B	4.156	−1.367	1.373	–	12.75	–	–	0.625	–	0.567	0.186
	Wald χ^2	19.479	0.097	11.09	–	0.389	–	–	49.03	–	21.858	9.51
	Significant	$p < 0.001$	$p < 0.001$	$p = 0.001$	–	$p < 0.001$	–	–	$p < 0.001$	–	$p > 0.001$	0.002
	CI_{95}	2.31; 6.01	−0.442;.609	0.557; 2.189	–	0.175; 0.602	–	–	−0.45; 0.80	–	0.372; 0.85	0.068; 0.304
Gender: male	Redundant											
Status: engaged (married, in a relationship)	B	–	–	−0.963	−0.26	–	−0.21	–	–	–	–	–
	Wald χ^2	–	–	5.82	7.610	–	3.821	–	–	–	–	–
	Significant	–	–	$p = 0.016$	$p = 0.006$	–	$p = 05$	–	–	–	–	–
	CI_{95}		–	−1.75; −0.181	−0.447; −0.076	–	−0.42; −0.001	–	–	–	–	–
Status: single (single, divorced, widower)	Redundant											
Education: Elementary school	B	–	−4.31	–	–	2.163		2.37	1.56	–	–	–
	Wald χ^2	–	6.324	–	–	10.51		15.19	8.1	–	–	–
	Significant	–	$p = 0.012$	–	–	$p = 0.001$		$p < 0.001$	$p = 0.004$	–	–	–
	CI_{95}		−7.76; −0.951	–	–	0.855; 3.47		1.178; 3.56	0.486; 2.63	–	–	–
Education: Middle-school	B	–	–	–	–	0.776	–	–	0.786	–	0.95	0.447
	Wald χ^2	–	–	–	–	8.79	–	–	13.4	–	9.63	9.52
	Significant	–	–	–	–	$p = 0.003$	–	–	$p < 0.001$	–	$p = 0.002$	$p = 0.002$
	CI_{95}		–	–	–	0.263; 1.29	–	–	0.365; 1.207	–	0.333; 1.477	0.163; 0.732
Education: High-school	B	4.59	–	1.672	–	–	–	0.395	0.382	0.243	0.45	0.229
	Wald χ^2	15.88	–	11.69	–	–	–	10.821	12.93	4.12	9.39	9.604
	Significant	$p < 0.001$	–	$p = 0.001$	–	–	–	$p = 0.001$	$p < 0.001$	$p = 0.042$	$p = 0.002$	$p = 0.002$
	CI_{95}	2.31–6.77	–	0.685; 2.7	–	–	–	0.15; 0.63	0.177; 0.600	0.008; 0.47	0.162; 0.738	0.083; 0.369
Education: Bachelor	B	–	–	1.183		0.324	–	–	0.376	–	0.45	0.219
	Wald χ^2	–	–	4.289		4.71	–	–	9.38	–	6.962	7.013
	Significant	–	–	$p = 0.046$		$p = 0.03$	–	–	$p = 0.002$		0.007	$p = 0.008$
	CI_{95}	–	–	0.022; 2.26		0.031; 0.617	–	–	0.135; 0.616		0.113; 0.766	0.057; 0.382

(Continued)

TABLE 1 | Continued

		Predicted variables										
Predictors	**Statistics**	**Anxiety**	**PA**	**NA**	**SB**	**KNW**	**VUL[a]**	**CON**	**SEV**	**TER**	**DFG**	**COM**
Education: Master	B	–	–	–	–	–	–	–	0.273	–	–	–
	Wald χ^2	–	–	–	–	–	–	–	5.76	–	–	–
	Significant	–	–	–	–	–	–	–	$p = 0.016$	–	–	–
	CI_{95}		–	–	–	–	–	–	0.05; 0.495		–	–
Education: P.hd./MS	Redundant											
Number of children (no children)	B	–	−1.287		–	–		–	0.46	–	0.932	–
	Wald χ^2	–	3.6		–	–		–	4.42	–	10.02	–
	Significant	–	$p = 0.058$		–	–		–	$p = 0.036$	–	0.002	–
	CI_{95}	–	−2.62; 0.043		–	–		–	0.031; 0.881	–	0.355; 1.51	–
Number of children (one children)	B	–	−1.369		–	–		–	0.45	–	0.896	–
	Wald χ^2	–	2.784		–	–		–	4.5	–	9.21	–
	Significant		4.05		–	–		–	$p = 0.033$	–	0.002	–
	CI_{95}	–	−2.7; −0.035		–	–		–	0.038; 0.89	–	0.317; 1.47	–
Number of children (two children)	B	–			–	–	–	–	–	–	0.794	–
	Wald χ^2	–			–	–	–	–	–	–	7.418	–
	Significant	–			–	–	–	–	–	–	0.006	–
	CI_{95}				–	–	–	–	–	–	0.223; 1.366	–
Number of children (three or more)	Redundant											
Residency: countryside	B		–	–	–	–	–	–	–	–	–	–
	Wald χ^2		–	–	–	–	–	–	–	–	–	–
	Significant		–	–	–	–	–	–	–	–	–	–
	CI_{95}		–	–	–	–	–	–	–	–	–	–
Residency: town	B	–	–	–	–	–	–	–	–	–	–	–
	Wald χ^2	–	–	–	–	–	–	–	–	–	–	–
	Significant	–	–	–	–	–	–	–	–	–	–	–
	CI_{95}		–	–	–	–	–	–	–	–	–	–
Residency: suburbs	B	–	–	–	–	–	–	–	–	–	–	–
	Wald χ^2	–	–	–	–	–	–	–	–	–	–	–
	Significant	–	–	–	–	–	–	–	–	–	–	–
Residency: city centre	Redundant											
Residency in Italy: Northern Italy	B	–	–	–	–	–	–	–				
	Wald χ^2	–	–	–	–	–	–	–	–	–	–	–
	Significant	–	–	–	–	–	–	–	–	–	–	–
Residency in Italy: Central Italy	B	–	–	–	–	–	–	–	–	–	–	–
	Wald χ^2	–	–	–	–	–	–	–	–	–	–	–
	Significant	–	–	–	–	–	–	–	–	–	–	–

(Continued)

TABLE 1 | Continued

Predictors	Statistics	Predicted variables										
		Anxiety	PA	NA	SB	KNW	VUL[a]	CON	SEV	TER	DFG	COM
Residency in Italy: Southern Italy	B	–	–	–	–	–	–	–	–	–	–	–
	Wald χ^2	–	–	–	–	–	–	–	–	–	–	–
	Significant	–	–	–	–	–	–	–	–	–	–	–
Residency in Italy: Islands	Redundant											
Age	B	−0.104	0.024	−0.062	−0.020	0.015	–	0.016	0.009	−0.014	–	−0.011
	Wald χ^2	6.49	3.84	12.02	18.68	10.28	–	13.083	5.22	10.46	–	15.995
	Significant	$p = 0.011$	$p = 0.05$	$p = 001$	$p < 0.001$	$p = 0.001$	–	$p < 0.001$	$p = 0.022$	$p = 001$	–	$p < 0.001$
	CI_{95}	−0.186; −0.024	−0.0,3-e; 0.049	−0.99; −0.028	−0.027; −0.01	0.006; 0.025	–	0.007; 0.24	0.001; 0.017	−0.023; −0.006	–	−0.016; −0.005

Note. "male" as category of "gender"; "single" as a category of "status"; "Ph.d./MS" as a level of "Education"; "three or more children" as "Number of children"; "city center" as a level of "Residency"; "Islands" as a level of "Residency in Italy" were not reported since they are a redundant levels. Marital status was transformed into a dummy variable (engaged vs. single). [a]The predictor was significant, but the omnibus model was not. CI95, conventional 95% confidence interval; PA, positive affect; NA, negative affect; SB, search behavior; KNW, knowledge; VUL, vulnerability; CON, control; SEV, severity; TER, terrifying; DFG, damage for future generations; COM, compliance.

significant except for the model with "Knowledge," i.e., a risk dimension, as the predicted variable.

We reported results for each of the dependant variables (anxiety, PA, NA, SB, KNW, VUL, CON, SEV, TER, DFG, COM) in relation to all predictors taken together (gender, marital status, education, number of children, residency, residency in Italy). Only B values useful for explaining results were reported in order to avoid redundancies.

Younger females (Age: B = −0.104) with lower education (high school: B = 4.59) are related with highest levels of anxiety. Regarding PA, being male (gender: B = −1.367), with lower number of children (number of children: beta decreased from one to no children but with a negative value: B = −1.369 to −1.287) and older (B = 0.024) significantly increased PA. Indeed, NA was significantly positively predicted by being a woman, not engaged (engaged marital status: B = −0.963) with lower education (from bachelor = 1.183 to high school: B = 1.672) and younger (B = −0.062). Younger (B = −0.26) and single people (gender did not result as a significant predictor) positively predicted the frequency of online health information searching behavior. Being female (B = 12.75), with a lower level of education (B = 2.163–0.776) and senior (B = 0.015), led to significantly higher perception of risk knowledge. Only being single (B = −0.21), i.e., not engaged, significantly positively predicted the perception of being vulnerable against risk. A lower education (beta decreased positively from high school to elementary school) and being older (B = 0.016) significantly positively predicted the perception of control over the risk associated with the pandemic. Being female, with a lower level of education, and with no to one child and older led to a significantly higher perception of risk severity. Being less educated and younger led to a significantly higher perception of risk as terrifying. Being female, with lower education, and an increasing number of children (from no to two children) led to a significantly higher perception of risk damage associated with new generations. Females with lower education and younger tended to report more compliance toward the government's measures.

Path Analysis

Descriptive statistics for all the measures and zero-order correlations between them are described in **Table 2**. With the aim of exploring a measurement model and construct validity, a confirmatory factor analysis (CFA) was conducted comparing four nested models from one factor to a final model composed of the four principal latent factors (risk perception, NA, PA, and anxiety). **Table 3** represents Chi-square and goodness of fit indices for the four measurement models developed. Considering that risk perceptions were all measured with single items, and despite the final CFA indexes not being optimal, there was an evident amelioration of all indices from the first to the final model. Therefore, the measurement model can be profitably used in further testing of the proposed structural model.

Thus, we tested through SEM the proposed structural model (**Figure 2**): the five risk perception dimensions (fatality, vulnerability, uncontrollability, terrifying) and risk knowledge as (correlated) antecedents, with direct relationships with both NA and PA as intermediate variables, which themselves have direct

TABLE 2 | Descriptive statistics and zero-order correlations among the variables of the study.

	M (SD)	1	2	3	4	5	6	7	8	9	10
1. Uncontrollability	3.87 (1.7)										
2. Terrifying	4.89 (1.3)	0.061									
3. Fatality	3.37 (1.2)	0.143**	0.095**								
4. Danger for future generation	3.31 (1.7)	0.125**	0.068*	0.477***							
5. Vulnerability	3.67 (1.5)	0.254***	0.043	0.214**	0.223***						
6. Risk knowledge	13.84 (5.7)	−0.056	−0.009	−0.086*	−0.026	−0.006					
7. Negative affect	11.83 (3.8)	0.164**	0.180**	0.263***	0.308***	0.237***	−0.022				
8. Positive affect	10.46 (2.6)	−0.163**	−0.036	−0.099**	−0.047	−0.086**	0.155**	−0.387***			
9. Anxiety	1.77 (0.83)	0.189**	0.117**	0.227***	0.263***	0.228***	−0.053	0.858***	−0.597***		
10. Complaint	2.4 (1.3)	0.008	0.148**	0.141**	0.124**	0.133**	0.029	0.153**	−0.047	0.166**	
11. Search behavior	3.87 (1.7)	0.068*	0.056	0.001	0.007	0.091**	0.171**	0.264***	−0.103**	0.246***	0.069*

****p < 0.001; **p < 0.01; *p < 0.05.*

TABLE 3 | Goodness of fit indices of the alternative measurement models on measured variables.

	Chi-square	df	RMSEA	CFI	IFI	SRMR
Model 1 – one factor	7205.047	560	0.154	0.734	0.724	0.113
Model 2 – two factors	6488.564	559	0.134	0.792	0.793	0.096
Model 3 – three factors	5720.552	557	0.101	0.853	0.843	0.089
Model 4 – four factors	5438.563	554	0.089	0.904	0.898	0.081

df, degrees of freedom; RMSEA, root mean square error of approximation; CFI, comparative fit index; IFI, incremental fit index; SRMR, standardized root mean square residual.

links with state anxiety that fully mediates information search behavior. The proposed model exhibited optimal goodness of fit: Chi-square = 112.812 (df = 23; $p < 0.000$), RMSEA = 0.063, CFI = 0.966, IFI = 0.967, NFI = 0.958, GFI = 0.980, TLI = 0.919. Consequently, we tested the same model deleting nonsignificant relationships (severity, vulnerability, and terrifying with PA; risk knowledge with NA) and some correlations between antecedents (vulnerability and danger for future generations, with terrifying risk, risk dimensions, and risk knowledge). Consistent with our hypothesized relationships, the model showed excellent goodness of fit: Chi-square = 129,737 (df = 33; $p < 0.000$), RMSEA = 0.054, CFI = 0.964, IFI = 0.964, NFI = 0.952, GFI = 0.977, TLI = 0.94, with all significant relationships ($p < 0.001$). Regression weights are presented in **Table 4**, while the path diagram of the final model is shown in **Figure 3**.

As hypothesized (Hp2a), each dimension of risk perception is positively related to NA. In contrast, only two dimensions (uncontrollability and danger for future generations) are significantly linked to PA, not confirming what was expected (Hp2b); conversely, confirming Hypotheses Hp3a but not Hp3b, risk knowledge is only positively related to PA. Results confirmed that the expected differential effect of NA (Hp4a) and PA (Hp4b) on search behavior and on a complaint is fully mediated by state anxiety (PA indirect effect on search behavior: $\beta = -0.051$, $p < 0.001$; NA indirect effect on search behavior: $\beta = 0.142$, $p < 0.001$). Overall, the relationships expressed in the model explained 17% of the variance for NA, 18% for PA, 82% for state anxiety, 10% for search behavior, and 7% for complaint in government actions.

DISCUSSION AND CONCLUSION

The present research carried forward the literature regarding the fact that cognitive factors predict population affect that, in turn, motivate and fully mediate information search behavior and complaints about government actions, overturning contributions that proposed that risk behavior is driven by affects (Kahan, 2008; Leppin and Aro, 2009; Wu et al., 2018).

Considering our sample of participants, results showed that being female and younger with a lower level of education led to more anxiety, NA, a higher risk perception as terrifying, and higher complaint regarding GR. Moreover, PA increased significantly in older males and those with a decreasing number

TABLE 4 | Standardized path coefficient (regression weights) of the final model.

			Estimate
Negative affect	←	Severity	0.110
Negative affect	←	Vulnerability	0.142
Negative affect	←	Uncontrollability	0.080
Negative affect	←	Danger for future generation	0.205
Negative affect	←	Terrifying	0.145
Positive affect	←	Knowledge	0.104
Positive affect	←	Damage for future generation	−0.090
Positive affect	←	Uncontrollability	−0.103
State anxiety	←	Negative affect	0.738
State anxiety	←	Positive affect	−0.312
Search behavior	←	State anxiety	0.245
Complaint	←	State anxiety	0.165

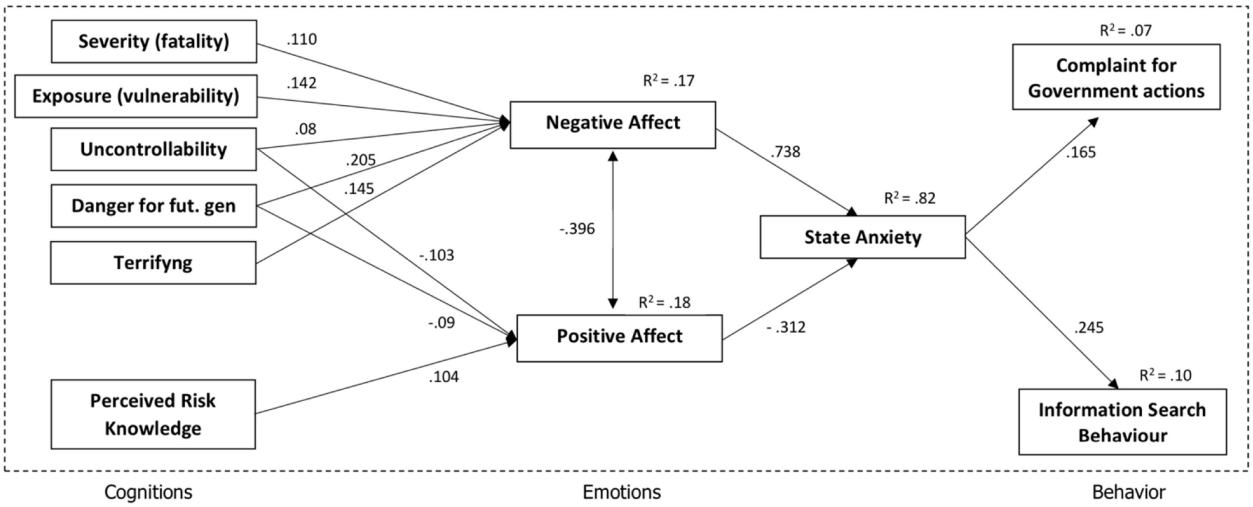

FIGURE 3 | Final structural model on study variables.

of children (less than two). Younger people or those who were not engaged or married tended to look for information online about the COVID-19 more frequently. Older females with a lower education level (from middle to elementary school) were more prone to perceive themselves as competent regarding their acquired knowledge on COVID-19. Being engaged or married acted as a protective factor regarding the perceived vulnerability against COVID-19. Older people with lower levels of education (from high school to elementary school degree) tended to feel more able to control the gravity of risks associated with this pandemic. Older females having from one to no children, and with high-school to elementary school degree, tended to perceive the COVID-19-associated risk as more severe. Females who have a higher number of children (from no child to two children) and with a lower level of education (this effect increased from bachelor to elementary school) tented to perceive an increased risk associated with COVID-19 for future generations. Younger females with lower education tended to report more compliance toward the government's measures.

Theoretical Implications

In this study, we elucidated two crucial phenomena in emergency: general NA and its link with anxiety. NA and anxiety have often resulted in closely positively intertwined affective states (Crawford and Henry, 2004) even though they can be considered as clear, distinguishable constructs (Watson and Kendall, 1989; Clark and Watson, 1991). The Tripartite model of anxiety and depression confirmed that high levels of NA underlie both anxiety and depression, while NA acts as a predictor of anxiety (Clark and Watson, 1991). Specifically, NA has been often considered as an early predictor of anxiety in several domains (Crawford and Henry, 2004; Cisler et al., 2010). The model tested in this study confirmed the direction of this link.

Emotions and affect also act as motivators of specific survival behaviors (Frijda et al., 1989), and this definition could hardly be more appropriate than in this worldwide emergency. In this case, affect can trigger behaviors such as online health information seeking or avoidance (Savolainen, 2014). While PA resulted in playing a pivotal role in determining people's attitudes toward information avoidance, the negative one predicted individuals' attitudes toward information seeking (Yang and Kahlor, 2013). On the other hand, searching for information about symptoms or specific illnesses can increase people distress and anxiety about their health following a reinforcing spiral to the extent that a new term has been coined to refer to this condition, i.e., "cyberchondria" (Te Poel et al., 2016). Indeed, people with high health anxiety (i.e., fears stemming when individuals exaggerate in interpreting their bodily symptoms as an indicating severe illnesses) (McMullan et al., 2019) trend to increase their negative responses related to the likelihood of suffering from a given disease now and in the future (Baumgartner and Hartmann, 2011).

The present result showed that anxiety triggered by NA acted as a strong predictor of people's searching behavior regarding health. In other words, Italians were motivated by anxiety stemming from NA and triggered by their risk perception on the controllability and vulnerability regarding SARS-CoV-2 spread and health searching behavior. Overall, results provided support for the cognitive appraisal framework in risk perception (Roseman et al., 1996; Keller et al., 2012) and the main hypotheses. Risk perception and knowledge acted with different mechanisms on emotions: risk perception mainly contributed to having an effect on negative affect, while knowledge influenced only positive affect. Furthermore, in line with our hypotheses, emotions fully mediated the relation among risk cognition, complaint, and information search behavior (Champion and Skinner, 2008; Carpenter, 2010; Jung et al., 2015).

Policy Implications

Risk perception and affective response to pandemics can be crucial factors for managing population behaviors, thus ensuring the best adherence to prescription and safety norms (Poletti et al., 2011; Merino, 2014; Shook et al., 2019). Moreover, the efficiency of prevention behaviors in pandemics by the Government is related to population cooperation, which is highly related to risk perception (Leppin and Aro, 2009; Goodwin et al., 2011). Exploring risk perception during pandemics is fundamental because misperceptions can often cause inadequate responses (Poletti et al., 2011; Merino, 2014). In particular, perceptions regarding infection can lead people to take safer actions, to reduce exposure, and to increase protective conducts (e.g., vaccination, social distancing, hygiene, search for information; Shook et al., 2019). These individual behaviors can significantly influence the disease progression at a system level (De Zwart et al., 2007; Jiang et al., 2009).

Since emotion and behavior are closely related (Loewenstein et al., 2001; Slovic and Peters, 2006; Brown, 2014), beliefs and perceptions regarding risk represent core predisposing factors to predict people reactions. Therefore, it would be crucial to promote public order and right risk communication and to prevent counterproductive behaviors linked to bad information and fake news (Brug et al., 2004; Voeten et al., 2009; Shook et al., 2019).

The risk controllability is one of the most important factors that need to be considered since PA can reduce anxiety and, consequently, affect complaint and informational search behavior. In Italy, especially during the first days of the epidemic (from the end of February), there was too much conflicting information (e.g., "This virus is very similar to normal flu."/"Please, pay attention, it is a very dangerous virus; it is not like normal flu.").

It is crucial to evidence that too much information, especially if conflicting (or worse, fake news), can cause confusion in the population, and this, in turn, can affect emotional states (Bawden and Robinson, 2009). Politicians should act on proper information dispersion procedures regarding specific risk, as perceived knowledge may act on search behavior and complaint. Our results can suggest more tailored strategies of communication for prevention to be implemented by the government, not just in pandemic emergency (Smith, 2006).

Research regarding the way the population appraised hazards acquired significant scientific attention, and different approaches and paradigms to the perception of risk have been discussed (Leppin and Aro, 2009; Keller et al., 2012). Recent contributions have conformed on the emotional appraisal of risk perception (Loewenstein et al., 2001; Wu et al., 2018). Thus, results from our study could offer evidence in favor of the hypothesis that the analytic system (i.e., risk judgment) would precede the emotional one, at least in a pandemic emergency.

Country-Level Implications

COVID-19 is having, and is predicted, to have a substantial impact on the world economy, both due to the effect on national health systems, and on the slowdown of business activities through lockdowns and measures of social distancing. The economic impact would be even more substantial in developing countries, due to both difficulties related to social distancing in the slums and in the suburbs, as well as for the absence of stable health systems, welfare measures, and smart-working policies, and for the access to the various forms of institutional communication and to the mass media. The literature concerning the other pandemics has clearly shown that the perception of risk has a strong cultural component; thus, communication strategies should be tailored according to the peculiarities of each country (Jiang et al., 2009). In this regard, the proposed model can indicate a priority of all the variables capable of influencing preventive behavior or adherence to restrictions directly, which must be taken into account when planning communication to the general public. For instance, accurate and clear communication should clarify the danger for future generations, the terror aroused, and the degree of exposure to the pandemic (Van Bortel et al., 2016). Furthermore, the proposed model evidenced also perceived knowledge of risk as another key variable to be considered in mass communication. Finally, communication in developing countries should consider that people living in precarious economic conditions could give less weight to the health consequences of COVID-19, in a cost-benefit assessment process that could overestimate economic costs to the detriment of those for health and economics (Leppin and Aro, 2009).

Limitations of the Study

Given the novelty and relevance of this study, some limitations should be discussed. First of all, the cross-sectional design of the research limits the generalizability of its findings.

Although results should be interpreted, especially concerning the specificity of both the contagion risk and the quarantine situation, useful indications on the mechanism that operates between cognitions, emotions, and behaviors in situations of high stress and forced captivity can be provided. Moreover, due to the recruitment type (i.e., online), and despite a large number of participants, this sample cannot be considered as fully representative of the Italian population (26% males, 57% in Northern Italy). Almost 50% of the participants filled out the survey in the first 2 days (maybe caused by people's reactions to the lockdown). Therefore, this distribution does not allow for longitudinal analysis.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AD and MB conceived and designed the experiments. MB and AC done through questionnaires to target groups investigation. MB, AC, and GK analyzed the data. AD contributed the analysis tools. MB, AC, and AD wrote the manuscript. AD and GK critically reviewed the manuscript. All authors contributed to the article and approved the submitted version.

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From Resilience to Burnout: Psychological Features of Italian General Practitioners During COVID-19 Emergency

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During the COronaVIrus Disease 2019 (COVID-19) pandemic in Italy, general practitioners (GPs) are ensuring continued access to primary care for citizens while also absorbing more of the impact of the crisis than most professional groups. The aim of this study is to explore the relationships between dimensions of burnout and various psychological features among Italian GPs during the COVID-19 emergency. A group of 102 GPs completed self-administered questionnaires available online through Google Forms, including Maslach Burnout Inventory (MBI), Resilience Scale, Intolerance of Uncertainty Scale Short Form (IU), and Coping Inventory for Stressful Situations (CISS). Cluster analysis highlighted four distinct burnout risk profiles: Low Burnout, Medium Risk, High Risk, and High Burnout. The High Burnout group showed both lower Resilience and lower CISS Task-oriented coping strategy than the Medium Risk group and higher IU Prospective than the Low Burnout group. Results of a linear regression analysis confirmed that CISS Emotion-oriented style positively predicted MBI Emotional Exhaustion, CISS Task-oriented and Emotion-oriented emerged as significant predictors (negatively and positively, respectively) of MBI Depersonalization, and Resilience positively predicted MBI Personal Accomplishment. In conclusion, the results showed that the COVID-19 emergency had a significant impact on GPs' work management. Implementing task-oriented problem management, rather than emotional strategies, appears to protect against burnout in these circumstances. It is possible that the emotions related to the pandemic are too intense to be regulated and used productively to manage the professional issues that the COVID-19 pandemic presents.

Keywords: burnout, resilience, general practitioners, pandemic, coping, coronavirus disease 2019

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INTRODUCTION

When a pandemic strikes, as COronaVIrus Disease 2019 (COVID-19) has over the last half year, the health system and the people working within it must adapt rapidly to cope with new challenges (Kaba and Kitaw, 2020). Healthcare professionals may be forced to put their lives at risk by serving as the first line of defense. This has certainly been the case in Italy, which, as of May 5, 2020, was the second highest in number of COVID-19 infections (211,938)

and highest in total number of deaths (29,079) in Europe (European Centre for Disease Prevention and Control, n.d.). Recently the "Federazione nazionale degli ordini dei medici chirurghi e degli odontoiatri FNOMCeO (2020)" website has created a section for all the physicians who have died fighting COVID-19. As of May 5, 2020, there are 154 reported victims, of which 52 are general practitioners (GPs), one of the most affected categories.

The pandemic has an impact on the mental health of the general population through rapid and abrupt changes, producing high levels of stress and depression, especially in those most at risk to contract the virus (Rodríguez-Rey et al., 2020). Under this tremendous existential threat, GPs continue to ensure access to primary care for citizens. In reporting infections, supporting regional assistance networks, treating patients with minor symptoms, and taking care of the worried well, they play a critical role in suppressing any pandemic (Opstelten et al., 2009) and in confronting disaster conditions (Redwood-Campbell and Abrahams, 2011). Ultimately, their primary care work prevents overcrowding in emergency departments (Levi et al., 2019) and consequently limits the spread of the disease.

In this context, GPs must cope with professional and personal challenges, highlighting big differences between countries (Burns et al., 2020). For example, in Italy, GPs have historically played an important and personal role in the lives of families, but in this pandemic situation, GPs modified their practice methods by using telephone calls and other digital approaches (Fiorino et al., 2020). With these changes, some typical functions of primary care, including physical examinations and immunizations, have been unavoidably neglected (Thornton, 2020) while GPs are tasked with new responsibilities, such as additional safety protocols, learning new technology, and daily e-mails for prescriptions.

Thus, now more than ever, Italian GPs are facing abnormal burdens of work, stressful clinical and organizational conditions, and emotional charges that are challenging their ability to resist stress.

Burnout is a psychological syndrome that occurs in response to chronic job-related stress, with features involving emotional exhaustion, depersonalization, and a sense of reduced personal accomplishment (Maslach et al., 1986). It is common among healthcare professionals who are frequently exposed to high levels of occupational stress, especially due to overwhelming emotional and interpersonal interactions (Bria et al., 2012). Burnout among healthcare professionals has been the subject of a great deal of research because at its higher levels, it is associated with negative impacts on individual physicians, patients, and healthcare organizations and systems (West et al., 2018). All of the research on GPs and burnout has been conducted in the context of daily work; the appropriateness of applying conclusions from that work to pandemic situations is questionable.

The majority of Italian studies presented in the literature were focused on physicians working in a hospital setting. Bressi et al. (2008) reported that levels of burnout were high in hemato-oncology physicians with specific demographic profiles and for those experiencing physical exhaustion and working with demanding patients. Sanfilippo et al. (2018) highlighted that cardiac anesthesiologists are at high and moderately high risk of developing burnout syndrome. Mannocci et al. (2019) showed that 40% of 70 healthcare professionals in hematological units had a high level of emotional exhaustion. Another Italian study compared the burnout levels of GPs to those of hospital physicians: GPs had higher levels of emotional exhaustion than hospital physicians but there were no significant differences for other burnout dimensions explored (Grassi and Magnani, 2000). This study showed that GPs have a high risk of developing burnout syndrome. Recent studies examined the prevalence of burnout during the COVID-19 emergency in health professionals working in Northern Italy (Giusti et al., 2020), showing high levels of burnout especially in Emotional Exhaustion and reduced Personal Accomplishment. These burnout findings were significantly higher than those detected in other Italian samples before the COVID-19 outbreak, especially for Emotional Exhaustion (Barello et al., 2020).

Some individual psychological features can contribute to or prevent the development of burnout.

Psychological resilience, described as the ability to "bounce back" from negative emotional experiences and to adopt flexible solutions to the changing demands of stressful experiences (Tugade and Fredrickson, 2004), has emerged as the main protective factor of burnout among nurses (Guo et al., 2018). In a study of 566 surgical residents, Lebares et al. (2017) showed, with statistical significance, that higher levels of resilience were associated with a lower risk of burnout from emotional exhaustion, depersonalization, and low personal accomplishments. Little information is available about GPs' resilience. In a survey on Australian GPs, Cooke et al. (2013) found an association between high resilience and low burnout.

In addition, the literature has focused on the role of coping strategies in the development or prevention of burnout syndrome. When individuals experience stress, they can rely on coping mechanisms, which can be either problem-focused (actively changing the stressful environment) or emotion-focused (managing the emotional response to the stressor). Endler and Parker (1994) detected three coping styles: task-, emotion-, and avoidance-oriented coping. Other research has demonstrated that task-oriented coping predicts lower burnout among healthcare professionals while emotion-oriented coping predicts increased burnout (Jaracz et al., 2005; Howlett et al., 2015; Rodríguez-Rey et al., 2019).

Finally, another psychological feature related to the ability to regulate stress is the intolerance of uncertainty, defined as "an individual's dispositional incapacity to endure the aversive response triggered by the perceived absence of salient, key, or sufficient information, and sustained by the associated perception of uncertainty" (Carleton, 2016). In the Cooke et al. (2013) study mentioned above, GPs' ability to tolerate uncertainty was also explored with greater intolerance being associated high levels of burnout and low resilience.

The majority of the findings discussed in this *Introduction* have involved studies taking place outside of the context of states of emergency, so are not necessarily directly applicable in a pandemic. They are likely of value in establishing a baseline

understanding of burnout among medical professionals but clearly it would be useful to examine how the related phenomena function in a pandemic.

The first aim of this study is to explore the relationships between dimensions of burnout and some psychological features (resilience, intolerance of uncertainty, and coping styles) among Italian GPs during the COVID-19 emergency. Its second aim is to identify which psychological and/or demographic features predict higher levels of burnout.

MATERIALS AND METHODS

Participants

The study focused on Italian GPs currently in service in the time period between March 10, 2020, and May 18, 2020, excluding pensioners and other medical specializations. Individuals in training at GP offices and functioning essentially in the same role as GPs, but not yet certified, were included. A total of 102 individuals participated in the study.

Procedure

We conducted a study on Italian GPs using snowball sampling and self-administered questionnaires. In March 2020, questionnaires were made available online through Google Forms, and several GP Associations and the State Medical Board were involved in data collection that was stopped on May 18, 2020. GPs accepted the informed consent and the privacy policy before the beginning of the questionnaires.

The study was carried out in accordance with the code of ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans. Ethical approval was granted by the ethics committee of the Department of Dynamic and Clinical Psychology.

Measures

Sociodemographic Questionnaire

The self-administered questionnaire collected data on multiple variables, including years of work experience, age, number of children, etc.

Maslach Burnout Inventory

The questionnaire adopted in this study to measure burnout is the Italian validation of the Maslach Burnout Inventory (MBI; Maslach et al., 1986; Sirigatti and Stefanile, 1993), composed of 22 items with a Likert scale from 0 (never) to 6 (daily). It defines burnout in three dimensions: emotional exhaustion (EE), depersonalization (DP), and personal accomplishment (PA). The EE represents the depletion of one's emotional resources (example: "I feel used up at the end of workday"). The dimension of DP brings a view of coworkers and clients as dehumanized objects instead of people (example: "I feel I treat some patients as if they were impersonal objects"). Finally, the PA reflects feelings of competence, productivity, and successful achievement in one's work (example: "I feel I'm positively influencing other people's lives through my work"). For this dimension only, a high score indicates low burnout level. In this study, Cronbach's alpha was satisfactory for all subscales: EE (α: 0.92), DP (α: 0.80), PA (α: 0.79).

Coping Inventory for Stressful Situations

The Coping Inventory for Stressful Situations (CISS; Endler and Parker, 1994) is a questionnaire of 48 items measured on a Likert scale from 1 (not at all) to 5 (very much). It was administered in the Italian validation (Sirigatti and Stefanile, 2009). The questionnaire can bring up three basic dimensions: *task-*, *emotion-*, and *avoidance-oriented coping*. The scale of Task-oriented coping emphasizes an action oriented to the task and on attempts to solve the problem. The Emotion-oriented coping scale involves the use of emotional strategies to reduce stress, where there are emotional responses (get angry, become tense) and in some cases the reaction actually increases stress. The scale of Avoidance-oriented coping describes activities and cognitive changes aimed at avoiding the stressful situation. The range of possible scores of each subscale is 16–80 with higher scores indicating greater use of a given coping style. Cronbach's alpha coefficient was 0.88 for Task-oriented coping, 0.90 for Emotion-oriented coping, and 0.85 for Avoidance-oriented coping.

The 14-Item Resilience Scale

The 14-item Resilience Scale (RS-14) used in this study is a 14-item resilience assessment (Wagnild, 2009) derived from the original Resilience Scale of Wagnild and Young (1993). This questionnaire is largely used in literature. The respondents to RS-14 were asked to state the degree to which they agree or disagree with each item on a 7-point Likert-type scale from 1 (strongly disagree) to 7 (strongly agree). In this research, we adopted the Italian version (Callegari et al., 2016) of this questionnaire (Cronbach's alpha: 0.89).

Intolerance of Uncertainty Scale Short Form

The Italian validation of Intolerance of Uncertainty Scale Short Form (IUS; Lauriola et al., 2016) is composed of 12 items measured on a Likert scale from 1 (not at all agree) to 5 (totally agree). In this questionnaire, uncertainty is conceptualized as a psychological stressor that can threaten an individual's capacity to cope effectively with situations when there is little or no information. The IUS has two scales: prospective IU and inhibitory IU. The prospective scale measures both the desire for predictability and an individual's active engagement in seeking information to increase certainty. The inhibitory scale reflects avoidance of uncertainty and paralysis in the face of uncertainty. In this study, Cronbach's alpha was 0.86 for prospective IU and 0.91 for inhibitory IU.

Data Analysis

The statistical analyses were conducted using the Statistical Package for Social Science (SPSS) version 25 for Windows (IBM, Armonk, NY, USA). Data were reported as frequencies and percentages for discrete variables and as means and standard deviations for continuous variables. Regarding burnout dimensions, a description of the levels at the MBI scales was

reported based upon cutoff scores identified by Sirigatti and Stefanile (1993). Moreover, we conducted a Cluster Analysis, which enables the categorization of participants on the basis of their profiles of responses on a selected set of variables (here, dimensions on the MBI). This approach allows researchers to identify groups that may not emerge *via* classical categorizations (i.e., low, medium, and high) but that nevertheless occur and do have a meaning for participants. The groups identified by the Cluster Analysis were compared on coping styles, intolerance of uncertainty, and resilience through one-way ANOVAs.

In addition, Pearson correlations were performed to explore the association between burnout dimensions and psychological features (coping, resilience, and intolerance of uncertainity). Finally, a set of multiple regression analyses was performed to investigate possible predictors of the burnout dimensions; multiple regression analyses were done separately for each of the three components of burnout as a dependent variable and the variables that were significant from the correlation analysis as predictors.

In all performed analyses, a significance criterion equal to or less than 0.05 was used to determine statistical significance.

TABLE 1 | Sociodemographic variables of the sample and descriptive statistics.

Sociodemographic variables	Mean	Standard deviation
Age	55.13	11.40
	%	*N*
Gender		
Female	62.7	64
Male	36.3	37
Other	1	1
Years of work experience		
Less than 3	7.8	8
From 3 to 5	2	2
From 5 to 10	3.9	4
More than 10	86.3	88
Psychotherapy		
No	88.2	90
Yes	11.8	12
Psychological Variables	**Mean**	**Standard Deviation**
MBI Emotional Exhaustion	26.47	13.33
MBI Depersonalization	7.53	6.13
MBI Personal accomplishment	35.02	6.95
CISS Task-oriented coping	62.38	9.19
CISS Emotion-oriented coping	39.21	12.00
CISS avoidant-oriented coping	45.40	11.02
Resilience	75.85	12.27
IU Prospective	22.12	6.49
IU Inhibitory	10.62	4.91

CISS, coping inventory for stressful situations; IU, intolerance of uncertainty; MBI, Maslach burnout inventory.

RESULTS

Descriptive Analysis

The total sample consisted of 102 Italian GPs (64 female). The sociodemographic characteristics and the questionnaire mean scale scores of the participants are presented in **Table 1**.

Regarding burnout levels, the EE score appears to be the most concerning finding (**Table 2**); 46.1% of the sample had a high level of EE based on the MBI cutoff (Maslach et al., 1986).

TABLE 2 | Levels of burnout in the sample.

	Low burnout Cutoff <17	Moderate burnout Cutoff 18–29	High burnout Cutoff >30
MBI Emotional Exhaustion	30.4%	23.5%	46.1%
	Low burnout Cutoff <5	**Moderate burnout Cutoff 6–12**	**High burnout Cutoff >12**
MBI Depersonalization	47.1%	35.3%	17.6%
	Low burnout Cutoff >40	**Moderate burnout Cutoff 36–39**	**High burnout Cutoff <36**
MBI Personal accomplishment	28.4%	29.4%	42.2%

MBI, Maslach burnout inventory.

Hierarchical Cluster Analysis and One-Way ANOVAs

As a first step, a hierarchical Cluster Analysis using Ward's method was run. We then adopted the squared Euclidean distance to determine profiles of participants according to their *z* scores on each subscale of the MBI (Hair et al., 2009; Berjot et al., 2017). The hierarchical Cluster Analysis suggested a four-cluster solution as shown by an examination of the dendrogram. The Bayesian Index Criterion (Schwarz, 1978) confirmed the four-cluster solution, as the lowest value was observed for this solution. In a second step, to validate the four-cluster solution, a k-mean Cluster Analysis on the numbers of clusters emerging in the hierarchical Cluster Analysis was run (Blashfield and Aldenderfer, 1988; Ransom and Fisher, 1995).

As shown in **Figure 1**, Cluster 1 (labeled "Medium Risk Burnout" profile, $N = 30$) included GPs who had relatively high levels of emotional exhaustion but medium depersonalization and personal accomplishment. Cluster 2 ("High Burnout" profile, $N = 6$) included GPs who had concomitantly high levels of emotional exhaustion and depersonalization and medium levels of personal accomplishment. Cluster 3 ("High Risk Burnout" profile, $N = 25$) was characterized by moderate levels of emotional exhaustion and depersonalization but also very low levels of personal accomplishment. Finally, Cluster 4 ("Low Burnout" profile, $N = 41$) was characterized by low levels of emotional exhaustion and depersonalization and a moderate level of personal accomplishment.

Means and SD for each dimension of the MBI scale according to the clusters were reported in **Table 3**.

Finally, we ran a series of one-way ANOVAs with clusters as an independent variable and each dimension – CISS, IU, and Resilience – as a dependent variable. As shown in **Table 4**, significant differences emerged on CISS Task-oriented ($F = 9.49$, $p = 0.00$) and Emotion-Oriented ($F = 16.78$, $p = 0.00$). Specifically, Bonferroni *post hoc* analysis showed lower levels of CISS Task-oriented coping in High Risk GPs compared to both

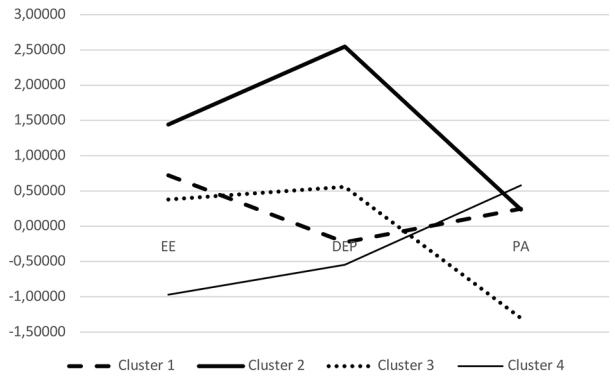

FIGURE 1 | Plot of means for each variable according to clusters. Cluster 1, medium risk burnout; Cluster 2, high burnout; Cluster 3, high risk burnout; Cluster 4, low burnout.

TABLE 3 | Mean scores and standard deviations for each dimension of the MBI scale according to clusters.

	N	Mean	SD
Emotional exhaustion			
Medium Risk Burnout	30	0.72	0.57
High Burnout	6	1.44	0.60
High Risk of Burnout	25	0.38	0.62
Low Burnout	41	−0.97	0.51
Depersonalization			
Medium Risk Burnout	30	−0.23	0.62
High Burnout	6	2.55	0.78
High Risk of Burnout	25	0.56	0.71
Low Burnout	41	−0.55	0.60
Personal accomplishment			
Medium Risk Burnout	30	0.25	0.62
High Burnout	6	0.24	0.92
High Risk of Burnout	25	−1.30	0.48
Low Burnout	41	0.58	0.73

Medium Risk (p = 0.05) and Low Burnout GPs (p = 0.05); higher levels of CISS Emotion-Oriented in High Burnout GPs compared to all the other groups (always p = 0.05). Regarding Resilience, higher levels emerged in Medium Risk GPs than in High Risk GPs (p = 0.05) and in Low Burnout than in High Risk (p = 0.05). Finally, higher levels of IU Prospective emerged in High Risk GPs than in Low Burnout (p = 0.05), and higher levels of IU Inhibitory were found in High Burnout GPs compared to both Medium Risk and Low Burnout GPs (always p = 0.05).

Correlational Analysis

Pearson correlational analyses were carried out to explore relationships between burnout subscales and sociodemographic characteristics. A correlation between MBI Depersonalization and age (r = −0.300, p = 0.002) and years of work experience (r = −0.283, p = 0.004) emerged, whereas no significant relationships were found for the gender and burnout dimensions.

Regarding the relationships between burnout and coping dimensions (**Table 5**), Pearson correlation analysis showed that MBI Emotional Exhaustion scale was positively correlated with CISS Emotion-oriented (r = 0.495, p = 0.001) and negatively with CISS Task-oriented (r = −0.247, p = 0.012); MBI Depersonalization scale correlated positively with CISS Emotion-Oriented (r = 0.522, p = 0.001) and Avoidance-oriented (r = 0.233, p = 0.019) and negatively with CISS Task-oriented (r = −0.221, p = 0.025); MBI Personal Accomplishment scale was correlated negatively with CISS Emotion-oriented (r = −0.312, p = 0.001) and positively with CISS Task-oriented (r = 0.590, p = 0.001).

Regarding the Resilience scale (**Table 5**), the analysis highlighted a significant positive correlation with the MBI Personal Accomplishment score (r = 0.686, p = 0.001) and a negative correlation with MBI Emotional Exhaustion (r = −0.247, p = 0.012) and Depersonalization (r = −0.200, p = 0.044).

Finally, the relationships between Burnout dimensions and Intolerance of Uncertainty (IU) subscales were explored (**Table 5**). MBI Emotional Exhaustion was correlated with IU Prospective and Inhibitory (respectively, r = 0.279, p = 0.005; r = 0.305, p = 0.002); MBI Depersonalization was positively correlated with IU Prospective (r = 0.232, p = 0.019); MBI Personal Accomplishment, on the other hand, was negatively correlated with IU Prospective and IU Inhibitory (respectively, r = −0.267, p = 0.007; r = −0.265, p = 0.007).

Regression Analysis

Since significant correlations between each dimension of burnout and participants' psychological and sociodemographic features emerged, three multiple linear regression models were performed to investigate possible predictors of MBI Emotional Exhaustion, Depersonalization, and Personal Accomplishment measures.

The first model of linear regression with MBI Emotional Exhaustion as the dependent variable and Resilience, CISS Emotion-oriented and Task-oriented, and IU Prospective as predictors was significant. The model predicted 27% of BMI Emotional exhaustion (R^2 = 0.274; adjusted R^2 = 0.244; p < 0.001) with only CISS Emotion-oriented scores found to be a significant predictor (beta = 0.461; p < 0.001).

A linear regression analysis having MBI Depersonalization as the dependent variable and age, resilience, all dimensions of CISS (Task-oriented, Emotion-oriented, and Avoidance-oriented), and IU Prospective as predictors was run. This model was significant and predicted 36% of MBI Depersonalization scores (R^2 = 0.365; adjusted R^2 = 0.318; p < 0.001); age and CISS Task-oriented and Emotion-oriented emerged as significant predictors (respectively, beta = 0.183, p = 0.034; beta = −0.298, p = 0.023; beta = 0.496, p < 0.001).

The last model of linear regression with MBI Personal Accomplishment as a dependent variable and Resilience, IU Inhibitory, and CISS Task-oriented and Emotion-oriented as predictors was run. This model was significant and predicted 51% of MBI Personal Accomplishment

TABLE 4 | One-way ANOVAs between cluster profiles on coping styles, resilience, and intolerance of uncertainty.

	Medium Risk Burnout		High Burnout		High Risk Burnout		Low Burnout			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F	p
CISS Task-oriented	63.03	8.31	61.67	11.78	55.28	9.10	66.34	6.94	9.49	0.00
CISS Emotion-oriented	38.47	9.44	58.83	14.62	45.60	8.05	32.98	10.51	16.78	0.00
CISS Avoidant-oriented	43.40	10.74	56.17	13.89	44.52	9.98	45.83	10.88	2.41	0.07
Resilience	77.43	10.16	74.83	18.08	65.00	12.77	81.46	7.68	12.94	0.00
IU Prospective	22.33	6.94	25.83	6.77	24.48	5.21	19.98	6.28	3.49	0.02
IU Inhibitory	10.57	5.10	17.00	5.83	11.76	4.54	9.02	4.09	5.96	0.00

CISS, coping inventory for stressful situations; IU, intolerance of uncertainty.

TABLE 5 | Correlation between burnout dimension and psychological features.

	CISS Emotional	CISS Task	CISS Avoidance	Resilience	IU Prospective	IU Inhibitory
MBI Emotional Exhaustion	0.495**	–0.247*	0.041	–0.247*	0.279**	0.305**
MBI Depersonalization	0.522**	–0.221*	0.233*	–0.200*	0.232*	0.192
MBI Personal accomplishment	–0.312**	0.590**	0.136	0.686**	–0.267**	–0.265**

*MBI, Maslach burnout inventory; CISS, coping inventory for stressful situations; Task, task-oriented coping; Emotional, emotion-oriented coping; Avoidance, avoidance-oriented coping; IU, intolerance of uncertainty. *$p < 0.05$; **$p < 0.001$.*

(R^2 = 0.512; adjusted R^2 = 0.486; $p < 0.001$) and showed that only Resilience was a predictor of MBI Personal Accomplishment (beta = 0.500; $p < 0.001$).

DISCUSSION

This research explored the relationships among psychological phenomena (coping, resilience, and perception of uncertainty) and Burnout among GPs in Italy. The extraordinary impact of the COVID-19 emergency on GPs, as frontline medical providers, was in part produced by the uncertainty of the procedures and treatments required and the immediate saturation of hospitals for critical case management. GPs had to respond directly to a huge number of requests without clear prevention or screening instruments. All these aspects affected the GPs, who, according to the MBI cutoff, simultaneously showed high perception of competence and productivity (the 28.4% of the sample had a high level of Personal Accomplishment at the MBI) and a reduction in emotional resources (the 46.1% had a high level of Emotional Exhaustion). In addition to a classification of participants according to existing cutoff scores, we utilized an alternative technique, cluster analysis, which provides criteria specific to the population under study. This choice allowed us to rise above "all or nothing" conceptualizations (i.e., people suffer from burnout or they do not) and to identify subgroups of burnout according to the individual experience of work (Berjot et al., 2017). It also allowed for the identification of specific groups or at-risk groups, which may enable the selection and the deployment of specific prevention and intervention programs (Clatworthy et al., 2005). The cluster analysis showed four different profiles, labeled "Low Burnout," "High Burnout," "Medium Risk Burnout," and "High Risk Burnout."

Results partially confirmed the cutoff categorization, showing 40% of the sample in the Low Burnout profile and only about 5% in the High Burnout profile.

Cluster analysis allows for a more qualitative reading using burnout scales. It highlighted two risk profiles: a "Medium Risk Burnout" cluster (30% of the sample) and a "High Risk of Burnout" cluster (25% of the sample). Those two groups cannot be classified as suffering burnout, but they emerged by cluster analysis as groups that can be described as being "at risk of burnout," composed of professionals who may 1 day suffer burnout if environmental demands and threats remain high while resources remain low. Specifically, the "Medium Risk Burnout" profile included GPs who had relatively high levels of emotional exhaustion but medium depersonalization and personal accomplishment while the "High Risk Burnout" profile was characterized by moderate levels of emotional exhaustion and depersonalization but very low levels of personal accomplishment. In this last case, the gratification that work

can offer cannot act as a personal resource, protecting against the risk of depersonalization and emotional exhaustion. Comparing all four groups strengthens this observation, highlighting that the high risk group showed lower resilience and did less task-oriented coping than the medium risk group and demonstrated more need for control than the low burnout group. These specific characteristics can be used as indications for differentiated interventions in support of GPs, focusing and intervening on specific pandemic reaction patterns. Moreover, the group with high burnout was characterized by higher use of emotional strategies to reduce stress than the other three groups and higher avoidance of uncertainty, as well as paralysis in the face of it.

Starting from these first analyses, and from the correlations' results, the regressions were performed in order to examine which psychological features predicted burnout levels. Results showed, according to the previous comparison between burnout profiles, that depletion of the emotional resources was related to emotion-oriented coping, so the activation of emotional strategies was associated with a less functional response to the emergency. These data are probably affected by the fact that GPs' activities were limited by lockdown rules and the impossibility of using concrete clinical findings to manage patients' symptoms and disease progression, relying instead on patient reports of their subjective experiences. Emotion-oriented coping is strictly related to a higher sense of responsibility to solve other problems (i.e., I blame myself for not knowing what to do) and take care of the situation, so the missing doctor-patient relationship and the absence of medical protocols generated a higher sense of inefficacy and frustration in the immediate reactions to the pandemic. Moreover, it is possible that GPs did not have the resources to experience and process the intense emotional reactivity linked to the pandemic, and to the perception of the risk of being infected, at least in the immediate emergency. This may have left many of them with intense, unregulated emotions, which could interfere with professional response.

This hypothesis is supported by the results related to the Depersonalization scale of the MBI that was predicted by high levels of Emotion-oriented coping and low levels of Task-oriented coping. The primary resource to avoid the tendency of viewing coworkers and clients as dehumanized objects seemed to be the task-oriented coping that, consistent with previous research, represented a proactive and concrete response to stress (Chang and Chan, 2015; Lall et al., 2019). In a highly stressful situation like the COVID-19 emergency, emphasizing a task-oriented action, planning, and problem-solving, rather than an emotion-oriented strategy, appears to be a more effective way to provide care without depersonalization. It is also important to note that depersonalization was the only variable related to age and years of work experience; this finding is supported by the literature (Lim et al., 2010), where a longer period of exposure to suffering tends to generate more depersonalization. The years of work variable was found to have the most significant positive correlations to Burnout (Iglesias et al., 2010). This finding is important to take into consideration in understanding any GP turnover that may follow this traumatic situation, as well as in simply understanding the impact of the pandemic on GPs. On the basis of these results, it would be appropriate for medical systems in Italy and beyond to develop programs for preventing and treating burnout syndromes in GPs.

The findings in this paper contribute to our field's understanding of the benefits and drawbacks of coping strategies focused on emotions or on problem-solving, which appear to be dependent on context. Understanding that in the context of a crisis like a pandemic, problem-solving strategies may do more to prevent burnout and depersonalization among medical professionals and can help to tailor training and preparation for these frontline providers in the future.

Furthermore, it is clear from these results that Resilience has an important role: it is a significant predictor of burnout Personal Accomplishment, according to the literature (Taku, 2014; Kutluturkan et al., 2016). Resilience is a person's ability to manage his or her sense of responsibility in an unfamiliar and chaotic situation like the COVID-19 pandemic and can have a meaningful impact on his or her capacity to work effectively. In fact, resilience – defined as a person's capacity for or produced outcome of successful adaptation despite challenging or threatening circumstances (Masten et al., 1990) – is positively correlated with feelings of competence, productivity, and success. Moreover, our findings showed that the High Risk Burnout group had lower scores in Resilience than all other groups, suggesting that this feature is important to prevent burnout. The fact that GPs' capacity for resilience in the present pandemic situation is connected in this research with their sense of work efficacy suggests that resilience may be an important part of professional identity in the medical field, as may be the case for a general belief in medical practice, even when immediate solutions and pharmacological cures fall short.

Finally, the perception of the COVID-19 pandemic as an unpredictable situation was analyzed using an assessment scale (Intolerance of Uncertainty Scale) that revealed two factors as principal reactions to uncertainty: the desire for predictability and uncertainty paralysis (Hong and Lee, 2015). Although the scales were not significant predictors of burnout in the regression analyses, they were positively correlated with emotional exhaustion and negatively correlated with personal accomplishment. The unpredictable situation and unfamiliar scenarios had a strong impact on emotional distress and raised psychological defenses. We can speculate that chaotic situations and constantly changing protocols affected self-efficacy and made a direct impact on GPs' personal and emotional lives.

There are several limitations inherent in the present study. First, since the COVID-19 pandemic affected regions of Italy in different ways, it would be interesting to have a larger sample to be able to verify whether the relationships between burnout and psychological characteristics are different depending on the severity of the health emergency in any given region. A second limitation involves the absence of a control group, which would be useful in future investigations for performing comparative analysis. Hospital staff, rather

than other emergency management personnel (such as the army force), could represent a comparison group. This would allow for the identification of specific stress reaction patterns in the different groups. In addition, long-term follow-up to collect further data on GPs' health status would help to verify the predictive role of burnout on the long-term psycho-physical health of participants.

In conclusion, the results of this study showed an impact on GPs' work management during the COVID-19 emergency. Implementing task-oriented problem management, rather than emotional strategies, appears to protect against burnout. It is possible that the emotions related to the pandemic are too intense to be regulated and used in order to manage the professional issues that the COVID-19 pandemic involves. Moreover, these results support the need to organize both training and psychological interventions for GPs, with the aim of providing them with greater skills in emotional regulation in general and, over the course of an emergency, supporting their capacity to process intense emotional experiences, which can impact the quality of medical work.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics Committee of Department of Dynamic and Clinical Psychology, University of Rome, Sapienza. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

CDM contributed to all the phases of the study. SM participated in research design development, in results interpretation, and in writing and editing the manuscript. RM participated in results interpretation and in writing the manuscript. MDT participated in research design. All authors contributed to the article and approved the submitted version.

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Mental Health Through the COVID-19 Quarantine: A Growth Curve Analysis on Italian Young Adults

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Introduction: Health emergencies, such as epidemics, have detrimental and long-lasting consequences on people's mental health, which are higher during the implementation of strict lockdown measures. Despite several recent psychological researches on the coronavirus disease 2019 (COVID-19) pandemic highlighting that young adults represent a high risk category, no studies specifically focused on young adults' mental health status have been carried out yet. This study aimed to assess and monitor Italian young adults' mental health status during the first 4 weeks of lockdown through the use of a longitudinal panel design.

Methods: Participants (n = 97) provided self-reports in four time intervals (1-week intervals) in 1 month. The Syndromic Scales of Adult Self-Report 18-59 were used to assess the internalizing problems (anxiety/depression, withdrawn, and somatic complaints), externalizing problems (aggressive, rule-breaking, and intrusive behavior), and personal strengths. To determine the time-varying effects of prolonged quarantine, a growth curve modeling will be performed.

Results: The results showed an increase in anxiety/depression, withdrawal, somatic complaints, aggressive behavior, rule-breaking behavior, and internalizing and externalizing problems and a decrease in intrusive behavior and personal strengths from T1 to T4.

Conclusions: The results contributed to the ongoing debate concerning the psychological impact of the COVID-19 emergency, helping to plan and develop efficient intervention projects able to take care of young adults' mental health in the long term.

Keywords: coronavirus disease 2019, quarantine, young adult, mental health, Achenbach adult self-report, internalizing/externalizing problems, growth model

INTRODUCTION

The novel coronavirus disease 2019 (COVID-19) is a highly infectious disease that began as a viral pneumonia in late December 2019. In March 2020, the World Health Organization (WHO) declared the state of pandemic.

As rapidly pointed out (Fiorillo and Gorwood, 2020; Jakovljevi et al., 2020), the COVID-19 global pandemic has affected—and is still affecting—not only physical health but also individual, family, and collective mental health. In line with recent studies (Horesh and Brown, 2020; Masiero et al., 2020), the COVID-19 pandemic should be classified as a critical event with a potential traumatic nature, which may be overwhelming and could lead to complex emotional responses that can negatively affect individuals and collective psychological systems.

Starting with China and followed by other states, extraordinary measures and containment efforts (e.g., lockdown) aimed to prevent the high risk of contagion and limit the COVID-19 outbreak have been adopted. In Europe, Italy was the first country that had to face the pandemic. Here, on March 09, 2020, strict lockdown measures were imposed by the government. A series of decrees imposed restrictions on the movements of individuals in the entire national territory from March 10 until May 3. During the lockdown, people were allowed to leave their homes only for limited and documented purposes. Schools, universities, theaters, and cinemas, as well as any shops selling non-essential goods were, therefore, temporarily closed.

As previous studies demonstrated (Tucci et al., 2017), health emergencies, such as epidemics, have detrimental and long-lasting consequences on people's mental health. Concerning the COVID-19 pandemic, initial studies carried out in China reported high levels of anxiety, depression, and trauma-related symptoms (Qiu et al., 2020), both during the epidemic peak and 1 month later (Wang et al., 2020). Moreover, the detrimental effect of epidemics on mental health seems to be higher during the implementation of strict lockdown measures. Specifically, previous studies have associated quarantine with higher levels of trauma-related disorders (Wu et al., 2009), depression (Hawryluck et al., 2004), irritability and insomnia (Lee et al., 2005), acute stress (Bai et al., 2004), and avoidance behaviors and anger (Marjanovic et al., 2007). In a recent review, Brooks et al. (2020) individuated major stress factors as being the long duration of quarantine, the fear of infection, the inadequate supplies and information, boredom, and frustration. In a recent Italian study carried out during the third week of lockdown, Cellini et al. (2020) have highlighted that Italians reported high levels of depression, anxiety, and sleep disturbances. Similarly, Rossi A. et al. (2020) have found that high rates of negative mental health outcomes were seen in the general population 3 weeks into the COVID-19 lockdown.

Within the stream of research investigating the impact of quarantine during epidemics on individual's mental health, there have been very few longitudinal investigations aimed at understanding and monitoring the changes in the mental health status during quarantine (Brooks et al., 2020). Where longitudinal research designs were carried out, they were limited to investigating people's mental health during and after quarantine (Jeong et al., 2016; Wang et al., 2020).

Recent psychological research on COVID-19 has also highlighted that specific target groups are more at risk than others to develop a wide variety of psychological problems, such as medical workers, marginalized people (i.e., homeless and migrants), and young adults. Regarding young adults (18–30 years old), recent researches have highlighted that they present higher levels of anxiety, distress, and depression than do other adult groups (Cao et al., 2020; Huang and Zhao, 2020; Qiu et al., 2020). These findings have also been confirmed in Italy (Rossi R. et al., 2020). According to Cheng et al. (2014), one of the possible reasons can be found in young adults' tendency to obtain information from social media, which can represent a high stress factor for mental health. These initial findings strongly suggest the need to assess and monitor young adults' psychological situation during the epidemic and the weight of their mental health outcomes. To the best of the authors' knowledge, there are no previous studies specifically aimed at evaluating the impact of lockdown measures on Italian young adults' mental health and monitor the changes in their mental health status.

To fill this gap, the current study presents a longitudinal panel design aimed to assess the Italian young adults' mental health status and monitor their mental health trends during the firsts 4 weeks of lockdown imposed from the Italian government during the COVID-19 outbreak. On the basis of recent literature on the general population, an increase in mental health problems among young adults during quarantine was hypothesized.

MATERIALS AND METHODS

Participants

Participants were enrolled online and provided self-reports over 1 month (1-week intervals, T1–T2–T3–T4). Participants were considered eligible for participation if they met the following inclusion criteria: (a) were between 19 and 29 years and (b) were in a lockdown condition. Exclusion criteria were as follows: (a) diagnosis of psychiatric disorder and/or psychopharmacological treatment (assessed with filter questions in the survey) and (b) not "absolute" lockdown condition (workers who were allowed to work outside their home during the lockdown measures).

From the initial sample size of T1 (N = 120), nine participants did not participate at T2 (N = 111); four other participants did not participate at T3 (N = 107); and 10 other participants did not participate at T4. These participants were, therefore, excluded from the data analysis. The final simple-size was composed of 97 participants.

Procedure

Approval from the University Research Ethics Committee was obtained for collecting data. Data collection took place during the Italian lockdown from mid-March 2020 to mid-April 2020. The administration took place in four time intervals (1-week intervals) in 1 month. The first survey (T1) was made at the end of the first week of lockdown. The second survey (T2) coincided with the end of the second week of the lockdown. The third

survey (T3) coincided with the end of the third week of the lockdown. The fourth survey (T4) coincided with the end of the fourth week of the lockdown.

Participants were informed about a complete guarantee of confidentiality and the voluntary nature of participation and their right to discontinue at any point. The enrollment procedure was carried out through an online advertising on social platforms. Participants voluntarily accessed the online platform used for data collection once a week for the 4 weeks of administration. To ensure anonymity, a request was made to create a personal identification code to be used for the four administrations.

Measures

Adult Self-Report (ASR/18-59)

The Syndromic Scales of Adult Self-Report 18-59 (Achenbach and Rescorla, 2003) were used to assess the internalizing and externalizing problems.

The ASR is especially valuable when used routinely, as in this study design. The ASR norms provide a standardized benchmark with which to compare what is reported by each individual. Standardized reassessments over a regular interval enable to identify reported stabilities and changes in a group who have particular kinds of problems. In this case, the ASR instrument was administered at regular intervals of 1 week for 4 weeks in the period of the Italian lockdown. The ASR was developed both to document specific problems and to identify syndromes of co-occurring problems. In this study, six specific Syndromic Scales, Anxious/Depressed, Withdrawn, Somatic Complaints, Aggressive Behavior, Rule-Breaking Behavior, and Intrusive were used. Anxious/Depressed (18 items) refers to anxiety and depressive symptoms (e.g., "I feel lonely" and "I am too fearful or anxious"). Withdrawn (8 items) mainly refers to attitudes of isolation and lack of contact with others (e.g., "I don't get along with other people" and "I keep from getting involved with others"). Somatic Complaints (12 items) include physical illness, without a known medical cause (e.g., "I feel dizzy or lightheaded" and "Physical problems without a known medical cause: stomachaches"). Aggressive Behavior (15 items) includes behaviors and attitudes characterized by poor control of one's aggression (e.g., "I blame others for my problems" and "I scream or yell a lot"). Rule-Breaking Behavior (14 items) refers to transgressive behavior and violation of social norms (e.g., "I am impulsive or act without thinking" and "I lie or cheat"). Intrusive (6 items) refers to the difficulty faced in the interpersonal relationships and to the prevalence of intrusive behavior (e.g., "I damage or destroy my things" and "I drink too much alcohol or get drunk"). In addition, the broadband scales, Internalizing and Externalizing, were computed. Internalizing problems reflect internal distress, while externalizing problems reflect conflicts with other people. The Internalizing scale consists of the syndrome scales Anxious/Depressed, Withdrawn, and Somatic Complaints, whereas the Externalizing scale consists of Aggressive Behavior and Rule-Breaking Behavior. Moreover, the scale of Personal Strengths (11 items) was used to assess the adaptive functioning of the individuals (e.g., "I try to get a lot of attention" and "I am louder than others").

The items are scored on a three-point rating scale: 0 (*not true*), 1 (*somewhat or sometimes true*), and 2 (*very true or often true*); and a total score may be calculated. Higher raw scores indicate more problematic behaviors on each scale. Then, a normalized *T* score—weighted for sex and age—was assigned for the Syndromic Scales and to each Internalizing and Externalizing Problem scales. Raw scores of the both types of scales have been quantitatively converted in terms of gender- and age-specific *T* scores. Clinical significant threshold is indicated by *T*-scores $\geq$ 70. Borderline range is from 65 to 69.

The ASR is a reliable and valid measure for the 18–59 general population (Achenbach and Rescorla, 2003). Cronbach's alpha (α) and McDonald's omega (ω) are reported in **Table 1**.

Data Analysis

Statistical analyses were performed with R software (v. 3.5.3; R Core Team, 2014, 2015) and the following packages: psych (v. 1.8.12; Revelle, 2018), irr (v. 0.84.1; Gamer et al., 2019), lme4 (v.1.1-21; Bates et al., 2015), lmerTest (v. 3.1-2; Kuznetsova et al., 2017), esvis (v. 0.3.1; Anderson, 2020), AICcmodavg (v2.3-0; Mazerolle, 2020), and ggplot2 (v. 3.1.0; Wickham, 2016).

No data were missing for any of the participants on any of the ASR scales at any of the measurement points. Reliability was evaluated by internal consistency analysis, using Cronbach's alpha (α) and McDonald's omega for categorical data (ω).

First, the mean differences between the four time intervals (T1, T2, T3, and T4) were performed. The unbiased sample estimate of standardized mean difference effect sizes (Hedges' *g*; Hedges, 1981) was performed, evaluating the magnitude of these differences. The following established ranges guide interpreting standardized mean difference magnitude: from 0.20 to 0.49 = small; from 0.50 to 0.79 = medium; and 0.80 = large (Cohen, 1988).

Growth curve analysis (GCA) models were used to estimate the growth trajectories (i.e., slopes) of the Syndromic Scales of the ASR—both Internalizing and Externalizing scales—and the personal strength scale. Models also estimated subject variability in change across time, as represented in random-intercepts coefficients. Parameters in each GCA model were computed with maximum likelihood (ML) estimation.

Several models were estimated for each of the outcome variables, separately. Specifically, it was hypothesized that the time (the week of quarantine) could have had an effect on the ASR Syndromic Scales. In addition, it was also hypothesized that covariates, such as sex and the experience of COVID-19 (EXP-CVD19), intended as the experience of direct proximity with relatives and/or friends affected by COVID-19, could have had an effect on the shape of the growth curve across time. Models were sequentially specified according to the guidelines (Long, 2012; Grimm et al., 2017). *First*, a null model was estimated to provide a baseline comparison and to calculate the intraclass correlation coefficient (Model 0—Intercept only). *Second*, a null model with covariates was specified (Model 1—Intercept model with covariates). *Third*, a linear model with time as predictor and covariate interactions was estimated (Model 2—Linear model with covariates). *Fourth*, a quadratic model was specified with linear interaction effects of the covariates (Model 3—Quadratic

TABLE 1 | Mean, standard deviation, reliability coefficients, and effect size (|g|) for each time comparison.

		Descriptive		Reliability		Time comparison (Hedge's *g*)			
		M	***SD***	α	ω	**T1**	**T2**	**T3**	**T4**
Anxious/depressed									
1	T1	58.40	8.61	0.88	0.91	–			
2	T2	61.82	9.39	0.88	0.90	0.38	–		
3	T3	70.64	15.28	0.94	0.96	0.98	0.69	–	
4	T4	69.34	13.70	0.92	0.93	0.95	0.64	0.09	–
Withdrawn									
1	T1	58.82	9.23	0.81	0.87	–			
2	T2	59.23	9.17	0.80	0.86	0.26	–		
3	T3	65.70	15.67	0.93	0.95	0.69	0.50	–	
4	T4	66.64	15.53	0.91	0.93	0.76	0.58	0.06	–
Somatic complaints									
1	T1	55.16	6.75	0.72	0.80	–			
2	T2	57.72	8.46	0.77	0.82	0.33	–		
3	T3	58.36	8.40	0.81	0.86	0.42	0.08	–	
4	T4	58.26	8.44	0.81	0.87	0.40	0.06	0.01	–
Aggressive behaviors									
1	T1	55.29	6.43	0.90	0.89	–			
2	T2	57.61	7.12	0.87	0.91	0.34	–		
3	T3	61.33	10.74	0.91	0.95	0.68	0.41	–	
4	T4	61.33	10.66	0.91	0.94	0.68	0.41	0.00	–
Rule-breaking behavior									
1	T1	53.61	5.01	0.68	0.75	–			
2	T2	54.62	6.82	0.82	0.87	0.17	–		
3	T3	57.22	6.20	0.65	0.79	0.17	0.40	–	
4	T4	57.60	6.25	0.64	0.78	0.72	0.45	0.06	–
Intrusive									
1	T1	54.80	6.48	0.75	0.84	–			
2	T2	54.87	6.09	0.64	0.81	0.01	–		
3	T3	53.27	4.55	0.65	0.71	0.27	0.30	–	
4	T4	53.23	4.25	0.63	0.68	0.28	0.31	0.01	–
Internalizing scales									
1	T1	55.33	11.32	0.91	0.93	–			
2	T2	60.32	10.62	0.91	0.93	0.45	–		
3	T3	67.26	13.01	0.65	0.75	0.97	0.58	–	
4	T4	66.95	12.20	0.78	0.88	0.98	0.58	0.02	–
Externalizing scales									
1	T1	51.71	9.14	0.87	0.90	–			
2	T2	54.44	9.76	0.90	0.92	0.29	–		
3	T3	58.26	9.02	0.88	0.92	0.72	0.40	–	
4	T4	58.41	9.03	0.85	0.90	0.74	0.42	0.02	–
Personal strengths									
1	T1	16.79	2.64	0.66	0.70	–			
2	T2	16.08	2.68	0.65	0.75	0.27	–		
3	T3	15.30	4.02	0.85	0.90	0.44	0.23	–	
4	T4	15.10	2.40	0.83	0.89	0.67	0.38	0.06	–

model with linear covariates interactions). *Fifth*, a quadratic model was specified with all possible interactions of the covariates (Model 4—full quadratic model with covariates). Equations of each model are reported in **Table 2**.

The best model fit was assessed with several indices. First of all, the likelihood ratio test (LRT) was performed between one model and the following one in a step-up approach analysis: Model 0 vs. Model 1; Model 1 vs. Model 2; Model 2 vs. Model 3; and Model 3 vs. Model 4—the most parsimonious model will be preferred (Long, 2012). In addition, also "information criteria" indices were computed by comparing the abovementioned models. First, the Schwarz Bayesian information criterion (BIC; Schwarz, 1978; Burnham and Anderson, 2002) was calculated: the model with the lower BIC indicated the best model—and it is recommended when model parsimony is overriding (Kadane and Lazar, 2004; Long, 2012). Moreover, considering that the BIC tends to favor simpler model (Long, 2012), the corrected Akaike information criterion (AICc; Akaike, 1973; Azari et al., 2006) was also computed: even in this case, the model with the lower AICc indicated the best model. In addition, considering that—on a theoretical level—the BIC is less desirable for model evaluation than the AICc (Long, 2012), several effect sizes based on the AICc were carried out: (I) the difference of AICc (ΔAICc); (II) the weight of evidence (W_h): given a set of competing models and the unknowable true model, the W_h indicates the probability that a model *h* is the best approximate model (the model with the large W_h is the best-fitting model) (the more probable the model is, the best approximating the model will be to the true model); (III) the evidence ratio (E_h) that expresses the difference—in odds—between the best-fitting model and the first worst-fitting model: the higher the E_h, the more plausible is the best-fitting model.

RESULTS

Preliminary Analysis

Of 97 participants, 48 were male (49.5%) and 49 were female (50.5%). The mean age of the sample was 24.62 (*SD* = 2.88; range = 19–29). A total of 29 participants (29.9%) had experienced proximity with a COVID-19-infected relative or friend. Most of the participants lived with their parents during the quarantine (80.4%). All participants came from the Campania region, in Southern Italy, and attended the university.

Means and standard deviations between the four time intervals (T1, T2, T3, and T4) and the effect size of means difference (Hedges' *g*) are displayed in **Table 1**. The preliminary analysis showed that the increments tended to be small from T1 to T2 for each syndromic scale and breadboard scale (0.45 was the highest value). From T2 to T3, the results highlighted a medium increase for the Anxious/Depressed, Withdrawn, and Internalizing scales. From T3 to T4, the increase was null. For Somatic Complaints, Aggressive Behaviors, Rule-Breaking Behavior, and Externalizing scales, the magnitude of the effect size was medium only considering the increments from T1 to T4. Across the weeks of quarantine, the Somatic Complaints scale increased with an almost null effect. Finally, the Personal Strengths showed a small increase only from T1 to T3 and from T1 to T4.

Scatterplot (**Figure 1**) showing the change of the Syndromic Scales and broadband scales score over time. **Figures 2–5** graphically show means and standard error of the Syndromic

TABLE 2 | Equations of each estimated model.

	Model	Equation
M.0	Intercept only	$y_{ij} = (\beta_0 + b_{0i}) + \varepsilon_{ij}$
M.1	Intercept model with covariates	$y_{ij} = (\beta_0 + b_{0i}) + \beta_1\,(sex_i) + \beta_2\,(experience\ with\ COVID19_i) + \varepsilon_{ij}$
M.2	Linear model with covariates	$y_{ij} = (\beta_0 + b_{0i}) + \beta_1\,(week\ of\ quarantine_{ij}) + \beta_2(sex_i) + \beta_3\,(experience\ with\ COVID19_i) + \beta_4(week\ of\ quarantine_{ij} * sex_i) + \beta_5(week\ of\ quarantine_{ij} * experience\ with\ COVID19_i) + \varepsilon_{ij}$
M.3	Quadratic model with linear covariates interactions	$y_{ij} = (\beta_0 + b_{0i}) + \beta_1\,(week\ of\ quarantine_{ij}) + \beta_2(week\ of\ quarantine_{ij}^2) + \beta_3\,(sex_i) + \beta_4\,(experience\ with\ COVID19_i) + \beta_5\,(week\ of\ quarantine_{ij} * sex_i) + \beta_6\,(week\ of\ quarantine_{ij} * experience\ with\ COVID19_i) + \varepsilon_{ij}$
M4	Quadratic model with all covariates interactions	$y_{ij} = (\beta_0 + b_{0i}) + \beta_1\,(week\ of\ quarantine_{ij}) + \beta_2(week\ of\ quarantine_{ij}^2) + \beta_3\,(sex_i) + \beta_4\,(experience\ with\ COVID19_i) + \beta_5\,(week\ of\ quarantine_{ij} * sex_i) + \beta_6\,(week\ of\ quarantine_{ij} * experience\ with\ COVID19_i) + \beta_7(week\ of\ quarantine_{ij}^2 * sex_i) + \beta_8\,(week\ of\ quarantine_{ij}^2 * experience\ with\ COVID19_i) + \varepsilon_{ij}$

Scales, as well as the related broadband scales, across the weeks of quarantine. Specifically, **Figure 3** was split by sex (males vs. females), and **Figure 4** was split by the experience of COVID-19 (yes vs. no). Finally, **Figure 5** shows the interaction between sex and experience of COVID-19. The broken lines demarcate a borderline clinical range from the 93rd to 97th percentiles for the Syndromic scales and from the 84th to 90th percentiles for the Internalizing and Externalizing broadband scales. Scores above the top broken line, i.e., above the 97th percentile for the Syndromic scales and above the 90th for the Internalizing and Externalizing broadband, indicate that the individual reported enough problems to be of clinical concern. Scores below the bottom broken line is in the normal range. As show in **Figure 2**, the Anxious/Depressed scale is above the clinical threshold in T3, and the Withdrawn scale is above the normal threshold in T3 with an increase in T4.

Anxious/Depressed

Preliminary analyses (M.0) revealed that the variance related to the random intercept of the participants was equal to 24.41.

The null model with covariates (M.1) revealed a non-statistically significant effect of the interaction between sex and EXP-CVD19 ($b = -0.961$, $SE = 3.460$, $t = 0.077$, $p = 0.782$) or their main effects (sex: $b = -0.081$, $SE = 1.891$, $t = -0.043$, $p = 0.966$; EXP-CVD19: $b = 0.191$, $SE = 2.476$, $t = 0.077$, $p = 0.939$).

The linear model with covariates (M.2) revealed a non-statistically significant effect of the interaction between time and EXP-CVD19 ($b = 0.310$, $SE = 1.065$, $t = 0.291$, $p = 0.771$) or the two simple main effects (sex: $b = 4.797$, $SE = 2.908$, $t = 1.649$, $p = 0.099$; EXP-CVD19: $b = -1.076$, $SE = 3.176$, $t = -0.339$, $p = 0.735$). However, the model revealed a statistically significant interaction effect between time and sex ($b = -2.066$, $SE = 0.975$, $t = -2.118$, $p = 0.035$) as well as the principal effect of time ($b = 5.114$, $SE = 0.760$, $t = 6.732$, $p < 0.001$). **Figure 3** shows a greater increase in males from T1 to T2 and from T2 to T3 than in females.

The quadratic model with linear interaction (M.3) showed a non-statistically significant effect of the interaction between time and EXP-CVD19 ($b = 0.310$, $SE = 1.057$, $t = 0.293$, $p = 0.769$) or the two simple main effects (sex: $b = 4.797$, $SE = 2.892$, $t = 1.659$, $p = 0.098$; EXP-CVD19: $b = -1.076$, $SE = 3.156$, $t = -0.341$, $p = 0.734$). However, the model revealed a statistically significant linear interaction effect between time and sex ($b = -2.066$, $SE = 0.967$, $t = -2.125$, $p = 0.033$) as well as the principal effect of time: both linear ($b = 11.016$, $SE = 2.807$, $t = 3.925$, $p < 0.001$) and quadratic ($b = -1.180$, $SE = 0.541$, $t = -2.183$, $p = 0.030$).

Finally, the quadratic model with all covariates interactions (M.4) showed a non-statistically significant effect of the interaction between time and EXP-CVD19, neither linear ($b = 5.1607$, $SE = 5.991$, $t = 0.861$, $p = 0.340$) nor quadratic ($b = -0.970$, $SE = 1.179$, $t = -0.823$, $p = 0.411$). In addition, M.4 showed also a non-statistically significant effect of the interaction between time and sex, neither linear ($b = -4.990$, $SE = 5.485$, $t = -0.910$, $p = 0.364$) nor quadratic ($b = 0.585$, $SE = 1.080$, $t = 0.542$, $p = 0.589$). Furthermore, also the simple main effects of sex ($b = -7.721$, $SE = 6.123$, $t = 1.261$, $p = 0.208$), EXP-CVD ($b = -5.926$, $SE = 6.688$, $t = -0.886$, $p = 0.376$), and time (quadratic term: $b = -1.186$, $SE = 0.841$, $t = -1.410$, $p = 0.160$) revealed a non-statistically significant effect. Only the main effect of time (linear term: $b = 11.043$, $SE = 4.272$, $t = 2.585$, $p = 0.010$) became statistically significant.

The comparison of the different multilevel growth curve models provided ambiguous results. Indeed, M.2 showed the lower BIC, but M.3 showed the lower AICc. The LRT suggested a statistical significant difference between M.3 and M.2 [$\chi^2(1) = 4.726$; $p = 0.030$]. In addition, the ΔAICc suggested a small difference M.3 and M.2 (2.63); the W_h of M.3 suggested that this model had 68% probability of being the best approximate model; and the E_h suggested that M.3 had a weight of evidence almost four times (3.72) greater than that of M.2 of being the best approximate model (**Table 3**).

Withdrawn

Preliminary analyses (M.0) revealed that the variance related to the random intercept of the participants was equal to 38.95.

The null model with covariates (M.1) revealed a non-statistically significant effect of the interaction between sex and EXP-CVD19 ($b = -2.474$, $SE = 3.768$, $t = -0.657$, $p = 0.513$) or their main effects (sex: $b = -0.059$, $SE = 2.059$, $t = -0.029$, $p = 0.977$; EXP-CVD19: $b = -1.441$, $SE = 2.696$, $t = -0.534$, $p = 0.594$).

TABLE 3 | Model comparisons for each ASR scale.

		Log likelihood	LRT: χ^2 (*df*)	*p*-value	BIC	AICc	ΔAICc	W_h
Anxious/depressed								
M.0	Intercept only	−1,542.2			3,102.3	3,090.5	61.06	0.00
M.1	Intercept model with covariates	−1,542.1	0.163 (3)	0.983	3,120.0	3,096.5	67.05	0.00
M.2	Linear model with covariates	−1,507.8	68.581 (2)	<0.001	3,063.4	3,032.1	2.63	0.18
M.3	Quadratic model with linear covariates interactions	−1,505.5	4.726 (1)	0.030	3,064.6	3,029.4	BM	0.68
M.4	Quadratic model with all covariates interactions	−1,505.0	0.955 (2)	0.621	3,075.6	3,032.7	3.27	0.13
Withdrawn								
M.0	Intercept only	−1,546.4			3,110.7	3,098.9	42.44	0.00
M.1	Intercept model with covariates	−1,545.1	2.697 (3)	0.441	3,125.9	3,102.3	45.90	0.00
M.2	Linear model with covariates	−1,520.0	50.064 (2)	<0.001	3,087.7	3,056.4	BM	0.66
M.3	Quadratic model with linear covariates interactions	−1,519.8	0.439 (1)	0.507	3,093.3	3,058.1	1.66	0.29
M.4	Quadratic model with all covariates interactions	−1,519.5	0.686 (2)	0.710	3,104.5	3,061.6	5.20	0.05
Somatic complaints								
M.0	Intercept only	−1,360.3			2,783.5	2,726.7	17.11	0.00
M.1	Intercept model with covariates	−1,359.3	2.031 (3)	0.566	2,754.3	2,730.8	21.24	0.00
M.2	Linear model with covariates	−1,347.1	24.340 (2)	<0.001	2,741.9	2,710.6	1.06	0.32
M.3	Quadratic model with linear covariates interactions	−1,345.5	3.152 (1)	0.076	2,744.7	2,709.6	BM	0.54
M.4	Quadratic model with all covariates interactions	−1,344.8	1.480 (2)	0.477	2,755.2	2,712.3	2.75	0.14
Aggressive behaviors								
M.0	Intercept only	−1,407.7			2,833.2	2,821.4	26.57	0.00
M.1	Intercept model with covariates	−1,407.2	1.009 (3)	0.799	2,850.1	2,826.6	21.72	0.00
M.2	Linear model with covariates	−1,389.2	35.880 (2)	<0.001	2,826.2	2,794.9	BM	0.47
M.3	Quadratic model with linear covariates interactions	−1,388.2	2.077 (1)	0.149	2,830.1	2,794.9	0.02	0.46
M.4	Quadratic model with all covariates interactions	−1,388.0	0.495 (2)	0.781	2,841.5	2,798.6	3.75	0.07
Rule-breaking behaviors								
M.0	Intercept only	−1,260.0			2,537.9	2,526.1	37.00	0.00
M.1	Intercept model with covariates	−1,252.2	15.723 (3)	0.001	2,540.1	2,516.5	27.43	0.00
M.2	Linear model with covariates	−1,236.4	31.591 (2)	<0.001	2,520.4	2,489.1	BM	0.68
M.3	Quadratic model with linear covariates interactions	−1,236.2	0.314 (1)	0.575	2,526.1	2,490.9	1.78	0.28
M.4	Quadratic model with all covariates interactions	−1,236.1	0.271 (2)	0.873	2,537.7	2,494.9	5.74	0.04
Intrusive								
M.0	Intercept only	−1,207.0			2,431.9	2,420.1	1.44	0.23
M.1	Intercept model with covariates	−1,204.6	4.726 (3)	0.193	2,445.1	2,421.5	2.87	0.11
M.2	Linear model with covariates	−1,201.1	7.029 (2)	0.030	2,450.0	2,418.6	BM	0.47
M.3	Quadratic model with linear covariates interactions	−1,201.1	0.010 (1)	0.921	2,455.9	2,420.7	2.09	0.17
M.4	Quadratic model with all covariates interactions	−1,200.9	0.526 (2)	0.769	2,467.3	2,424.4	5.79	0.03
Internalizing scales								
M.0	Intercept only	−1,536.1			3,090.1	3,078.2	65.61	0.00
M.1	Intercept model with covariates	−1,535.9	0.398 (3)	0.941	3,107.6	3,084.0	71.37	0.00
M.2	Linear model with covariates	−1,500.1	71.621 (2)	<0.001	3,047.9	3,016.5	3.91	0.10
M.3	Quadratic model with linear covariates interactions	−1,497.1	6.002 (1)	0.014	3,047.8	3,012.6	BM	0.69
M.4	Quadratic model with all covariates interactions	−1,496.2	1.845 (2)	0.397	3,057.9	3,015.0	2.38	0.21
Externalizing scales								
M.0	Intercept only	−1,427.5			2,872.9	2,861.1	30.32	0.00
M.1	Intercept model with covariates	−1,425.1	4.710 (3)	0.194	2,886.1	2,862.5	31.77	0.00
M.2	Linear model with covariates	−1,407.2	35.908 (2)	<0.001	2,862.1	2,830.8	0.02	0.46
M.3	Quadratic model with linear covariates interactions	−1,406.1	2.113 (1)	0.146	2,865.9	2,830.7	BM	0.47
M.4	Quadratic model with all covariates interactions	−1,405.9	0.491 (2)	0.782	2,877.3	2,834.5	3.73	0.07
Personal strengths								
M.0	Intercept only	−980.8			1,979.5	1,967.6	12.55	0.00
M.1	Intercept model with covariates	−980.1	1.350 (3)	0.717	1,996.0	1,972.4	17.36	0.00
M.2	Linear model with covariates	−969.3	21.515 (2)	<0.001	1,986.4	1,955.1	BM	0.61
M.3	Quadratic model with linear covariates interactions	−968.9	0.848 (1)	0.357	1,991.5	1,956.3	1.25	0.33
M.4	Quadratic model with all covariates interactions	−968.5	0.887 (2)	0.642	2,002.5	1,959.7	4.59	0.06

BM, best model; ASR, adult self-report; LRT, likelihood ratio test; BIC, Bayesian information criterion; AICc, corrected Akaike information criterion; Wh, weight of evidence.

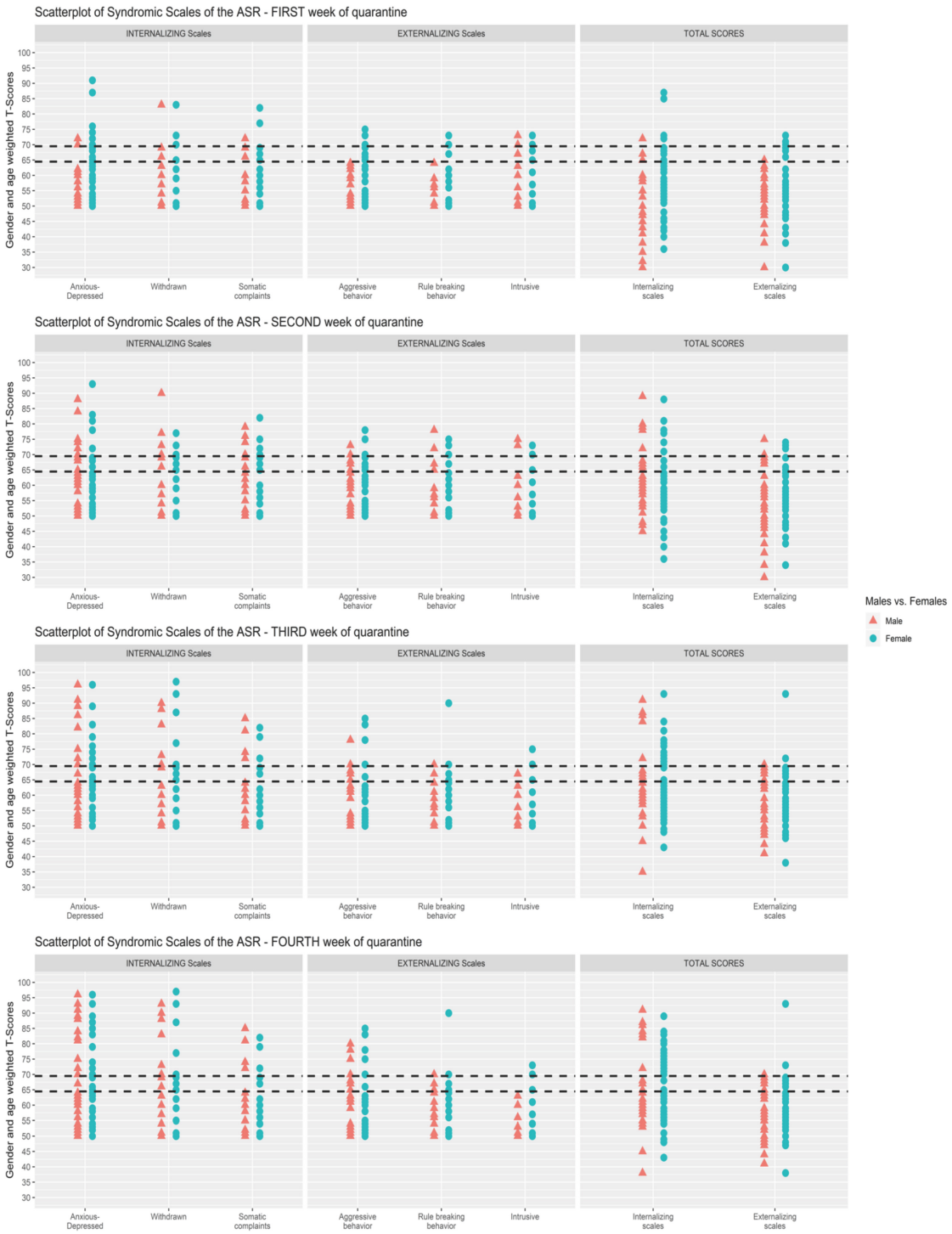

FIGURE 1 | Scatterplot of Syndromic Scales of the Adult Self-Report (ASR) for each week of quarantine.

The linear model with covariates (M.2) revealed a non-statistically significant effect of the interaction between time and EXP-CVD19 (b = 0.925, SE = 1.079, t = 0.858, p = 0.392) or the two simple main effects (sex: b = −3.817, SE = 3.015, t = −1.266, p = 0.206; EXP-CVD19: b = −5.022, SE = 3.292, t = −1.525, p = 0.128). Moreover, the model revealed a non-statistically significant interaction effect between time and sex (b = 1.205, SE = 0.988, t = 1.222, p = 0.222). Only the main effect of time (b = 2.705, SE = 0.769, t = 3.515, p < 0.001) became statistically significant.

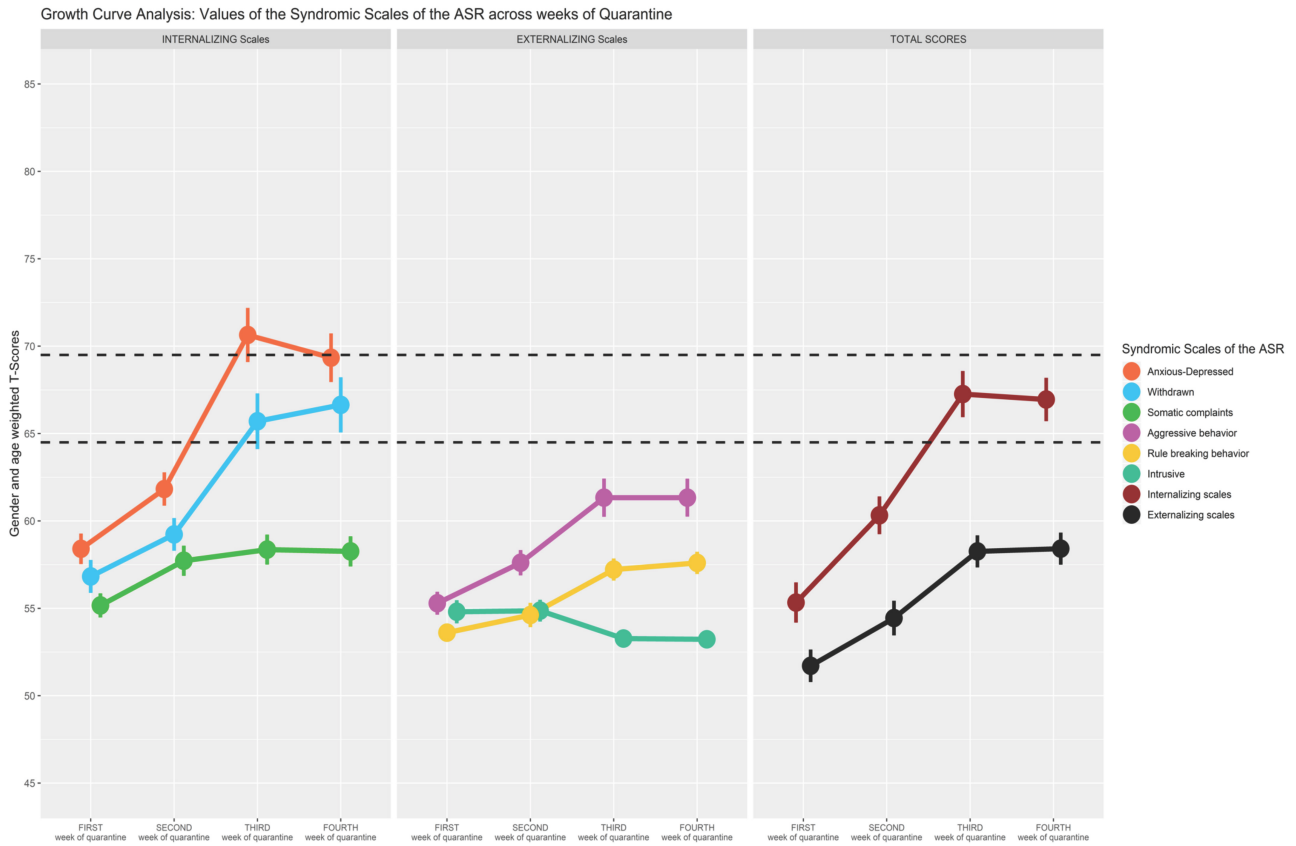

FIGURE 2 | Growth curve analysis: means and standard error of the Syndromic Scale across weeks of quarantine.

The quadratic model with linear interaction (M.3) showed a non-statistically significant effect of the interaction between time and EXP-CVD19 ($b = 0.925$, $SE = 1.078$, $t = 0.858$, $p = 0.391$) or the two simple main effects (sex: $b = 3.817$, $SE = 3.013$, $t = -1.267$, $p = 0.206$; EXP-CVD19: $b = -5.022$, $SE = 3.291$, $t = -1.526$, $p = 0.128$). Moreover, the model revealed a non-statistically significant linear interaction effect between time and sex ($b = 1.207$, $SE = 0.987$, $t = 1.223$, $p = 0.222$) as well as the principal effect of time: both linear ($b = 4.535$, $SE = 2.864$, $t = 1.583$, $p = 0.114$) and quadratic ($b = -0.366$, $SE = 0.552$, $t = -0.663$, $p = 0.508$).

Finally, the quadratic model with all covariates interactions (M.4) showed a non-statistically significant effect of the interaction between time and EXP-CVD19, neither linear ($b = 5.035$, $SE = 6.116$, $t = 0.823$, $p = 0.411$) nor quadratic ($b = -0.822$, $SE = 1.204$, $t = -0.683$, $p = 0.495$). In addition, M.4 showed also a non-statistically significant effect of the interaction between time and sex, neither linear ($b = 3.739$, $SE = 5.600$, $t = -0.669$, $p = 0.505$) nor quadratic ($b = 0.506$, $SE = 1.102$, $t = -0.459$, $p = 0.646$). Furthermore, also the simple main effects of sex ($b = -6.349$, $SE = 6.281$, $t = -1.011$, $p = 0.313$), EXP-CVD ($b = -9.132$, $SE = 6.859$, $t = -1.331$, $p = 0.184$), and time (linear term: $b = 2.027$, $SE = 4.361$, $t = 0.465$, $p = 0.642$, and quadratic term: $b = -0.136$, $SE = 0.859$, $t = 0.158$, $p = 0.875$) revealed a non-statistically significant effect.

The comparison of the different multilevel growth curve models suggested that the linear model with covariates (M.2) showed the lower BIC and the lower AICc. The LRT showed that M.2 was statistically significantly different from M.1 (intercept model with covariates). However, despite that M.2 was not statistically significantly different from M.3, it was the most parsimonious, and thus, it was chosen as the best model. Indeed, the ΔAICc suggested a small difference M.2 and M.3 (1.66), the W_h of M.2 indicates that this model had 66% probability of being the best approximate model, and the E_h suggested that M.2 had a weight of evidence more than two times (2.29) greater than M.3 of being the best approximate model (**Table 3**).

Somatic Complaints

Preliminary analyses (M.0) revealed that the variance related to the random intercept of the participants was equal to 6.25.

The null model with covariates (M.1) revealed a non-statistically significant effect of the interaction between sex and EXP-CVD19 ($b = -0.557$, $SE = 2.019$, $t = -0.276$, $p = 0.783$) or their main effects (sex: $b = 0.169$, $SE = 1.103$, $t = 0.153$, $p = 0.878$; EXP-CVD19: $b = 1.704$, $SE = 1.445$, $t = 1.179$, $p = 0.241$).

The linear model with covariates (M.2) revealed a statistically significant effect of the interaction between time and EXP-CVD19 ($b = 2.714$, $SE = 0.734$, $t = 3.698$, $p < 0.001$), and of the simple main effect of EXP-CVD19 ($b = -5.365$, $SE = 2.094$,

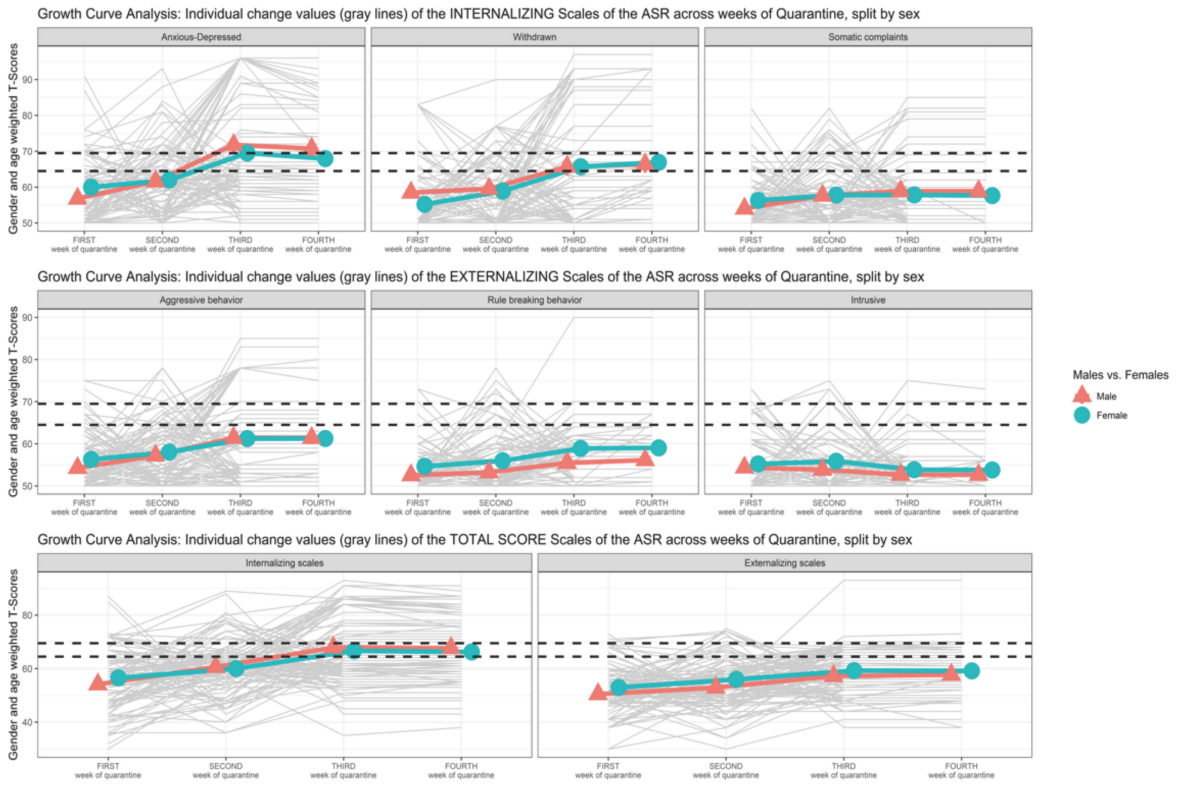

FIGURE 3 | Growth curve analysis (GCA): means and standard error of the Syndromic Scale across weeks of quarantine split by sex.

$t = -2.562$, $p = 0.011$). However, the model revealed a non-statistically significant main effect of sex ($b = 3.049$, $SE = 1.912$, $t = 1.590$, $p = 0.113$). Moreover, the model revealed a non-statistically significant interaction effect between time and sex ($b = -1.219$, $SE = 0.762$, $t = 1.183$, $p = 0.070$) as well as the principal effect of time ($b = 0.796$, $SE = 0.523$, $t = 1.521$, $p = 0.129$). **Figure 4** shows a greater increase from T3 to T4 of the participants with EXP-CVD19.

The quadratic model with linear interaction (M.3) showed a statistically significant effect of the interaction between time and EXP-CVD19 ($b = 2.714$, $SE = 0.729$, $t = 3.718$, $p < 0.001$), and of the simple main effect of EXP-CVD19 ($b = -5.365$, $SE = 2.085$, $t = -2.573$, $p = 0.010$). However, the model revealed a non-statistically significant main effect of sex ($b = 3.049$, $SE = 1.901$, $t = 1.597$, $p = 0.111$). Moreover, the model revealed a non-statistically significant linear interaction effect between time and sex ($b = -1.219$, $SE = 0.668$, $t = 1.823$, $p = 0.069$). The model showed a statistically significant effect of time as linear ($b = 4.121$, $SE = 1.938$, $t = 2.125$, $p = 0.034$) but not as a quadratic term ($b = -0.665$, $SE = 0.373$, $t = 1.780$, $p = 0.076$).

Finally, the quadratic model with all covariates interactions (M.4) showed a non-statistically significant effect of the interaction between time and EXP-CVD19, neither linear ($b = 6.929$, $SE = 4.134$, $t = 1.676$, $p = 0.094$) nor quadratic ($b = -0.843$, $SE = 0.814$, $t = -1.036$, $p = 0.301$). In addition, M.4 showed also a non-statistically significant effect of the interaction between time and sex, neither linear ($b = -3.668$, $SE = 3.786$, $t = -0.969$, $p = 0.333$) nor quadratic ($b = 0.490$, $SE = 0.745$, $t = 0.657$, $p = 0.511$). Furthermore, also the simple main effects of sex ($b = 5.498$, $SE = 4.186$, $t = 1.314$, $p = 0.190$) and time (linear term: $b = 4.098$, $SE = 2.948$, $t = 1.390$, $p = 0.166$, and a quadratic term: $b = -0.660$, $SE = 0.580$, $t = 1.138$, $p = 0.256$) revealed a non-statistically significant effect. However, the model showed a statistically significant effect of EXP-CVD19 ($b = -9.580$, $SE = 4.571$, $t = -2.096$, $p = 0.037$).

The comparison of the different multilevel growth curve models provided unclear results. Indeed, the linear model (M.2) showed the lower BIC, but the quadratic model (M.3) showed the lower AICc. The LRT showed that M.2 was not statistically significantly different from M.3. However, M.2 was the most parsimonious and thus was chosen as best model. Also the effect size indices suggested a negligible preference for M.3 instead of M.2. Indeed, the ΔAICc suggested a very small difference M.2 and M.3 (1.66), the W_h of M.3 suggested that this model had 54% probability of being the best approximate model (W_h of M.2 was 32%), and the Eh suggested that M.3 had a weight of evidence almost two times (1.7) greater than M.2 of being the best approximate model (**Table 3**).

Aggressive Behavior

Preliminary analyses (M.0) revealed that the variance related to the random intercept of the participants was equal to 14.70.

The null model with covariates (M.1) revealed a non-statistically significant effect of the interaction between sex and

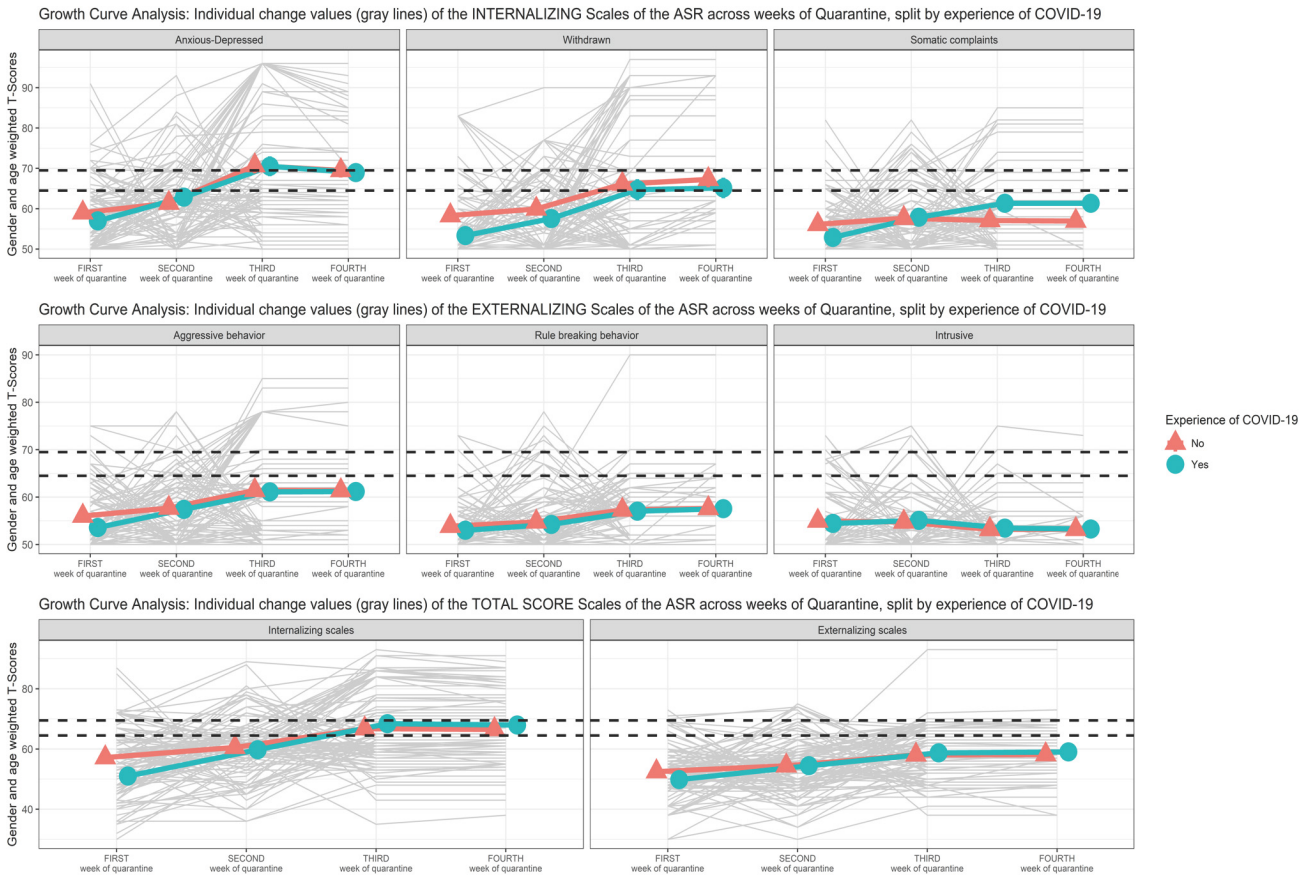

FIGURE 4 | Growth curve analysis (GCA): means and standard error of the Syndromic Scale across weeks of quarantine split by "experience of COVID-19".

EXP-CVD19 ($b = 1.333$, $SE = 2.518$, $t = 0.529$, $p = 0.598$) or their main effects (sex: $b = 0.250$, $SE = 1.376$, $t = 0.182$, $p = 0.856$; EXP-CVD19: $b = -1.507$, $SE = 1.802$, $t = -0.836$, $p = 0.405$).

The linear model with covariates (M.2) revealed a non-statistically significant effect of the interaction between time and EXP-CVD19 ($b = 0.670$, $SE = 0.788$, $t = 0.850$, $p = 0.396$) or the two simple main effects (sex: $b = 2.533$, $SE = 2.141$, $t = 1.183$, $p = 0.238$; EXP-CVD19: $b = -2.498$, $SE = 2.338$, $t = -1.069$, $p = 0.286$). Moreover, the model revealed a non-statistically significant interaction effect between time and sex ($b = -0.754$, $SE = 0.721$, $t = -1.045$, $p = 0.297$) but only a statistically significant principal effect of time ($b = 2.365$, $SE = 0.562$, $t = 4.221$, $p < 0.001$).

The quadratic model with linear interaction (M.3) showed a non-statistically significant effect of the interaction between time and EXP-CVD19 ($b = 0.670$, $SE = 0.785$, $t = 0.853$, $p = 0.394$) or the two simple main effects (sex: $b = 2.533$, $SE = 2.135$, $t = 1.186$, $p = 0.236$; EXP-CVD19: $b = -2.499$, $SE = 2.332$, $t = -1.071$, $p = 0.285$). Moreover, the model revealed a non-statistically significant linear interaction effect between time and sex ($b = -0.754$, $SE = 0.719$, $t = -1.049$, $p = 0.295$) and the principal effect of time as a quadratic term ($b = -0.580$, $SE = 0.402$, $t = -1.444$, $p = 0.150$). Conversely, the model showed a statistically significant principal effect of time as a linear term ($b = 5.265$, $SE = 2.085$, $t = 2.525$, $p = 0.012$).

Finally, the quadratic model with all covariates interactions (M.4) showed a non-statistically significant effect of the interaction between time and EXP-CVD19, neither linear ($b = 3.262$, $SE = 4.453$, $t = 0.733$, $p = 0.464$) or quadratic ($b = -0.519$, $SE = 0.877$, $t = -0.592$, $p = 0.555$). In addition, M.4 showed also a non-statistically significant effect of the interaction between time and sex, neither linear ($b = -2.320$, $SE = 4.077$, $t = -0.569$, $p = 0.570$) nor quadratic ($b = 0.313$, $SE = 0.830$, $t = 0.390$, $p = 0.670$). Furthermore, also the simple main effects of sex ($b = 4.099$, $SE = 4.546$, $t = 0.902$, $p = 0.368$), EXP-CVD19 ($b = -5.091$, $SE = 4.964$, $t = -1.026$, $p = 0.306$), and the time both linear ($b = 5.281$, $SE = 3.175$, $t = 1.663$, $p = 0.097$) and quadratic ($b = -0.583$, $SE = 0.625$, $t = -0.933$, $p = 0.352$) revealed a non-statistically significant effect.

The comparison of the different multilevel growth curve models suggested that the linear model with covariates (M.2) showed the lower BIC and the lower AICc. The LRT showed that M.2 was statistically significantly different from M.1 (intercept model with covariates). However, although M.2 was not statistically significantly different from M.3, it was the most parsimonious—and thus, it was chosen as the best model. However, the effect size indices suggested a negligible preference

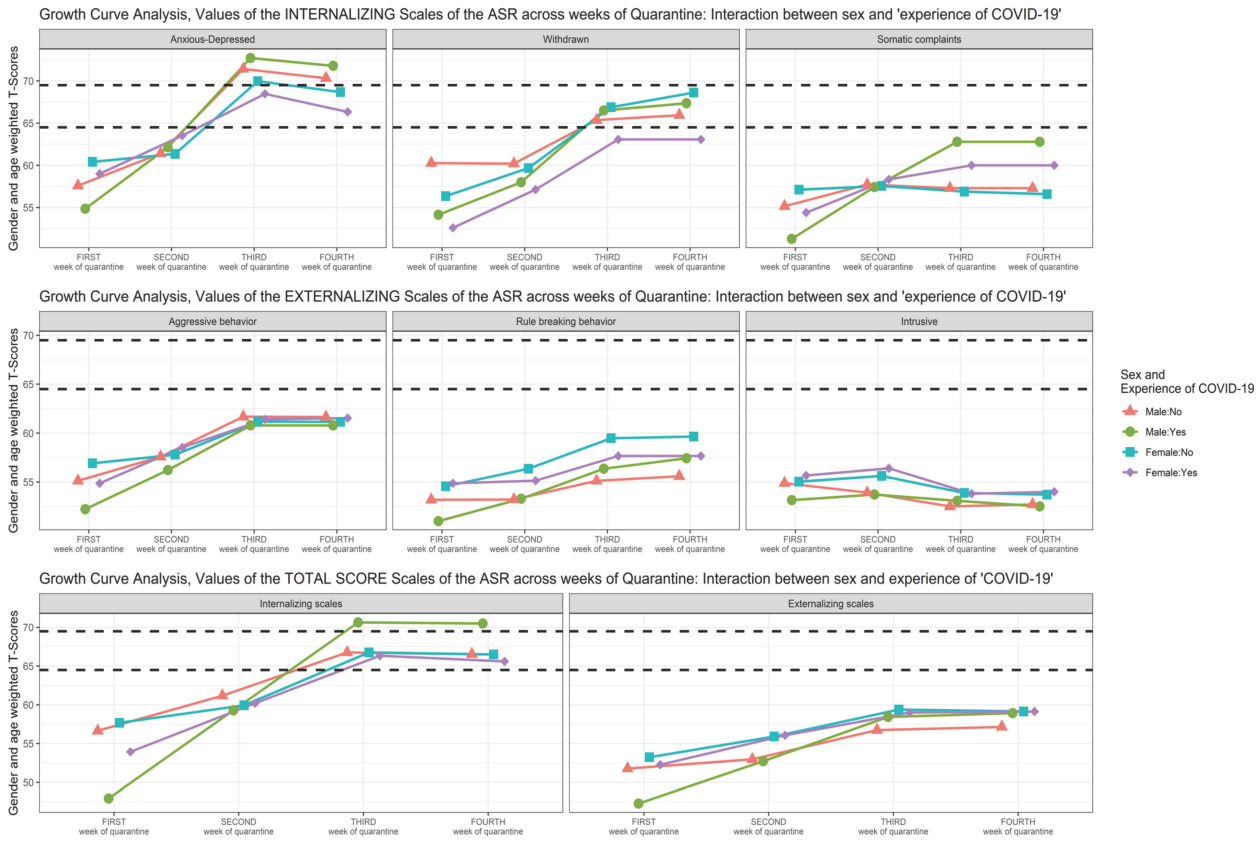

FIGURE 5 | Growth curve analysis (GCA): means of the Syndromic Scale across weeks of quarantine—interaction between "sex" and "experience of COVID-19".

for M.2. Indeed, the ΔAICc suggested a very small difference M.2 and M.3 (0.02), the W_h of M.2 suggested that this model had 47% probability of being the best approximate model (W_h of M.3 was 46%), and the E_h suggested that M.2 had a weight of evidence of 1.01 greater than M.3 of being the best approximate model (**Table 3**).

Rule-Breaking Behavior

Preliminary analyses (M.0) revealed that the variance related to the random intercept of the participants was equal to 5.53.

The null model with covariates (M.1) revealed a non-statistically significant effect of the interaction between sex and EXP-CVD19 ($b = -1.419$, $SE = 1.540$, $t = -0.922$, $p = 0.359$) or the main effect of EXP-CVD19 ($b = 0.246$, $SE = 1.102$, $t = 0.223$, $p = 0.824$). Instead, the model shows a significant effect of sex ($b = 3.235$, $SE = 0.842$, $t = 3.843$, $p < 0.001$).

The linear model with covariates (M.2) revealed a non-statistically significant effect of the interaction between time and EXP-CVD19 ($b = 0.263$, $SE = 0.548$, $t = 0.480$, $p = 0.632$) or the two simple main effects (sex: $b = 2.045$, $SE = 1.441$, $t = 1.419$, $p = 0.157$; EXP-CVD19: $b = -1.139$, $SE = 1.573$, $t = -0.724$, $p = 0.469$). Moreover, the model revealed a non-statistically significant interaction effect between time and sex ($b = 0.306$, $SE = 0.502$, $t = 0.610$, $p = 0.542$) but a statistically significant principal effect of time ($b = 1.223$, $SE = 0.391$, $t = 3.129$, $p = 0.002$).

The quadratic model with linear interaction (M.3) showed a non-statistically significant effect of the interaction between time and EXP-CVD19 ($b = 0.263$, $SE = 0.548$, $t = 0.480$, $p = 0.631$) or the two simple main effects (sex: $b = 2.045$, $SE = 1.440$, $t = 1.420$, $p = 0.156$; EXP-CVD19: $b = -1.139$, $SE = 1.573$, $t = -0.724$, $p = 0.469$). Moreover, the model revealed a non-statistically significant linear interaction effect between time and sex ($b = 0.306$, $SE = 0.502$, $t = 0.611$, $p = 0.542$) as well as the principal effect of time: both linear ($b = 2.009$, $SE = 1.455$, $t = 1.381$, $p = 0.168$) and quadratic ($b = -0.157$, $SE = 0.280$, $t = -0.561$, $p = 0.575$).

Finally, the quadratic model with all covariates interactions (M.4) showed a non-statistically significant effect of the interaction between time and EXP-CVD19, neither linear ($b = 0.408$, $SE = 3.110$, $t = 0.131$, $p = 0.896$) nor quadratic ($b = -0.029$, $SE = 10.612$, $t = -0.047$, $p = 0.962$). In addition, M.4 showed also a non-statistically significant effect of the interaction between time and sex, neither linear ($b = 1.757$, $SE = 2.847$, $t = 0.617$, $p = 0.538$) nor quadratic ($b = -0.290$, $SE = 0.560$, $t = -0.518$, $p = 0.605$). Furthermore, also the simple main effects of sex ($b = 0.594$, $SE = 3.151$, $t = 0.189$, $p = 0.851$), EXP-CVD19 ($b = -1.284$, $SE = 3.441$, $t = -0.373$, $p = 0.709$), and time (linear term: $b = 1.233$, $SE = 2.218$, $t = 0.556$, $p = 0.579$; quadratic term: $b = -0.001$, $SE = 0.436$, $t = 0.005$, $p = 0.996$) revealed a non-statistically significant effect.

The comparison of the different multilevel growth curve models suggested that the linear model with covariates (M.2) showed the lower BIC and the lower AICc. The LRT showed that M.2 was statistically significantly different from M.1 (intercept model with covariates). However, despite that M.2 was not statistically significantly different from M.3, it was the most parsimonious—and thus, it was chosen as the best model. However, the effect size indices suggested a small preference for M.2. Indeed, the ΔAICc suggested a small difference M.2 and M.3 (1.78), the W_h of M.2 indicates that this model had 68% probability of being the best approximate model, and the E_h recommend that M.2 had a weight of evidence more than two times (2.24) greater than M.3 of being the best approximate model (**Table 3**).

Intrusive Behavior

Preliminary analyses (M.0) revealed that the variance related to the random intercept of the participants was equal to 2.81.

The null model with covariates (M.1) revealed a non-statistically significant effect of the interaction between sex and EXP-CVD19 ($b = 0.801$, $SE = 1.339$, $t = 0.598$, $p = 0.551$) or their main effects (sex: $b = 1.059$, $SE = 0.732$, $t = 1.446$, $p = 0.151$; EXP-CVD19: $b = -0.393$, $SE = 0.958$, $t = -0.410$, $p = 0.683$).

The linear model with covariates (M.2) revealed a non-statistically significant effect of the interaction between time and EXP-CVD19 ($b = 0.165$, $SE = 0.509$, $t = 0.324$, $p = 0.746$) or the two simple main effects (sex: $b = 1.282$, $SE = 1.317$, $t = 0.973$, $p = 0.331$; EXP-CVD19: $b = -0.395$, $SE = 1.439$, $t = -0.275$, $p = 0.784$). Moreover, the model revealed a non-statistically significant interaction effect between time and sex ($b = 0.006$, $SE = 0.466$, $t = 0.014$, $p = 0.989$) as well as the principal effect of time ($b = -0.685$, $SE = 0.363$, $t = -1.88$, $p = 0.060$).

The quadratic model with linear interaction (M.3) showed a non-statistically significant effect of the interaction between time and EXP-CVD19 ($b = 0.165$, $SE = 0.509$, $t = 0.324$, $p = 0.746$) or the two simple main effects (sex: $b = 1.281$, $SE = 1.317$, $t = 0.973$, $p = 0.331$; EXP-CVD19: $b = -0.395$, $SE = 1.438$, $t = -0.275$, $p = 0.784$). Moreover, the model revealed a non-statistically significant linear interaction effect between time and sex ($b = 0.006$, $SE = 0.466$, $t = 0.014$, $p = 0.989$) as well as the principal effect of time: both linear ($b = -0.557$, $SE = 1.352$, $t = -0.412$, $p = 0.681$) and quadratic ($b = -0.025$, $SE = 0.260$, $t = -0.099$, $p = 0.921$).

Finally, the quadratic model with all covariates interactions (M.4) showed a non-statistically significant effect of the interaction between time and EXP-CVD19, neither linear ($b = 1.431$, $SE = 2.889$, $t = 0.495$, $p = 0.621$) nor quadratic ($b = -0.253$, $SE = 0.568$, $t = -0.445$, $p = 0.656$). In addition, M.4 showed also a non-statistically significant effect of the interaction between time and sex, neither linear ($b = 1.481$, $SE = 2.645$, $t = 0.560$, $p = 0.576$) nor quadratic ($b = -0.295$, $SE = 0.521$, $t = -0.566$, $p = 0.572$). Furthermore, also the simple main effects of sex ($b = -0.192$, $SE = 2.918$, $t = -0.066$, $p = 0.947$), EXP-CVD19 ($b = -1.662$, $SE = 3.187$, $t = -0.521$, $p = 0.602$), and time (linear term: $b = -1.680$, $SE = 2.060$, $t = -0.815$, $p = 0.415$; quadratic term: $b = 0.199$, $SE = 0.406$, $t = 0.490$, $p = 0.624$) revealed a non-statistically significant effect.

The comparison of the different multilevel growth curve models provided unclear results. Indeed, the intercept-only model (without covariates—M.0) showed the lower BIC, but the linear model (M.2) showed the lower AICc. The LRT showed that M.0 was not statistically significantly different from M.1 (intercept model with covariates) but M.2 was statistically significantly different from M.1. In addition, the effect size indices suggested a negligible preference for M.2. Indeed, the ΔAICc suggested a very small difference M.2 and M.0 (1.44), the W_h of M.2 suggested that this model had 47% probability of being the best approximate model (W_h of M.0 was 23%), and the E_h suggested that M.2 had a weight of evidence two times (2.05) greater than M.0 of being the best approximate model (**Table 3**).

Internalizing Broadband Scale

Preliminary analyses (M.0) revealed that the variance related to the random intercept of the participants was equal to 16.37.

The null model with covariates (M.1) revealed a non-statistically significant effect of the interaction between sex and EXP-CVD19 ($b = 0.514$, $SE = 3.224$, $t = -0.159$, $p = 0.874$) or their main effects (sex: $b = -0.059$, $SE = 1.762$, $t = -0.033$, $p = 0.973$; EXP-CVD19: $b = -0.690$, $SE = 0.307$, $t = -0.299$, $p = 0.766$).

The linear model with covariates (M.2) revealed a statistically significant effect of the interaction between time and EXP-CVD19 ($b = 2.540$, $SE = 1.062$, $t = 2.392$, $p = 0.017$) and the EXP-CVD19 simple main effect ($b = -7.304$, $SE = 3.106$, $t = -2.351$, $p = 0.019$). Moreover, the model revealed a non-statistically significant interaction effect between time and sex ($b = -1.269$, $SE = 0.972$, $t = -1.305$, $p = 0.193$) and the sex simple main effect ($b = 2.961$, $SE = 2.844$, $t = 1.041$, $p = 0.298$). Only the main effect of time ($b = 4.061$, $SE = 0.757$, $t = 5.636$, $p < 0.001$) became statistically significant.

The quadratic model with linear interaction (M.3) showed a statistically significant effect of the interaction between time and EXP-CVD19 ($b = 2.540$, $SE = 1.051$, $t = 2.417$, $p = 0.016$) and the simple main effects of EXP-CVD19 ($b = -7.304$, $SE = 3.083$, $t = -2.369$, $p = 0.018$). However, the model revealed a non-statistically significant linear interaction effect between time and sex ($b = -1.269$, $SE = 0.962$, $t = -1.319$, $p = 0.188$) and the sex simple main effect ($b = 2.961$, $SE = 2.822$, $t = 3.827$, $p < 0.001$). The effects of time both linear ($b = 10.685$, $SE = 2.792$, $t = 3.827$, $p < 0.001$) and quadratic ($b = -1.325$, $SE = 0.538$, $t = -2.463$, $p = 0.014$) became statistically significant.

Finally, the quadratic model with all covariates interactions (M.4) showed a non-statistically significant effect of the interaction between time and EXP-CVD19, neither linear ($b = 9.509$, $SE = 5.950$, $t = 1.598$, $p = 0.111$) nor quadratic ($b = -1.394$, $SE = 1.171$, $t = -1.190$, $p = 0.325$). In addition, M.4 showed also a non-statistically significant effect of the interaction between time and sex, neither linear ($b = -4.910$, $SE = 5.448$, $t = -0.901$, $p = 0.368$) nor quadratic ($b = 0.728$, $SE = 1.073$, $t = 0.679$, $p = 0.498$). Furthermore, also the simple main effects of sex ($b = -6.601$, $SE = 6.058$, $t = 1.090$, $p = 0.277$) and time (quadratic term: $b = -1.275$, $SE = 0.835$, $t = -1.527$, $p = 0.128$) revealed a non-statistically significant effect. The main effects of EXP-CVD19 ($b = -14273$, $SE = 6.616$, $t = -2.157$, $p = 0.031$)

and the time as a linear term (b = 10.439, SE = 4.243, t = 2.460, p = 0.014) became statistically significant.

The comparison of the different multilevel growth curve models suggested that the quadratic model with linear covariates interaction (M.3) showed the lower BIC and the lower AICc. The LRT showed that M.3 was statistically significantly different from M.2 (linear model with covariates). However, the LRT suggested that M.3 was not statistically significantly different from M.4, but it was more parsimonious—and thus, M.3 was chosen as the best model. However, the effect size indices suggested a small preference for M.3. Indeed, the ΔAICc suggested a small difference M.3 and M.4 (2.38), the W_h of M.3 suggested that this model had 69% probability of being the best approximate model, and the E_h suggested that M.3 had a weight of evidence more than three times (3.29) greater than M.4 of being the best approximate model (**Table 3**).

Externalizing Broadband Scale

Preliminary analyses (M.0) revealed that the variance related to the random intercept of the participants was equal to 5.82.

The null model with covariates (M.1) revealed a non-statistically significant effect of the interaction between sex and EXP-CVD19 (b = 0.013, SE = 2.269, t = 0.006, p = 0.996) or their main effects (sex: b = 2.264, SE = 1.240, t = 1.826, p = 0.071; EXP-CVD19: b = −0.315, SE = 1.624, t = −0.194, p = 0.847).

The linear model with covariates (M.2) revealed a non-statistically significant effect of the interaction between time and EXP-CVD19 (b = 1.131, SE = 0.867, t = 1.303, p = 0.193) or the two simple main effects (sex: b = 3.319, SE = 2.241, t = 1.481, p = 0.139; EXP-CVD19: b = −3.135, SE = 2.448, t = −1.281, p = 0.201). Moreover, the model revealed a non-statistically significant interaction effect between time and sex (b = −0.420, SE = 0.794, t = −0.529, p = 0.597). Only the main effect of time (b = 2.266, SE = 0.619, t = 3.662, p < 0.001) became statistically significant.

The quadratic model with linear interaction (M.3) showed a non-statistically significant effect of the interaction between time and EXP-CVD19 (b = 1.130, SE = 0.864, t = 1.308, p = 0.192) or the two simple main effects (sex: b = 3.319, SE = 2.235, t = 1.485, p = 0.138; EXP-CVD19: b = −3.135, SE = 2.441, t = −1.284, p = 0.199). Moreover, the model revealed a non-statistically significant linear interaction effect between time and sex (b = −0.420, SE = 0.792, t = −0.531, p = 0.596) as well as the principal effect of time as a quadratic term (b = −0.644, SE = 0.442, t = −1.456, p = 0.146). Only the main effect of time as a linear term (b = −5.487, SE = 2.296, t = 2.389, p = 0.017) became statistically significant.

Finally, the quadratic model with all covariates interactions (M.4) showed a non-statistically significant effect of the interaction between time and EXP-CVD19, neither linear (b = 4.135, SE = 4.905, t = 0.943, p = 0.400) nor quadratic (b = −0.601, SE = 0.966, t = −0.622, p = 0.534). In addition, M.4 showed also a non-statistically significant effect of the interaction between time and sex, neither linear (b = 0.965, SE = 4.492, t = 0.215, p = 0.830) nor quadratic (b = −0.277, SE = 0.884, t = −0.313, p = 0.754). Furthermore, also the simple main effects of sex (b = 1.934, SE = 4.953, t = 0.390, p = 0.696), EXP-CVD19 (b = −6.140, SE = 5.410, t = −1.135, p = 0.258), and time (linear term: b = 3.889, SE = 3.498, t = 1.112, p = 0.267, and quadratic term: b = −0.325, SE = 0.689, t = −0.472, p = 0.638) revealed a non-statistically significant effect.

The comparison of the different multilevel growth curve models provided unclear results. Indeed, the linear model (M.2) showed the lower BIC, but the quadratic model (M.3) showed the lower AICc. The LRT showed that M.3 was not statistically significantly different from M.2. However, despite that M.2 was not statistically significantly different from M.3, it was the most parsimonious—and thus, it was chosen as the best model. However, the effect size indices suggested a negligible preference for M.3. Indeed, the ΔAICc suggested a very small difference M.3 and M.2 (0.02), the W_h of M.3 suggested that this model had 47% probability of being the best approximate model (W_h of M.2 was 46%), and the E_h suggested that M.3 had a weight of evidence of 1.01 greater than M.2 of being the best approximate model (**Table 3**).

Personal Strengths

Preliminary analyses (M.0) revealed that the variance related to the random intercept of the participants was equal to 1.18.

The null model with covariates (M.1) revealed a non-statistically significant effect of the interaction between sex and EXP-CVD19 (b = −0.248, SE = 0.792, t = −0.313, p = 0.755) or their main effects (sex: b = −0.154, SE = 0.433, t = −0.357, p = 0.722; EXP-CVD19: b = 0.499, SE = 0.567, t = 0.880, p = 0.381).

The linear model with covariates (M.2) revealed a non-statistically significant effect of the interaction between time and EXP-CVD19 (b = 0.066, SE = 0.274, t = 0.242, p = 0.809) or the two simple main effects (sex: b = 0.228, SE = 0.724, t = 0.315, p = 0.752; EXP-CVD19: b = 0.206, SE = 0.791, t = 0.261, p = 0.794). Moreover, the model revealed a non-statistically significant interaction effect between time and sex (b = −0.182, SE = 0.250, t = −0.729, p = 0.466). Only the main effect of time (b = −0.513, SE = 0.195, t = −2.629, p = 0.009) became statistically significant.

The quadratic model with linear interaction (M.3) showed a non-statistically significant effect of the interaction between time and EXP-CVD19 (b = 0.066, SE = 0.273, t = 0.242, p = 0.809) or the two simple main effects (sex: b = 0.228, SE = 0.723, t = 0.316, p = 0.752; EXP-CVD19: b = 0.206, SE = 0.789, t = −0.261, p = 0.794). Moreover, the model revealed a non-statistically significant linear interaction effect between time and sex (b = −0.182, SE = 0.250, t = −0.730, p = 0.466) as well as the principal effect of time: both linear (b = −1.157, SE = 0.726, t = −1.594, p = 0.112) and quadratic (b = 0.128, SE = 0.139, t = 0.921, p = 0.358).

Finally, the quadratic model with all covariates interactions (M.4) showed a non-statistically significant effect of the interaction between time and EXP-CVD19, neither linear (b = 0.820, SE = 1.549, t = 0.529, p = 0.597) nor quadratic (b = −0.150, SE = 0.305, t = −0.494, p = 0.621). In addition, M.4 showed also a non-statistically significant effect of the interaction between time and sex, neither linear (b = −1.314, SE = 1.418, t = −0.926, p = 0.355) nor quadratic (b = 0.226, SE = 0.279, t = 0.810, p = 0.418). Moreover, also the simple main effects of

sex (b = 1.360, SE = 1.572, t = 0.865, p = 0.388), EXP-CVD19 (b = −0.547, SE = 1.717, t = −0.319, p = 0.750), and time (linear term: b = −0.811, SE = 1.104, t = −0.734, p = 0.463; quadratic term: b = 0.059, SE = 0.217, t = 0.274, p = 0.784) revealed a non-statistically significant effect.

The comparison of the different multilevel growth curve models suggested that the linear model with covariates (M.2) showed the lower BIC and the lower AICc. The LRT showed that M.2 was statistically significantly different from M.1 (null model with covariates). However, the LRT suggested M.2 was not statistically significantly different from M.3, but it was more parsimonious—and thus, M.3 was chosen as the best model. However, the effect size indices suggested a small preference for M.2. Indeed, the ΔAICc suggests a small difference M.2 and M.3 (1.25), the W_h of M.2 indicates that this model had 61% probability of being the best approximate model (W_h of M.3 was 33%), and the E_h suggested that M.2 had a weight of evidence almost two times (1.87) greater than M.3 of being the best approximate model (**Table 3**).

DISCUSSION

As stated above, in addition to being a public physical health emergency, the COVID-19 pandemic also implies a global mental health emergency that may have a potential traumatic nature and provoke complex emotional responses that could negatively affect individual and collective mental health (Jakovljevi et al., 2020; Masiero et al., 2020). Therefore, this global pandemic constantly requires researchers and professionals to monitor and assess the current mental health situation, in order to plan and develop efficiency-driven strategies aimed to reduce its negative psychological impacts.

This study assessed and monitored Italian young adults' mental health status during the firsts 4 weeks of lockdown imposed by the government during the COVID-19 outbreak, from March 16 to April 16. To the authors' knowledge, this is the first study specifically focused on young adults' mental health status during COVID-19 quarantine, both in Italy and worldwide. A longitudinal panel design was carried out in order to assess *Internalizing* and *Externalizing problems* on 97 Italian young adults living in the Campania region, Southern Italy. A GCA (Jackson et al., 2018) was performed to monitor the changes during the first 4 weeks of quarantine.

First of all, in line with the global trend reported by previous studies carried out on the general population (Cao et al., 2020; Huang and Zhao, 2020; Qiu et al., 2020; Rossi R. et al., 2020), this study confirmed the negative behavioral and emotional responses provoked by COVID-19 quarantine and also highlighted the high vulnerability of young adults in developing psychological distress.

Comparing the *Internalizing* and *Externalizing domains*, the results showed an analogous increase for both areas from T1 to T4, even though higher rates of internalizing manifestations were registered. Specifically, the growth curve modeling highlighted that, within the Internalizing problems area, the levels of *Anxiety/Depression*, *Withdrawal*, and *Somatic Complaints* overall increased from T1 to T4, showing an increase while the lockdown measures were in place. In this context, in line with results obtained on medical health workers (Zhang et al., 2020), having experienced a closeness with a COVID-19-infected relative or friend resulted in an increase of somatic complaints. Similarly, within the Externalizing problems area, the levels of *Aggressive Behavior* and *Rule Breaking Behavior* increased from T1 to T4. Among the *Internalizing domains*, youth reported clinical-level symptoms of anxiety and depression. According to the recent review on the psychological impact of quarantine (Rajkumar, 2020), anxiety as well as depressive symptomatology was the most common. Furthermore, the results showed that *Withdrawal* level was above the normal threshold. This finding could be related to the specific situation of quarantine and the impossibility to engage in social behaviors due to the lockdown. Indeed, the physical distance can intensify feelings of loneliness that in turn trigger intense anxiety (Boffo et al., 2012; Banerjee and Rai, 2020; Rossi A. et al., 2020).

If, broadly, the results obtained confirmed the general detrimental effects of social isolation due to epidemics on young adults' mental health (Hawryluck et al., 2004; Tucci et al., 2017; Qiu et al., 2020; Wang et al., 2020), some brief reflections need to be outlined about the specificities of young adults' condition. Indeed, young adults live a specific transition period in which their identity development process is based and founded on continuous affective investments on social and extra-familiar relationships (Sica et al., 2018). In this context, the lockdown measures may be interpreted as a forced regression that triggers negative mental health outcomes even more. Within the range from T1 to T4, higher levels of *Internalizing* and *Externalizing* problems were registered at T3, whereas a sort of stabilization from T3 to T4 emerged. The peak reported at T3 probably indicated a sort of gradual cognitive and emotional recognition experienced from young adults about the seriousness of the pandemic, which increased feelings of anxiety, depression and worry, and irritability and anger. Regarding the stabilization of both internalizing and externalizing problems between T3 and T4, these findings might need to be interpreted in relation to the specific historical context of the COVID-19 pandemic in Italy. Specifically, T4 corresponded to the week from April 16 to 12 in which a double attitude was observed in Italy. On the one hand, despite the lockdown, the Italian "Civil Protection" continued to alert the general population about the very high levels of contagions; on the other hand, in that period, Italians also started to receive the first information about the so-called "Phase 2," which followed the forced lockdown. It might be hypothesized that the high levels of viral load continued to worry participants, even though the closeness to Phase 2 assumed a sort of protective function regarding an eventual mental health worsening.

In correspondence to the increase of mental health distress, the results also showed a gradual decrease of participants' perception of their personal strengths, suggesting the need for researchers to strengthen individual's psychological resources in order to mediate the individual reaction to the COVID-19 pandemic (Di Giuseppe et al., 2020).

In conclusion, regarding gender differences, a significant increase of the levels of *Anxiety/Depression* from T1 to T2 and, to a lesser extent, from T2 to T3 in males than the females

emerged. These findings were in line with previous studies that pointed out higher symptoms of anxiety and depression in condition of social isolations in boys than girls (Troop-Gordon and Ladd, 2005; Derdikman-Eiron et al., 2011). The results reported no other statistically significant differences between sex. These findings seemed to be in opposition with the recent studies that have investigated the impact of COVID-19 on mental health and highlighted a higher vulnerability for women to develop negative mental health outcomes, as compared with men (Qiu et al., 2020; Rossi R. et al., 2020). In the context of gender studies, a wide range of recent literature tended to connect these results to the reinforced gender inequalities promoted by the lockdown measures. According to these studies (Adams-Prassl et al., 2020; Béland et al., 2020; Etheridge and Spantig, 2020), in fact, during the lockdown measures, the increase of unemployment rates as well as the commitment into the domestic work and in the management of children has represented a high risk factor for women, compared with men. Within the same interpretation field, the lack of significant gender differences as emerged by the results might be correlated to the same nature of the sample, which mostly involved university students who probably were involved in the same challenges and tasks and did not experienced greater or smaller efforts connected to specific gender roles, such as to outline differences.

The present study is not free from limitations. First of all, the number of participants should be increased in future studies, and the results need to be replicated in other geographical areas to determine their generalizability. Furthermore, the sample was only composed of university students who came from the Campania region in Southern Italy where the COVID-19 outbreak has been taken more under control. To assess the mental health of young people during the quarantine, only a self-report measure was used. Consequently, the data may be influenced by a reporting bias (e.g., social desirability). Moreover, despite the longitudinal panel, the study is an observational study. In this sense, experimental manipulations and a control group are lacking. Future researches need to extend the young adults' mental health assessment to other Italian regions, taking into consideration that in the South of Italy, where the study was carried out, the COVID-19 outbreak has been taken moderately and was under control, compared with the North. Higher levels of distress might be hypothesized in places where very high numbers of losses and deaths have been registered. Moreover, the present study investigated the internalizing and externalizing problems as individual responses to COVID-19 pandemic; further investigations to measure the traumatic symptomatology and the characteristics of post-traumatic effects caused by such stressful events are needed (Troisi, 2018; Margherita and Tessitore, 2019). Follow-up investigations are also needed. Considering the high levels of *Withdrawal* that emerged from the results, future investigations should explore the function and the role played by virtual environments and e-communities during pandemic in-depth, taking into account the roles played by the online environments and by the use of social media in terms of both risks and protective functions (Faccio et al., 2019; Gargiulo and Margherita, 2019; Margherita and Gargiulo, 2018; Procentese et al., 2019; Boursier et al., 2020). In this sense, future investigations might be also directed to investigate the changes in the dynamics of social and love relationships (Mannarini et al., 2013, 2017a; Balottin et al., 2017; Margherita et al., 2018) as well as the role of social support (Ratti et al., 2017) post-lockdown and post-pandemic. In conclusion, recognizing the fundamental value of qualitative investigations to shed light on the inner aspects and subjective meanings of personal experiences is also vital (Margherita et al., 2017; Tessitore and Margherita, 2019; Tessitore et al., 2019; Felaco and Parola, 2020; Parola, 2020; Parola and Felaco, 2020; Tessitore and Margherita, 2020). These are much needed actions in order to develop an in-depth understanding of the emotional and affective dimensions connected to the experience of the COVID-19 pandemic, as well as possible risk and protective factors for mental health.

In conclusion, the present study could contribute to the ongoing debate concerning the psychological impact of the COVID-19 emergency, helping to develop efficient and person-centered intervention projects able to take care of young adults' mental health in the medium and long terms, understanding their specific needs and susceptibilities (Benedetto et al., 2018; Parola and Donsì, 2018, Parola and Donsì, 2019; Fusco et al., 2019). This is even more urgent considering that despite the distressing and prolonged situation, a significant number of people avoid seeking psychological help (Rossi and Mannarini, 2019). On the one hand, some of these people may be reluctant to seek professional help due to the associated stigma (Mannarini et al., 2017b, 2018, 2020; Faccio et al., 2019; Mannarini and Rossi, 2019). On the other hand, some individuals may deny the problem, leading them to think that it will probably resolve itself naturally (Sareen et al., 2007; Rossi Ferrario et al., 2019; Rossi Ferrario and Panzeri, 2020), thus choosing to manage the psychological issue on their own (Wilson and Deane, 2012).

DATA AVAILABILITY STATEMENT

The datasets generated in this article are not readily available because to ensure the privacy of the participants. Requests to access the datasets should be directed to AP, anna.parola@unina.it.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethical Committee of Psychological Research of University of Naples Federico II and was carried out in accordance with the American Psychological Association rules. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AP developed the theoretical framework of the present study, designed the study, and developed the methodological approach. AR performed all the analyses and designed tables and figures. FT and GT led the literature search and interpretation of data. SM critically revised the manuscript. All authors read and approved the final version of the work.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Correlates of Health-Protective Behavior During the Initial Days of the COVID-19 Outbreak in Norway

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The coronavirus outbreak manifested in Norway in March 2020. It was met with a combination of mandatory changes (closing of public institutions) and recommended changes (hygiene behavior, physical distancing). It has been emphasized that health-protective behavior such as increased hygiene or physical distancing are able to slow the spread of infections and *flatten the curve*. Drawing on previous health-psychological studies during the outbreak of various pandemics, we investigated psychological and demographic factors predicting the adoption and engagement in health-protective behavior and changes in such behavior, attitudes, and emotions over time. We recruited a non-representative sample of Norwegians (n = 8676) during a 15-day period (March 12–26 2020) at the beginning of the COVID-19 outbreak in Norway. Employing both traditional methods and exploratory machine learning, we replicated earlier findings that engagement in health-protective behavior is associated with specific demographic characteristics. Further, we observed that increased media exposure, perceiving measures as effective, and perceiving the outbreak as serious was positively related to engagement in health-protective behavior. We also found indications that hygiene and physical distancing behaviors were related to somewhat different psychological and demographic factors. Over the sampling period, reported engagement in physical distancing increased, while experienced concern or fear declined. Contrary to previous studies, we found no or only small positive predictions by confidence in authorities, knowledge about the outbreak, and perceived individual risk, while all of those variables were rather high. These findings provide guidance for health communications or interventions targeting the adoption of health-protective behaviors in order to diminish the spread of COVID-19.

Keywords: COVID-19, coronavirus, health protective behavior, perceived risk, concern, Norway

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INTRODUCTION

On the 30th of January 2020, the World Health Organization (WHO) declared the outbreak of a new coronavirus type (SARS-CoV-2) a Public Health Emergency of International Concern. While first cases of COVID-19, caused by this virus, were reported in the Chinese city of Wuhan at the end of December 2019, by the end of March 2020 the virus had spread to all populated

continents, resulting in exponential growth and more than 700.000 recorded infections and 30.000 fatalities worldwide. At that time, COVID-19 had already significantly impacted physical and psychological health in many countries, with consequences for many individuals' daily lives and economic situations.

Increasing evidence about COVID-19 suggests that adopting widespread public behavior change can have strong influences on controlling the virus' spread and limiting its harmful consequences on physical health and healthcare systems (Ferguson et al., 2020; Li et al., 2020). Some of these changes may be enforced by states (e.g., closure of schools), while others may be advised but not strictly enforced (e.g., reduction of group size in public), and others may be advised but outside of a state's control (e.g., hand washing in private). Experiences from previous disease outbreaks such as Ebola, SARS, and the swine flu suggests that psychological factors including attitudes and affective reactions have a significant impact on whether individuals adopt health protective behavior or not (e.g., Tang and Wong, 2003; Bish and Michie, 2010; Bults et al., 2011). Facilitating such behavior change during an outbreak is an important task of applied psychology during the COVID-19 outbreak (Lunn et al., 2020; Van Bavel et al., 2020).

In the current study, we explore what demographic and psychological variables predicted the adoption and engagement in health-protective behavior and how attitudes and self-reported behaviors changed over the course of a period of 15 days during the COVID-19 outbreak in Norway. Norway represents an interesting case as it featured the second highest rate of confirmed cases per capita (after Italy) at the beginning of data collection (12th March), while having Europe's third lowest population density. Four weeks after the closing of schools and beginning of our data collection, Norway had managed to reverse the growth of hospitalizations due to COVID-19. Our data are collected during this period. While our data are cross-sectional rather than longitudinal, they allow the description of a social change process, in addition to exploring correlates of individual behavior.

Protective behavior in a pandemic can be categorized broadly into three types: preventive, avoidant, and management behavior. Preventive behavior includes mainly increase in hygiene (e.g., handwashing), avoidant behavior refers mainly to physical distancing[1], and management includes taking medication and seeking help from health professionals and use of help lines. An important question to curb infections is, what individual factors predict this kind of behavior. Bish and Michie (2010) reviewed the literature on this following the SARS crisis. They particularly focused on reported associations between demographic factors, attitudes, and behavioral measures (reported, intended, or actual behavior). Most reviewed studies were carried out in the middle of actual outbreaks, mostly of influenza and the SARS coronavirus (SARS-CoV). The review found that preventive and avoidant behavior was predicted by a few demographic factors. These behaviors were more common among women, older people, and people indicating a higher education level (cf. Ibuka et al., 2010; Agüero et al., 2011; Tooher et al., 2013; Moran and Del Valle, 2016; Zettler et al., 2020). More recent evidence has also identified household size as a crucial variable. People living in larger households seem more likely to take precautions (Ibuka et al., 2010), presumably out of increased fear of getting infected or out of increased sense of responsibility for others, or both. The driving factor may be the presence of school-aged children (Agüero et al., 2011; for contradicting findings, see Bults et al., 2011).

Preventive and avoidant behavior were also related to psychological factors. In particular, they were found to increase with perceived susceptibility to the disease (i.e., perceived likelihood of contracting the virus) and perceived severity of symptoms increase (Tang and Wong, 2003; Agüero et al., 2011; Tooher et al., 2013; Gershon et al., 2018; Webster et al., 2020). In a Spanish sample, the adoption of preventive measures during an influenza outbreak was increased by perceived effectiveness of these behaviors in reducing the risk of infection (Agüero et al., 2011; see also Tang and Wong, 2003). These observations are in line with classic and modern versions of expectancy-value theories, where expectancy equals susceptibility and severity equals value. For instance, the Theory of Planned Behavior explains behavior as deriving from intentions that are influenced by attitudes, perceived social norms, and perceived behavioral control or effectiveness of the behavior (Ajzen, 1991). Risk and severity may mediate effects of demographic variables, especially for gender.

Pandemics highlight the interdependence among individuals, and citizens' relations to their government. Bish and Michie (2010, p. 817) conclude from their review "that having a high level of trust in authorities and satisfaction with the communications received about the disease is associated with compliance with preventive, avoidant, and management behaviors." Evidence from actual outbreaks confirms this (Liao et al., 2010; Bults et al., 2011).

It seems that little is known on how crucial psychological variables develop during the course of an epidemic. Information on behavioral change over time is important for modeling a pandemic's course, and providing appropriate health messaging over time (Poletti et al., 2012; Collinson et al., 2015). Over the course of the first wave of the 2009 influenza (H1N1) epidemic in Hong Kong, knowledge on modes of transmission did not improve, the adoption of avoidant behavior did not change, and, surprisingly, physical distancing declined, suggesting that changes might sometimes be counterintuitive (Cowling et al., 2010). This may be due to the ongoing nature of the threat, the requirement to consistently engage in sometimes complex and unpleasant behaviors over a long period of time, and information or media fatigue resulting in reduced behavioral engagement. During the H1N1 outbreak in the Netherlands, perceived severity and anxiety decreased over time in line with better estimates of fatality, but also in line with claims that citizens can be fatigued by media reports (Collinson et al., 2015). It thus seems important to observe the time course of the involved psychological variables.

Wise et al. (2020) surveyed 1591 US-American participants between 3/11/20 and 3/16/20, focusing on perceived risk from the virus and propensity to engage in protective behaviors.

[1]Similar to previous studies (e.g., Pfattheicher et al., 2020), we employ the term *physical distancing* instead of *social distancing* to highlight the fact that individuals are advised to keep a *physical* distance.

Their sample (recruited through Prolific.co) had roughly equal numbers of women and men and a median age of 30, skewing young. Participants saw a medium risk of getting infected themselves (43%), which rose during the time of the sampling. Participants reported that they washed their hands more and stayed at home more than usual, and this also increased during the sampling period. Notably, they were able to reassess a subsample of participants, once at the beginning and once at the end of the sampling period, and confirmed that these changes also occurred within participants.

Self-reported increased hand-washing and physical distancing were predicted by perceived likelihood of becoming infected, but not severity of illness. To a lesser extent, perceived impact from global consequences also predicted both behaviors. Wise et al. (2020) used multiple regressions with 10 different risk perceptions as simultaneous predictors for these analyses and controlled for age. The other predictors (e.g., likelihood of infecting somebody else) did not predict behavior above risk to self, and neither did age. Wise et al. (2020) also identified a subgroup in their sample that perceived low risk and disengaged from information seeking.

In a non-representative sample of 1210 respondents from 194 cities in China during the initial phase of the pandemic, about one third reported moderate to severe anxiety. Interestingly, precautionary measures (e.g., hand hygiene, wearing a mask) were associated with lower levels of stress and anxiety, suggesting successful coping and belief in the behavior's effectiveness (Wang et al., 2020).

In a small, mostly British, community sample (n = 324) collected between March 27th and 28th, experiencing fear was the only positive and stable predictor of health-protective behavior (Harper et al., 2020). Sampling 770 US adolescents from the 20th to the 22nd of March, health-protective behavior including physical distancing and hand washing was positively predicted by perceived severity of the outbreak and social responsibility, as well as negatively predicted by self-interest (Oosterhoff, 2020).

Finally, a nearly identical version of the questionnaire employed in the current project was distributed among Australian adults (n = 2174) between the 2nd and 9th of March (Faasse and Newby, 2020). As the number of cases was considerably low in Australia at that time (<100), the authors observed low prevalence of physical distancing behavior but rather high engagement with hygiene behavior. Further, in the study engagement in health-protective behavior was positively predicted by the amount of media exposure, concern or worry about the outbreak, perceived severity of the outbreak, confidence in scientists and health professionals, and accurate knowledge about COVID-19. Perceived likelihood of being infected was not a significant predictor of engagement with health behaviors.

The first infected case in Norway became known on February 26. The number of known infections grew at a relatively slow pace to 227 until March 9, without much action by authorities or concern in the population. The total population of Norway is 5.4 Million. Because authorities had been blindsided by an influx of infected people coming back from winter holidays in Italian and Austrian skiing locations, infections then suddenly increased to 804 until March 12, and community spread was assumed.

That day, on which we started data collection, was tumultuous: The first death was registered. Because Norway lacked testing capacity, a change in testing criteria was announced, prioritizing severely sick people and health personnel rather than travelers. Mildly and moderately ill people did not have access to testing throughout the sampling period. Also on March 12, the Norwegian Institute of Public Health (Folkehelseinstitutet, FHI) published a report predicting that between 20 and 80% of the Norwegian Population would be infected in the first wave, which was expected to take up to 1 year (Folkehelseinstiuttet, 2020). That report was widely publicized. Finally, on the same day the government announced comprehensive measures to fight the virus, most notably shutting down schools and kindergartens, training facilities, and all cultural events. Increased stocking up on food and supplies lead to empty shelves in some grocery shops, which was documented on social media.

On March 13, it was reported that many Norwegians left cities toward holiday homes in remote locations, which led to a rebuke by the authorities due to risk of spreading the virus. Travel by foreigners without residence permits to Norway via plane or boat was shut down March 15. The same day, in an extraordinary announcement, the Norwegian King asked people to stand together and follow the authorities' advice. On March 16, FHI published a general call for increased physical distancing, and rules about quarantine, assemblies, and visiting cabins started being enforced with fines and short prison sentences. On the 17th, the national TV channel NRK aired a debate in which a medical doctor argued that Norway should go into total isolation and that FHI was too lax. This was seen as controversial, praised by some, but criticized by many others. The number of hospitalizations passed 200 on March 24, with 10 people dead.

Three representative data sets are available with Norwegian samples that help to anchor our data. Sætrevik (2020) reported data from a representative sample of more than 4000 Norwegians between March 20 and March 29. Respondents thought the average Norwegian was likely to be infected by the coronavirus (46% of the panel said "Somewhat high" or "Very high"), while fewer thought that this would happen to themselves. Quite few (8%) believed that they were at risk of becoming seriously ill themselves.

Kantar.no (Gallup) conducted web interviews with representative samples N = 947 and N = 1538, on March 12–13 and March 19–20, respectively, thus at the beginning and end of our first week of data collection (Kantar, 2020a,b). On March 19/20, the vast majority (>85%) said that they had high or very high confidence that the health authorities would take the necessary measures to handle the situation in the best possible way, and that they provided accurate information on the situation. Both numbers had increased compared to the week before. Less than half, 42% (up from 37 a week earlier), expected that they would likely or very likely be infected (up by 5% during the last week), while 18% said that was unlikely or very unlikely. A large group, 37%, was unsure, saying it was neither likely nor unlikely. Answers judging infection as likely or very likely were more frequent than average among inhabitants of Oslo and people younger than 44, but less frequent among people older than 60 (only 20%). The same age effect was reported by

Sætrevik (2020). When asked about behavioral changes in the last 7 days, more than half and up to 88% reported increased hygiene behavior, reduced social contact, and increased purchasing of goods. From March 12–13 to March 19–20, the number of people who were worried or very worried about the consequences for themselves or their families (the question did not specify what kind of consequences) increased by 6–78%.

Opinion.no conducted a daily poll of Norwegians from March 13 to March 21 (Opinion, 2020). N varied between 313 and 819 (Gaute Aas Askheim, 2020, March 23, 2020, personal communication). On every day of that period, more than 60% of polled individuals expressed confidence in the measures taken by the authorities and trust in the information given by them to the public; confidence actually increased from 65% on March 13–75% on March 17, and then fell again slightly.

In the current project we investigated the influence of psychological and demographic variables in predicting health-protective behavior in a Norwegian sample. Simultaneously, we focused on exploring the trajectories and developments of reported behavior, attitudes, and affective reactions during a 15-day period during the outbreak of COVID-19. We focused mainly on two aspects of protective behavior: preventive and avoidance behavior (Bish and Michie, 2010). We did not focus on management behaviors, such as taking medicine or seeing health-professional, as no medication was available at the time of data collection and the main focus was on minimizing transmission and rapid dissemination by flattening the curve through hygiene practices and physical distancing (Ferguson et al., 2020).

Note that our sampling strategy primarily reached participants who were already engaged in discussing topics related to COVID-19, and are presumably more concerned than average. We were thus less likely to sample a lot of participants who viewed the risk as low and were disengaged from seeking information on COVID-19. Our data are thus by no means representative. Absolute means should be interpreted as being at the upper end of the real distribution. Our analyses focus on relations between variables, which we assume to be generalizable to the larger population. Also note that our data are not longitudinal, and we cannot draw causal conclusions. We nevertheless use the term prediction to describe the results of regression analyses for ease of phrasing.

Our analysis strategy in identifying important variables predicting engagement in health-protective behavior was twofold. First, we focused on a theory-driven strategy based on reviews and previous studies relating to health epidemics. Second, we employed an exploratory data-driven machine learning approach in order to classify important variables. Based on reviews concerning factors predicting behavior during pandemics and recent research (e.g., Wise et al., 2020), we derived the following hypotheses for the first strategy:

(I) Engagement in health-protective behavior was expected to be predicted by gender, education level, age, and household size. Women, individuals with higher education level, older individuals, as well as those from larger households were expected to have more engagement in health-protective behavior.

(II) We expected that effects in I were mediated by own perceived risk (likelihood and severity; for gender, education level, and age) or by perceived risk of close others (likelihood and severity; for household size). Females, individuals with higher education or older age should show increased perceived risk, which in turn should be associated with higher reports in health-protective behavior. Similarly, larger household size should be associated with higher perceived risk for close others, which in turn should positively predict health-protective behavior.

(III) Increased confidence and trust in authorities should positively predict engagement in health-protective behavior.

Note that these hypotheses were generated while performing data collection and not completely *a priori*. This was mostly due to time constraints as we wanted to ensure data collection during early periods of COVID-19 outbreak in Norway.

The current project was ethically approved by the Internal Review Board of the University of Oslo. All materials, raw data, and syntaxes are available at our project page: https://osf.io/crs2n/.

MATERIALS AND METHODS

Participants

We recruited a total of 9537 participants residing in Norway through social media (e.g., Facebook, Twitter) and email lists. Data collection took place for 15 days from the 12th of March to the 26th of March 2020. Between March 13 and March 17, we ran a paid ad on Facebook, selecting Norwegian users older than 18 as the target group. The ad reached 33.655 viewers (71% female according to Facebook), of which 1990 clicked through to the survey. The post was shared 165 times and reached over 70.000 Facebook users. The researchers did not themselves share the study in their own networks. After the ad campaign on Facebook ended, the survey was shared on the website of the Department of Psychology (PSI) of the University of Oslo (UiO) and in the Facebook feeds of both PSI and UiO.

After excluding participants who failed an attention check or spent less than 1 min taking the questionnaire, we arrived at a final sample size of 8676 (6292 females, 1811 males, 59 non-binary or different identity, 28 preferred not to say, 486 missing). The majority of participants were between 20 and 59 years of age. Median age for both male and female participants was between 35 and 39. The majority of participants reported residing in Oslo county (n = 3302, 38.1%), while the fewest participants were from Nordland (n = 183, 2.1%). Similarly, the majority indicated residing in a large city (n = 4299, 49.5%), while the lowest amount came from a rural area (n = 938, 10.8%). The majority of the sample indicated a high degree of school education, having earned a college degree (41.8%), whereas a smaller proportion indicated their highest education as less than high school or high school graduate (16.6%). An

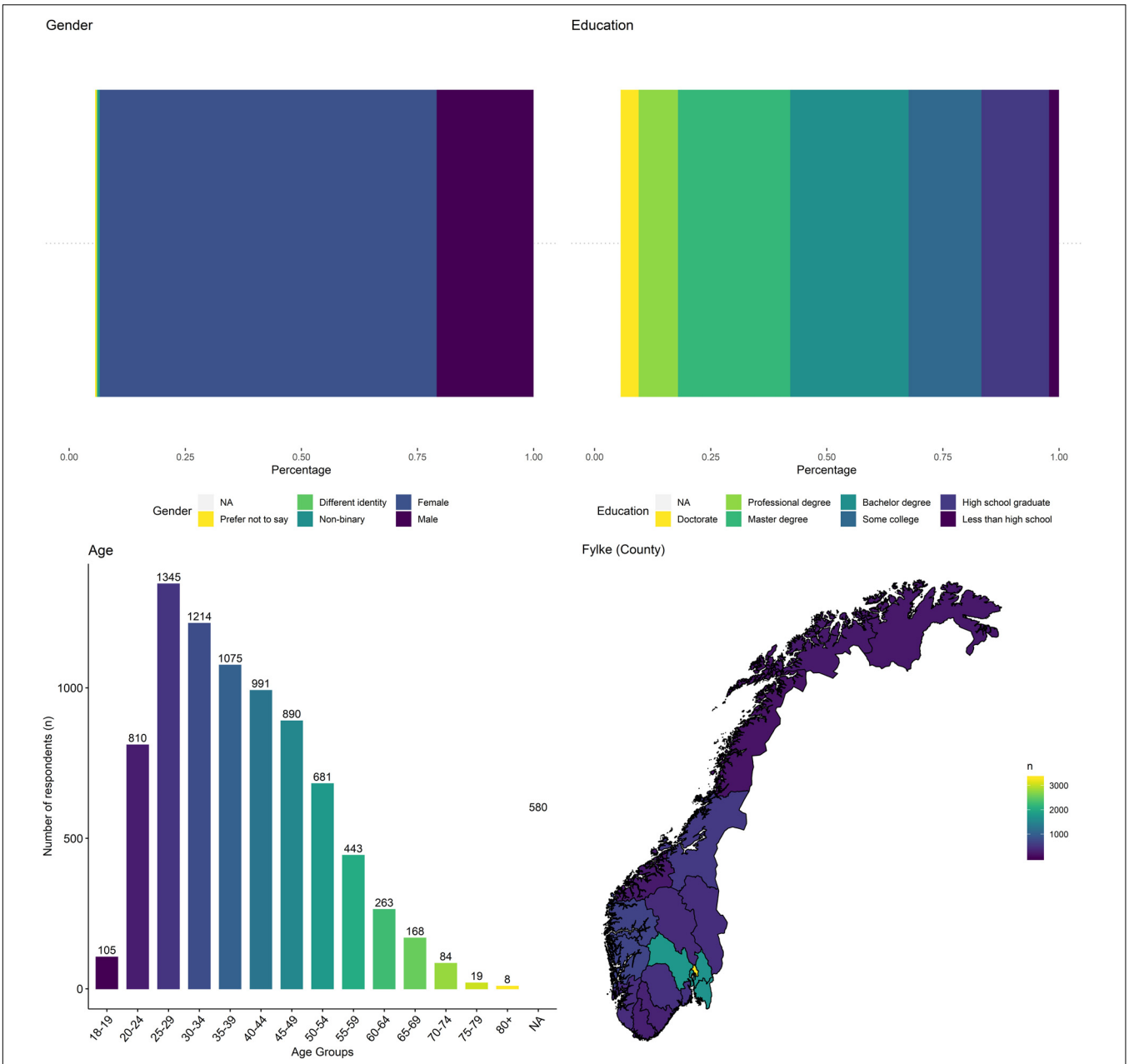

FIGURE 1 | Overview of sample characteristics based on gender, education, age, and residence.

overview of sample characteristics is provided in **Figure 1** or in the **Supplementary Materials**[2].

Participants were able to take part in a raffle getting the chance of winning one out of 20 vouchers at a value of 200 NOK. This served mainly to jumpstart the participation; we did not anticipate the large sample ultimately achieved. To participate in the voucher draw, participants were invited to enter their email in a separate follow-up survey that was not linked to the main dataset.

[2]https://osf.io/crs2n/

Materials and Procedure

The main procedure was based on a similar survey conducted in Australia and the US (Faasse and Newby, 2020).

Geographical Information

After providing informed consent, we checked whether potential respondents were residing in Norway. Those who did not were thanked and the survey was terminated. We then collected information on participants' postcodes and the county they resided in. Based on the postcode data, we identified the municipality participants resided in. Using these data, we added

the amount of COVID-19 cases for that given municipality on the day the respondent completed the survey based on numbers provided by the Norwegian institute of health [Folkehelseinstitutt (FHI)] and made accessible by the newspaper VG[3]. Similarly, we added information on population density per municipality level based on data from the Statistisk Sentralbyrå.

Information Sources

In order to assess the variety and amount of media exposure, we asked participants how much they had seen, read, or heard about COVID-19 [from nothing at all (1) to a lot (4)], how much they think they know about COVID-19 [nothing at all (1) to a lot (4)], and how closely they had been following news about the recent outbreak [from not at all (0) to very closely (10)]. These three items were combined into a mean media exposure score ($\alpha = 0.68$).

Afterward, we instructed respondents to check all possible sources through which they had been getting information about the COVID-19 outbreak [including news media, social media, official government websites, family member(s), colleague(s) or friend(s), none of the above, and other]. Similarly, we asked participants which out of several sources they trusted the most concerning the outbreak [my doctor, my local hospital, Folkehelseinstitutt, (Norwegian) media, WHO, Norwegian government, state department of health, none of the above, other]. To further investigate respondent's confidence, we asked how much confidence they had in different sources: the Norwegian government providing full and accurate information, the Chinese government providing full and accurate information, and scientists and medical experts understanding the outbreak. All items were completed on a 10-point scale (not at all confident to very confident, and don't understand at all to understand very clearly).

Respondents were also asked about how confident they thought health authorities, and hospitals and medical services were able to manage the COVID-19 outbreak [from not at all confident (0) to very confident (100)]. The four items (excluding the item on the Chinese government) were averaged into a confidence score ($\alpha = 0.73$). The item focusing on the Chinese government was excluded as we mainly intended to focus on confidence in Norwegian health authorities. Additional analyses including the item are presented in the **Supplementary Materials**.

Perceived Risk

Respondents were asked how concerned or worried they were about the COVID-19 outbreak [not at all concerned (1) to extremely concerned (5)]. Participants indicated how likely they thought it would be that they themselves would get infected by COVID-19 and also how likely they thought it would be that close others (family/friends) would get infected [not at all likely (0) to extremely likely (100)]. Similarly, we asked how much participants thought they could do to protect themselves [effectiveness of behavior, I can't do anything to protect myself (0) to I can do a lot to protect myself (100)]. Asking about perceived severity, participants reported how serious they thought their symptoms would be if they got infected, and what the worst possible outcome could be for a family member or close friend that got the virus [no symptoms (1) to severe symptoms leading to death (6)]. Then, we asked whether participants had already wondered at some point whether they were infected [not at all (0) to very much so (100)]. Finally, we asked respondents whether they thought that too much fuss was being made about the risks of COVID-19 [strongly disagree (1) to strongly agree (5)]. This item was used previously to tap skepticism about warnings in public health crises (Rubin et al., 2015).

Emotional States

Affective reactions were captured with several items. Participants reported whether they felt fearful, frightened, anxious, optimistic, encouraged, hopeful, relaxed, furious, outraged, depressed, and sad [strongly disagree (1) to strongly agree (5)][4]. We averaged the first three items to create a fear score ($\alpha = 0.85$), items four to six to create a hope score ($\alpha = 0.69$), items eight and nine to create an anger score ($\alpha = 0.80$), and the last two items to create a sadness score ($\alpha = 0.61$). We included items on specific *basic* negative emotions (Ekman, 1992; Ahorsu et al., 2020) and future-oriented positive emotions (Fredrickson, 2001) that we expected to occur commonly in response to health epidemics (Kleinberg et al., 2020; though see Fiske, 2019 for a critique of this approach).

Knowledge

In order to test participant's knowledge about the COVID-19 outbreak, we first asked them to judge whether 16 statements about the virus and disease were true (answer alternatives true, false, and unsure). We then asked participants to indicate what the most common symptoms of COVID-19 were from a list of seven possible symptoms (fever, cough, sore throat, shortness of breath, nausea, vomiting, diarrhea)[5]. Afterward, respondents were prompted to indicate how COVID-19 could spread, according to their knowledge (by air, by water, by mosquitoes, droplets spread through coughing or sneezing, touching surfaces that have been recently touched by someone who is sick, and touching or shaking hands with a person who is sick). The symptoms and transmission items used the same scale (yes, no, unsure). Because the employment of face masks has been a popular debate, we asked who should be wearing a face mask to minimize transmission (healthy people - to prevent infection, sick people - to stop them spreading the virus, everyone, and no one)[6]. Finally, we asked participants to estimate what percentage of people who had been infected with COVID-19 had died from the

[3]https://www.vg.no/spesial/2020/corona/

[4]In a first version of the questionnaire the scale went from "strongly agree (1)" to "strongly agree (5)" due to a clerical error. This was corrected immediately after the first approximately 20 responses.

[5]At the time the survey was started, symptoms like nausea or diarrhea were not regarded as typical symptoms of COVID-19. However, as the outbreak proceeded the WHO added these to the list of possible symptoms (https://www.who.int/health-topics/coronavirus#tab=tab_3). Thus, these responses were not part of the final knowledge score.

[6]During the time the study was conducted there was a general recommendation that face masks should only be worn by infected people. This recommendation changed after the project was terminated, highlighting the usefulness of face masks also for healthy people.

virus. Respondents were able to provide an answer between 0 and 100%. Out of all correct answers[7] we constructed a knowledge sum score (ranging from 0 to 31). For the last item, we took the range between 1 and 5% as a correct answer, as official indications had been varying somewhat during the period the study was conducted.

Avoidance Behaviors

We then asked respondents to indicate whether they performed 24 different health-protective behaviors in response to the COVID-19 outbreak during the past 2 weeks. These behaviors consisted of physical distancing behavior (13 items, e.g., reduced or avoided going to work or university), hygiene behavior (6 items, e.g., used sanitizing hand gel to clean your hands more often than usual), prosocial behavior (3 items, e.g., helped buying groceries and supplies for people who are in quarantine), and two additional items (e.g., worn a face mask when going out in public)[8]. Responses could be made using four alternatives (yes, no, unsure, not applicable). For each type of behavior, we computed a sum score based on whether the behavior was performed or not. In addition, we computed an overall health/communal-protective behavior sum score based on the physical distancing, hygiene, and prosocial items (summing up all items). Finally, respondents were able to write down whether they did anything else in response to the COVID-19 outbreak.

Demographics and Health-Related Information

We collected several items on demographic information and health-related behavior and characteristics. First, participants were asked how likely they would be to get vaccinated in case an effective vaccine for COVID-19 had been developed [would definitely get the vaccine (1) to would definitely NOT get the vaccine (5)]. We then asked to what age groups respondents belonged to (e.g., 18–19, 20–24, 25–29, 30–34, . . ., 80+) and with what gender they identified (male, female, non-binary, different identity, prefer not to say). Participants then indicated how many children they had (none, 1, 2, more than 2) and the level of their highest education (less than high school, high school graduate, some college, BA degree, MA degree, professional degree, doctorate). We then asked what type of community they lived in (large city, suburb, small city/town, rural area) and how many people (including them) lived in their household (from 1 to 5 or more). Participants then completed some items about their health status, including how they would rate their health in general [poor (1) to excellent (5)], whether they had a flu vaccine within the last year (yes, no, unsure), whether they had been in an affected area with high transmission within the past 2 weeks, whether they had been in close contact with people who are suspected to be infected, whether they had experienced any COVID-19 symptoms, whether close others experienced any symptoms (on all yes, no, unsure), whether they had any chronic health problems that increased their risk, and whether close others had any chronic health problems (both items yes, no, unsure, prefer not to say). Finally, participants were thanked and provided with several links to websites from official sources (WHO, ECDC, FHI) that provided information about the COVID-19 outbreak.

Data Analysis

When analyzing data using null hypothesis significance testing (NHST), we set our alpha level at $p < 0.001$. This decision was based on the fact that we employed a considerably large dataset and our findings might have important health-psychological implications (see Lakens et al., 2018). As even small effects will reach statistical significance given large samples, we primarily focus on interpreting effect sizes and their direction and magnitude.

As said above, our analytic strategy was twofold: first a theory-driven step and second an exploratory data-driven machine learning step. For the theory-driven step, we used regular linear regression. The mediation models also tested in this first step employed a bootstrapping method ($n = 1000$) to calculate confidence intervals around the indirect effect.

For the data-driven step, the goal was to classify what variables predicted health-protective behavior out of all predictors we had available in a bottom-up fashion. To do so, we combined supervised machine learning with a partially confirmatory approach (split-half validation) as employed in previous research dealing with large numbers of predictors (e.g., IJzerman et al., 2018). As a supervised machine learning technique, we used conditional random forests, a bootstrap-like algorithm that assesses the relative contribution of each variable on the dependent variable (the signal), therefore being considered a supervised approach (Breiman, 2001). As the name suggests, the algorithm "plants a forest consisting of several trees" that represent the importance of a predictor randomly sampled from the dataset. This procedure is based on out of bag estimates, also called bagging, that features repeated sampling from the original data. In essence, the technique bootstraps several non-parametric regression models and summarizes the importance of each predictor by aggregating and weighting the predictors into a parsimonious set (see Breiman, 2001; IJzerman et al., 2016; Yarkoni and Westfall, 2016). As summarized by IJzerman et al. (2018), employing a supervised machine learning algorithm has several advantages in comparison to classical regression models, and especially using them for exploratory analyses. The algorithm is naive to non-linear relationships, does not assume the direction of a relationship, has less problems with multicollinearity, and has the advantage of assessing each predictors individual role, but also its multivariate interactions with other variables (Strobl et al., 2008).

For our analyses we employed R (Version 3.6.2) and several packages including: dplyr (Wickham and François, 2020), car (Fox et al., 2020), sjmisc (Lüdecke et al., 2020), tidyr (Wickham and Henry, 2020), and stringr (Wickham, 2019) for data recode and wrangling routines, ggpubr (Kassambara, 2020), sp (Pebesma et al., 2020), viridis (Garnier et al., 2018), cowplot (Wilke, 2019), fhidata (White, 2019) for plotting, apaTables (Stanley, 2018)

[7] https://osf.io/utk5y/

[8] Originally, we subsumed these under the label of *counterproductive behavior*. However, as the outbreak progressed and more people got infected, wearing a face mask if infected could be considered a behavior protective of others' health. Similarly, we added *prosocial* as an own category, but most physical distancing behavior can be regarded as prosocial in the long run (e.g., Pfattheicher et al., 2020).

for tables, lavaan (Rosseel et al., 2019) for mediation analyses, and randomForest (Breiman et al., 2018), party (Hothorn et al., 2020), tree (Ripley, 2019), lattice (Sarkar, 2008) for the machine learning analyses.

RESULTS

Descriptives

Considering respondents' information sources, the majority indicated that they received their information about the COVID-19 outbreak from several different sources – on average, participants indicated M = 3.15 different sources (SD = 1.21). A total of 95% reported news media as an information source, with a smaller number using official government websites (83%) or social media (63%). Less than half of all participants indicated that they used colleagues (42%) or family members (31%) as an information source. No participant reported relying on no source at all.

The majority of participants expressed trust in advice and information from the Norwegian health institute (FHI; 88%). This trust was much smaller for the Norwegian department of health (38%), the Norwegian government in general (34%), and the European Centre for Disease Prevention and Control (ECDC; 33%). A total of 20% of respondents reported trusting (Norwegian) media, and the overall lowest trust was indicated for one's doctor or general practitioner (10%), and one's local hospital (12%).

Respondents rated their own perceived likelihood of catching COVID-19 on average somewhat over the midpoint of the 100-point scale (M = 60.34, SD = 22.27). Assuming they would get infected, the majority predicted to have mild or moderate symptoms (82.7%), while a small proportion reported to expect no (0.4%) or more severe symptoms (14.2%). Participants saw it as even more likely that someone from their family or a close friend would get infected (M = 72.85, SD = 22.53). When imagining the worst possible outcome for a family member or friend who would get infected, the majority (70.9%) also foresaw potentially worse outcomes including severe symptoms or severe symptoms leading to hospitalization or death. Participants reported that they had already wondered whether they were infected somewhat lower than the midpoint of the scale (M = 43.59, SD = 35.97). Finally, on average respondents tended to disagree that too much fuss was being made about the risks of the COVID-19 outbreak (M = 1.84, SD = 1.12 on a 1–5 scale), with only around 10.9% tending to agree or strongly agree.

On average, participants indicated that they were moderately concerned or worried about the outbreak (M = 3.09, SD = 0.91), with 32.4% being very or extremely concerned. Similarly, on average respondents reported to show the highest levels of fear (M = 3.61, SD = 1.00), followed by sadness (M = 3.11, SD = 1.05), hope (M = 2.46, SD = 0.88), and anger (M = 2.26, SD = 1.16).

Considering behavior responses, the majority of respondents reported that they had reduced or avoided going to public events (84%), taking public transport (74%) or going to shops (79%). Similarly, a high percentage of participants disclosed that they had washed their hands more often (92%) and more thoroughly (92%), tried to stay away more than 1 m from others coughing or sneezing (90%), as well as tried to sneeze into the crook of their arm (86%). For prosocial behavior, a majority of respondents indicated that they talked to others and tried reminding them of protective behavior (76%). A rather low occurrence of participants reported that they had avoided Chinese restaurants or neighborhoods specifically (9%) or donated money to charity focusing on combating the COVID-19 outbreak (9%). An overview of all behaviors is provided in **Figure 2**.

Factors Predicting Health-Protective Behavior

In order to classify important variables predicting engagement in health-protective behavior we employed two different strategies: a highly confirmatory theory-driven strategy based on reviews and previous studies on the COVID-19 outbreak, and a highly exploratory data-driven approach using a supervised machine learning procedure combined with split-half validation.

Theory Driven Approach

In order to test hypothesis I, we conducted a linear regression using the health-protective behavior sum score as the outcome and gender, education, age, and household size as predictors (see **Table 1** and **Figure 3** for results). As predicted, reporting one's gender as female, indicating a higher education level, as well as a bigger household was associated with significantly more engagement in health-protective behavior. Contrary to our prediction, age showed a negative association with health-protective behavior. However, when inspecting the relationship between age and engagement in health-protective behavior, we observed a non-linear relationship showing first an increase in behavior with increasing age that leveled off at around 40–44 years of age (**Figure 3B**). Notably, our sample included few individuals over the age of 70, suggesting that these findings should be interpreted with caution. Similarly, when repeating the model with time as a covariate the age effect was not significant, while the other predictors still showed positive effects (see **Supplementary Material**).

To test hypothesis III, we regressed the confidence score (mean score based on ratings of confidence in Norwegian government, scientists, health authorities, and medical services) on engagement in health-protective behavior (**Table 1** and **Figure 3D**). Contrary to our prediction, we observed a small negative association. The more confidence respondents expressed in authorities, the less health-protective behavior they reported.

Mediation Analyses

We tested four mediation models. The tests are documented in detail in the **Supplementary Material** (**Supplementary Figure S1**). In all models, health-protective behavior was the dependent variable. The first three models tested separately whether the effects of gender, age, and education level, respectively, were mediated by two mediators, likelihood and severity of perceived risk. The fourth model tested whether the effect of household size on health-protective behavior was mediated by likelihood and severity of risk to close others.

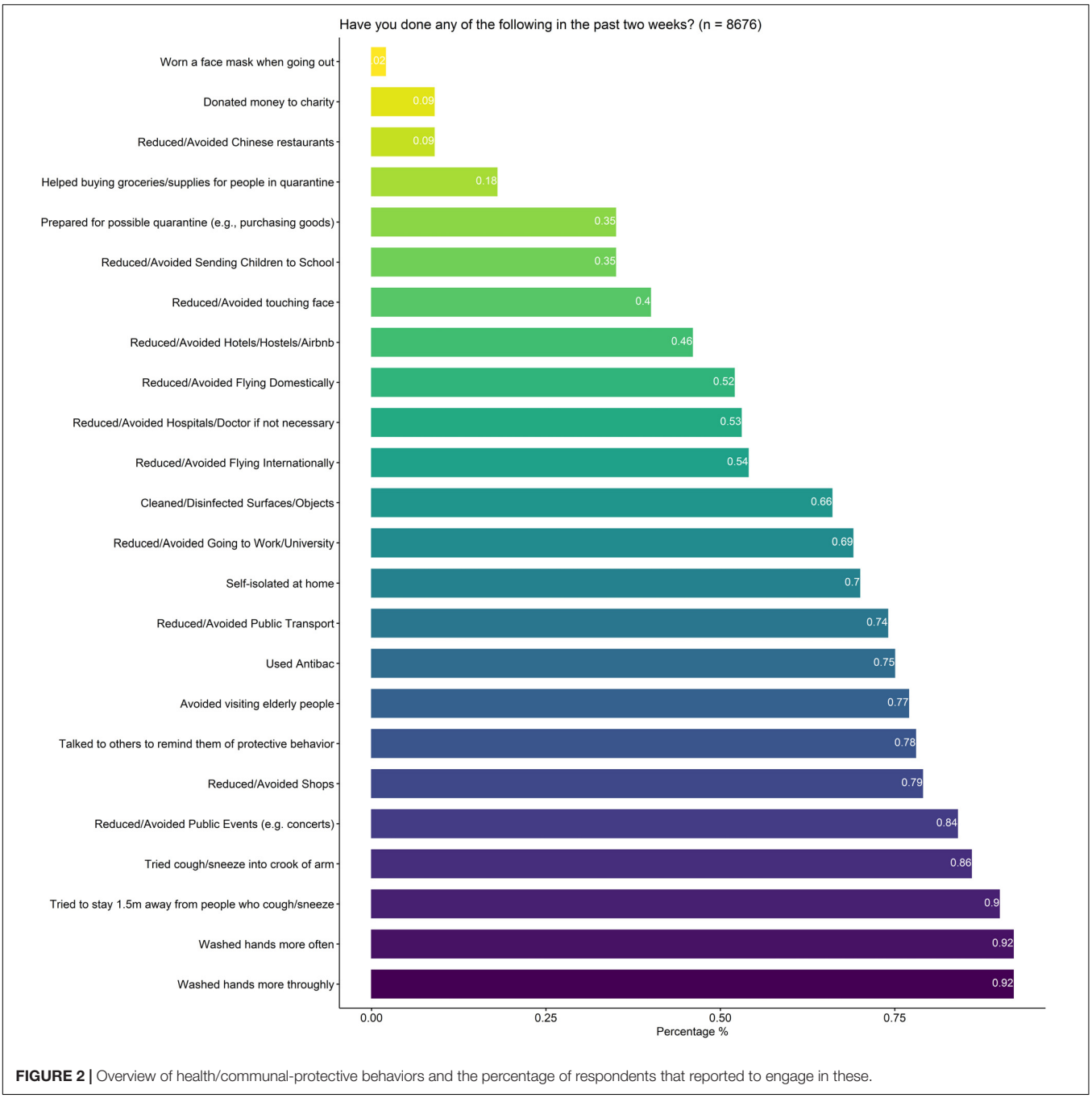

FIGURE 2 | Overview of health/communal-protective behaviors and the percentage of respondents that reported to engage in these.

In short, we found some evidence for mediation of the demographic variables gender, age and education level through likelihood and severity of risk, confirming classic notions of expectancy × value theories. This was especially true for age and education, and the mediation through likelihood. However, all observed mediations were small and partial, and the patterns varied between the different models. This suggests that the demographic variables impact behavior through other channels that were not captured by our measured constructs. We thus do not go into further detail on these here; see the **Supplementary Material** for further information.

Data Driven Approach

Following the strategy laid out above, we employed a data driven approach to identify the strongest predictors that parsimoniously predict health-protective behavior from all predictors we had available. For this purpose, we first split the dataset randomly in half and performed conditional random forests on one half, the training dataset (n = 4338). For reproducibility, we actually performed the algorithm using two different seeds and two versions of the amount of variables sampled at each tree (MTry, the square root of the number of variables, 5 or 6). The Spearman Rank correlation among the replications was between 0.96 and

TABLE 1 | Regression models results using health-protective behavior as the criterion.

Predictor	*b*	*b* 95% CI [LL, UL]	*beta*	*beta* 95% CI [LL, UL]	*r*
Model 1. Fit: R^2 = 0.040*, 95% CI [0.03,0.05]					
(Intercept)	10.91*	[9.87, 11.96]			
Gender	0.86*	[0.69, 1.03]	0.11	[0.09, 0.13]	0.11*
Age	−0.05*	[−0.08, −0.02]	−0.04	[−0.06, −0.02]	−0.05*
Education Level	0.10*	[0.05, 0.15]	0.04	[0.02, 0.06]	0.04*
Household Size	0.42*	[0.36, 0.47]	0.15	[0.13, 0.18]	0.16*
Model 2. Fit: R^2 = 0.004*, 95% CI [0.00,0.01]					
(Intercept)	15.27*	[14.99, 15.54]			
Confidence in Authorities	−0.13*	[−0.17, −0.09]	−0.06	[−0.09, −0.04]	−0.06*

*Gender was dummy coded (0 = Male; 1 = Female). A significant b-weight indicates the beta-weight and semi-partial correlation are also significant. b represents unstandardized regression weights. beta indicates the standardized regression weights. r represents the zero-order correlation. LL and UL indicate the lower and upper limits of a confidence interval, respectively. *Indicates p < 0.001.*

0.98 and therefore considered as stable. According to this analysis of the training dataset, health-protective behavior was best predicted by (in order; see also **Supplementary Figure S2**):

> concern/worry, fear, household size, thinking that too much fuss is made, number of children, perceived effectiveness of behavior, media exposure, sadness, anger, age, relaxation, symptoms (close others), symptoms, perceived risk (likelihood), being to an area with a high number of cases, gender, contact to other individuals showing symptoms, community type, education level, perceived health, knowledge, perceived risk (severity), population density at municipality level.

We observed no evidence that perceived risk (severity) of close others, feeling hope, perceived risk (likelihood) of close others, amount of media sources consumed, actual number of cases per municipality, confidence in authorities and scientists, or taking a flu vaccine within the last year predicted better than random noise.

We then continued to run a regression analysis on health-protective behavior using the second half of the data, the test dataset (n = 4338) with the predictors found in training dataset. This was done to reduce random noise from the first step. An overview of the results is provided in **Table 2**. Health-protective behavior was positively and significantly (at the 0.001 level) predicted by household size, number of children, perceived effectiveness of the behavior, and media exposure, when controlling for all other variables. Similarly, we observed that thinking that people made a fuss about the outbreak and reported age showed significant negative predictions when controlling for the other predictors.

As mentioned earlier, the negative finding concerning age should be interpreted with caution since we sampled a small number of older adults exceeding 70 years of age and considering the relationship between age and health-protective behavior showed a non-linear association, resembling a reverse u-shaped curve. While other variables such as concern or fear showed the strongest variable importance in the first step, they did not emerge as significant predictors from the second step. However, they still showed a similar positive effect as for example media exposure and medium zero-order correlations. The same was true for symptoms and relaxation, with the latter showing a negative prediction.

We repeated the procedure of training machine learning and test using linear regression for hygiene and physical distancing behavior separately. Results differed only minimally and can be found in the **Supplementary Materials**. For physical distancing, perceived effectiveness of the behavior and respondent's symptoms had a stronger variable importance. For hygiene behavior, the amount of media sources they were exposed to and whether respondents received a flu vaccine within the last year were more important. Physical distancing was positively and significantly predicted by household size, number of children, whether the respondent experienced symptoms, and perceived effectiveness of one's own behavior. On the other hand, thinking that people made a fuss and age predicted physical distancing negatively. For hygiene behavior, concern/worry, fear, and media exposure showed a significant positive association when controlling for the other variables. Thinking that 'too much fuss' was being made about the risk of COVID-19 predicted hygiene behavior negatively. In general, it seemed that being surrounded with more people, and regarding staying away from others as effective, predicted physical distancing, whereas emotional reactions and media exposure were more important for in engaging in hygiene behavior.

Development of Behavior, Attitudes, and Affective Reactions Over Time

Finally, we explored the development of behaviors, attitudes, and affective reactions over time. We focused specifically on physical distancing and hygiene behavior (behavior), confidence in authorities, perceived risk likelihood, perceived risk severity (attitudes), and concern/worry, fear, and hope (affective reactions). We regressed each variable on day and day squared. We excluded dates that included less than 50 participants, which was true for the beginning (March 12, n = 18) and end of data collection (March 26, n = 20). The first day of the time series was thus coded as 1. Thus, we focused on 13 data points per variable (n = 8638). Notably, we did not employ a repeated measurement design. We can thus only model changes between participants, but not within, and changes observed over time

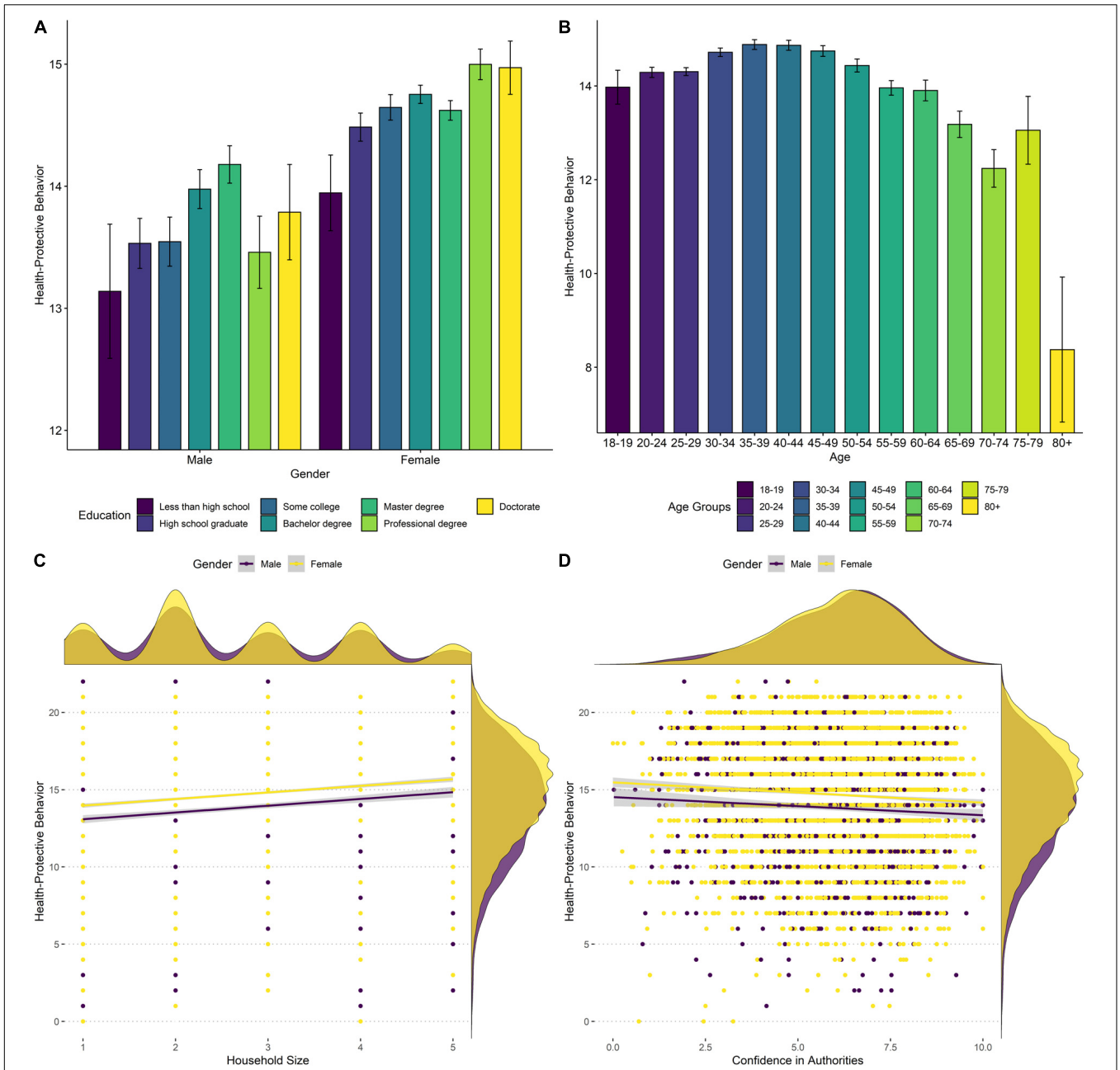

FIGURE 3 | (A) Health-protective behavior by gender and education level. **(B)** Health-protective behavior by age group. **(C)** Association of health-protective behavior and household size separately for gender. **(D)** Association between health-protective behavior and confidence in authorities separately for gender.

could be due partially to changes in the sample composition. In order to control for changes in demographics per day we computed four logistic regression models regressing age, gender, education level, and household size on day and day squared. We only observed statistically significant effects for age showing a negative linear effect ($B = -0.69$, $SE = 0.05$) and a positive quadratic effect ($B = 0.04$, $SE = 0.003$), suggesting that the sample in general became younger over time, but then increased in age at the end of the sampling period. As previous analyses suggested that age predicted health-protective behavior and other variables, we added age as a covariate to all models in order to control for it.

Results are provided in **Table 3** and time series can be found in **Figure 4**. For behavior, we observed that physical distancing showed a significant positive linear trend. Overall, engagement in physical distancing behavior increased during the days of data collection. On the other hand, hygiene behavior showed no significant linear or quadratic effect. Instead, it showed a small decrease during the first days, but remained rather stable.

TABLE 2 | Regression results using health-protective behavior as the criterion.

Predictor	*b*	*b* 95% CI[LL, UL]	*beta*	*beta* 95% CI[LL, UL]	*r*
Model 3. R^2 = 0.173*, 95% CI[0.14,0.19]					
(Intercept)	7.91*	[5.20, 10.62]			
Concern/Worry	0.27	[0.07, 0.48]	0.07	[0.02, 0.13]	0.26
Fear	0.23	[0.04, 0.42]	0.07	[0.01, 0.13]	0.25
Household Size	0.30*	[0.15, 0.44]	0.11	[0.06, 0.16]	0.18
Fuss	−0.27*	[−0.40, −0.14]	−0.09	[−0.13, −0.05]	−0.20
# Children	0.37*	[0.17, 0.56]	0.12	[0.06, 0.19]	0.11
Perceived Effectiveness	0.02*	[0.01, 0.03]	0.11	[0.07, 0.15]	0.10
Media Exposure	0.33*	[0.14, 0.52]	0.07	[0.03, 0.11]	0.17
Sadness	0.04	[−0.11, 0.20]	0.01	[−0.03, 0.06]	0.15
Anger	0.11	[−0.02, 0.24]	0.04	[−0.01, 0.08]	0.12
Age	−0.16*	[−0.23, −0.08]	−0.12	[−0.17, −0.06]	−0.09
Relaxation	−0.21	[−0.34, −0.07]	−0.07	[−0.12, −0.02]	−0.22
Symptom Close Others	0.11	[−0.20, 0.41]	0.02	[−0.03, 0.06]	0.11
Symptoms	0.48	[0.15, 0.81]	0.07	[0.02, 0.11]	0.15
Perceived Risk (Likelihood)	0.01	[−0.00, 0.01]	0.04	[−0.01, 0.08]	0.14
Area	0.14	[−0.19, 0.48]	0.02	[−0.02, 0.06]	0.03
Gender	0.40	[0.08, 0.72]	0.05	[0.01, 0.09]	0.12
Contact	0.44	[0.06, 0.83]	0.05	[0.01, 0.09]	0.09
Community Type	−0.14	[−0.30, 0.03]	−0.04	[−0.10, 0.01]	−0.03
Education	0.09	[−0.01, 0.19]	0.04	[−0.00, 0.08]	0.05
Perceived Health	−0.01	[−0.17, 0.14]	−0.00	[−0.05, 0.04]	−0.03
Knowledge	−0.05	[−0.10, −0.00]	−0.04	[−0.08, −0.00]	−0.00
Perceived Risk (Severity)	0.06	[−0.13, 0.26]	0.01	[−0.03, 0.06]	0.04
Population Density (Municipality)	0.00	[−0.00, 0.00]	0.01	[−0.05, 0.06]	0.01

*A significant b-weight indicates the beta-weight are also significant. b represents unstandardized regression weights. beta indicates the standardized regression weights. r represents the zero-order correlation. LL and UL indicate the lower and upper limits of a confidence interval, respectively. *Indicates $p < 0.001$.*

Considering attitudes, we observed that confidence in authorities slightly increased during the testing period, though this effect was not statistically significant. Perceived likelihood of catching COVID-19 showed both a significant positive linear trend and a significant negative quadratic trend, first increasing, but later showing a small decrease. Severity of the disease combined a significant negative linear and a positive quadratic trend, first decreasing and then increasing. Taken together, it seems that the more likely catching COVID-19 was reported to be, the less severe respondents estimated it to be over time. Finally, experiencing concern or worry showed a significant negative linear effect decreasing over time. At the same time, we also observed a significant positive quadratic trend, suggesting that concern increased at the end of the testing period. Experiencing fear showed a small decrease over time. For experiencing hope, we did not find any significant linear or quadratic trends.

DISCUSSION

We sampled over 8.000 Norwegian participants in the first 2 weeks after schools were closed and many employees were sent to work from home, at the beginning of the COVID-19 outbreak in Norway. We observed self-reported health-protective behavior and emotions in real time, while numbers of registered infections rose from 805 to 3399, the number of hospitalized patients rose from 32 to 265, and the number of deceased patients rose from 1 to 14.

Although policy setting may be the main determinant of behavior, psychological factors play an important role in responses to health crises as they modulate how people adopt the guidelines. In the present project we focused on what factors are correlated to engagement in two variants of protective behavior: preventive, such as hygiene behavior, and avoidance, including physical distancing. We employed both a theory- and a data-driven approach, and we explored how attitudes, behavior, and affective reactions changed over the course of the 15-day sampling period. To protect us from overinterpreting spurious effects, which would be costly in the current situation, we set our significance level to $p < 0.001$.

Information Sources, Confidence in Authorities and Perceived Risk

In our sample, main news sources were news media, government websites, and social media in that order, more than colleagues and family members. When indicating whom they trusted most, participants mainly pointed to the Norwegian Institute of Health (FHI), more so than other Norwegian government sources or European sources. One's own doctor and hospital was rarely reported as the most trusted source. Confidence

TABLE 3 | Changes in main variables over the sampling period detailed through regressing them on day of answering (linear and quadratic), controlling for participant age.

Predictors	*B*	*SE*	*t*
Physical Distancing			
Intercept	7.34	0.20	37.22*
Time	0.28	0.06	5.05*
Time^2	−0.01	0.004	−3.06
Age	−0.05	0.01	−4.35*
Hygiene Behavior			
Intercept	5.40	0.09	57.14*
Time	−0.06	0.03	−2.13
Time^2	0.003	0.002	1.50
Age	−0.01	0.006	−1.74
Confidence in Authorities			
Intercept	5.57	0.13	44.10*
Time	0.08	0.04	2.08
Time^2	−0.002	0.003	−0.65
Age	0.03	0.007	3.68*
Perceived Risk Likelihood			
Intercept	58.76	1.71	34.46*
Time	1.97	0.49	4.04*
Time^2	−0.17	0.04	−4.90*
Age	−0.54	0.10	−5.39*
Perceived Risk Severity			
Intercept	2.72	0.06	45.81*
Time	−0.14	0.02	−8.31*
Time^2	0.01	0.001	7.34*
Age	0.10	0.003	29.83*
Concern/Worry			
Intercept	3.41	0.07	48.83*
Time	−0.13	0.02	−6.37*
Time^2	0.008	0.001	5.45*
Age	0.02	0.004	5.22*
Fear			
Intercept	4.06	0.08	52.29*
Time	−0.08	0.02	−3.69*
Time^2	0.004	0.002	2.66
Age	−0.03	0.005	−6.12*
Hope			
Intercept	2.18	0.07	31.71*
Time	0.06	0.02	2.96
Time^2	−0.004	0.001	−2.59
Age	0.02	0.004	4.27*

*Indicates $p < 0.001$.

was high that authorities, including the Norwegian government, scientists, health professionals, and medical services, were able to manage the outbreak. Despite the increase in infected cases, we observed that confidence stayed stable and even slightly (but not significantly) increased over the time of 15 days.

Respondents expected that they too would likely get infected, with an average above the midpoint on our likelihood rating scale (60%). This average was at the upper end of FHI's prediction for the general population from 12/03, and higher than the number in Wise et al.'s (2020) sample (M = 43) and the representative sample analyzed by Sætrevik (2020), suggesting that due to our sampling strategy our participants might be more concerned and engaged with the topic than the Norwegian population on average. At the same time, perceived severity was predominantly rated with mild or moderate symptoms. Ratings were higher for the perceived likelihood of close others catching the disease (73%) and similarly, a high proportion of respondents (71%) could imagine that someone from their family would show severe symptoms or even die when imagining the worst case. This was also in line with the observations made in parallel by Sætrevik (2020).

Health-Protective Behavior

Self-reported behavior was very much in line with policies asking for (but not mandating by law) physical distancing and protective hygienic behavior. Even behavior that is sometimes difficult to avoid like taking public transport and going to shops was reported as being reduced or avoided by more than 70% of the sample. More than 70% reported other-protective behavior in the form of reminding other individuals of proper behavior or not visiting older individuals. Fewer people actively helped others by for instance buying groceries or even giving money to charities combating COVID-19. Only a small minority reported irrational avoidant behavior (e.g., avoiding Chinese restaurants – given that the main group bringing infections into Norway were Norwegians coming from winter holidays in the Alps rather than travelers associated with China).

In line with previous findings during other pandemics and also COVID-19 (Bish and Michie, 2010; Harper et al., 2020; Wise et al., 2020), the elevated level of appropriate protective and avoidant behavior was predicted by demographic variables: female participants, higher education levels, and larger household sizes. To some extent, these effects were mediated by elevated perceptions of likelihood and severity of the disease for self and others, but these mediations did not explain much variance and indirect effects were considerably small. These models may underestimate the true effect, however, because expectations and behavior changed over the course of the sampling period. There might be other factors that explain this pattern of results. For instance, recent findings show that compassion and empathy play an important role for the engagement in physical distancing during the COVID-19 outbreak (Pfattheicher et al., 2020) and such reactions have been observed to a higher degree in women (Christov-Moore et al., 2014).

Previous studies also reported that older age predicted more engagement in health-protective behavior. We failed to find a clear replication in the current sample. In fact, our regression analyses point in the direction that older age is associated with less adoption of health-protective behavior. When exploring this association in more detail, we observed four important boundaries. First, we observed a non-linear relationship between age and protective behavior, suggesting that engagement in health-protective behavior increased with age as predicted by previous literature, but then leveled off at around the age of 40–44 and decreased with older age. Second, our sample included only a few participants above the age of 70. Their estimates are therefore highly imprecise compared to younger respondents (that we

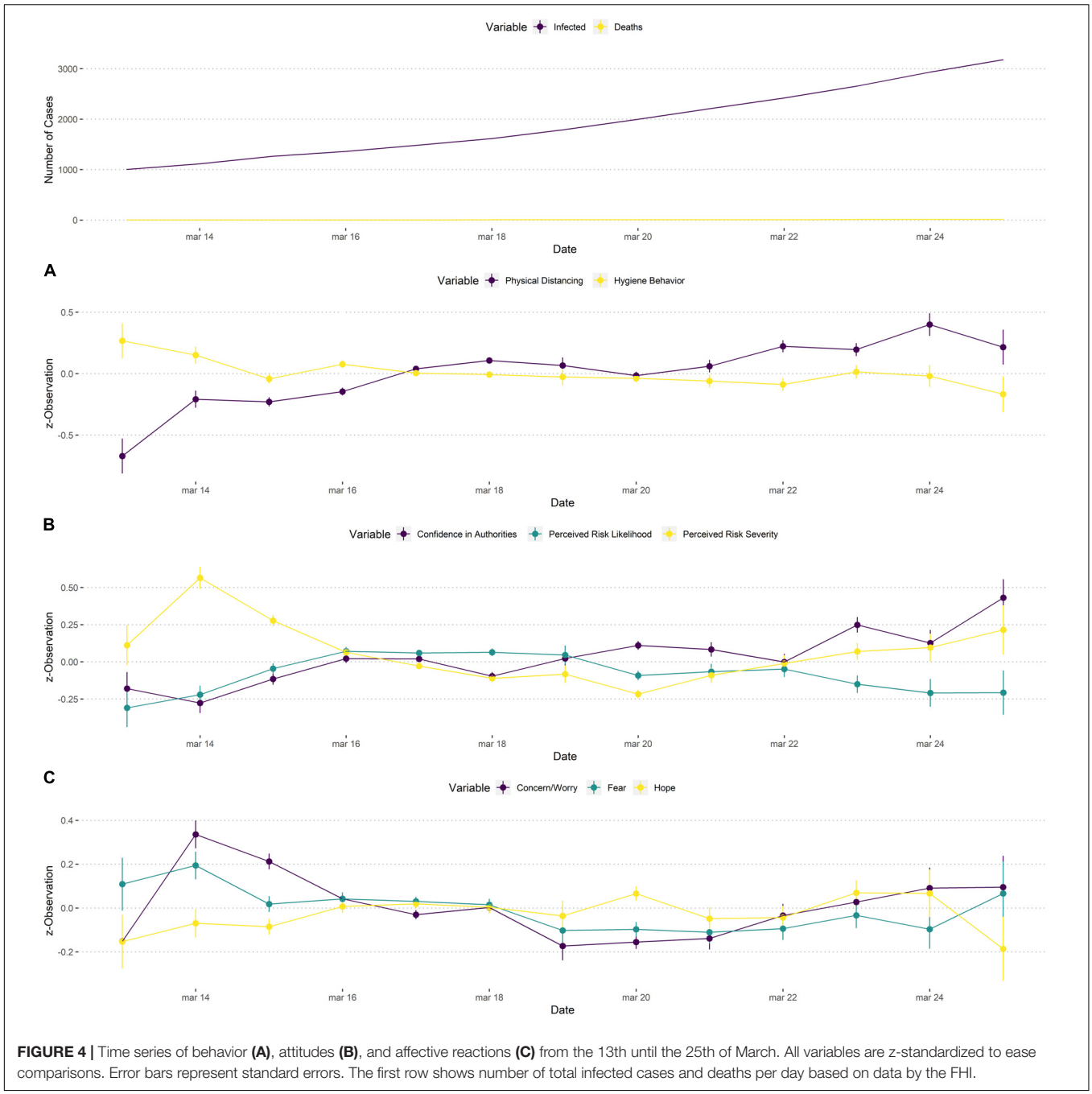

FIGURE 4 | Time series of behavior **(A)**, attitudes **(B)**, and affective reactions **(C)** from the 13th until the 25th of March. All variables are z-standardized to ease comparisons. Error bars represent standard errors. The first row shows number of total infected cases and deaths per day based on data by the FHI.

sampled around 100 times more often) and when excluding age groups with less than 50 participants the relationship between age and protective behavior was reduced to near zero. Third, the effect was reduced when controlling for time. Fourth, when constructing the main outcome variable in a different way in order to account for the possibility that some behaviors from our list were not applicable for older adults (e.g., avoiding work) we observed a weaker effect (see **Supplementary Material**). Thus, given the composition of our sample we can be more certain that respondents at the age of 40 engage in more protective behavior than respondents at the age of 20. However, whether engagement in health-protective behavior again decreases for individuals at the age of 50 should be interpreted with caution. If this is indeed the case, this would represent an important finding as risk factors and susceptibility increase with age. We recommend testing this question with a representative sample.

In a second step, we tested the influence of more than 30 variables on health-protective behavior employing a supervised machine learning algorithm. We observed that higher engagement in health-protective behavior was associated with (1) larger household size, (2) more children, (3) higher perceived effectiveness of the protective behavior, (4) more media

exposure, and (5) reduced belief that 'too much fuss' was made about the outbreak (i.e., discrediting the severity and credibility of the crisis, Rubin et al., 2015) above and beyond other factors such as knowledge, perceived risk, living in a municipality with a high amount of recorded cases or one's own perceived health. The simultaneous presence of demographic and psychological predictors indicates that the psychological mediators of the remaining demographic factors remain unclear.

When considering preventive and avoidance behaviors separately, we observed that household size (i.e., being surrounded by more people) and regarding staying away from others as effective predicted physical distancing, whereas emotional reactions such as concern, worry, or fear and media exposure had a stronger importance in engaging in hygiene behavior. Our findings replicate previous studies suggesting that high perceived effectiveness is important as a predictor of engaging in health-protective, and specifically avoidance behavior (Ajzen and Timko, 1986; Agüero et al., 2011).

The importance of household size and the number of children, especially for the adoption of avoidance behavior, points to the possibility that individuals might feel more personally responsible for their co-habitants. Literature on the effectiveness of health communications suggests that personal relevance represents an important factor for engaging in protective behavior, which is likely higher if more people within one's social proximity could be affected (Ruiter et al., 2001). Similarly, household size is typically conflated with age showing an inverse u-shaped curve, which fits our observations concerning the association between age and protective behavior. In addition, individuals that need to care for others might show more empathy or compassion, thereby increasing engagement of avoidance behavior as a means of prosociality (Pfattheicher et al., 2020).

On the other hand, engagement in preventive behavior such as hand washing or using hand sanitizing gel was associated less with social-contextual variables, but to a higher degree with felt concern, fear, or worry, as well as increased engagement with the topics. For both types of behaviors, we found that believing there is too much fuss made about the outbreak reduced it. This relation could have several reasons. Wise et al. (2020) identified a subgroup that was disengaged from the news, unaware of risks, and not practicing recommended behavioral change. Participants who indicated that "too much fuss was made" may have belonged to a similar subgroup. On the other hand, there might be a group of people who for some reason cannot change their behavior, and consequently adapt their attitudes to be consistent. In any case, if that group is large enough, it could counteract quarantine measures in communities. It thus seems important to follow up on this effect, again ideally with representative samples.

Contrary to our predictions, we observed that increased confidence in authorities reduced the adoption of health-protective behaviors. Similar findings were observed in the sister study of the current project with an Australian sample (Faasse and Newby, 2020). While confidence in governments, health professionals, and medical services has been reported as crucial for individuals to adopt behavioral change (Bish and Michie, 2010), it is possible that overconfidence results in reckless behavior, as it is assumed that everything will be under control no matter what individual actions are performed. This finding points at a dilemma, as confidence in authorities is needed to establish protective behavior in the first place and reduce panicking or intense fear of the outbreak (Asmundson and Taylor, 2020). Health communications therefore need to highlight the importance of individuals actions as part of greater societal outcomes, and simultaneously communicate conviction in recommended measures and risk.

During the 15-day sampling period, we observed a significant increase in avoidance behaviors. These changes could be explained by individual psychological factors such as increased personal relevance or concern, group behavior and attitudes (such as injunctive norms), or contextual factors. For instance, throughout Norway schools and universities were closed on the 12th of March, creating a uniform behavior change. Similarly, most public events such as sports or concerts were canceled. It is not possible for the present data to show whether changes in avoidance behavior were based on psychological factors or situational constraints. Interestingly, we observed little change in hygiene behavior during the sampling period. It could be possible that hygiene behavior was already quite high at the beginning of data collection: over 90% indicated engaging in more thorough hand washing behavior. On the other hand, increased self-isolation through avoidance behavior could have resulted in neglecting additional preventive behavior.

In contrast to previous studies on responses to pandemics or specifically COVID-19, we failed to find strong associations between perceived risk or knowledge and engagement in protective behavior. While perceived likelihood and severity showed positive relations with health-protective behavior, these effects were considerably small and smaller than factors such as the number of children or experienced concern. Similarly, knowledge showed no or even a negative relationship with engagement in protective behavior. As knowledge and media exposure were on average quite high, it could be that we simply did not have enough variation in the sample to detect a larger effect. Nevertheless, the implication seems to be that motivating people to practice protective behavior works best by emphasizing that it is effective, rather than by exaggerating risks of not engaging in it.

The present findings mostly replicate an earlier study using nearly identical methods in an Australian sample in an earlier stage of the pandemic (Faasse and Newby, 2020). Similar to this study, we found positive relations to media exposure, concern and worry, as well as effectiveness of behavior. In addition, we also replicated the finding that confidence in authorities and believing that too much fuss was made resulted in less health-protective behavior.

Our observed effect sizes ranged from zero-order correlations (r) of 0.26 between concern/worry and health-protective behavior to standardized regression coefficients (beta) of 0.07 for the prediction by media exposure when controlling for the other variables, or less. The estimated effect sizes are in line with published literature focusing on attitude-behavior relationships (Bosco et al., 2015) and can be considered as small to medium

effects. Similarly, our effects are comparable to previous research exploring predictors of health-protective behavior during the COVID-19 outbreak (Faasse and Newby, 2020; Harper et al., 2020; Wise et al., 2020). It would have been helpful to define a smallest effect size of interest in order to be able to conclude when an effect is absent by for example applying equivalence testing (Lakens, 2017). However, given the exponential nature of the growth of infections it is difficult to decide on a cut-off regarding which effects might not be of practical importance anymore. While standardized regression or correlation coefficients of 0.05 might be typically considered as too small to be of practical importance, they could still be informative in the current context. Answers to that can only come from models that integrate behavior and epidemiological effects (e.g., Poletti et al., 2012). In general, we note that our effects were on average comparable small.

Limitations

Our study has several limitations that should be considered when interpreting the findings. First, although large, our sample was not collected in a way that makes it representative. Women, younger people, and individuals with a higher education level are overrepresented; this should be taken into account when interpreting the presented findings. Nevertheless, our total sample size was large enough that we trust our estimates for male participants. Notably, percentage of people expecting to become infected, confidence in the government to handle the crisis, and percentage of those worried about family members are similar to numbers found in two representative survey studies among the Norwegian population (Kantar, 2020a,b), suggesting that our sample might be quite similar to the Norwegian population at large. Nevertheless, our study provides a snapshot of a 15-day period, focusing on a non-representative sample representing a specific culture with all its societal and normative implications, as well as certain healthcare systems and authorities that are hardly generalizable to different countries, healthcare systems, or timepoints in a pandemic.

Second, although time is a meaningful variable in the 15 days window that we observed, our sample is cross-sectional, not longitudinal. Changes over time can thus be caused by various confounding variables and simply be due to sampling variation, despite our efforts to control for that. Strong inferences about intra-individual change need repeated measures in a longitudinal design, which we do not have (Borsboom et al., 2003; Fisher et al., 2018).

Third, we did not pre-register our research methods and analysis plan. Indeed, we largely adopted an existing instrument and developed the literature review and hypothesis in parallel to data collection. The main research scope of the present project was exploratory in nature and we did our best to increase the reliability of our findings by conducting a split-half validation method (IJzerman et al., 2018). Due to the exploratory approach, we included several variables that have been found to predict protective behavior in past literature or were deemed important. Of course, it is possible that we failed to include important variables associated with health-protective outcomes, such as compassion or empathy (Pfattheicher et al., 2020).

Fourth, the measurement of some of the included variables, especially our outcome variable, could be improved. In the current project we assessed protective behavior using a dichotomous format (answer alternatives yes/no, we also added unsure, and not applicable). A Likert-scale type measurement might be superior in capturing the whole breadth of responses in the outcome variable. At the moment a respondent will answer yes if she avoided specific situations once or several times within the last 2 weeks. Using more response options would allow us to differentiate among such responses. Similarly, we focused on self-report of behavior, not actual behavior and there might be a gap between reported and actual health-protective behavior. However, recent research focusing on GPS movement data in the US during the COVID-19 outbreak suggests that self-report data might be used as a proxy for actual behavior (Gollwitzer et al., 2020).

Our measures of protective and avoidant behavior were much more comprehensive than our measure of other-supporting behavior. As the crisis proceeds, various behaviors that support the community through donating food, equipment, and money, making masks, supporting each other through buying food, and taking care of children become important, and it is known that such communal behavior emerges in crises and can be stifled by authorities reacting the wrong way (Solnit, 2009; Drury et al., 2019). Future studies should place more emphasis on such measures.

Finally, we believe that our understanding of the motives behind protective and avoidant behavior is not ideal. Unless one knows for sure whether oneself or another person is infected, most behavior serves both to protect oneself and others. For instance, the discussion about wearing non-clinical facial masks has moved from initial arguments that they are not providing total protection for the wearer to the insight that they do protect others if the wearer is infected - and if everybody protects everybody else, then everybody is protected. In our data, we are not able to tease apart motivation to protect the self and other-protection motivation, either for close others or the community. Again, this remains a crucial topic for future work.

CONCLUSION AND OUTLOOK

The present project provides a snapshot of individuals' attitudes, behavioral actions, and affective reactions during 2 weeks following the COVID-19 outbreak in Norway. While our findings do not generalize to the whole Norwegian population, nor to other countries with different courses of action responding to the outbreak or different healthcare systems, they provide important information on the nature of what psychological and demographic variables might influence health-protective behavior and how such variables change over time. The findings can provide insights and indications in order to improve healthcare communications:

(1) Perceptions of effectiveness of protective behavior are important; they emerge as crucial especially when trying to predict physical distancing. They could be increased

by tailoring communication strategies to various groups, emphasizing how different people can engage in effective preventive (hygienic) or avoidance (distancing) behavior.

(2) People differ, and these differences matter for the adoption of protective behavior: being female, household size, and number of children all seem to play a role. On one hand, these factors point to how early on in a crisis first changes can be reached quickly by targeting such response groups. On the other hand, this again shows that tailored messaging and targeted behavior change campaigns are indicated.

(3) Physical distancing and hygiene seem to be driven by somewhat different factors: the former more by social variables and beliefs of effectiveness, the second more by emotional processes. Again, campaigns targeting these complementary protections should be aware of that.

(4) In line with previous literature, there is a subset of the population that discredits severity and credibility of the crisis, indexed in our study as the belief that "too much fuss is being made" about this, which is in turn associated with less engagement in health-protective actions (cf. Rubin et al., 2015). It may be fruitful to model and investigate the potential impact such individuals can have on the spread of the disease, the reasons for their beliefs, and targeted ways to change their beliefs.

Finally, the present project highlights that although similar factors can be found across different countries or medical systems that seem to influence protective outcomes (e.g., Harper et al., 2020; Wise et al., 2020), it is important to take the specific trajectories and developments in each country or healthcare systems into account to be able to successfully model and identify important variables predicting health-protective behavior (see Mækelæ et al., 2020).

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found in the article/ **Supplementary Material**.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Internal Review Board, Institute of Psychology, University of Oslo. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JG and KF devised the original method. JZ, TS, and AH adapted the original instrument for Norway, and AH translated it into Norwegian. JZ analyzed the data and wrote the first draft. All authors contributed to revisions.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.564083/full#supplementary-material

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Interactions Between Socioeconomic Status and Mental Health Outcomes in the Nigerian Context Amid COVID-19 Pandemic: A Comparative Study

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This study examines the mental health outcomes among the healthcare personnel and the general population and the role of socioeconomic status. Eight hundred and eighty-four (884) residents in Nigeria comprising 382 healthcare personnel and 502 general residents aged between 18 to 78 years (M = 28.75, SD = 8.17) responded to an online survey with measures of Impact of Event Scale-Revised (IES-R), Generalized Anxiety Disorder (GAD-7), Patient Health Questionnaire (PHQ–9), and Insomnia Severity Index. Collected data were subjected to statistical analysis using the SPSS v.25. Results revealed significant difference in the prevalence of depressive symptoms (χ^2 = 14.26; df = 4; $p < 0.01$), insomnia symptoms (χ^2 = 40.21; df = 3; $p < 0.01$), posttraumatic stress symptoms (χ^2 = 08.34; df = 3; $p < 0.05$), and clinical anxiety symptoms (χ^2 = 06.71; df = 1; $p < 0.05$) among healthcare personnel and the general population, with a higher prevalence reported by the healthcare personnel. Further, socioeconomic status significantly influences prevalence of depressive symptoms (χ^2 = 04.5; df = 4; $p < 0.05$). The study concluded that the prevalence of poor mental health outcomes during the COVID-19 crisis among Nigerians is worrisome. Also, the socioeconomic status of the citizens has serious implications on depressive symptoms. The study recommends that the government and stakeholders should pay attention to policy that will favor tele-mental health services and adequate palliative measures to cushion the psycho-economic impacts of COVID-19 on residents. Also, healthcare workers should be considered for better remuneration and other welfare benefits to sustain their well-being during the present and future pandemic.

Keywords: COVID-19, mental health, socioeconomic status, healthcare workers, Nigeria

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INTRODUCTION

Since the outbreak of coronavirus, otherwise known as COVID-19, which was first reported in December 2019 in Wuhan China, declared as a Public Health Emergency of International Concern in January 2020 and later a pandemic in March 2020 by the World Health Organization (WHO), the world has not been the same (World Health Organisation, 2020). For instance, the statistics released on August 28, 2020, indicated that there had been more

than 24.6 million confirmed cases of COVID-19 and 835,000 deaths worldwide (Worldometer, 2020). Worldometer reported further that, at the end of August 2020 in Nigeria, more than 53,317 cases have been confirmed, while over 1,011 people have died (Worldometer, 2020). Despite the disturbing figures, it has been opined that the actual global incidence rate of COVID-19 cases is likely to be far higher than what the statistics show (Flaxman et al., 2020).

Being a novel disease that is highly contagious, spreading fast across the world, and the fact that there is yet to be an established cure for it, the COVID-19 pandemic has created a lot of panic in every part of the world. In response, many countries have put up different measures, especially those upholding social distancing order, to slow down the spread of the disease. Although there is evidence of the effectiveness of quarantine measures to control the spread of infectious diseases such as cholera, severe acute respiratory syndrome (SARS), or Ebola in the past (e.g., Twu et al., 2003), the effect of restriction of movement and lockdown on socioeconomic activities across different countries of the world has generated different opinions about the impact on the general citizens (Goldman et al., 2018; Forbes and Krueger, 2019; Mbamalu, 2019; The World Bank, 2020).

From the foregoing, emerging evidence has implicated the ongoing COVID-19 pandemic in the mental health outcomes among different populations such as the healthcare professional and the general public worldwide (e.g., Ji et al., 2017; Brooks et al., 2020; Lai et al., 2020; Olaseni et al., 2020; and Rossi et al., 2020). Besides, the social-distancing and self-isolation during the COVID-19 pandemic place more challenges on the mental health and general well-being of the people (Mukhtar, 2020). In addition, it is crucial to assess the mental health outcomes of people during a global crisis such as the COVID-19 pandemic alongside the socioeconomic status and attributes of the people. This is because several studies have established strong relationships between socioeconomic status (SES) and mental well-being. More importantly, low SES have been implicated in poor self-reported mental health including depression, anxiety, sleep problems, and psychological distress in adults and adolescents (Richter et al., 2009; Salami and Walker, 2014; Pappas, 2020).

Having a holistic understanding of the mental health outcomes of all members of the society, not only focusing on direct victims (patients) and healthcare providers in response to any major event, is crucial to the recovery of the people. This position was emphasized by the proposition of the Canadian National Advisory Committee on SARS and Public Health in 2003 that a "systemic perspective," focusing on the general population and not just medical staff and patients should be embraced in addressing the SARS epidemic (Naylor et al., 2003). Nevertheless, the literature shows that many studies addressing the psychological consequences of COVID-19 are focusing exclusively on either the healthcare professionals or the general public, therefore limiting the opportunity of comparison between the two populations concerning the mental health outcomes during the COVID-19 crisis.

Furthermore, the situation in Nigeria calls for special attention because being a developing country where small medium enterprises (SMEs) contributed 48% of the national gross domestic products (GDP) that account for 96% of the businesses and 84% of employment (Public Works Corporation, 2020), the effect of the present COVID-19 pandemic and lockdown on socio-economic activities is likely to be severe on the well-being of the people, many of whom rely on daily income to cater for their personal and family financial needs. Hence, the significance of this study addresses that the interaction between socioeconomic status and mental health outcomes of Nigerians during the COVID-19 pandemic cannot be overemphasized. Specifically, the following objectives guided this study:

1. To investigate the interaction between socioeconomic status of respondents and mental health outcomes during the COVID-19 crisis.
2. To compare the mental health outcomes of healthcare workers with the general public during the COVID-19 pandemic.

MATERIALS AND METHODS

Design

This research was a web-based cross-sectional survey that was conducted via social media (Facebook and WhatsApp posts) using a Google form from March 20 to April 19, 2020. This was found appropriate to enable the investigators to assess the psychological distress experienced by participants during the COVID-19 pandemic without manipulating the variables of interest.

Sampling

A snowball sampling technique was utilized in this study. This method was considered appropriate due to the imposed restrictions of movement and lockdown in Nigeria during the period. Key persons (e.g., known healthcare workers or frontline staff, friends, colleagues, and those on the contact of the researchers) across each category of respondents (healthcare workers and the general population) were considered the seed in the study, and they were encouraged to disseminate the links with others in the same category accordingly. The online semi-structured questionnaire developed using Google forms with an appended consent form was sent through emails, WhatsApp, and Facebook platforms to potential respondents on the contact of the investigators. Those prospective individuals were then encouraged to roll out the survey to other colleagues or residents in Nigeria.

Participants

Eight hundred and eighty-four (884) participants were involved in the current study. The sampled respondents cut across healthcare personnel and the general public. Healthcare personnel were 43.21% (n = 382), while the general public constituted 56.79% (n = 502) of the study respondents. Considering the gender disparity, the majority of the respondents were male, which constituted the 54.5% of the total respondents, while the female counterparts constituted 45.5%. There was

a disparity in the distribution of geo-political zones of the respondents; the majority of the respondents were from the southern part of Nigeria, constituting 85.2% of the sample, 10.9% were from the northern part of Nigeria, while 4% were foreign residents in Nigeria. The disparity across respondents' marital status and level of education were also reported (see **Table 1**).

Instrument

Data were collected via an online self-reported questionnaire designed by the investigators. The questionnaire contained six sections related to the mental health outcome of health workers in Nigeria amid the coronavirus pandemic. The first section consisted of information assessing demographic attributes such as sex, age, religion, and marital status of participants.

The second section contained the 22-item of the Impact of Event Scale-Revised (IES-R) (Weiss, 2007). The scale was developed to measure the subjective response of an individual to a specific traumatic event, especially the response to sets of intrusion, avoidance, and hyperarousal, as well as total subjective stress. The IES-R is not a diagnostic tool but just a screening measure. The total IES-R score was divided into 0–23 (normal), 24–32 (mild psychological impact), 33–36 (moderate psychological impact), and >37 (severe psychological impact). Briere (1997) affirmed the validity and reliability of the scale. Cronbach's alpha 0.82 was established as the reliability coefficient for the scale in this study.

Section three of the questionnaire was the GAD-7 (Spitzer et al., 2006). It consisted of 7 questions assessing generalized anxiety disorder. The items focused on the frequency of symptoms during the preceding 2-week period of COVID-19 lockdown in Nigeria. The GAD-7 requires approximately 1–2 min to administer and for each symptom queried provides the following response options: "not at all," "several days," "over half the days," and "nearly every day" and these items are scored as 0, 1, 2, or 3, respectively. A score ranging from 0 to 21 is obtainable by respondents. Scores of 5, 10, and 15 are taken as the cut-off points for mild, moderate, and severe anxiety, respectively. Cronbach's alpha 0.81 was established as the reliability coefficient for the scale in this study.

The fourth section contained the Patient Health Questionnaire (PHQ–9). The PHQ–9 is a nine-item depression scale that has the potential of performing a dual-purpose of the instrument. It can establish the diagnosis of a depressive disorder and reveal the grade of symptom severity (Kroenke et al., 2001). Statements measuring depressive symptoms such as "little interest/pleasure in doing things" were rated from 0 (not at all) to 3 (nearly every day) by respondents as applicable to them over the past two weeks during the lockdown. PHQ-9 scores can range from 0 to 27. The scale has strong psychometric properties (e.g., Botha, 2011) and has been widely used. Cronbach's alpha 0.87 was established as the reliability coefficient for the scale in this study.

The fifth section contained the Insomnia Severity Index; this is a 7-item self-report questionnaire assessing the nature, severity, and impact of insomnia. Participants were required to rate their sleep condition in the last 2 weeks as described by each item of the scale. Questions on the ISI cut across the severity of sleep onset, sleep maintenance, and early morning awakening problems, sleep dissatisfaction, interference of sleep difficulties with daytime functioning, noticeability of sleep problems by others, and distress caused by the sleep difficulties. The scale is responded to on a 5-point Likert scale with a score ranging from 0 to 4, thus yielding a total score ranging from 0 to 28. The total score is interpreted as follows: the absence of insomnia (0–7); sub-threshold insomnia (8–14); moderate insomnia (15–21); and severe insomnia (22–28). Previous studies have reported adequate psychometric properties for both the English and French versions (e.g., Bastien et al., 2001). Cronbach's alpha 0.78 was established as the reliability coefficient for the scale in this study.

TABLE 1 | Socio-demographic characteristics of the study participants.

Characteristics	Overall (*N* = 884/%)	Healthcare personnel (*n* = 382/%)	General population (*n* = 502/%)
Sex			
Male	482 (54.5)	207 (54.2)	269 (53.6)
Female	402 (45.5)	169 (44.2)	225 (44.8)
Religion affiliation			
Christianity	609 (68.9)	272 (71.2)	337 (67.1)
Islam	261 (29.5)	102 (26.7)	159 (31.7)
Others	14 (01.6)	08 (2.1)	06 (1.2)
Regional affiliation			
Southern, Nigeria	753 (85.2)	319 (83.5)	433 (86.3)
Northern, Nigeria	96 (10.9)	44 (11.5)	47 (9.4)
Foreigner	35 (4.0)	17 (04.4)	22 (4.4)
Marital status			
Single	297 (33.6)	132 (34.6)	165 (32.9)
Married	577 (65.3)	244 (63.9)	333 (66.3)
Separated/divorced	10 (01.1)	06 (01.6)	04 (0.8)
Level of Education			
Bachelor degree and its equivalent	352 (39.8)	154 (40.3)	198 (39.4)
Diploma and its equivalent	236 (26.7)	100 (26.2)	136 (27.1)
Postgraduate education	254 (28.7)	108 (28.3)	146 (29.1)
Secondary school education	42 (04.8)	20 (05.2)	22 (04.4)

Procedure

The study was an online cross-sectional survey study. Only adults (aged between 18 and 78 years) who were either healthcare workers or Nigerian residents with access to the internet were involved in this study. Also, participants must be able to read and understand in basic English language and be willing to click the agree button to participate before having to access the survey. A link to the survey on Google form was sent to all participants. On receiving and clicking the link, the participants got auto-re-directed to the survey items. A detailed informed consent form was attached at the beginning of the online questionnaire and only individuals who gave their consent participated in the study. The data collection was initiated on March 20, 2020, and closed on April 19, 2020. The sampling technique utilized allowed the investigators to collect data from across various states of Nigeria. Eight hundred and eighty-four (884) correctly filled

questionnaires were recovered through the Google form and processed for statistical analyses.

Data Analysis

The collected data were analyzed using the Statistics Package of Social Sciences (SPSS; version 25). The analyzed data responded to the two research questions stated earlier in this study. The analyses included reliability coefficients of the used scales, prevalence estimate analysis, and chi-square analysis.

RESULTS

This section presents the results and interpretation of the data collected. The analyses of the interaction between socioeconomic status and mental health outcomes of selected respondents (healthcare personnel and the general population) in Nigeria during the COVID-19 pandemic lockdown were conducted. The results captured the socio-demographic characteristics of the respondents as well as the interaction between socioeconomic status and mental health outcomes of respondents which are presented in **Tables 1**–**3**.

Outcomes of the study (see **Table 2**) revealed that there was a significant difference in the prevalence of depressive symptoms among respondents with different socioeconomic status (χ^2 = 04.05; df = 4; $p < 0.05$). Furthermore, it was found that the prevalence of clinical depressive symptoms was significantly higher among respondents with the standard income compare to those above standards and below standard incomes (61.5% vs. 22.8% and 20.2%; 95% CI, 0.63–4.60; $p < 0.05$). Further findings revealed that there was no significant difference in the prevalence of insomnia symptoms among categories of socioeconomic status (χ^2 = 02.38; df = 3; $p > 0.05$). However, the prevalence of clinical insomnia symptoms was insignificantly higher among respondents with standard income compared to respondents with the above standard and below standard incomes (60.1% vs. 24.9% and 15.3%; 95% CI, 0.20–1.68; $p > 0.05$).

Similarly, study findings revealed that there was no significant difference in the prevalence of posttraumatic stress symptoms (PTSS) among different socioeconomic classes (χ^2 = 01.50; df = 3; $p > 0.05$). However, the prevalence of posttraumatic symptoms was insignificantly higher among respondents with standard income compared to respondents with the above standard and below standard incomes (48.3% vs. 43.3% and 47.9%; 95% CI, 0.53–2.98; $p > 0.05$). Insignificant difference was also reported in the prevalence of clinical anxiety symptoms among classes of socioeconomic status (χ^2 = 0.19; df = 1; $p > 0.05$). However, the prevalence of anxiety symptoms was insignificantly higher among respondents with standard income compared to respondents with the above standard and below standard incomes (46.9% vs. 45.3% and 47.3; 95% CI, 0.49–2.83; $p > 0.05$).

Another objective of the study proposed to examine the comparative analysis of mental health outcomes among the healthcare population and the general population was presented in **Table 3**.

Responses from 884 participants in the study (i.e., both healthcare personal and the general population) were screened for depression, anxiety, insomnia, and posttraumatic symptoms constituted the outcome of the analysis. Outcomes of the study (see **Table 3**) revealed that there was a significant difference in the prevalence of depressive symptoms among healthcare personal and the general population (χ^2 = 14.26; df = 4; $p < 0.01$). Further, it was found that the prevalence of clinical depressive symptoms was significantly higher among healthcare personnel than the general population (35.1% vs. 23.5%; 95% CI, 0.54–1.03; $p < 0.01$). Finding further revealed that there was a significant difference in the prevalence of insomnia symptoms among healthcare

TABLE 2 | Showing the interaction between socioeconomic status of respondents and the prevalence of depression, insomnia, and posttraumatic stress symptoms and anxiety in Nigeria (*N* = 884).

Outcome	Above standard income (*n* = 201*%)	Standard income (*n* = 516*%)	Below standard income (*n* = 167*%)	Prevalence ratio (95% CI)	χ^2	*p*
Depression	46 (22.8)	155 (61.5)	51 (20.2)	0.63 – 4.60	04.05	<0.05
Insomnia	50 (24.9)	122 (60.1)	31 (15.3)	0.20 – 1.68	02.38	>0.01
PTSS	87 (43.3)	249 (48.3)	80 (47.9)	0.53 – 2.98	01.50	>0.05
Anxiety	91 (45.3)	242 (46.9)	79 (47.3)	0.49 – 2.83	00.19	>0.05

Note: Clinical severity in the study outcomes are the reference categories of all variables.

TABLE 3 | Prevalence of depression, insomnia, and posttraumatic stress symptoms and anxiety in healthcare personnel and general population (*N* = 884).

Outcome	Healthcare personnel (*n* = 382*%)	General population (*n* = 502*%)	Adjusted prevalence ratio (95% CI)	χ^2	*p*
Depression	134 (35.1)	118 (23.5)	0.537 – 1.034	14.26	<0.01
Insomnia	127 (33.2)	76 (15.1)	0.289 – 0.579	40.21	<0.01
PTSS	201 (52.6)	215 (42.8)	0.847 – 1.519	08.34	<0.05
Anxiety	223 (58.4)	249 (49.6)	0.719 – 1.307	06.71	<0.05

Note: Clinical severity in the study outcomes are the reference categories of all variables.

personal and the general population (χ^2 = 40.21; df = 3; $p < 0.01$). Such that, the prevalence of clinical insomnia symptoms was significantly higher among healthcare personnel than the general population (33.2% vs. 15.1%; 95% CI, 0.29–0.58; $p < 0.01$).

Similarly, study findings revealed that there was a significant difference in the prevalence of PTSS among healthcare personal and the general population (χ^2 = 08.34; df = 3; $p < 0.05$). Such that, the prevalence of posttraumatic symptoms was significantly higher among healthcare personnel than the general population (52.6% vs. 42.8%; 95% CI, 0.85–1.52; $p < 0.05$). A significant difference was also reported in the prevalence of clinical anxiety symptoms among healthcare personal and the general population (χ^2 = 06.71; df = 1; $p < 0.05$). Such that, the prevalence of anxiety symptoms was significantly higher among healthcare personnel than the general population (58.4% vs. 49.6%; 95% CI, 0.72–1.31; $p < 0.05$).

DISCUSSION

The objectives of this study are to investigate the interaction between socioeconomic status and mental health outcomes of respondents during the COVID-19 pandemic and to make a comparison between the mental health outcomes of healthcare workers and the general public in Nigeria during the COVID-19 pandemic. Consequently, our study revealed significant differences among the three socioeconomic status classes on depression only, invariably, this means that no significant difference was found among the three socioeconomic status classes on insomnia, posttraumatic stress symptoms and anxiety in Nigeria during the COVID-19. In detail, our study revealed that the standard income socioeconomic class reported almost two-thirds (62%) higher prevalence of depression as against the above standard income and below standard income class (22.8% vs. 20.2%).

Consistent with our findings, various studies have reported the relationship between socioeconomic status and mental health during COVID-19, but there has been a disparity in the class that is most affected. While our study reported the standard (middle) income socioeconomic class having the highest prevalence of depression during the COVID-19 pandemic, Heath (2020) reported 45% of the above standard (upper) income socioeconomic status class reported their emotional well-being harmed by coronavirus as against 34% and 36% from the lower and middle socioeconomic status class. Besides, contrary to our findings, Pappas (2020) suggested that people with lower socioeconomic status have a higher tendency to have mental health issues; however, the low socioeconomic level has been associated with death and high illness rates in several studies, regardless of the cause of death being from infectious or non-infectious diseases and indices for measuring socioeconomic status (Kaplan et al., 2007; Oguntayo et al., 2018).

The reason for our result could be associated to the fact that the standard (middle) income socioeconomic class in Nigeria is the largest socioeconomic group, occupying the wide inequality gap between the haves and the haves not. These individuals are mostly business owners (SMEs) and major salary earners from the private and government establishments; therefore, they are the most hit by the closure of businesses and lockdown in the country. Besides, there is speculation of a looming recession due to the COVID-19 pandemic (The World Bank, 2020), which has spurred some organizations to lay off staff and reduce the salary of the retained staff while so many have not received any salary since the lockdown in Nigeria. In this respect, Holmes et al. (2020) argued that serious psychological distress is anticipated from potential global economic crisis following the COVID-19 pandemic. This argument is substantiated by previous evidence linking the socioeconomic status of the people to their mental health outcome following the SARS epidemic in 2003 (e.g., Nickell et al., 2004; Tsang et al., 2004; Yip et al., 2010; Kanter and Manbeck, 2020). These are valid reasons why this group may have reported a higher prevalence of depression compared to the above standard (high) income class who are mostly politicians and big industrialists that have no fear of layoff or reduction in salary and below standard income class.

The unbalanced prevalence of depression among the socioeconomic classes in our study (22.8% vs. 61.5% vs. 20.2%) confirmed the assertion of Kanter and Manbeck (2020) that a large population may develop inequitably distributed depression due to the stressors of the COVID-19 crisis. Fear of inability to feed, pay house rent, and purchase of basic safety materials such as sanitizer and mandatory nose mask to fit into the new norm have added to the economic burden of the standard income and below standard income class, thereby leading to the prevalence of higher depressive states compared against the above standard income class. Importantly, the above standard income class in Nigeria holds the economic power of the country and economic power translates into political power, thereby giving control of state structure into the hands of the above standard income class. Moreover, various studies have confirmed that mental health deteriorates in line with the level of socioeconomic status (Goldman et al., 2018) and economic recessions (Forbes and Krueger, 2019).

Our study further revealed differences in the mental health outcomes between the Nigerian healthcare workers and the general population during the COVID-19 pandemic. In specifics, the prevalence of depression, insomnia, posttraumatic stress symptoms, and anxiety was higher among the healthcare workers (35.1%, 33.2%, 52.6%, and 58.4%, respectively) as against the prevalence of depression, insomnia, posttraumatic stress symptoms, and anxiety of the general population (23.5%, 15.1%, 42.8%, and 49.6%, respectively). The higher prevalence of mental health outcomes among healthcare workers during the COVID-19 pandemic can hereby be connected with their role as caregivers and essential workers during the pandemic. Interestingly, a similar higher prevalence of mental health outcomes was reported among healthcare workers in China caring for COVID-19 patients as against lower prevalence of mental health outcomes among the Chinese general population (Lai et al., 2020; Wang et al., 2020).

Healthcare workers are essential workers that have to care for the infected despite the impending risk during a pandemic, due to the duty and obligation to care. Compared against the general

population that has restricted movement and discontinued working due to the COVID-19 pandemic, healthcare workers are required to be at work, despite the human-to-human transmissible nature of the virus, wear uncomfortable personal protective equipment, work overtime, and observe directly, the devastation of the virus on their patients. These experiences have a more social, emotional, and psychological effect on healthcare workers than the general population as revealed in this study.

CONCLUSION

This study exposed the prevalence of mental health outcomes among Nigerians during the COVID-19 pandemic. Specifically, the result revealed a disproportionate prevalence of depression among the three socioeconomic classes, whereby the standard income (middle) socioeconomic class recorded the highest prevalence of depression. Besides, the prevalence of mental health outcomes (depression, insomnia, posttraumatic stress symptoms, and anxiety) was higher among the Nigerian health care workers when compared against the general population in Nigeria.

LIMITATION OF THE STUDY

This study established the association between socioeconomic status and stress-related behaviors; however, there are still some probable limitations. The participants were relatively few; therefore, this result should be carefully generalized as there is a possibility that outcomes would vary if measured on more numbers of participants. Also, response biases which most times are difficult to eliminate in a self-report survey study like this might have affected respondents' opinions, thereby limiting the results of this study. All these shortcomings might have influenced this result and limit the external validity of this study.

RECOMMENDATIONS

Looking at the results of the current study, these recommendations are suggested to alleviate the mental health challenges among the residents and health workers during the pandemic period:

1. Federal and state governments in Nigeria should initiate a bill honoring the tele-mental health services to manage present and future pandemic psychological implications. This will help to integrate psychological and medical health services in the fighting against any disease outbreak in the country, especially when face-to-face appointments are risky.
2. Healthcare stakeholders needed to collaborate with psychotherapists in the management of pandemic or disease outbreak to regulate residents' emotions and that of self to promote wholistic well-being in Nigeria.
3. Stakeholders in government should pay attention to policy that will favor adequate palliative measures to cushion the economic impacts of COVID-19 on the mental health of residents in Nigeria. Also, healthcare workers should be considered for better remuneration and other economic benefits to sustain their well-being during the present and future pandemic.

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found in the article/ Supplementary Material.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent was implied via completion of the questionnaire/survey.

AUTHOR CONTRIBUTIONS

RO and SA contributed to the conception and design of the study. SA, OA, RO, and AO contributed to the acquisition of data. AO contributed to the analysis and interpretation of data. RO, OA, and SA contributed to the drafting of the manuscript. OA contributed to the critical revision of the manuscript. All authors read and approved the final manuscript for publication.

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This is to notify you that this manuscript has been uploaded as preprint on research gate profiles of authors on May 6, 2020 and at OSF host on https://psyarxiv.com/5b2dq/.

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Parents and Children During the COVID-19 Lockdown: The Influence of Parenting Distress and Parenting Self-Efficacy on Children's Emotional Well-Being

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On March 10, 2020, Italy went into lockdown due to the Coronavirus Disease-19 (COVID-19) pandemic. The World Health Organization highlighted how the lockdown had negative consequences on psychological well-being, especially for children. The present study aimed to investigate parental correlates of children's emotion regulation during the COVID-19 lockdown. Within the Social Cognitive Theory framework, a path model in which parenting self-efficacy and parental regulatory emotional self-efficacy mediated the relationship between parents' psychological distress and both children's emotional regulation, and children's lability/negativity, was investigated. A total of 277 parents of children aged from 6 to 13 years completed an online survey that assessed their psychological distress, regulatory emotional self-efficacy, and parenting self-efficacy. Parents reported also children's emotional regulation and lability/negativity. A structural equation model (SEM) using MPLUS 8.3 was tested. Results showed that the hypothesized model exhibited excellent fit, chi-square (83) = 140.40, $p < 0.01$, RMSEA = 0.05, CFI = 0.97, TLI = 0.96, SRMR = 0.04. The influences of parents' psychological distress and parents' regulatory emotional self-efficacy on children's emotional regulation and lability/negativity were mediated by parenting self-efficacy. The mediation model was invariant across children's biological sex and age, and geographical residence area (high risk vs. low risk for COVID-19). Results suggested how parents' beliefs to be competent in managing parental tasks might be a protective factor for their children's emotional well-being. Implications for intervention programs are discussed.

Keywords: pandemic, parents, children, psychological distress, parents' self-efficacy, parenting, emotion regulation, COVID-19

INTRODUCTION

The spread of the pandemic COVID-19 in Italy from February 2020 and the subsequent health emergency led to several restrictive measures. Schools and universities have been closed at the end of February, and starting from March 9th, 2020, a quarantine measure became necessary leading to a general closure of almost all public businesses and work activities.

Children and families have been deprived of their educational, work, and sport activities, but also from all their friendship and relational contacts. Suddenly parents had to manage their children at home from school 24 h a day and, at the same time, most of them had to start smart-working from home, still carrying out their children's school commitments. Many parents also had to manage difficulties and pain related to having sick or dead relatives, having had wages reductions, or in some cases, having lost their work. It is easy to understand how Italian families have been exposed to a very strong emotional and psychological stress.

This situation had relevant repercussions on daily life of families, especially of children that have been deprived of their socialization and play spaces. The parents suddenly became the only point of reference for their children since the other references and educational figures were no longer available.

As enlightened by the World Health Organization (WHO, 2020a,b), this situation could have long-term negative consequences on psychological well-being and there is a need to invest in mental health services and other services. A recent review stressed how people all over the world can show many different psychological disorder symptoms related to the pandemic (Shahyad and Mohammadi, 2020). The WHO (2020a) highlighted that children were also showing signs of mental illness. In fact, both international and domestic studies showed that, during the lockdown, children exhibited several problems, such as anxiety and emotional and behavioral disorders (Jiao et al., 2020; Spinelli et al., 2020; Xie et al., 2020).

The European Pediatric Association–Union of National European Pediatric Societies and Associations (EPAUNEPSA; Jiao et al., 2020) has stressed the importance to address children's psychological needs during the pandemic due to the negative repercussions on their psychological well-being, highlighting the relevant protective role of parents in decreasing their fear and stress. Research on psychological consequences of traumatic events, such as the terroristic attack of September 11, 2001, showed how children can also experience long-term effects on psychological well-being, reporting mental disorders after 6 months (Hoven et al., 2005).

All these data highlight the importance of not underestimating the psychological risks that children and their families could face. In a report on May 13th, 2020, the United Nations also underlined how, during the COVID-19 pandemic, the emotional problems of children and adolescents were exacerbated by family stress, social isolation, interruption of school and educational activity, and uncertainty for the future which occurred in critical moments of their emotional development (United Nations, 2020). Understanding how to strengthen parents and families in this situation, with the aim to protect children, represents an important goal that researchers should have in this period because it is possible that other future pandemics will affect humanity (Cluver et al., 2020).

The limited research conducted to date on the effects of the COVID-19 pandemic on well-being of parents and their children both in China and in Italy showed that COVID-19 related risks, such as (a) living in a red zone (i.e., a high-risk zone like Lombardia and Veneto for Italy), (b) being a parent positive to SARS-COV-2, (c) having relatives or friends positive to the SARS-COV-2 or who died from the SARS-COV-2, and (d) living in a high-risk environment (i.e., not having an open space in the home during the lockdown, losing a job during the pandemic, having a low income, not having internet connection), did not have strong negative direct effects on families' well-being (Spinelli et al., 2020) or on children's symptoms and problematic behaviors *per se* (Jiao et al., 2020). Actually, the research conducted by Spinelli et al. (2020) in Italy showed that it was the parenting stress related to the health emergency, the pandemic, and the lockdown that increased children's psychological, emotional, and behavioral problems. In line with these findings, Wang et al. (2020) suggested the need to deeply understand the family functioning and processes that can promote children's psychological well-being during the pandemic.

For this reason, this study focused on identifying which parental psychological variables can mediate the relationship between parents' psychological distress during the pandemic and the lockdown and their children's emotional regulation, in order to understand which possible intervention should be implemented to ameliorate families' well-being. Two recent meta-analyses highlighted the relevant role that the parent–child relationship can have in promoting children's effortful self-regulation (Pallini et al., 2018) and in decreasing children's behavioral problems, specifically attention problems (Pallini et al., 2019).

The stress of quarantine can affect psychological well-being of adults, as confirmed in a recent review (Brooks et al., 2020), and might also have long-term effects (Liu et al., 2012). A study conducted on parents and children quarantined in 2009 during the H1N1 influenza showed that the high-stressful isolation increased parents' psychological distress that in turn had an impact on their children's well-being (Sprang and Silman, 2013). Children who have parents with high levels of stress showed more externalizing problems and developed less emotion regulation (Deater-Deckard and Panneton, 2017).

As reported by Leary and Hoyle (2009), psychological distress upsets the ability to self-regulate (Tillema et al., 2001; Scott and Cervone, 2002) but regulatory emotional self-efficacy is crucial in the self-regulation of relationships and behavior (Bandura et al., 2003). According to Bandura (1997), psychological distress, such as lack of social support or parental depression, can affect parenting self-efficacy, which is the belief that parents have to be able to manage their parental tasks successfully and that it is, in turn, related to children's adjustment (Jones and Prinz, 2005).

Some previous studies showed that the relationship between parental mental health and children's emotional and behavioral well-being is mediated by positive parenting strategies (Giallo et al., 2014). According to Eisenèberg et al. (2005), parents'

positivity and warmth can promote effortful control in children, reducing their externalizing behaviors. Likewise, self-efficacy, specifically parenting self-efficacy, can function as a mediator between environmental variables or psychological conditions related to an external situation (e.g., the stress related to the pandemic) and parenting competence. In fact, environmental aspects might also indirectly affect parents' belief to be competent in managing parental tasks, and this could lead to less psychological well-being of the children (Jones and Prinz, 2005). For this reason, it is important that parents have a good parenting self-efficacy in order to display positive parenting strategies that can foster adaptive functioning and emotion regulation in children (Stack et al., 2010).

Aims and Hypotheses

Within the theoretical framework of Social Cognitive Theory (Bandura, 1997), the present study aimed to investigate a path model in which parenting self-efficacy and parents' regulatory emotional self-efficacy (related to COVID-19 lockdown) mediated the relationship between parents' psychological distress and both children's emotional regulation, and children's lability/negativity, in line with a previous study that stressed how parenting self-efficacy can mediate the relationship between parents' psychological distress and children's adjustment (Giallo et al., 2014). Additionally, in our model parents' psychological distress was also predicted by being exposed to several risks related to COVID-19 quarantine and the pandemic.

Moreover, the second aim was to assess whether children's biological sex, children's age, and geographical area (Northern Italy, which is the most at-risk area for the spread of the pandemic and for the risk of contagion, vs. the rest of Italy) moderated the structural paths of the model. There is evidence that children's biological sex can affect parents' way to respond to children (Sanders and Morawska, 2018) and that parenting self-efficacy can change over time (Deater-Deckard and Panneton, 2017), growing during early childhood (Weaver et al., 2008), and decreasing when children become adolescents (Glatz and Buchanan, 2015). Conversely, we did not expect to find any differences regarding living (or not living) in a high at-risk zone for the COVID-19 (i.e., Northern Italy), as found by recent Italian and Chinese studies (Jiao et al., 2020; Spinelli et al., 2020).

MATERIALS AND METHODS

Participants

The present study was conducted in Italy, via an online survey, during April 2020 when there was a lockdown related to the health emergency due to the COVID-19 pandemic. Specifically, Italian parents with a child aged between 6 and 13 years were recruited through a snowball sampling procedure to complete the online survey. At the time of data collection, Italy had been in quarantine for more than 1 month. A link to the survey was shared among parents using different social networks (e.g., Facebook, WhatsApp), also asking parents to share the link among their contacts. Overall, 417 parents have had access to the survey, and a total of 277 valid questionnaires were used in the present investigation, yielding a response rate of 66.4%. Parents' age ranged from 30 to 58 years old (M_{age} = 43.36, SD_{age} = 4.76) and the recruited sample mostly consisted of mothers (n = 248; 89.5%). As abovementioned, children were aged between 6 and 13 years (M_{age} = 9.66, SD_{age} = 2.29) and were almost equally distributed for biological sex (48% were boys and 52% were girls). Parents' socioeconomic status (SES) was predominantly medium-high (92.1%; n = 255). 14.1% (n = 39) lived alone at home with children during the quarantine. 62% (n = 171) of parents were from northern Italy, the Italian area most affected by the pandemic, and 37.9% (n = 105) were from Central and Southern Italy which were areas less affected by the pandemic (although they were also put in lockdown). Regarding their work situation, 195 parents (70.4%) continued to work and earn as before the quarantine, while 82 parents (29.6%) lost their works or have had wage reductions or layoffs. 7.9% (n = 22) were health workers and 5.8% (n = 16) were health workers in a hospital department that treated SARS-COV-2-positive patients. 91.7% of parents (n = 254) did not have any relative tested positive for the SARS-COV-2, and 8.3% (n = 23) had at least one relative that tested positive for the SARS-COV-2. 96.8% (n = 268) have not-hospitalized relatives due to SARS-COV-2, and 3.2% (n = 9) have at least one hospitalized relative. Finally, 32.5% of parents (n = 90) did not have any acquaintance or a loved one that tested positive to SARS-COV-2, and 67.5% (n = 187) had at least one acquaintance or a loved one that tested positive for SARS-COV-2. Each parent gave his/her consent by clicking "Yes, I accept to participate in the study" on the first page of the survey. This study was approved by the Ethics Committee of Sapienza University of Rome, Department of Developmental and Social Psychology, protocol number: 427, April 16, 2020.

Two power analyses were conducted to determine the recommended minimum sample size: (1) for detecting a significant bivariate effect and (2) for conducting a structural equation model (SEM; Cohen, 1988). A moderate effect size of 0.25 was anticipated with a power level set at 0.80 and a significant alpha level set at 0.05. The minimum sample size necessary to detect a significant bivariate effect was N = 124. Regarding the SEM, with five latent and fifteen observed variables, using the software developed by Soper (2020), results indicated that the required minimum sample size to run a SEM and detect a significant effect was N = 229.

Measures

COVID Risk Index

Using a similar procedure as used by Spinelli et al. (2020), we created an *ad hoc* index that assessed risks related to the COVID-19 pandemic. Specifically, a composite index was created given one point for each of the following risk factors, if present: (a) relatives that tested positive for SARS-COV-2, (b) friends or acquaintances that tested positive for SARS-COV-2, (c) hospitalized relatives due to SARS-COV-2, (d) living in northern Italy, which was the most at-risk area for the spread of the pandemic and for the risk of contagion, (e) being a health worker, and (f) being a health worker in hospital departments that treated SARS-COV-2 positive patients.

Family Risk Index

Again, using a similar procedure as used by Spinelli et al. (2020), we created an *ad hoc* index that assessed risks related to family situation during the quarantine and the pandemic. Specifically, a composite index was created given one point for each of the following risk factors if present: (a) a lower SES, (b) a worsened working situation during the quarantine, and (c) being a single or divorced parent who had to manage her/his own children at home alone during the quarantine. Both the family risk index and the COVID risk index are intended as summative rating scales that were created *ad hoc* for this research.

Parents' Psychological Distress

Parents' psychological distress during the lockdown was evaluated using the Perceived Stress Scale (Cohen et al., 1983; Italian validation by Mondo et al., 2019). Parents were asked to think about the last month. The scale is composed of 10 items that parents rated on 5 point-Likert scales from 1 (*never*) to 5 (*very often*). An example item is "During last month how do you usually feel nervous and stressed?" The scale showed a good reliability and validity also in the Italian validation (Mondo et al., 2019). In the present sample, the measure showed a good reliability, Cronbach's alpha of 0.84.

Parents' Regulatory Emotional Self-Efficacy

The Regulatory Emotional Self-Efficacy Scale (Caprara et al., 2013b) is a 13-item scale that evaluates the belief of parents to be able to manage with their negative emotions (i.e., anger, sadness, fear, and guilt) during the COVID-19 lockdown on a 5 point-Likert scale from 1 (*Not able*) to 5 (*Able*). The scale was modified asking parents to think about the quarantine period related to COVID-19 health emergency, and the following item was added to the scale "How do you feel able to manage the anxiety caused by hearing the news about coronavirus that is given on TV or that you read on the internet?" The scale showed good validity and reliability (Caprara et al., 2013a,b). In the present sample, the scale showed a good reliability: Cronbach's alpha of 0.87.

Parenting Self-Efficacy

Parents completed the Parenting Self-Agency Measures (Dumka et al., 1996; Baiocco et al., 2017) which is an 8-item scale that evaluates the belief of parents to be able to manage with daily parental demands (i.e., feeling to be a good parent, working to face and solve difficulties with their children) during the month of lockdown on 7-point Likert scales from 1 (*seldom*) to 7 (*always*). The scale was modified, asking parents to think about the quarantine period related to COVID-19 health emergency, and three items were added to the original scale. These three items asked parents how they feel able to reassure their children about the health emergency, to organize their children's daily life during the quarantine, and to explain to their children what is happening. The scale showed good validity and reliability (Baiocco et al., 2017, 2018). In the present sample, the scale showed a good reliability: Cronbach's alpha of 0.87.

Children's Emotion Regulation

Parents were asked to think about their child during the quarantine and to complete a short version of the Emotion Regulation Checklist (Molina et al., 2014). This is a 10-item scale that evaluates two sub-dimensions, namely, emotional regulation (i.e., positive emotions, being able to give voice to his/her negative emotions) and lability/negativity (i.e., anger, disruptive behaviors, excessive exuberance) of children during the COVID-19 lockdown on a 4 point-Likert scale from 1 (*Almost never*) to 4 (*Almost always*). The scale showed good validity and reliability (Molina et al., 2014; Di Maggio et al., 2016). In the present sample, both emotional regulation and lability/negativity scores showed acceptable reliability, respectively Cronbach's alpha of 0.65 and 0.78.

Data Analysis

Firstly, bivariate correlations among variables were calculated along with descriptives. Afterward, a mediation analysis with latent variables was performed via SEM, employing a parceling strategy (e.g., Bagozzi and Heatherton, 1994; Little et al., 2002). A parcel represents an aggregate of different items measuring a specific construct (Little et al., 2002; Coffman and MacCallum, 2005). Two or three parcels were constructed for each of the latent variables using the "item-to-construct" balance approach (Little et al., 2002), which means building each parcel by examining the item–construct relationships as represented by factor loadings in the item-level factor analyses (for a detailed description of this procedure, see Little et al., 2002). In such a way, parcels typically contained a balanced number of items and had comparable reliabilities. Therefore, our model comprised three latent variables with three parcels each and two latent variables with two parcels each. Summative indexes (such as the CRI and FRI) were treated as manifest variables.

Model fit was evaluated with the following indices: (a) the Comparative Fit Index (CFI); (b) the Tucker–Lewis index (TLI); (c) the root mean squared error of approximation (RMSEA); (d) and the standardized root mean square residual (SRMR). In general, for TLI and CFI, values between 0.90 and 0.95 are considered acceptable (e.g., Bollen, 1989; Byrne, 1994; Marsh et al., 2004) and values above 0.95 are deemed to be very good (Hu and Bentler, 1999). On the other hand, RMSEA and SRMR values smaller than (or equal to) 0.08 indicate a good fit (e.g., Bollen, 1989; Browne and Cudeck, 1993; Hu and Bentler, 1999; Marsh et al., 2004).

In order to evaluate the statistical significance of indirect effects, which represented the "mediated" effects, the bootstrapping procedure was used employing 5000 samples with replacement from the full sample to construct bias-corrected 95 percent confidence intervals (CI) (Preacher and Hayes, 2008; Hayes, 2009). Mediation typically occurs if the indirect effect is significant, that is, the zero value is not included in the CI (Preacher and Hayes, 2008; Hayes, 2009).

Finally, to test possible moderation effects of children's biological sex and age, and living in a geographical area with high COVID-19 risk, a multigroup approach within SEM was employed as suggested by Baron and Kenny (1986). In this procedure, the invariance of the structural parameters of the proposed model was tested separately for (a) boys and girls; (b) different levels of children's age; (c) geographical residential area, that is, living (vs. not living) in Northern Italy. A detailed

description of the procedure will be given in the "Results" section (see also Sauer and Dick, 1993; Cattelino et al., 2019). All analyses were run with statistical software SPSS 25 and MPLUS 8.3.

RESULTS

Correlations Among Variables

The family risk index was positively related with parents' psychological distress and positively with lability/negativity. Parents' psychological distress was negatively related with parenting self-efficacy, parents' regulatory emotion self-efficacy, and children's emotion regulation and was positively related with children's lability/negativity. Parenting self-efficacy was positively related with parents' regulatory emotion self-efficacy, and children's emotion regulation, and was negatively related with children's lability/negativity. Parents' regulatory emotion self-efficacy was positively related with children's emotion regulation and negatively related with children's lability/negativity. Finally, children's emotion regulation was negatively related with children's lability/negativity. Correlations, means, and standard deviations are reported in **Table 1**.

Mediation Model

A SEM was employed to test the hypothesized mediation model in which parenting self-efficacy and parents' regulatory emotional self-efficacy (related to the COVID-19 lockdown) mediated the relationship between parents' psychological distress and both children's emotional regulation and children's lability/negativity. Moreover, parenting self-efficacy mediated the relationship between parents' regulatory emotional self-efficacy and both children's emotional regulation and children's lability/negativity.

In the present paper, the mediation analysis strategy recommended by James et al. (2006) was followed. In the first step, the mediation model was tested (i.e., model without the direct effects, indicated with M_{med}). In the second step, a full model, including all the direct effects, was tested (indicated with M_{full}). The two nested models were compared via the chi-square difference test, contrasting M_{med} with M_{full} ($\Delta\chi^2$, Satorra and Bentler, 2001). A non-significant $\Delta\chi^2$ would reveal that the full model does not significantly increase the fit and therefore the mediation model is to be preferred since it is more parsimonious.

The mediation model (M_{med}) showed an overall good fit, chi-square (83) = 140.40, $p < 0.01$, RMSEA = 0.05, CFI = 0.97, TLI = 0.96, SRMR = 0.04. The full model including direct effects (M_{full}) did not apparently improve the model fit, chi-square (79) = 134.52, $p < 0.001$, RMSEA = 0.05, CFI = 0.97, TLI = 0.96, SRMR = 0.04. In fact, the two models were contrasted, and the chi-square difference test was not significant, $\Delta\chi^2$ (4) = 5.88, $p = 0.20$. Therefore, the mediation model (M_{med}) should be preferred due to being more parsimonious compared to the full model.

In **Figure 1, all measurement** and **structural** parameters of the mediated model (M_{med}) are reported.

Parents' psychological distress (ppd) was significantly, although modestly, affected by both COVID and family risk indexes. In turn, parents' psychological distress significantly and negatively affected both parents' regulatory emotional self-efficacy (pser) and parenting self-efficacy (pse). Parents' regulatory emotional self-efficacy significantly and positively affected parenting self-efficacy. Finally, parenting self-efficacy positively and significantly influenced children's emotional regulation (er_c) and negatively children's lability/negativity (ln_c). More importantly, parenting self-efficacy mediated the effect of parents' psychological distress and parents' regulatory emotional self-efficacy on both children's emotional regulation and children's lability/negativity. With the exception of those involving the COVID and family risk indexes, all other indirect effects were statistically significant, supporting the mediated model (see **Table 2**). In **Table 2**, a full decomposition of total and specific indirect of the mediated model (M_{med}) are reported. The COVID and family risk indexes displayed no significant effects on the other variables except for the aforementioned influence on parents' psychological distress.

Moreover, referring to the full model (M_{full}), we also decomposed total, direct and indirect effects (see **Table 3**) with the aim to report the ratio of indirect to the direct effect and the proportion of mediated effect (MacKinnon et al., 1995).

In regard to the relationship between ppd and er_c, the ratio of indirect to the direct effect was 1.06 (−0.18/−0.17 = 1.06), while with respect to the relationship between ppd and ln_c the ratio was 0.64 (0.09/0.14 = 0.64). In regard to the relationship between ppd and er_c, about the 51.42% of the effect was mediated (−0.18/−0.35 = 0.5142), while with respect to the relationship

TABLE 1 | Correlations among variables.

	1	2	3	4	5	6	7	8	9	*M*	*SD*
1. Children's age	1									9.66	2.29
2. Children's biological sex	−0.02	1								–	–
3. Family risk index	0.10	−0.08	1							0.68	0.96
4. COVID-risk index	0.01	0.01	0.01	1						1.62	1.04
5. Parents' psychological distress	−0.05	0.01	0.15**	0.11	1					2.83	0.59
6. Parenting self-efficacy	−0.07	0.01	−0.10	−0.04	−0.46**	1				5.37	0.89
7. Parents' regulatory emotional self-efficacy	−0.02	0.01	−0.05	−0.11	−0.59**	0.48**	1			3.08	0.54
8. Children's emotional regulation	−0.11	0.01	−0.08	−0.01	−0.27**	0.50**	0.20**	1		3.29	0.48
9. Children's lability/negativity	−0.06	−0.08	0.14*	0.02	0.19**	−0.24**	−0.15*	−0.38**	1	1.75	0.58

*$p < 0.05$, **$p < 0.01$. Biological sex was coded as 0 = boys and 1 = girls.*

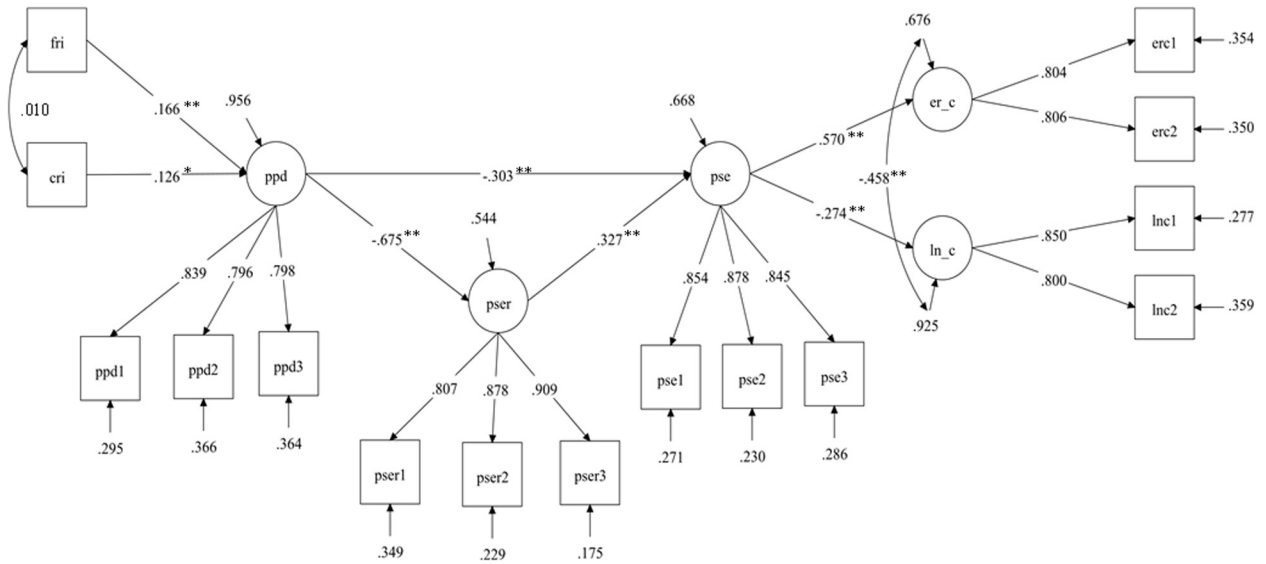

FIGURE 1 | Multivariate mediation model with structural equation modeling. Standardized coefficients are reported. Fri, family risk index; Cri, COVID risk index; ppd, parents' psychological distress; pser, parents' regulatory emotional self-efficacy; pse, parenting self-efficacy; er_c, emotional regulation of children; ln_c, lability/negativity of children. All measurement parameters were statistically significant for $p < 0.01$. Fit Indexes Chi-square (83) = 140.40, $p < 0.01$, RMSEA = 05, CFI = 0.97, TLI = 0.96, SRMR = 0.04. *$p < 0.05$; **$p < 0.01$.

between ppd and ln_c about the 39.13% of the effect was mediated (0.09/0.23 = 0.3913).

In regard to the relationship between pser and er_c, the ratio of indirect to the direct effect was −1.11 (0.20/−0.18 = −1.11), while with respect to the relationship between pser and ln_c the ratio was −3.5 (−0.07/0.02 = −3.5). More problematic was to estimate, in the same fashion, the amount of mediated effect regarding the relationship between pser with both er_c and ln_c since in those cases the indirect and the direct effects have opposite signs (as can be seen in **Table 3**), and therefore, they tend to suppress each other, resulting in a reduced non-significant total effect (pser er_c:0.02 = −0.18 + 0.20; pser ln_c: −0.05 = −0.07 + 0.02). With respect to non-significant total effect, scholars have pointed out that mediation can occur also in the absence of a detectable total effect if the indirect effect is significant (e.g., MacKinnon, 2008; Hayes, 2009). This is apparently the case. In this perspective, although it cannot be absolutely claimed that effects were totally mediated and despite the presence of null total effects, it is worth to note that indirect effects were significant and that mediation has occurred.

Overall, we can conclude that the hypothesized mediation model (M_{med}), reported in **Figure 1**, is consistent with the data.

TABLE 2 | Decomposition of indirect effects of the mediated model.

	Effect	SE	Bootstrap 95% CI
total indirect effect: ppd er_c	−0.30	0.05	[−0.39, −0.20]
specific indirect effect: ppd pse er_c	−0.17	0.06	[−0.29, −0.07]
specific indirect effect: ppd pser pse er_c	−0.13	0.04	[−0.20, −0.05]
total indirect effect: ppd ln_c	0.14	0.04	[0.06, 0.23]
specific indirect effect: ppd pse ln_c	0.08	0.03	[0.02, 0.16]
specific indirect effect: ppd pser pse ln_c	0.06	0.03	[0.02, 0.12]
indirect effect: pser pse er_c	0.19	0.06	[0.07, 0.29]
indirect effect: pser pse ln_c	−0.09	0.04	[−0.17, −0.02]

All effects are standardized coefficients. If the zero value is not included in the bootstrap 95% CI, the effect is significant at p < 0.05. ppd, parents' psychological distress; pser, parents' regulatory emotional self-efficacy; pse, parenting self-efficacy; er_c, emotion regulation of children; ln_c, lability/negativity of children.

TABLE 3 | Decomposition of total, direct, and indirect effects in the full model.

	Effect	SE	Bootstrap 95% CI
ppd er_c			
total effect	−0.35	0.08	[−0.50, −0.17]
direct effect	−0.17	0.07	[−0.37, 0.02]
indirect effect	−0.18	0.10	[−0.32, −0.02]
ppd ln_c			
total effect	0.23	0.08	[0.07, 0.37]
direct effect	0.14	0.07	[−0.07, 0.37]
indirect effect	0.09	0.04	[0.009, 0.20]
pser er_c			
total effect	0.02	0.11	[−0.22, 0.23]
direct effect	−0.18	0.10	[−0.38, 0.01]
indirect effect	0.20	0.06	[0.07, 0.33]
pser ln_c			
total effect	−0.05	0.10	[−0.23, 0.15]
direct effect	0.02	0.10	[−0.17, 0.24]
indirect effect	−0.07	0.04	[−0.17, −0.003]

All effects are standardized coefficients. If the zero value is not included in the bootstrap 95% CI, the effect is significant at p < 0.05. ppd, parents' psychological distress; pser, parents' regulatory emotional self-efficacy; er_c, emotion regulation of children; ln_c, lability/negativity of children.

Moreover, the mediation did not fit significantly worse than the full model (M_{full}) and therefore it was retained since it is more parsimonious (James et al., 2006). Additionally, all indirect effects of the mediated model (M_{med}) were significant, indicating that mediation has occurred (e.g., Preacher and Hayes, 2008; Hayes, 2009).

Multigroup Analysis

Within SEM, the test for a moderator effect can be performed using a multigroup analysis of the model in which the structural parameters are constrained equal across groups. Firstly, the structural parameters are freely estimated across groups to test for the baseline model. Secondly, the structural parameters are constrained to be equal across groups to test for the invariant model. In order to compare the fit of the two models, the chi-square difference test was used (Satorra and Bentler, 2001). A non-significant chi-square indicates that the parameters cannot be ruled out to be equal, then the invariant model should be retained and no moderation occurs. Instead, if the chi-square difference between the invariant and the baseline models is significant, which would mean that the invariant model fits significantly worse. Therefore, parameters are not equal across the groups and there is a moderation effect. Results of chi-square difference tests of multigroup analyses with SEM are reported in **Table 4**.

Regarding children's biological sex, the fit of the baseline model was chi-square (134) = 185.88, $p < 0.01$, RMSEA = 0.05, CFI = 0.97, TLI = 0.97, SRMR = 0.07, whereas the fit of the invariant model was chi-square (139) = 187.98, $p < 0.01$, RMSEA = 0.05, CFI = 0.98, TLI = 0.97, SRMR = 0.08. The chi-square difference test was not significant showing that the invariant model could not be rejected (**Table 4**). This finding suggests that biological sex of the children was not a moderator variable.

In regard to children's age (6–10 y.o. vs. 11–13 y.o.), the fit of the baseline model was chi-square (134) = 169.55, $p < 0.01$, RMSEA = 0.04, CFI = 0.98, TLI = 0.98, SRMR = 0.06; conversely, the fit of the invariant model was chi-square (139) = 179.32, $p < 0.01$, RMSEA = 0.05, CFI = 0.98, TLI = 0.98, SRMR = 0.07. The chi-square difference test was not significant showing that the invariant model could not be rejected (**Table 4**). Therefore, children's age did not appear to moderate the mediational effects tested in our model.

Finally, turning to geographical area (Northern Italy vs. rest of Italy), the fit of the baseline model was chi-square (134) = 172.56, $p < 0.01$, RMSEA = 0.05, CFI = 0.98, TLI = 0.98, SRMR = 0.06. Instead, the fit of the invariant model was chi-square (139) = 182.53, $p < 0.01$, RMSEA = 0.05, CFI = 0.98, TLI = 0.98, SRMR = 0.09. The chi-square difference test was not significant, showing that the invariant model did not fit significantly worse and therefore could not be rejected (**Table 4**). This result suggested that living in a high at-risk area for COVID-19, as it was Northern Italy at the time of data collection, did not significantly affect the structural parameter of our hypothesized model.

DISCUSSION

The health emergency related to the COVID-19 pandemic and the consequent restrictive measures of quarantine have upset our lifestyles and our daily life. In particular, families with children had to face an unprecedented and completely new situation in which parents suddenly remained the only reference point for their children. Results of the present study, indeed, showed that the COVID risk index and the family risk index partially contributed to the psychological distress of parents, although their impact was modest in terms of accounted variance. Specifically, parents with higher levels of psychological distress tendentially had a lower SES, had seen their working situation worsened during the quarantine, and were single or divorced parents who had to manage their children at home alone during the quarantine. Furthermore, regarding the COVID-19 risk index, parents with more psychological distress more likely had relatives, friends, or acquaintances tested positive for the SARS-COV-2, had hospitalized relatives because of the SARS-COV-2, lived in northern Italy which was the most at-risk area for the spread of the pandemic and for the risk of contagion, were health workers, and worked in hospital departments that treated SARS-COV-2-positive patients.

However, our SEM showed that parents' psychological distress impacted on the emotional regulation and lability/negativity of their children passing through the mediators' effect of parenting self-efficacy and parents' regulatory emotion self-efficacy. These findings suggested that what could have a positive effect on children's well-being and positive emotional regulation was not just being exposed to low level of parents' psychological stress, but it was the fact that parents felt able to manage and carry out their parental role and the related tasks. Our results suggest that self-confident parents can successfully activate many personal resources that in turn seem to prevent their children's emotional dysregulation, even in emergency situations such as the pandemic that increased their levels of psychological distress.

Furthermore, three multigroup analyses were performed to test the possible moderation effects of children's biological sex and age and of geographical area (i.e., living or not living in Northern Italy, which is the most at-risk area for the spread of the pandemic and for the risk of contagion). The multigroup analyses showed that the hypothesized model was robust and invariant across children's biological sex, and age, and living (or not living) in Northern Italy. Thus, in line with Spinelli et al. (2020), parents' and children's psychological distress was not affected by living in the high at-risk zone for COVID-19 (vs. not living in the high at-risk zone). We can speculate that, regardless of living in a more risky area, relationships among variables remained stable because this unprecedented situation characterized by the isolation and quarantine measures was perceived in the same way throughout Italy. Alternatively, it is also possible that our study did not have enough power to detect differences in parameters between groups.

Parents should be supported to improve their strengths and to feel able to manage their parental role and their emotions. During the quarantine, parents were the unique reference point for their children aged between 6 and 13 years who rely much on

TABLE 4 | Multigroup analyses for children's biological sex and age.

	χ^2	*p*	χ^2_{diff}
Children's biological sex (Boys vs. Girls)			
Model 1: Baseline, Parameter Freely Estimated	$\chi^2(134) = 185.88$	<0.01	
Model 2: Invariant, Structural Parameter Constrained Equal	$\chi^2(139) = 187.98$	<0.01	
			χ^2_{diff} (5) = 2.10; $p = 0.83$
Children's age (6–10 y.o. vs. 11–13 y.o.)			
Model 1: Baseline, Parameter Freely Estimated	$\chi^2(134) = 169.55$	<0.01	
Model 2: Invariant, Structural Parameter Constrained Equal	$\chi^2(139) = 179.32$	<0.01	
			χ^2_{diff} (5) = 9.77; $p = 0.08$
Geographical area (Northern Italy vs. Rest of Italy)			
Model 1: Baseline, Parameter Freely Estimated	$\chi^2(134) = 172.56$	<0.01	
Model 2: Invariant, Structural Parameter Constrained Equal	$\chi^2(139) = 182.53$	<0.01	
			χ^2_{diff} (5) = 9.97; $p = 0.08$

their parents in this life stage. It is important that parents know that they can protect their children, preventing their emotional dysregulation, using their strengths and self-confidence, even if they are experiencing fear and severe stress for the health emergency. Moreover, even if parents are exposed to high levels of stress, they can still promote a positive emotional functioning in their children if they feel able to reassure their children about the health emergency, to organize their children's daily life during the quarantine, and to explain them what is happening.

Despite these important findings, this study had some limitations. We collected a convenience sample that was not representative of the Italian population. Moreover, emotion regulation and lability/negativity of children were reported by parents and this could be less informative. However, many other scholars have used this type of data collection which is very common in this kind of studies (e.g., Trumello et al., 2018; Spinelli et al., 2020). Moreover, our data are correlational and it is also conceivable that parental distress and self-efficacy could be affected by children's lack of emotion regulation and lability/negativity. Furthermore, we assessed the parent's own judgment of their children's well-being and it is possible that parents who experience (according to themselves) a lot of distress also tend to judge their children's well-being more negatively irrespective of the children's actual well-being. Finally, it is not possible to infer causal relationships among variables because of the correlational nature of data. Future longitudinal study can be conducted in order to deeply test the possible long-term effects of parents' psychological distress related to the health emergency on their children's psychological well-being and the possible reverse causation effect.

However, despite these limitations, the present study presents many implications for prevention and intervention programs. In order to prevent children's distress, intervention programs should start from family and parents. This programs should be aimed at increasing parents' regulatory emotional self-efficacy and parenting self-efficacy, by activating their adaptive strategies and resources to deal with daily tasks and reinforcing their strengths. These parents' skills could be taught and learned, representing an important resource even in emergency situations such as a pandemic, in which parents remain the only points of reference and education for their children. These prevention programs should be primarily addressed at (but not limited to) parents who are health workers, who lived alone with children during the quarantine, who have sick relatives, and who have a low SES and a worsened work situation, in order to prevent the impact of their psychological distress on their children, reinforcing their belief to be able to face this difficult situation and to manage both their parents tasks and their unavoidable negative emotions.

These findings suggest how clinicians should give psychological support to parents remotely during a lockdown, reinforcing their personal strengths and working on effective parenting and regulatory efficacy strategies. Indeed, parents with beliefs of self-efficacy in parenting behaviors and emotional regulation have children more emotionally regulated and psychologically healthy.

Likewise, the present results can be used to implement psychological and educational intervention for parents in order to prevent their children's psychological distress. These results can also give pediatricians and psychologists important indications on how to specifically support families during the quarantine due to a global pandemic, providing advice to parents who in this period turn to pediatricians or psychologists to understand what to do to improve the well-being of their children. Telling parents that, even if they experience negative emotions, they can do a lot to help their children could empower parents, activating their skills and strategies. Intervention programs should be aimed to explain parents how to communicate to their children what is happening in the world around them. Using the correct words is more probable when parents have high levels of parental self-efficacy and emotional regulation self-efficacy (Jones and Prinz, 2005), and this could be very useful for parents' and children's well-being. Talking about the fear and the negative emotions related to the pandemic and the isolation would represent an important protective factor for families' well-being. If parents understand which is the right way to communicate about the pandemic with their children, they can probably feel more self-confident in managing their parental tasks and their children's emotion, and this aspect can have in turn positive effects on their children's positive adjustment.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of the Department of Developmental and Social Psychology, Sapienza University of Rome. Written informed consent was not provided because data were collected via an online survey and participants were recruited via a snowball sampling. Thus, participants gave their informed consent by clicking "Yes, I accept to participate to this study" on the first page of the online survey.

AUTHOR CONTRIBUTIONS

MM, AC, EC, and RB conceptualized the study and organized the data collection. MM, AC, EC, RB, CT, AB, and CC collected the data. AC and MM run the analyses and wrote the methodological and results section. MM wrote the first draft of the manuscript. EC, CT, AB, and CC contributed to revision of the final version of the manuscript. All authors contributed to the article and approved the submitted version.

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Impact of the Family Environment on the Emotional State of Medical Staff During the COVID-19 Outbreak: The Mediating Effect of Self-Efficacy

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During the outbreak of the coronavirus disease 2019 (COVID-19), the medical staff was facing severe work pressure, which led to a negative emotional state. The purpose of this study was to explore the relationship between the family environment and the emotional state of the medical staff members during the COVID-19 outbreak. Due to the importance of self-efficacy in regulating mental health, the mediating role of self-efficacy in the association between family environment and emotional state was also explored. A cross-sectional survey was performed, using an online questionnaire, on 645 medical staff who participated in the epidemic prevention and control tasks during the COVID-19 outbreak in Beijing. Family environment, self-efficacy, anxiety, and depressive symptoms were measured by the Family Environment Scale-Chinese Version (FES-CV), the General Self-Efficacy Scale (GSES), the Generalized Anxiety Disorder Scale-7 (GAD-7), and the Patient Health Questionnaire-9 (PHQ-9), respectively. Correlation analysis and mediating effect analysis were used to explore the relationships between them. First, a higher prevalence of anxiety (39%) and depressive (33%) symptoms were confirmed among the medical staff. Second, the symptoms of anxiety and depression were negatively correlated with the dimensions of cohesion and expressiveness and positively correlated with the dimensions of conflict in the FES-CV scale. Third, self-efficacy significantly mediated the association between the family environment and anxiety symptoms ($P < 0.001$) as well as the family environment and depressive symptoms ($P < 0.001$). These findings show that a negative family environment was the main predictor of symptoms of anxiety and depression in the medical staff during the COVID-19 outbreak. Furthermore, we found that self-efficacy played a critical mediating role between the family environment and the symptoms of anxiety and depression. Our study also indicates that improvements in the family environment benefit the mental health care of the medical staff, and high self-efficacy enhances this effect.

Keywords: COVID-19, medical staff, family environment, self-efficacy, anxiety symptoms, depression symptoms

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INTRODUCTION

The outbreak of coronavirus disease 2019 (COVID-19) continues to attract worldwide attention (Wang et al., 2020). To date, COVID-19 cases have been confirmed in more than 200 countries around the world, and it has become a public health emergency of international concern. Many people who have directly faced this large-scale public crisis, especially the medical staff involved in the prevention and control of this epidemic, showed anxiety symptoms (Huang et al., 2020). They faced a high risk of getting infected at their workplace and the possibility of their family members at home getting infected through them (Xiang et al., 2020). Medical staff working in a high-pressure environment suffer from psychological problems, especially anxiety and depression (Kang et al., 2015; Wang et al., 2020). Although guidelines on the care of the mental health issues in medical staff have been issued in China (Kang et al., 2020), some of the staff refused to receive mental health care (Chen et al., 2020).

It has been reported that the incidence of anxiety and depression was high among the medical staff during the outbreak of COVID-19, with prevalence rates of anxiety and depressive symptoms being 44.6% and 50.4%, respectively (Lai et al., 2020). Due to the stigma around mental health problems in China (Bai et al., 2004), many members of the medical staff community were reluctant to accept professional psychological help (Chen et al., 2020). However, they preferred to seek help from their family members. Some medical staff was far away from their families because of the fear of infection, and they were reluctant to have close contact with them. Others were isolated and cannot return home for a long time (Raven et al., 2018). It has shown that family support is very important for medical staff involved in epidemic prevention (Mohindra et al., 2020). However, there has been no research on how family members can help medical professionals suffering from mental health issues and what kind of family environment can be useful in relieving negative emotions in these individuals during an epidemic. The family, which is the basic social unit, may affect the mental health of family members (Cheng et al., 2017). In Chinese culture, family relations are highly valued, and family is a very important support system (Poulin et al., 2012). It means that the importance of family is the core feature for most Chinese people. Previous studies have shown that the family environment can directly affect the emotions in family members, especially the dimension of cohesion (Harris and Zakowski, 2003; Burnett et al., 2017), expressiveness (Luebbe and Bell, 2014), and conflict (Yap et al., 2014; Yap and Jorm, 2015; Fosco et al., 2016). However, whether the family environment has an effect on the mental health of medical staff during the epidemic is still not clear.

Self-efficacy refers to an individual's judgment about his or her ability to complete a certain task successfully, and it reflects the self-confidence of an individual to cope with various difficulties and setbacks in life (Tang et al., 2019). Previous research has shown a positive correlation between the family environment and self-efficacy (Mahmoudi, 2012). Individuals with a better family environment were shown to be more likely to have higher levels of self-efficacy (Hemati et al., 2020). For example, individuals can freely communicate with family members, express more about themselves, and have a frequent high contact of intimacy with other family members, which will lead to a high level of self-efficacy (Hemati et al., 2020). Studies show that increasing self-efficacy is an essential aspect of the psychological intervention to protect the mental health of individuals (Caldwell et al., 2009). It seems that the higher the self-efficacy in an individual, the better the mental health (Sebastian, 2013; Jiang et al., 2020). High self-efficacy can improve an individual's mental health (Bandura, 2012). However, a low level of self-efficacy harms a person's psychological well-being (Cieslak et al., 2008; Sachs-Ericsson et al., 2011). Importantly, studies have shown that self-efficacy is one of the critical factors that modulate an individual's emotions, especially feelings of anxiety and depression (Bandura et al., 1982; Kanfer and Zeiss, 1983; Cybulski et al., 2017; Schönfeld et al., 2019). These studies suggested that higher levels of self-efficacy are associated with lower levels of feelings of anxiety and depression. During the outbreak of SARS, medical staff with low self-efficacy often had a higher fear of the epidemic, which was positively correlated with their poor mental health status (Ho et al., 2005). Self-efficacy can predict the significant difference in mental health during the epidemic. The lower the self-efficacy, the worse the mental health status (Yıldırım and Güler, 2020). It has been found that lower psychological stress among dentists during the COVID-19 epidemic is associated with being in a stable relationship and having a higher sense of self-efficacy (Shacham et al., 2020). It suggests that family relationships and self-efficacy during the epidemic may both affect the mental health of medical staff. The partial mediating role of self-efficacy in some psychological trait relationships has been supported by relevant research (Haj-Yahia et al., 2019). Indeed, it has been found that self-efficacy was a mediator for the association of daily stress and mental health (Schönfeld et al., 2019). However, there has been no study focusing on the relationship between family environment, self-efficacy, and the emotional state of medical professionals during an epidemic. The relationship between family environment, self-efficacy, and depression and anxiety, and whether the influence of family environment on anxiety and depression is regulated by self-efficacy needs to be further studied.

Therefore, the purpose of this study was to further explore the direct and indirect impact of the family environment on symptoms of anxiety and depression among the medical staff involved in controlling the epidemic. When examining the indirect effects, we took self-efficacy as an intermediary variable. Mediating effect analysis was performed to explore the role of self-efficacy in the relationship between family environment and symptoms of anxiety and depression. Based on our findings, we provide viable strategies for the family based psychological intervention of the medical staff during an epidemic that will help to improve our psychological crisis intervention system.

MATERIALS AND METHODS

Participants

This research was a cross-sectional study using the convenience sampling method to collect survey results through an online

questionnaire. The online survey was conducted in Beijing from February 28, 2020 to March 9, 2020. Inclusion criteria for the study were as follows: (1) Chinese, working in Beijing; (2) 18–65 years old; (3) medical staff including doctor or nurse involved in COVID-19 epidemic prevention and control; and (3) has read and agreed to the online informed consent. The protocol of this study was approved by the Ethics Committee of the Beijing Huilongguan Hospital.

Study Instruments

The Family Environment Scale-Chinese Version (FES-CV)

This scale was based on the Family Environment Scale (FES) developed by Moss (Moos and Moos, 1994), which was translated into Chinese by Wang et al. (Wang et al., 1999). The scale has 90 entries in total, including 10 dimensions (cohesion, expressiveness, conflict, independence, achievement orientation, intellectual-cultural orientation, active-recreational orientation, moral-religious emphasis, organization, and control), with nine entries for each dimension. Each entry has a true and false option. The higher the score of a particular dimension, the more prominent the characteristics of the family in that aspect. The scores of conflict and control were negatively correlated with the family environment, whereas others positively correlated with the family environment. This scale has been shown to have good structural, content, and external validity when applied to the Chinese population (Phillips et al., 1998). In this study, we selected three dimensions of this scale that were closely related to emotions investigated in previous studies: cohesion, expressiveness, and conflict (Harris and Zakowski, 2003; Burnett et al., 2017).

The General Self-Efficacy Scale (GSES)

This scale was developed by German psychologist Schwarzer (Schwarzer, 1995), which was translated and revised for the Chinese version by Wang et al. (Wang et al., 2001). The scale comprises of 10 items with four answer options, and the answer options range from 1 (not at all true) to 4 (completely true). Higher scores mean higher levels of self-efficacy; a score of 1.0–2.0 means low level, 2.1–3.0 means medium level, and 3.1–4.0 means a high level of self-efficacy. The revised scale has been shown to have excellent reliability and validity in the Chinese population (Wang et al., 2001). The Cronbach's alpha of this scale is 0.87, the retest reliability is 0.83, and the correlation coefficient between the 10 items and the total scale score is 0.60–0.771.

The Generalized Anxiety Disorder Scale-7 (GAD-7)

This scale was developed by Spitzer et al. (Spitzer et al., 2006). Previous research demonstrated that the Chinese version of GAD-7 has good reliability and validity, and the sensitivity and specificity of this version were 0.86 and 0.95, respectively (Huang et al., 2019). This scale is composed of seven items, and each item has a 0–3 points scale. The total score range is 0–21 points; 0–4 for no anxiety, 5–9 for mild anxiety, 10–14 for moderate anxiety, and more than 15 for severe anxiety.

The Patient Health Questionnaire-9 (PHQ-9)

The scale was developed based on the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (Kroenke et al., 2001). We used the Chinese version of this scale. This scale is composed of nine items, and each item has a 0–3 points scale. The symptom severity is determined by the total score, with 5–9 being mild, 10–14 being moderate, 15–19 being moderately severe, and 20–27 being severe. Cronbach's alpha of the PHQ-9 in the Chinese population is 0.86, and the retest reliability is 0.86, which indicates that this test has excellent reliability and validity (Wang et al., 2014).

Statistical Analysis

All of the analyses were performed using SPSS for Windows 23.0. We reported means and standard deviations for continuous variables showing normal distribution and frequencies and proportions for categorical variables. The original scores of the dimensions of conflict in FES-CV were not normally distributed and were presented as medians and quartiles. A chi-squared test was used to test the relationship between the demographic data of the participants and their anxiety and depressive symptoms. The study participants were grouped based on whether they showed/did not show anxiety or depressive symptoms. The inter-group comparison of the scores of FES-CV and GSES was carried out using the independent sample t-test and the independent sample Kruskal-Wallis test. Spearman correlations were calculated to determine the relationships between the scores of the various scales. We categorized the family environment (cohesion, expressiveness, and conflict) as an independent variable, anxiety and depression symptoms as dependent variables, and self-efficacy as an intermediary variable. After controlling for demographic variables, the direct, indirect, and total effects of the family environment on the symptoms of anxiety and depression were examined. The mediation analysis was run on the PROCESS macro for SPSS (Preacher and Hayes, 2004), using 5,000 bootstrap samples for bias correction and to establish 95% confidence intervals. All of the tests were two-tailed, and the significance level was set at $p < 0.05$.

RESULTS

The medical staff involved in this study mainly includes two groups. One is the staff of the hospital involved in treating patients infected with COVID-19; the other is the staff at the isolation point, whose main task is nucleic acid testing and medical services for the quarantined personnel. A total of 653 medical staff members completed the online questionnaire, out of which six individuals did not complete the basic information, and two took more than 5 min to answer the questionnaire. Thus, 645 medical staff members participated in the study, of which 485 (75%) were women, and 160 (25%) were men, aged 21–65, with an average age of 35.88 ± 8.64. Most of the participants were under 40 (75%), had a bachelor's degree (61%), were married (73%), and were living with their families (83%). Among these participants, 251 (39%) had anxiety symptoms, and 215 (33%) had depressive symptoms. The symptoms of anxiety and

depression were closely related to the gender of the medical staff and whether they lived with their family members or not. The prevalence rate of anxiety and depression symptoms was higher in women ($X^2 = 9.25$, $p = 0.002$; $X^2 = 4.09$, $p = 0.043$) and in those who did not live with their families ($X^2 = 5.38$, $p = 0.02$; $X^2 = 4.35$, $p = 0.037$) (**Table 1**).

We divided the participants into two groups: one group with anxiety symptoms (GAD-7 score $>$ 4) and the other group without anxiety symptoms (GAD-7 score $\leq$ 4). We then investigated the significance of the differences in the scores of the two groups for the FES-CV and GSES scales. Next, the participants were divided into two groups according to whether they had depressive symptoms or not (depressive symptoms: PHQ-9 score $>$ 4; no depressive symptoms: PHQ-9 score $\leq$ 4). Like the anxiety symptoms, we investigated the significance of the difference between the scores of FES-CV and GSES scales in the two groups. The results, which show the significant differences among groups, are shown in **Table 2**.

Next, we used correlation analysis to determine the correlation between the scores of each scale. The results showed that there were statistically significant relationships between the anxiety and depressive symptoms of medical staff, their family environment, and their sense of self-efficacy. Anxiety and depressive symptoms showed a significant positive correlation with the dimension of conflict in FES-CV scale ($r = 0.29$, $p < 0.001$; $r = 0.25$, $p < 0.001$), and a significant negative correlation with the dimension of cohesion ($r = -0.31$, $p < 0.001$; $r = -0.38$, $p < 0.001$), expressiveness ($r = -0.23$, $p < 0.001$; $r = -0.30$, $p < 0.001$), and self-efficacy ($r = -0.25$, $p < 0.001$). More specifically, individuals with bad family environments and low self-efficacy were more likely to show symptoms of anxiety and depression. Besides, self-efficacy positively correlated with the dimension of cohesion and expressiveness and negatively associated with the dimension of conflict (**Table 3**).

After controlling for demographic variables, we examined the mediating effects of self-efficacy (**Figure 1**). Self-efficacy was significantly associated with the symptoms of anxiety and depression. It significantly mediated the association between the family environment and anxiety symptoms ($\beta = -0.12$; 95% CI, -0.19 to -0.06; $\beta = -0.10$; 95% CI, -0.16 to -0.05; and $\beta = 0.06$; 95% CI, 0.02 to 0.11). Similarly, it mediated the association between family environment and the depressive symptoms ($\beta = -0.09$; 95% CI, -0.16 to -0.03; $\beta = -0.08$; 95% CI, -0.14 to -0.03; and $\beta = 0.06$; 95% CI, 0.02 to 0.11). When controlling for self-efficacy, the association between the family environment and anxiety symptoms were still significant ($\beta = -0.62$, $p < 0.001$; $\beta = -0.52$, $p < 0.001$; and $\beta = 0.55$, $p < 0.001$) and similarly for family environment and depressive symptoms ($\beta = -0.87$, $p < 0.001$; $\beta = -0.84$, $p < 0.001$; $\beta = 0.55$, $p < 0.001$). Thus, self-efficacy partly mediated the relationship between the family environment and the symptoms of anxiety and depression.

TABLE 1 | Demographic characteristics of the study participants ($N = 645$).

Variables	Total	Anxiety symptoms		Depressive symptoms	
	$N = 645$	X^2	P	X^2	P
Gender		9.25	0.002	4.09	0.043
Male	160				
Female	485				
Age		6.30	0.098	5.97	0.113
≤30	208				
31–40	274				
41–50	119				
≥51	44				
Education		2.71	0.607	2.39	0.664
Below bachelor's	126				
Bachelor's	396				
Master's or higher	123				
Marital status		1.55	0.213	0.96	0.326
Single	176				
Married	496				
Live with family		5.38	0.02	4.35	0.037
Yes	535				
No	110				

DISCUSSION

In the current study, we conducted an online questionnaire survey of some medical staff involved in COVID-19 prevention and control in hospitals and isolation sites in Beijing. We found that a considerable proportion of medical professionals had anxiety (39%) and depressive symptoms (33%), as noted in previous studies (Huang et al., 2020; Lai et al., 2020). Moreover, our results showed that the family environment of medical staff and their symptoms of anxiety and depression during the epidemic were closely related to self-efficacy, and self-efficacy partly mediated the relationship between the family environment and the symptoms of anxiety and depression.

In this present study, we found that the self-efficacy of male medical staff was significantly higher than that of female medical staff ($t = 3.245$, $p = 0.001$). However, the symptoms of anxiety ($p < 0.001$) and depression ($p = 0.002$) during COVID-19 were significantly lower than that of female medical staff, which was consistent with previous research results. For example, it showed that female medical workers experience higher levels of anxiety, depression, and distress during COVID-19 (Lai et al., 2020). It also reported that the self-efficacy of male medical staff is significantly higher than that of female medical staff (Tang et al., 2019). It should also be noted that medical staff who did not live with their families were more likely to have symptoms of anxiety and depression during the epidemic. Thus, our study suggests that we should pay more attention to such medical staff and provide them psychological intervention. This observation also indicates that the family plays a certain role in regulating negative emotions. Furthermore, our study showed a close relationship between the family environment of the medical staff and their symptoms of anxiety and depression. The medical staff members with low cohesion and expressiveness, as well as high conflict in

TABLE 2 | Differences in scores of the family environment and self-efficacy under different emotions (N = 645).

Variables	Anxiety symptoms			Depressive symptoms		
	Yes	No		Yes	No	
	M (SD)/M (P25, P75)		*t*/*Z*	M (SD)/M (P25, P75)		*t*/*Z*
FES-CV						
Cohesion	7.05 (2.25)	8.12 (1.35)	6.76***	6.64 (2.31)	8.20 (1.28)	9.09***
Expressiveness	5.34 (1.79)	5.97 (1.49)	4.66***	4.90 (1.78)	6.11 (1.42)	8.57***
Conflict	2 (1.3)	3 (2.5)	–6.12***	2 (1.3)	3 (2.5)	–6.12***
GSES	2.53 (0.56)	2.76 (0.55)	5.15***	2.47 (0.54)	2.76 (0.55)	6.26***

****P < 0.001. FES-CV, The Family Environment Scale-Chinese Version; GSES, The General Self-Efficacy Scale.*

TABLE 3 | Correlations between the factors of different scales (N = 645).

Variables	Cohesion	Expressiveness	Conflict	General self-efficacy	Anxiety symptoms	Depressive symptoms
Cohesion	-					
Expressiveness	0.44***	–				
Conflict	–0.32***	–0.14**	–			
General self-efficacy	0.24***	0.15***	–0.11**	–		
Anxiety symptoms	–0.31***	–0.23***	0.29***	–0.25***	–	
Depressive symptoms	–0.38***	–0.30***	0.25***	–0.25***	0.72***	–

***P < 0.01; ***P < 0.001.*

the family environment, were more likely to show anxiety and depressive symptoms during the epidemic.

Notably, in this present study, the relationship between the family environment and the symptoms of anxiety and depression reveals that the family environment can, directly and indirectly, affect the emotions of medical staff during an epidemic. The family environment can significantly predict the emergence of anxiety and depressive symptoms directly, which is consistent with previous results. For example, some studies found that there was a correlation between cohesion in the family environment and depression in family members (Burnett et al., 2017); families with high cohesion, which have high levels of family support and ties, likely reduce depression (Park et al., 2018; Cano et al., 2020). In contrast, low family cohesion and conflict between parents increased the risk of depression and anxiety in family members (Park et al., 2018; Cano et al., 2020). In families with a high degree of cohesion, individuals can get more psychological help and emotional support within the family (Birgisdóttir et al., 2019), so that the psychological pressure can be appropriately relieved. Positive emotional expression within the family can prevent suppression of inner feelings and buffer internal conflicts, especially in the face of stressful events. In contrast, negative emotional expression and low emotional expression within the family are associated with higher anxiety and depression (Luebbe and Bell, 2014; Park et al., 2018). In a high-conflict family, family members are prone to conflict between each other, leading to anxiety. Therefore, the results in this study support the hypothesis that the family environment can influence the emotional state of the family members and that a negative family environment is a psychological risk factor for the rising emotional distress of the medical staff during an epidemic.

Additionally, the influence of the medical staff's family environment on their symptoms of anxiety and depression during the COVID-19 epidemic is partly through the role of self-efficacy, which means self-efficacy plays a critical role in mediating the effect of family environment on symptoms of anxiety and depression. Indeed, previous studies supported that self-efficacy had a protective effect on mental health (Bandura, 2012) and played a vital role in the regulation of stress (Bandura et al., 2003). High self-efficacy was related to better psychological adjustment (Bandura, 2012) and lower emotional distress (Benight and Harper, 2002). Individuals with high self-efficacy had positive expectations and beliefs, had successful experiences, generated positive emotions, and were more likely to seek psychological support to modulate their emotions when facing stressful situations (Tsang et al., 2012). A bad family environment can reduce an individual's self-confidence and ability (Hemati et al., 2020). Self-efficacy is the embodiment of such confidence and ability (Tang et al., 2019). That is to say, the family environment affects self-efficacy by affecting people's self-confidence and ability, thus affecting individuals' behavioral patterns and emotional responses to stress (Tsang et al., 2012). For example, a medical worker with a good family environment has confidence in the success of the fight against the epidemic and also believes that he is capable of doing his job, which will ease his fear of the epidemic and anxiety about the high-risk work of infection. Self-efficacy played a partial mediating role between the family environment and symptoms of anxiety and depression, indicating the existence of other variables between them. Future studies should, therefore, include other relevant variables that are likely involved in the relationship between the family environment and negative emotions. This

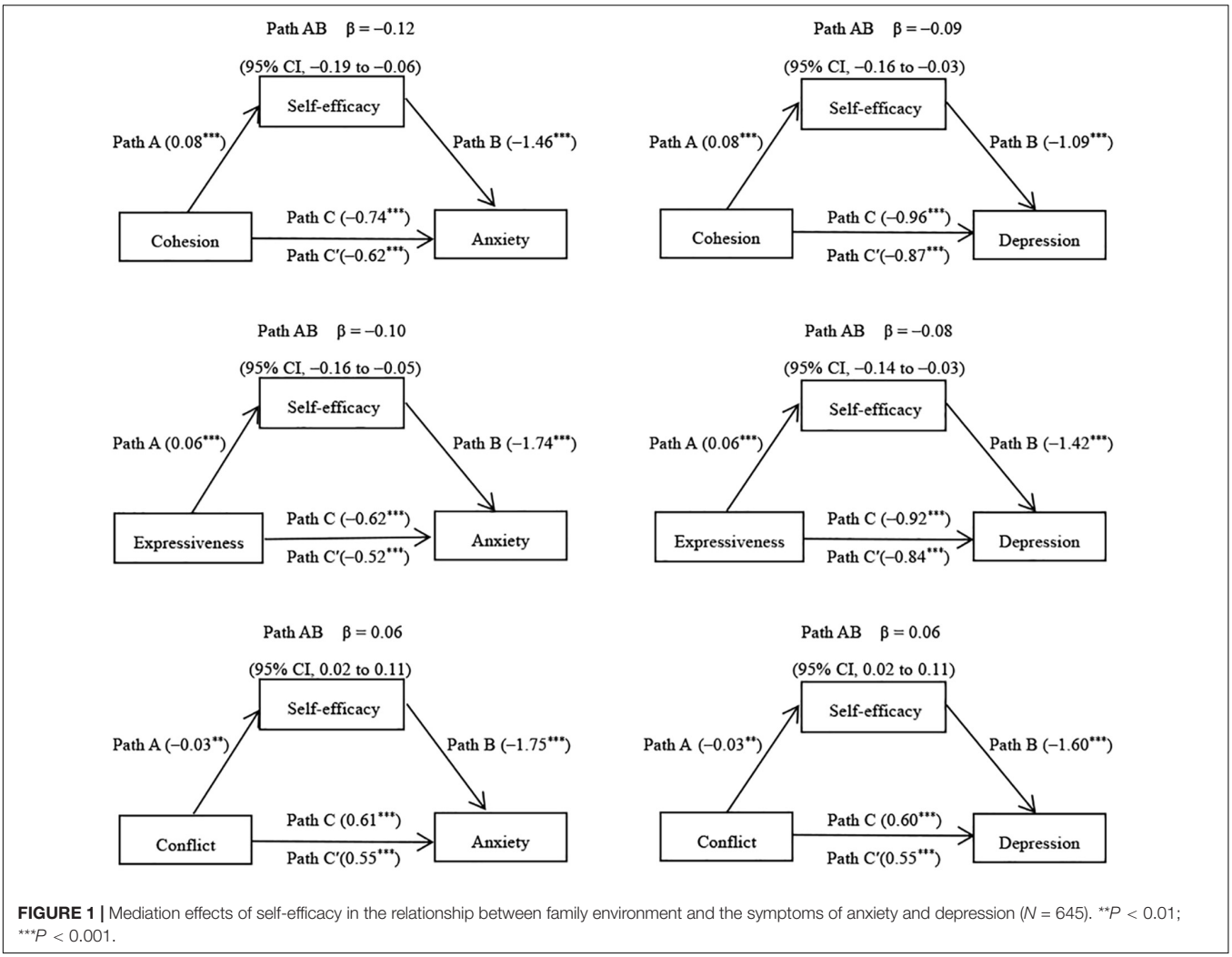

FIGURE 1 | Mediation effects of self-efficacy in the relationship between family environment and the symptoms of anxiety and depression ($N = 645$). $^{**}P < 0.01$; $^{***}P < 0.001$.

study indicates that adjusting self-efficacy is a meaningful way to regulate the anxiety and depressive symptoms of medical staff during an epidemic.

Because of the close correlation between the family environment and the symptoms of anxiety and depression of medical staff during an epidemic, we need to pay more attention to psychological assistance for medical staff from the perspective of their family situation. When providing psychological assistance to medical staff during the epidemic, we should not only focus on the medical staff but also care about their family members and family relations. By improving the family environment and increasing the active support of the family, their emotional problems can be effectively alleviated (Mohindra et al., 2020). The focus of the medical staff's treatment of family relations should be to enhance the intimacy between family members, increase their interaction, encourage them to talk to each other, resolve the family conflicts in time, and create a good family atmosphere. Based on the results of this study, we propose the following suggestions for medical staff. First, we suggest that medical staff should have time to communicate with their families and that they should be encouraged to share their feelings with family members and get their support and encouragement. For example, they should be encouraged to record their routines in the hospital and share them with their families (Chen et al., 2020). The hospital or isolation point shall provide relevant communication conditions and equipment for this purpose. Second, during the epidemic period, the staff of the relevant departments of the hospital should be aware of the difficulties existing in the family of medical staff, and they should guide these staff members and help them solve those problems to avoid family conflicts. Third, the family members of medical staff should be aware of the mental health issues of the staff member. Family safety plays the most important role in reducing the pressure of medical staff during the epidemic (Cai et al., 2020). Therefore, the staff members should stay connected with their families through WeChat, SMS, and other apps to understand their health status, which will help lessen the negative mental state of the medical staff during the COVID-19 pandemic outbreak. These Suggestions can bring medical staff closer to their families, have more emotional communication, and reduce family conflicts. With the implementation of these measures, the medical staff's sense of self-efficacy will also be improved.

Besides, our results suggest that improving self-efficacy will help to alleviate the anxiety and depressive symptoms of medical staff during the COVID-19 outbreak. Manipulating self-efficacy is an important way to prevent mental health problems when dealing with stress (Schönfeld et al., 2019). Previous studies have focused on the effects of self-efficacy on the mental health and work quality of medical staff (Amiri et al., 2019; Tang et al., 2019), and it suggested that necessary interventions should be implemented to improve the self-efficacy of medical staff. In the prevention and control of COVID-19, medical staff is faced with two main difficulties. On the one hand, medical staff has heavy work tasks, great pressure, high risk of infection, and lack of support (Spoorthy et al., 2020). On the other hand, most of the medical staff are required to be isolated in hospitals or isolation points. Their families will face more prominent problems (Mohindra et al., 2020). Some positive motivation factors can boost morale and improve the self-efficacy of medical staff, such as family and social support, positive example, recognition, and appreciation from others, successful experience, self-identity (Spoorthy et al., 2020). Positive feedback and encouragement from others could also effectively improve self-efficacy (Bandura, 1997; Zinken et al., 2008; Brown et al., 2012). The pre-job training, encouragement from colleagues and family, affirmation from patients and society, and sufficient material support were all helpful ways to improve the self-efficacy of medical staff during the COVID-19 outbreak. Medical staff in a good family environment can get better family support. The support reduces the sense of uneasiness caused by isolation, and improve self-efficacy, increase work confidence, improve work efficiency and quality, and reduce the negative emotions caused by epidemic infection.

It has been reported that the mental health status of Chinese medical staff is poor (Zhou et al., 2018), and they are exposed to immense workplace pressure and face complex doctor-patient relationships. The reason lies in the contradictions in the current medical system reform in China, such as the uneven distribution of medical resources (Lu et al., 2019), the disequilibrium between health care needs and medical development (Zhou et al., 2018), and the imperfection of the medical system (Ta et al., 2020). During an epidemic period, protecting the mental health of the medical staff would benefit their health as well as the control of the epidemic worldwide (Kang et al., 2020). The National Health Commission of China has published a national guideline of psychological crisis intervention for COVID-19, which is guided for the protection of the mental health of the medical staff (Kang et al., 2020). However, the family environment is particularly important to the mental health of the medical staff, and self-efficacy plays an important role in regulating the relationship between them. Appropriate guidelines should be issued nationally to improve the family environment of the medical staff and for the improvement of their self-efficacy.

There are some limitations to the current study that need to be addressed. First, there are limitations to the method of sampling. Sampling bias may have occurred by using a convenient sampling method. Second, we have a small sample size, and all participants are from Beijing, so the research participants in this study may not be sufficiently representative of the population we are interested in studying, which may limit the conclusion of research results. Third, online questionnaire surveys cannot observe the participants' answering process, there is the possibility of random answer and perfunctory answer, cannot guarantee the complete authenticity of data. Fourth, we did not measure other potential confounding variables that may exist between the family environment and the emotional state of medical staff during the COVID-19 outbreak. Finally, the researchers are all medical staff, and the design of the survey may be more based on clinical observation. In the future, the research design can be combined with clinical observation and the existing theoretical framework.

CONCLUSION

In the current study, we found that the anxiety and depressive symptoms of medical staff during the COVID-19 outbreak was closely related to their family environment, and their self-efficacy regulated the relationship between them. This study provides a new direction for the psychological intervention in medical staff during the epidemic that mainly focuses on improving their family environment and their self-efficacy.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

AUTHOR CONTRIBUTIONS

NH contributed to the manuscript writing. J-XC, YL, and S-SH contributed to the conception and designed the work. YL, L-LW, Y-YW, and LY contributed to the critical revision of the article. All authors contributed to the article and approved the submitted version.

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Effect of the Novel Coronavirus Pneumonia Pandemic on Medical Students' Psychological Stress and Its Influencing Factors

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In December 2019, an outbreak of the novel coronavirus pneumonia infection occurred in Wuhan City, Hubei Province, China, and it has received substantial attention globally. Few studies have investigated the psychological stress of students in Health University during the COVID-19 outbreak, and almost no work has attended to the influencing factors that may cause their psychological stress risk. This cross-sectional, survey-based, region-stratified study collected demographic data and mental measurement from 2,498 medical students and 1,177 non-medical students in 31 provinces from March 5, 2020, to March 10, 2020, in China. The psychological stress was measured using the Chinese Perceived Stress Scales (CPSS) under a self-design questionnaire. Sociodemographic, major characteristics, and knowledge of the novel coronavirus pneumonia were also identified as potential influencing factors of stress. The study revealed that medical students are suffering from more stress than non-medical students almost in all provinces of China. Four influencing factors including level of familiarity with the novel coronavirus, family income, major of students, and status of the intern student can be significantly related to students' stress in the medical group by using the univariate and multivariate analysis. Further analysis showed that students with low stress had a greater number of positive psychological emotions and a lower number of negative psychological emotions than with medical students with high stress. In addition, high stress caused low enthusiasm for learning in these medical students and lead to little/no willingness to do professional medical work in the future. In conclusion, we need to increase the level of our knowledge related to the novel coronavirus pneumonia to reduce stress and strongly focus on the special populations in medical students with certain features, such as intern students, clinical nursing students, and low-income families, to improve their learning attitudes and establish positive professional mental outlooks.

Keywords: novel coronavirus pneumonia, medical students, stress, perceived stress scales, influencing factors

INTRODUCTION

In December 2019, an outbreak of the novel coronavirus pneumonia infection occurred in Wuhan City, Hubei Province, China, and has spread to the rest of the country. This speedy onset crisis was accompanied with strong infectivity, rapid rate of course changes of the disease, and the general susceptibility of the population. On January 20, 2020, the National Health Committee included pneumonia caused by the new coronavirus infection as a Class B infectious disease under Category A of Infectious Disease Management (Drosten et al., 2003; Zaki et al., 2012; Chang et al., 2020). The World Health Organization 2020 has identified the novel coronavirus infection as a Public Health Emergency of International Concern and named it "COVID-19" (World Health Organization [WHO], 2020). As of March 6, 2020, more than 3000 medical staff in Hubei Province have been infected with COVID-19, of which 40 and 60% have been infected in hospitals and communities, respectively. All of them were local medical staff in Hubei Province, and most of them specialize in non-communicable diseases (The State Council Information Office of the People's Republic of China, 2020). As of 19:00 on March 25, 2020, China had confirmed 81,896 cases of COVID-19, including 3287 dead and 73,793 recovered (National Health Commission of the People's Republic of China, 2020).

From January 25, 2020, 30 provincial-level administrative units have initiated major public health emergency level responses for effective prevention and control (Li Z. et al., 2020). On January 27, 2020, the Minister of Education issued a notice on the extension of the spring semester (Ministry of Education of the People's Republic of China, 2020). Colleges and universities in each region have to start in accordance with the control of the local epidemic and the unified deployment of the local education administration and government (Rothe et al., 2020). Many college students would be required to take home isolation because of the implementation of strict traffic control and the postponement of the opening of colleges. However, these young students in the learning stage are still in the mature period of psychological development. In the face of such a ferocious epidemic and heavy academic work, they will be burdened by the pressure caused by COVID-19 or social isolation and interruption of normal school activities. In addition, cyberspace rumors can exacerbate psychological stress on students due to being unfamiliar with the novel disease. The widespread news also causes more concerns related to the severity of the disease. Lazarus and Folkman showed that when someone has to face huge hazards that are beyond their ability to handle, the physical and mental health are affected directly (Liu et al., 2015). As the first mental problem, stress can change students' feelings through further physical and mental symptoms (Yuan and Lin, 2009). Therefore, focusing on the particularity of stress is helpful to improve the ability of early prevention of mental illness.

Among these students, medical students are considered a special population. Although the COVID-19 epidemic is very dangerous, there are still many other factors that would affect students' psychological stress. Firstly, during the outbreak response, online teaching approaches have been launched successively to avoid delays in study progress. But the lack of interaction and teaching materials and the unfamiliar classroom environment increase the concerns and discomfort among the students (Yang et al., 2020). Secondly, based on expectations for the future, medical students may suffer more stress than other professional students in academic and employment in the current environment (McGuire, 1966; Dyrbye and Shanafelt, 2011; Dyrbye et al., 2011; Voltmer et al., 2012). Furthermore, some medical interns were even required to be on the frontline to fight the COVID-19 in some cities of China. The poor situation of frontline medical workers has attracted much more attention from medical students, which furtherly enhance the stress perception of medical students. Additionally, a lot of basal characteristics of personal students can also change the personal psychological stress, such as family incoming, student's age and gender, etc. For these factors, seeking the sources of students' stress with a great importance are worth exploring.

As we know, psychological stress can effect the overall mental health of these medical students (Al-Rabiaah et al., 2020), such as anxiety and depression, etc. (Cao et al., 2020; Liu J. N. et al., 2020). This outbreak has highlighted the fragility of mental resilience. For now, there are many researches focusing on the mental health of medical care workers who were exposed to COVID-19 with increasing frequencies of mental symptoms (Liu C. Y. et al., 2020). The rates of anxiety and depression among medical students are almost 12.5–23.48% (Chen et al., 2014; Zhao et al., 2018) and 13.2–48.7% (Chi et al., 2019; Xiong et al., 2019), respectively. Meanwhile, the researchers also show that the numbers of psychological mental health are generally increasing among college students (Cao et al., 2020). Therefore, to explore the correlation analysis between these mental health symptoms in medical students would bring huge benefits to the comprehensive management of students in the pandemic period.

Of note, if high psychological stress and poor employment environment both were part of a vicious circle, it may lead to the decline of academic and employment performance and obviously reduce the quality of life of medical students (Dyrbye et al., 2005). To clarify, if the perceived stress of medical students has existed for a long time, it would directly affect the choice of medical career (McGuire, 1966; Kumar et al., 2019). In extreme cases, mental illness of these students during this period may even lead to students' suicide (Singh et al., 2016; Kumar et al., 2019; Li H. Y. et al., 2020).

Despite the importance of these issues, only a few studies have investigated the psychological stress of medical students in Health University in the COVID-19 outbreak in China. Therefore, this study's aim is to design an online survey based on the CPSS questionnaire by collecting the demographic data (such as gender, age, educational background, nationality, monthly income of families and understanding of the disease, etc.) to describe the distribution of the psychological stress of medical students and to identify its influencing factors in China during the pandemic period. In addition, we also focus on exploring the relationship between stresses with psychologies phenomena and the changing of attitudes of learning and employment. Our findings might help governments, schools, or health authorities to recognize the causes of increased stress and their influences in medical students, and then to provide early effective measures to reduce that stress.

MATERIALS AND METHODS

Study Population

Using the cross-sectional research method, online students were investigated anonymously online by snowballing through questionnaires sent to WeChat and QQ. We restricted the IP address of each device (mobile phone, computer, and tablet) to answer the survey only once. The survey period is from March 5, 2020, to March 10, 2020. The questionnaire survey platform was developed by Changsha Ranxing Information Technology Co., Ltd. In total, 3,680 questionnaires were distributed and 3,675 valid questionnaires were recovered, with an effective rate of 99%. The inclusion criteria of this study were as follows: (1) Full-time college students aged 16∼31 years old; (2) Be able to read and write; (3) Those who are willing to participate in this project. The exclusion criteria included: (1) Those who were unable to complete the study due to severe visual or hearing impairment, mental disorder, etc.; (2) Those with cognitive dysfunction.

Pilot Survey

Four medical administrators, four medical students, and four non-medical students were selected to conduct a pre-survey to understand the use of the questionnaires in this study. According to the feedback of the respondents, the questionnaire was modified appropriately.

Data Collection

Using the online questionnaire preparation method, the questionnaire items are entered one by one, and online release and questionnaire were collected. Before the input of the collected data, the errors were checked, and omissions were made up and the logic checked. Additionally, the questionnaires with obvious logic errors and more missing items were eliminated.

Questionnaire Contents

The first part included the general situation, such as gender, age, educational background, nationality, average monthly income of family members, learning attitude, and professional attitude. For the education background, we divided full-time college students into medical major and non-medical major. The medical major mainly includes clinical medicine and clinical nursing. Non-medical major mainly includes information management and high-speed rail crew, etc. The second part consisted of the Chinese version of perceived stress scale (CPSS). Previous PSS is widely accepted and used for psychological stress assessment. Cohen et al. (1983) developed the PSS in 1983. The Cronbach coefficient of the scale is 0.78, indicating good reliability and validity. Now, the scale has been sinologized by Yang Yanzhong of Zhejiang University (Yang and Huang, 2003). The CPSS can quickly judge the individual stress state through 14 designed questions. The 4, 5, 6, 7, 9, 10, and 13th questions were reverse items, and the total score range was 0–56. A high score indicates high psychological stress. A total score of ≥25 points is defined as high stress. In the current study, we used the CPSS as the subjective index of psychological stress assessment. The Cronbach coefficient of this questionnaire was 0.827 to show good reliability.

Statistical Analysis

In this questionnaire, the continuous variables were reported as mean and standard deviation (SD) and compared by using the Student's *t*-test or ANOVA test in two or more groups. LSD test was used to detect the multi-comparison after ANOVA test. The dichotomous data were presented as frequency (%) and compared by using the chi-square or the Fisher's exact test in two groups. The distribution of mean CPSS score of the students from each province was also calculated. We firstly compared the CPSS score between the medical and non-medical student groups. Then, univariate analysis methods, such as the Student's *t*-test and chi-square or Fisher's exact test, were used to explore the candidate variables that related to the high CPSS score in the medical students. The standard mean difference (SMD) of these candidate variables between the two groups was calculated by the "tableone" package in R. Then, the multivariate logistics regression analysis was performed to determine the independent risk factors of the CPSS score. We presented the results of the multivariate analysis on a forest plot for all the comparative Odds Ratio (OR) values with it 95% confidence interval (CI) of the associations. Lastly, the bar plots of some potentially related variables were also used to analyze the differences between high CPSS and low CPSS groups. The main packages, including "forestplot," "glm," "ggolot2," "maps," "mapdata," and "tableone," were applied to visualize and analyze the results and conclusions. All the reported *P*-values with a significance level of 0.05 were defined based on two-sided tests. All statistical processes were performed in the R software (R Foundation for Statistical Computing, Vienna, Austria, and version 3.6.0).

RESULTS

Questionnaires Collection and Study Design

This is a cross-sectional, survey-based, region-stratified study and collected demographic data and CPSS measurement from 3,680 students in 31 provinces from March 5, 2020, to March 10, 2020, in China. Specifically, a total of 3,680 questionnaires were distributed and 3,675 valid questionnaires were recovered to analysis, with an effective recovery rate of 99%. To fully demonstrate the role of stress in medical students during the pandemic period, a comprehensive analysis with a flowchart was designed in **Supplementary Figure S1**.

Distribution of CPSS Score of Medical and Non-medical Students in China

Exactly 68.2% (2,498/3,675) of the students were medical students, whereas the remaining were non-medical students (31.8%, 1,177/3,675) in the questionnaire. First, we presented the distribution of CPSS score of all students in 31 provinces of China (**Figure 1A**), as well as the medical students (**Figure 1B**). Apparently, we found a regional heterogeneity in these provinces

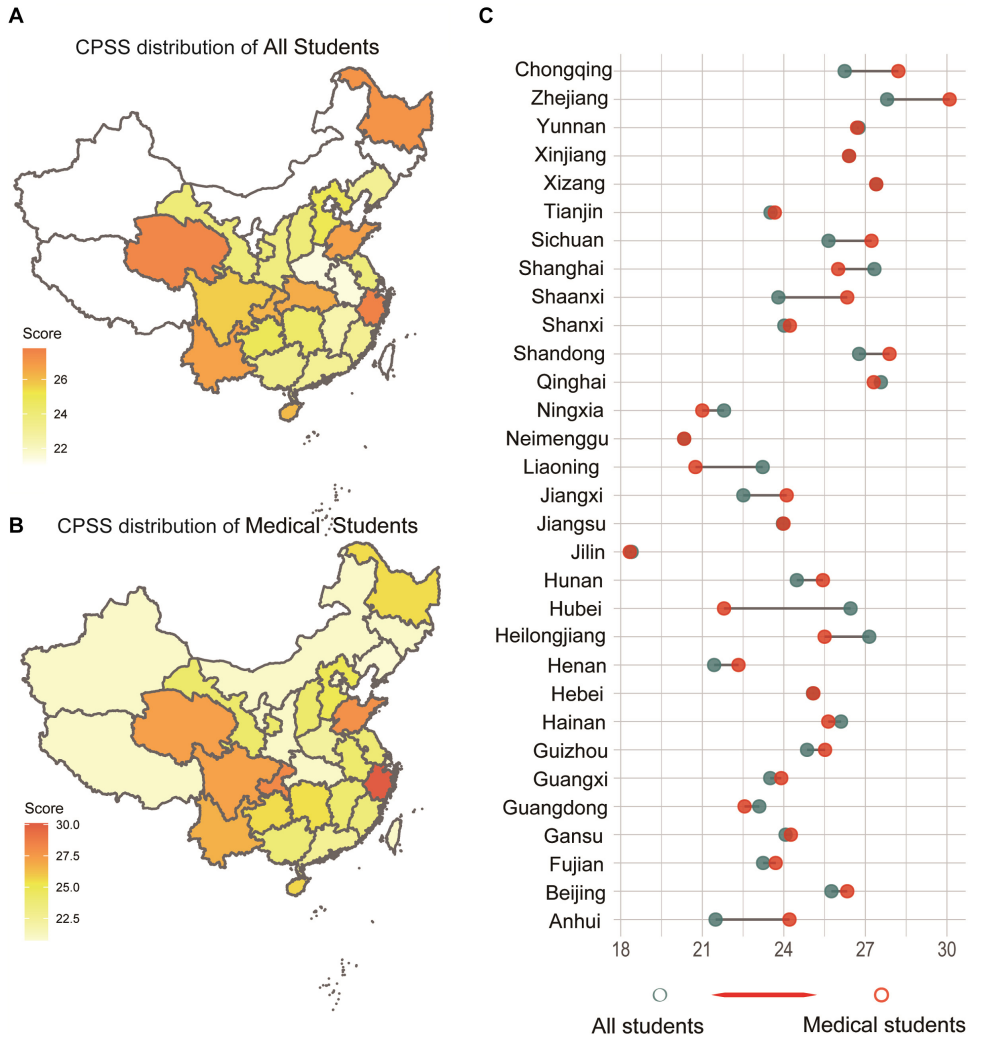

FIGURE 1 | The distribution and difference of the CPSS score of all students in each province of China. **(A)** The distribution of all students. **(B)** The distribution of the CPSS score of medical students. **(C)** CPSS score Changing from all students to medical students in each province of China.

through the different depth of colors in the distribution map of CPSS score. From **Figure 1C**, we clearly found an increasing trend of CPSS score in the medical students by comparing with the total students in each Chinese province. The detailed digital results of these figures are included in **Supplementary Table S1**.

Demographic Comparison of Medical and Non-medical Students

To detect the basal demographic characteristics of the medical and non-medical students, we compared collecting variables in **Table 1**. The differences of some variables, such as sex, age, race, source of the student, and the family income, also were detected between the two groups. By using the *t*-test the gaps between medical and non-medical students in the CPSS score were investigated. We found that the medical students had a higher mean CPSS score than the non-medical students (**Figure 2A**, CPSS score, medical: 24.14, non-medical: 22.63; $P < 0.001$). We stratified all the students into two groups, namely, the high- and low-CPSS group, by using the cutoff (value = 25) of the CPSS score (Yang and Huang, 2003). Therefore, based on the cut-off of CPSS in our study, the rate of high CPSS was 44.8% (1,648/3,676) in all students. Among them, the rate of medical students with high CPSS was 48.7% (1,219/2,499), and the rate of the students with low CPSS was 36.4% (429/1,178). The bar plot with the chi-square test can also detect the differences between two groups (**Figure 2B**, medical: 48.8%, non-medical: 36.4%; $P < 0.001$).

Univariate and Multivariate Analysis for High CPSS Score Among Medical Students

To select the impact factors that related to the CPSS score among the medical students, we firstly compared the differences in the variables in the medical students with High CPSS score or Low CPSS score. **Table 2** showed that five factors (i.e.,

TABLE 1 | The basal characteristics of medical and non-medical students in the design questionnaire.

Variables	Medical students (*n* = 2,498)	Non-medical students (*n* = 1,177)	*P*-value
Sex (%)			**<0.001**
Male	364(14.6)	350(29.7)	
Female	2,134(85.4)	827(70.3)	
Age [mean (*SD*)]	20.78(1.53)	19.59(1.36)	**<0.001**
Only one child (%)			0.311
No	491(19.7)	249(21.2)	
Yes	2,007(80.3)	928(78.8)	
Race (%)			0.031
Han	2,347(94.0)	1,127(95.8)	
Others	151(6.0)	50(4.2)	
Students source (%)			**<0.001**
City	281(11.2)	194(16.5)	
Town	596(23.9)	268(22.8)	
Rural	1,621(64.9)	715(60.7)	
Income of family (per months)			**<0.001**
–2,000	648(25.9)	209(17.8)	
2,000–3,000	809(32.4)	313(26.6)	
3,001–4,000	429(17.2)	253(21.5)	
4,001–5,000	258(10.3)	193(16.4)	
5,000–	354(14.2)	209(17.8)	
Level of familiar for coronavirus (%)			0.230
Very understanding,	297(11.9)	143(12.1)	
Relatively understanding	1,335(53.4)	588(50.0)	
General understanding	828(33.1)	420(35.7)	
Little understanding	34(1.4)	23(2.0)	
Not at all	4(0.2)	3(0.3)	
Live with family during the period of coronavirus (%)			**0.025**
Yes	2,428(97.2)	1,159(98.5)	
No	70(2.8)	18(1.5)	
Infection cases (%)			0.191
No	2,497(100.0)	1,174(99.7)	
Yes	1(0.0)	3(0.3)	
Number of positive. emotions	3.75(1.34)	3.79(1.29)	0.335
Number of negative emotions	1.98(1.49)	1.86(1.40)	**0.024**
Attitude of learning (%)			**<0.001**
Never	57(2.3)	17(1.4)	
Hardly	131(5.2)	51(4.3)	
Sometimes	1,220(48.8)	508(43.2)	
Often	799(32.0)	423(35.9)	
Always	291(11.6)	178(15.1)	
#Intern student (%)			NA
Yes	994(39.8)	NA	
No	1,504(60.2)	NA	
#Attitude of medical work (%)			NA
Very willing	1,222(48.9)	NA	
Relatively willing	888(35.5)	NA	
General willing	330(13.2)	NA	
Little willing	44(1.8)	NA	
Unwilling	14(0.6)	NA	

Note: #Only for medical students; Chi-square test for categorical variables; T-test for continuous variables. Bold font means there is a significant difference between the two groups.

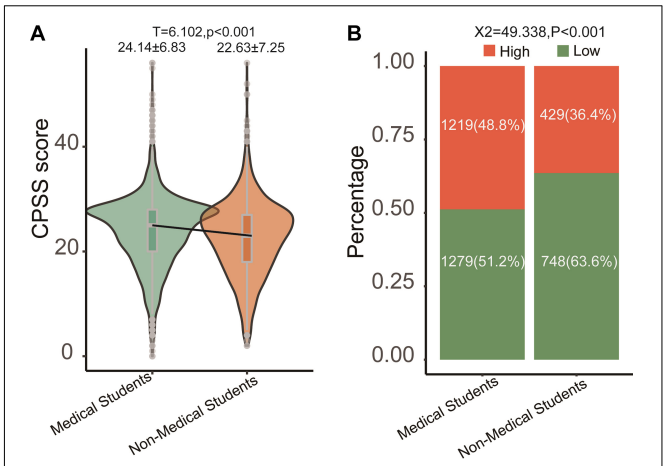

FIGURE 2 | Comparison of medical students with non-medical students. **(A)** Continuous CPSS score; **(B)** category CPSS score (high > 25 vs. low ≤ 25).

age, family income, level of familiarity to COVID-19, major of students, and status of the intern student) could be the candidate variables related to the CPSS score in medical students (all $P < 0.01$). Then, we obtained the ranking of the five most relevant factors to CPSS by using the method of SMD in the package of "tableone" in R (**Figure 3A**). Thereafter, we included the five significantly related variables into multivariate logistic regression analysis. Finally, it showed that four variables were the independent risk factors of the CPSS score in the medical students (**Figure 3B**, all $p < 0.05$). As a supplement, we also tested the relationship between the continuous CPSS score with these factors by using the *T*-test and the LSD test and obtained results similar to those of the regression and general chi-square tests (**Figures 3C–F**, $P < 0.05$).

Relationship of CPSS Score With Psychological Phenomena Among Medical Students

In general, stress and other emotions interacted in an individual person, and we still detected the relationship of the positive and negative effects of psychologies with CPSS score in our study. With the increasing number of positive psychologies, the frequency of high CPSS score is less and less in the medical students (**Figure 4A**, $P < 0.001$). Separately, we found that concern for other people (**Figure 4C**), keeping protection from COVID-19 (**Figure 4D**), and keeping good health (**Figure 4F**) could significantly reduce the CPSS score ($P < 0.001$) in the medical students, but not for unlike public morality (**Figure 4B**, $P = 0.07$) and following the epidemic news (**Figure 4E**, $P = 0.36$). Unlike positive phenomena, the negative phenomena of medical students including anxiety, depression, worried about health, boring, fear, helplessness, loneliness, and insomnia in the high CPSS score group were all higher than that in the low CPSS score group (**Figures 5A–I**, all $P < 0.001$).

TABLE 2 | The relationship of influencing factors with CPSS score (high vs. low) in medical students.

Influencing factors	High CPSS score (*n* = 1,219)	Low CPSS score (*n* = 1,279)	*P*-value
Sex (%)			0.086
Male	162(13.3)	202(15.8)	
Female	1,057(86.7)	1,077(84.2)	
Age [mean (*SD*)]	20.87(1.52)	20.69(1.53)	**0.003**
Only one child (%)			0.359
Yes	230(18.9)	261(20.4)	
No	989(81.1)	1,018(79.6)	
Race (%)			0.761
Han	1,143(93.8)	1,204(94.1)	
others	76(6.2)	75(5.9)	
Source of students (%)			0.153
City	122(10.0)	159(12.4)	
Town	298(24.4)	298(23.3)	
Rural	799(65.5)	822(64.3)	
In come of family (per month)			**0.009**
2,000 down	347(28.5)	301(23.5)	
2,000–3,000	406(33.3)	403(31.5)	
3,001–4,000	190(15.6)	239(18.7)	
4,001–5,000	118(9.7)	140(10.9)	
5,000 up	158(13.0)	196(15.3)	
Level of familiarity for coronavirus (%)			**<0.001**
Very understanding	110(9.0)	187(14.6)	
Relatively understanding	630(51.7)	705(55.1)	
General understanding	453(37.2)	375(29.3)	
Little understanding	22(1.8)	12(0.9)	
Not at all	4(0.3)	0(0.0)	
Live with family (%)			0.418
Yes	1,181(96.9)	1,247(97.5)	
No	38(3.1)	32(2.5)	
Infection cases (%)			0.981
No	1,218(99.9)	1,279(100.0)	
Yes	1(0.1)	0(0.0)	
Major of student (%)			**<0.001**
Clinical	185(15.2)	267(20.9)	
Nursing	1,034(84.8)	1,012(79.1)	
Intern student (%)			**<0.001**
Yes	530(43.5)	464(36.3)	
No	689(56.5)	815(63.7)	

Note: #Chi square test for categorical variables; T-test for continuous variables; Bold font means there is a significant difference between the two groups.

We also aimed to detect the relationship between CPSS and the attitude of learning and professional medical career. Then, learning and professional medical career attitudes with five levels were filled in by the subjects of the questionnaire. We could find that a high CPSS score led to the low enthusiasm for learning among medical students (**Figure 6A**, $X^2 = 196.49$, $P < 0.001$). A five-level category for the attitude of professional medical career, including very, relatively, general, slightly willing, and unwilling, was further analyzed (**Figure 6B**). Although most of the medical students in the high- and the low-CPSS score groups (80.26 and 88.42%, respectively) continued their medical career, a high CPSS score still could cause a high proportion of students to be slightly willing and unwilling to do medicine-related work in the future (**Figure 6B**, $X^2 = 68.61$, $P < 0.001$). To better comprehend the differences in the professional medical career attitude in the high- and the low-CPSS score groups in medical students, we also required the subjects to support the diversity of reasons for being unwilling to select the medical career in the questionnaire. Then, we divided these reasons into two parts, good and bad. The good reasons, such as "meaningful work" and "devotion of love," were significantly higher in the medical student with low CPSS score. However, the poor reasons, such as "Disrespect by Patients," "low salary," "hard work and serving people," "high academic requirements," "Non-conformity for Career Planning," and "Career without Future" were all higher in the medical students with high CPSS score (**Table 3**, all $P < 0.05$).

DISCUSSION

As we know, COVID-19 is highly contagious with 20% severe illness and 2% mortality rate. In such a short period, the sharply increasing number of COVID-19-infected people may lead to students who are suffering from psychological strain of disease outbreak, anxiety, and other disruptive emotions. As we can see in most cities in China, the government had to shut down schools and some entertainment or gathering place at all levels and did not allow students to participate in various forms of social activities and entertainment for nearly 2 months. "Homestay" was really against normal learning tools but was necessary in the pandemic period. Importantly, we can easily clarify the stress situations of college students by using the CPSS tool, which is a brief assessment of someone's stress level in any aspect of life situation (Cohen et al., 1983). Considering that medical students suffer a huge amount of stress from academics and employment, they deeply need to learn medicine knowledge in the available online courses. Thus, these reasons would raise the levels of their stress during the pandemic, especially for medical students with their extensive duties (Arora, 2015). Of note, mild, moderate, and high levels of stress and even burnout have been reported among medical students and healthcare professionals in other countries (Al Khalidi and Wazaify, 2013; Muzafar et al., 2015; Aamir et al., 2017; Alkot et al., 2017; Syed et al., 2019). In total, understanding of the distribution and reasons of high stress in students during the COVID-19 outbreak may be helpful to governments, schools, or health authorities.

This study firstly evaluated the distribution and huge differences of stress levels between medical and non-medical students in almost 31 provinces of China. To demonstrate the source of the high stress in medical students, we obtained four influencing factors, which could be significantly related to the progression of CPSS score in medical students by using the univariate and multivariate analysis, such as major of students, status of the intern student, family income,

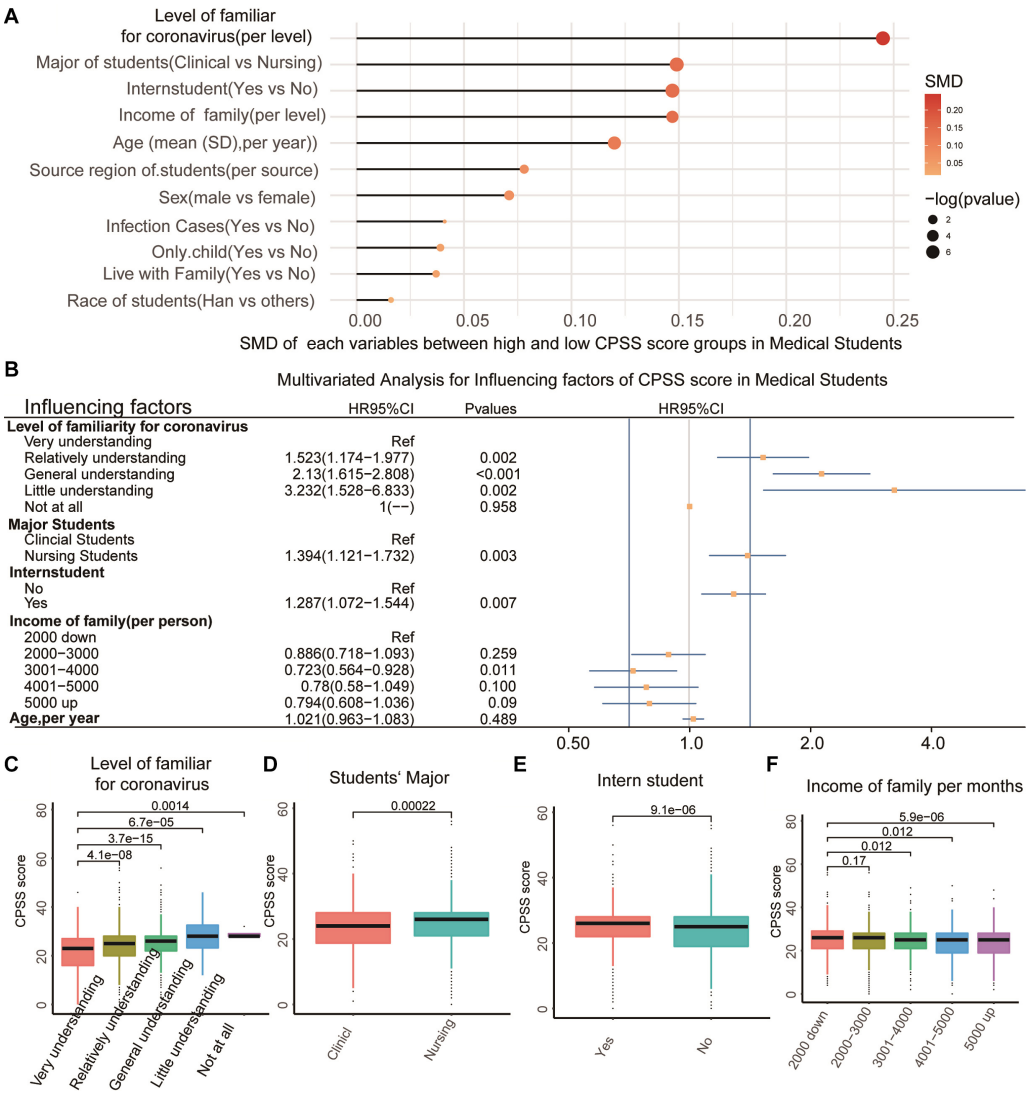

FIGURE 3 | Association of common variables with the CPSS score. **(A)** The SMD value of each variable between high CPSS score and low CPSS score in medical students. **(B)** The multivariable regression for the high CPSS score in medical students. **(C–F)** The significant difference of CPSS scores with four influencing factors.

and level of familiarity with COVID-19. By comparing the female and older students with the male or young students, it was indicated that they have more mental problems, which is similar to the previous study (Cao et al., 2020; Li H. Y. et al., 2020; Liu C. Y. et al., 2020); however, statistical analysis showed no significant difference. In our study, approximately 85% of them were female medical students who could respond to the results. Among the population who answered the questionnaire, 66% of the students are nursing majors. Obviously, compared with other clinical majors, nursing students would face higher stress when they are undergoing the strictly learning and work environments (Magnavita and Chiorri, 2018). Additionally, medical interns have higher stress than the non-interns medical students (Babar et al., 2004; Liselotte et al., 2006; Guo et al., 2019; Shadid et al., 2020). Not only the clinical practice and emergencies in hospital, but also the task of publishing a graduation dissertation sends these intern students into a high-stress situation. What's more, medical intern students need to avoid making mistakes because of the importance of patients' life, because during the throat swab collection and medical operations, safety is uncertain all the time. Thus, responsible teachers and hospital managers should attend to these students, especially the nursing interns, regardless of school and hospital. It's easy to understand that there is another reason that low family income tends to make students feel inferior, resulting in high stress in most instances (Wang et al., 2019). Finally, it is exceedingly profound to know that the higher level of familiarity with COVID-19 can lessen the anxiety and depression level of these students (Huang et al., 2020), as well as the stress in our study. People becoming familiar with things will significantly

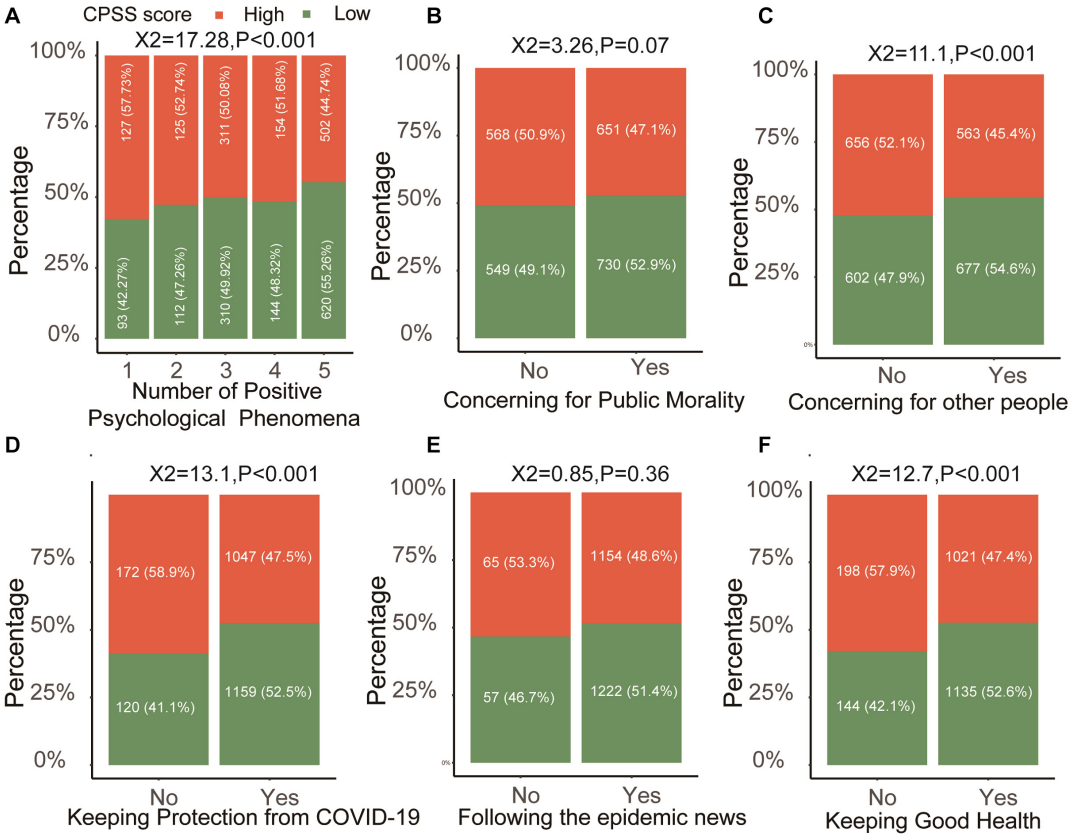

FIGURE 4 | The relationship between CPSS score with different positive psychological phenomena in medical students. **(A)** The trend of the number of positive psychological phenomena in high or low CPSS score groups. **(B–F)** The individual positive psychological phenomenon.

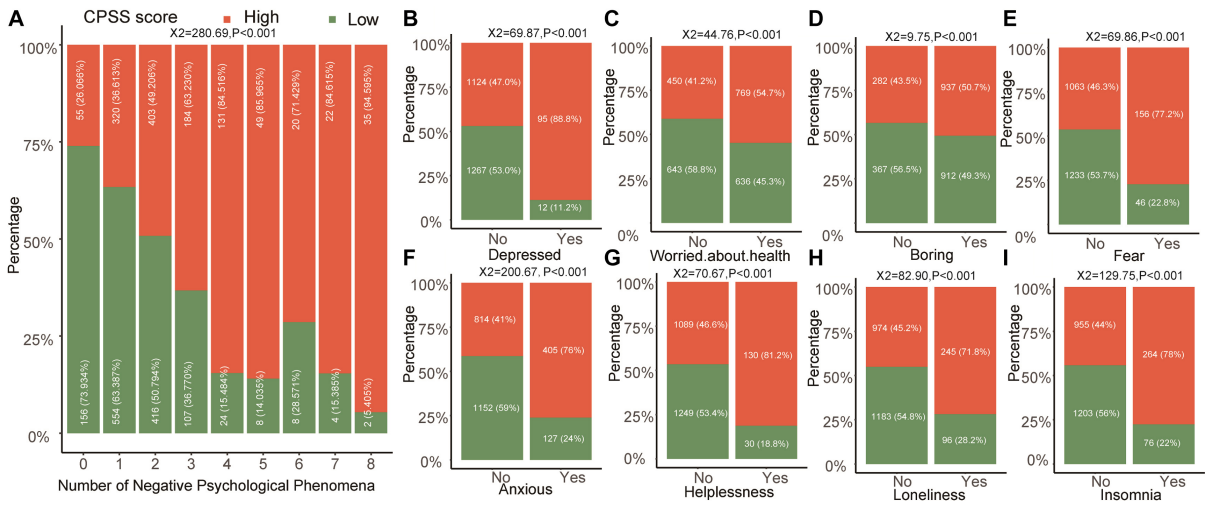

FIGURE 5 | The relationship between CPSS score with different negative psychological phenomena in medical students. **(A)** The trend of the number of negative psychological phenomena in high or low CPSS score groups. **(B–I)** The individual negative psychological phenomenon.

TABLE 3 | The differences of the diverse reasons for choosing the medical career in medical students with high or with low CPSS score.

Stratified	Reasons for medical work	High CPSS score(n = 1,219)	Low CPSS score(n = 1,279)	X^2	P
Good	Meaningful work	896(73.50%)	1,061(82.96%)	32.868	**<0.001**
	Devotion of love	590(48.40%)	736(57.54%)	20.957	**<0.001**
	Stable workplace	671(55.05%)	750(58.64%)	3.288	0.07
	Easy employment	444(36.42%)	499(39.01%)	1.784	0.182
Poor	Work at risk	882(72.35%)	918(71.77%)	0.104	0.747
	Disrespect by patients	556(45.61%)	496(38.78%)	11.946	**0.001**
	Low salary	465(38.15%)	320(25.02%)	49.904	**<0.001**
	Strict college entrance examination	410(33.63%)	385(30.10%)	3.59	0.058
	Hard work and serving people	407(33.39%)	328(25.65%)	18.02	**<0.001**
	High academic requirements	332(27.24%)	289(22.60%)	7.193	**0.007**
	Non-conformity for career planning	255(20.92%)	190(14.86%)	15.673	**<0.001**
	Career without future	145(11.89%)	94(7.35%)	14.904	**<0.001**

Chi-square test for categorical variables; Bold font means there is a significant difference between the two groups.

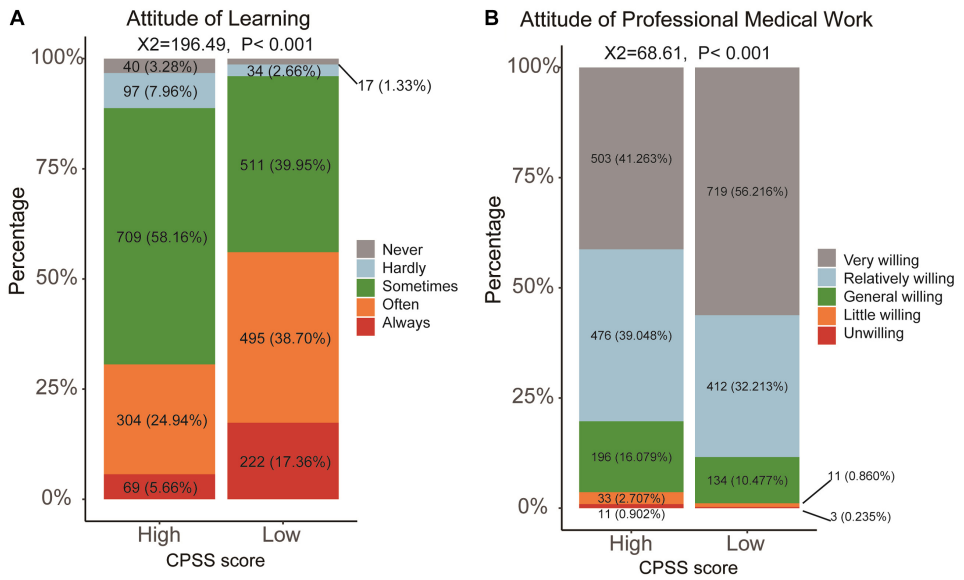

FIGURE 6 | The changing of the attitudes of learning and professional work in medical students with high or low CPSS score. **(A)** Learning; **(B)** the professional work (medical work).

reduce psychological stress, fear, and other pessimistic moods. Therefore, it becomes much more important to reduce psychological stress through the comprehensive and accurate education of medical students in the prevention and control of the COVID-19 pandemic.

The survey also asked students to fill other positive and negative psychological emotions in the form voluntarily in the study. The negative psychological emotions included depression, worry, boredom, fear, anxiety, helplessness, loneliness, and insomnia, and these were all significantly related to the higher CPSS score in the medical students. Previous studies have reported that stress is closely related to negative psychology that can lead adolescent students to avoid coping, and avoidance of coping enhances the severity of psychological stress (Ozawa, 2010; Arsenio and Loria, 2014). Positive psychological emotions including five psychological aspects, namely, "health protection measures," "following the epidemic news," "health condition," "concern about public morality," and "caring for others" were also related to psychological stress. It is obvious that the positive states of students are lower under the high pressure in the pandemic period. Therefore, it is equally important to find other psychological changes to improve the status of the students' physical and mental health.

The attitudes of learning and professional medical career were also reduced by the high stress brought by the epidemic. For the attitude of learning, medical students with low CPSS scores are more comfortable with learning than those with high CPSS scores. Researches showed that the lower psychological stress for learners who take the initiative to study in professional courses or read extracurricular books in online learning, the more efficient

of the studying (Zhang et al., 2020). We also proved that most of the medical students both in the high- and the low-CPSS score groups would continue their medical careers. However, a higher proportion of medical students would be slightly willing and unwilling to do work related to medicine in the medical students with high stress. The medical students with low CPSS scores had a more stable professional mentality that was extremely helpful in controlling their occupational risks, and their motivation reasons are undeniable. In the pandemic period, for instance, from the arrival of the first medical team in Wuhan on New Year's Eve on March 1 (Li Z. et al., 2020), a total of 42,322 medical staff used their spirit of selflessness and careers professionally, and this affected these medical students to reduce their stress. After COVID-19 in China, medical students would enhance their sense of social responsibility and professional attitude awareness. Thus, we strongly recommend that experts address these problems to improve the attitudes of learning and professional work by completing the formulation of sound incentive schemes.

Limitations

This cross-sectional study had certain limitations. Although we have collected much demographic information and made a lot of data analysis, we cannot determine the causal relationship between stress and these indicators, the same as the relationship between positive psychology and negative psychology and stress. Further longitudinal research is needed to obtain the final causality and improve decision-making ability. In addition, data was collected by using self-administered questionnaires/instruments. Hence, we cannot rule out information bias. To enhance the applicability of the research results, we should further expand the sample size and improve the representativeness in the follow-up research. Despite these limitations, this study provided invaluable information related to the students during the COVID-19 outbreak across 31 provinces and autonomous regions in China, and our results can be used as a historical reference.

CONCLUSION

Our study showed that the distribution of psychological stress (CPSS score) of the college students was obviously different among the different provinces in China during the outbreak of COVID-19. Among them, medical students suffer from higher stress than non-medical students in total and in most of the provinces. The top four independent risk factors related with psychological stress, including the lower level of familiarity with COVID-19, older age, lower family income, and the intern student, could significantly increase the psychological stress in the medical students in the pandemic period. Meanwhile, stress was related to some common positive and all the negative psychological phenomena significantly. Finally, timely decreasing of medical students' stress can correct their learning attitudes and establish positive professional attitudes in the outbreak of COVID-19. The findings of the present study mainly could arouse the concern of policymakers, especially in the department of governments, schools, or health authorities.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Medical Ethics Committee of Xiamen Medical College. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

WY and XY conceived, designed, and carried out the study and prepared the first draft of the manuscript. YL helped design and carry out the study and prepared the first draft of the manuscript. QL assisted in design, data extraction, and interpretation of results. SV helped design and revised this manuscript. XY and YG performed data analysis. XY, HY, YZ, and CZ critically evaluated earlier drafts of the manuscript. All authors contributed to the article and approved the submitted version.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.548506/full#supplementary-material

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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From Shattered Goals to Meaning in Life: Life Crafting in Times of the COVID-19 Pandemic

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The novel COVID-19 pandemic has created an extraordinary situation for our generation, with many countries being on lockdown. With this, new situation comes many psychological challenges not only for health care workers and people suffering from COVID-19 but also for the general population. Adapting to the new situation can be demanding. Experts have suggested that emotions during this situation are very similar to grief, and people experience emptiness and sadness about the loss of their normal lives, which can even lead to a loss of meaning in life. In this paper, we argue that life crafting could offer a way to help people cope with the situation and renew their sense of meaning. A life crafting intervention is based on theoretical insights from multiple areas of research, like positive psychology, expressive writing, and the salutogenesis framework. Life-crafting interventions help people find meaning in life by focusing on their ideal future, and helping them set goals, and make concrete plans to achieve those goals and overcome obstacles. Since having a clear purpose or meaning in life has been shown to have many benefits, we propose that it can also help people to cope with the psychological effects of the pandemic. A life-crafting intervention can offer people a chance to evaluate their goals in a time of uncertainty and rediscover meaning in life to guide them through these difficult times.

Keywords: COVID-19, pandemic, life crafting, grief, collective trauma, meaning in life, purpose in life, goal setting

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INTRODUCTION

The COVID-19 pandemic has caused a unique situation in the world. There are many different measures being taken to contain the virus. Most countries around the world have implemented a "lockdown" in some form, and although some countries have stricter regulations than others, most of them involve at least some type of so-called "social distancing" (Hale et al., 2020). In a short period of time, the normal life that people were used to living has been drastically and unexpectedly changed. This has consequences for people's mental and physical well-being (for a review, see Schippers, 2020).

Grief experts have suggested that emotions during the COVID-19 pandemic are very similar to grief, as in the case of losing a loved one (Berinato, 2020). Kessler described the current situation as follows: "Our world as we knew it has died and we are feeling the sadness"

(Amanpour and Company, 2020; Berinato, 2020). In accordance with these statements, scientific research has also shown that grief is not only experienced after a bereavement but can also play a role after other life changing losses, such as a divorce or job loss (Papa et al., 2014). Although these forms of grief are rather individual, more collective forms of grief that are not necessarily related to direct individual experiences of bereavement can also occur, for example, in refugees when they need to adjust to a host country (Baškauskas, 1981).

There are several ways grief might play a role during the COVID-19 pandemic. Needless to say, people who are directly affected by the virus or have loved ones who have suffered from or even passed away because of the virus experience grief. However, these grief processes are not the focus of this paper. Rather, this paper is directed at the collective grief processes that might be present in the general population, as a result of a loss of normalcy, caused partly by the many containment measures. This loss of normalcy and the grief over what is no longer possible can lead to a sense of emptiness, and even a loss of meaning in life (Berinato, 2020; Taha, 2020). Some researchers have even suggested that isolation measures that take more than 10 days may lead to post traumatic stress syndrome (Schippers, 2020). In accordance with this, different theories have shown that finding meaning is an important element for recovery in a grief process, and have suggested that it can help in finding post-traumatic growth instead of post-traumatic stress (Hogan and Schmidt, 2002; Janoff-Bulman, 2006; Updegraff et al., 2008; Kessler, 2019). As the mental health effects can be quite severe (Fegert et al., 2020; Schippers, 2020), restoring a sense of meaning in life can be an essential part of the healing process (e.g., Hogan and Schmidt, 2002; Updegraff et al., 2008). However, research also suggests that people might need guidance to find meaning in a structured manner (Steger et al., 2008). Therefore, in this perspective paper, we argue that a life crafting intervention, which is aimed at finding meaning in life, could be helpful to guide people through this grief-like process.

GRIEF AND FINDING MEANING

Finding meaning seems to be a central theme in the grief and trauma literature. However, the term "meaning" has been defined and operationalized differently across different fields of study. In their review, Martela and Steger (2016, p. 531) distinguished between three main types of meaning in life: coherence, purpose, and significance. Coherence refers to "a sense of comprehensibility and one's life making sense." Purpose means having "a sense of core goals, aims, and direction in life," and significance refers to "a sense of life's inherent value and having a life worth living".

In the literature about grief and trauma, finding meaning often refers to the first type of meaning, coherence, conceptualized as making sense of what has happened. One well-known theory in the literature on grief and trauma is the theory of shattered assumptions, developed by Janoff-Bulman (1992). According to this theory, there are three fundamental human assumptions about the self and the world that form a person's assumptive world, and that guide our day-to-day thoughts and behaviors. These assumptions are that the world is benevolent and meaningful, and that the self is worthy. A traumatic event can shatter these fundamental assumptions. To recover, assumptions should be rebuilt. One way to do this is to find meaning in the traumatic event, or, in other words, a way to make sense of it. Schwartzberg and Janoff-Bulman (1991) showed that the greater the ability of a bereaved individual to find meaning, defined as making sense of the loss, the less intense their grief. Although this theory is usually referred to in studies about individual grief or trauma, research by Updegraff et al. (2008) showed that finding meaning is also of importance after a collective trauma, in this case the 9/11 terrorist attacks. They found that in the general population (i.e., the majority of their sample consisted of people who were not directly exposed to the attacks), finding meaning, again defined as making sense of what happened, in the early aftermath of the event was related to lower post-traumatic stress symptoms in the 2 years following. This effect was mediated by reduced fears of future terrorism, which the authors saw as a sign that finding meaning led to rebuilding of assumptions about security and invulnerability. This definition of meaning thus refers to finding meaning in the events that have occurred and rebuilding assumptions of a meaningful and coherent world.

Another kind of meaning that seems important in the grief process is the meaning in one's own life, which corresponds more with meaning in the sense of purpose and significance, as defined by Martela and Steger (2016). Besides making sense of the event itself and rebuilding assumptions about the world, rebuilding the assumptive world seems to entail more. Janoff-Bulman (2006) also suggested that rumination about questions regarding the meaning of life itself may later shift to rumination about finding meaning in one's own life. In general, having a clear sense of purpose in life has been shown to have many benefits for mental as well as physical well-being (for a review, see Schippers and Ziegler, 2019). In the context of trauma, Sawyer and Brewster (2019) also showed that meaning in life was positively related to post-traumatic growth after bereavement. In the specific context of the COVID-19 pandemic, Trzebiński et al. (2020) have shown that a higher level of meaning in life (i.e., having a clear purpose and meaning in life, having life goals, not being afraid of the future; comparable to what Martela and Steger define as "purpose") was related to lower anxiety and emotional distress during the crisis. Therefore, the authors argue that meaning in life (i.e., purpose), among other factors, may work as a buffer against stress reactions to the pandemic. Notably, whereas they assessed meaning in life as a stable factor, the authors argue that in the face of a prolonged crisis, meaning in life may be affected as well.

In the present paper, we predominantly focus on the second and third type of meaning as distinguished by Martela and Steger (2016): purpose and significance. In line with the reasoning of Trzebiński et al. (2020), we expect that the sense of purpose and in severe cases even significance in life for many people in the general population might have already been affected during the pandemic. The UN agency has estimated that in

the second quarter of 2020, 305 million jobs have already been lost worldwide, mainly caused by prolonged containment measures (Straus, 2020). Furthermore, the IMF has predicted a severe worldwide economic crisis (International Monetary Fund, 2020). In addition, as described earlier, grief-like emotions over the loss of normalcy can also lead to a loss of purpose in life. In accordance with this, one study has shown that during the COVID-19 pandemic, the sense of purpose in life of students in higher education decreased in the second half of the academic year, whereas in the cohort of students from the year before, it remained stable (Schippers et al., in preparation).

We expect that there are individual differences in the degree to which purpose and significance are affected by the pandemic and the containment measures. For some people, life may have remained relatively normal, and their purpose in life may have stayed intact. However, because of the containment measures, some of their underlying goals might have been compromised. For example, someone's purpose in life might be to become a psychologist, but because of the containment measures they cannot do their internship as planned (i.e., cannot attain this intermediary goal), and they need to find new ways and set new goals to reach their purpose. For others, who have, for example, lost their job or even their company (i.e., their life's work) during the pandemic, their purpose or even significance in life itself might also be harmed. Consequently, the individual might experience a loss of directionality in their life as "goal are signals that orient a person to what is valuable, meaningful and purposeful" (Emmons, 2003, p. 107) and can be seen as a key element in human functioning (Emmons, 2003; Schippers and Ziegler, 2019). Some might even lose their sense of significance in life. Purpose and significance in life are often entangled. Significance is partly dependent on purpose, but also on other factors such as relationships with friends or family (Martela and Steger, 2016). However, since the containment measures mainly comprise of social distancing, this may make it more difficult to maintain social connections and support, which potentially makes the threat to the sense of significance even larger. Since many studies have shown that having purpose in life is essential to well-being and health (e.g., Hill and Turiano, 2014; Kim et al., 2014; for a review, see Schippers and Ziegler, 2019), we argue that it should be rebuilt. We propose that a life-crafting intervention could help people in rebuilding their sense of purpose and significance in life.

WHAT IS LIFE CRAFTING AND HOW CAN IT HELP TO FIND MEANING?

Individuals searching for meaning are often unlikely to do so in an organized manner and might be more focused on the past and present than particularly concerned about the future (Steger et al., 2008). Relatedly, while the presence of meaning in life is associated with positive outcomes, the actual (prolonged) search for meaning is associated with greater negative outcomes, and such a search could be indicative of meaninglessness (Updegraff et al., 2008; Linley and Joseph, 2011).

A more structured approach to finding meaning and purpose in life, called "life crafting," was recently proposed by Schippers and Ziegler (2019, p. 3). They defined the term life crafting as "a process in which people actively reflect on their present and future life, set goals for important areas of life – social, career, and leisure time – and, if required, make concrete plans and undertake actions to change these areas in a way that is more congruent with their values and wishes." Subsequently, the authors discuss an expressive-writing intervention to aid individuals in finding a purpose in life, while at the same time ensuring that they make concrete plans to work toward this purpose. This type of expressive writing exercises has shown to have benefits for (mental) health as well as academic performance (e.g., Lepore and Smyth, 2002; Morisano et al., 2010; Morisano and Shore, 2010; Schippers et al., 2015, 2020), and has roots in the fields of positive psychology, expressive writing (King and Pennebaker, 1996; Pennebaker, 1997; King, 2001), and salutogenesis (Antonovsky, 1996). Participants usually take part in such a life crafting intervention *via* an online questionnaire that guides them through the different writing exercises (e.g., Schippers et al., 2015), but could also be delivered by a chatbot (Dekker et al., 2020). A central part of the life crafting intervention described by Schippers and Ziegler (2019) is based on the Japanese concept of "Ikigai;" which can be defined as a sense of "a life worth living" (Sone et al., 2008, pp. 709). The term ikigai directly relates to the significance of one's life, which has been defined as the third facet of meaning in live, next to purpose and coherence (Martela and Steger, 2016, pp. 537). As the authors describe, significance "is about evaluating one's life as a whole, including past, present, and the future, while the other (purpose) is distinctively future-oriented: it is about evaluating the potential future value of one's life through sustained goals that give life direction and momentum". As such, the life-crafting intervention proposed by Schippers and Ziegler (2019) does not only strive to provide a framework which can help the individual in structuring their search for a (renewed) purpose in life but also lets the individual reintegrate this new purpose into their life as a whole (significance).

How Can Life Crafting Help to Find Meaning During the COVID-19 Crisis?

Important elements of a life-crafting intervention are: (1) discovering values and passions, (2) reflecting on one's ideal future, (3) writing about specific goal attainment and "if-then" plans, and (4) making public commitments to the goals set (Schippers and Ziegler, 2019; see also **Table 1** and **Figure 1**). In general, people often have difficulty with finding meaning in life, and therefore, a life-crafting intervention could be beneficial to many people. As it seems that the timing of interventions is crucial (Wilson, 2011), this may be particularly useful when people experience a loss of meaning. For the current pandemic situation, we propose several adjustments to the original intervention. First, it should be assessed what exactly has been shattered for the individual. Is it just their

TABLE 1 | Elements and description of a life-crafting intervention.

Part	Elements	Tasks involved
1. Discovering values and passion	Values and passion	Writing about: (1) What they like to do, (2) what kind of relationships they would like to have, both in their private life and their work life, (3) what kind of career they would like to have, and (4) lifestyle choices
	Current and desired competencies and habits	(1) Qualities they admire in others, (2) competencies they have or would like to acquire, and (3) their own habits they like or dislike
2. Reflecting on one's ideal future	Present and future social life	(1) Relationships that energize and de-energize them, (2) kinds of friends and acquaintances they would like to have in the future, and (3) what their ideal family life and broader social life would look like
	Possible future career (path)	(1) What is important in a job, (2) what is it they like to do, (3), what kind of colleagues do they want, and (4) whom do they want to meet through their work?
	Ideal vs. less ideal future	Best possible self and future when there are no (self-imposed) constraints. Contrast this with future if no changes are made
3. Writing about specific goal attainment and "if-then" plans	Goal attainment and "if-then" plans	(1) Formulating, strategizing, and prioritizing goals, (2) identifying and describing ways to overcome obstacles, and (3) monitoring progress toward goals
4. Making public commitment to the goals set	Public commitment to goal	Photo with statement, which communicates their goals to the world; communicating goals to friends, coworkers

Adapted from Schippers and Ziegler (2019).

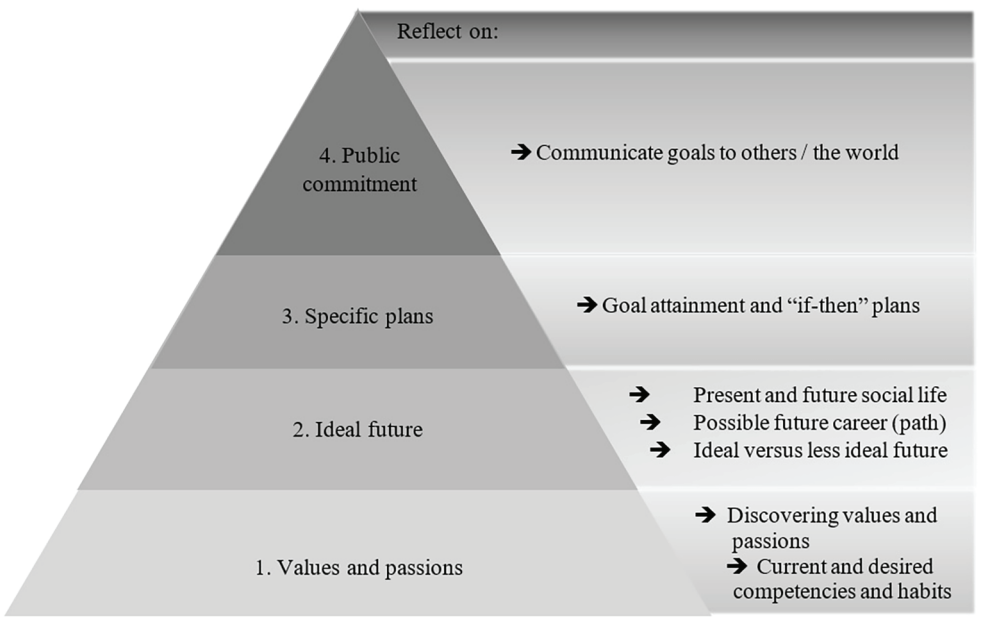

FIGURE 1 | Overview of a life-crafting intervention (adapted from Schippers and Ziegler, 2019).

goals, or also their purpose in life or even their sense of significance in life? Second, based on this assessment, a custom intervention could be presented to the individual. For individuals with compromised goals only, but purpose intact, an emphasis could be placed on part 3 (see **Table 1**) of the intervention. For example, someone's purpose in life may be to become an Olympic champion in athletics. During the crisis, (s)he might not be able to pursue the intermediary goal to train three times a week at a running track. Though the purpose remains intact, the athlete should formulate new intermediate goals, for example, through an adapted scheme that focuses on an alternative and achievable training routine, which still allows the pursuit of the original purpose in a different way. For individuals with a compromised purpose in life, both part 2 and 3 would be important. For example, someone's purpose in life may have been to build up a business and (s)he has just opened three restaurants. However, due to the pandemic and the restrictive measures, nobody can visit the restaurants, and therefore, the person loses the company. This person would need to think about a new purpose in life during and after the crisis, for it might take a while before the economy is fully restored, and opening new restaurants may be unrealistic in the near future. This person may have been very passionate about the hospitality business, and since

purpose and significance in life are often intertwined, the sense of significance in life may also be compromised for this person. In such a case, it would be beneficial to take the full intervention, to discover new values and passions that lie within, and be able to find a new pathway to significance in life. This allows the person to discover other values and passions that exist besides the one that the person was focused on, and may help to find other directions in life that are also found worthy of pursuing.

DISCUSSION

Social and behavioral science research offers valuable insights into how the general population can be aided to cope better with the psychological effects of the COVID-19 pandemic and its restrictive measures (e.g., Schippers, 2020; Van Bavel et al., 2020). In this perspective paper, we argued that a life crafting intervention can be beneficial to rebuild meaning in life after it has been shattered by grief-like emotions over the loss of normalcy during the COVID-19 pandemic. A customized intervention is proposed based on the degree to which the sense of meaning has been affected.

An obvious advantage of the life-crafting intervention is that it is easily scalable. The expressive writing exercises can be done online, individually. This might be especially important during the COVID-19 pandemic, where many people struggle with psychological issues (e.g., Holmes et al., 2020), whereas demands on mental health care have increased, and are expected to maintain on a high level for the coming time. Some psychologists have argued that psychological help for the general population during this crisis has been largely overlooked (Van Hoof, 2020). Schippers (2020) has reviewed the combination of effects and ripple effects that the crisis and the measures that have been taken has in terms of economic, social, mental, and physical health, and presents a model of the interrelated effects. She also points to the fact that interventions are needed in order to counteract some of these effects. Fegert et al. (2020) expected that many young people will experience psychological problems not only during but also in the aftermath of the pandemic, and predict that the return to normality may take a long time.

The degree to which people suffer from psychological problems during the pandemic differs per individual and also depends on pre-existing psychological problems and vulnerabilities (e.g., Fegert et al., 2020). Therefore, there is even more need for customized, scalable interventions (see also Schippers, 2020). The large majority of the general population would likely not need extensive psychological care but could still benefit from interventions to rebuild their sense of meaning in life. For the more severe cases, more extensive psychological care would be needed. In a recent paper, it has been proposed that life-crafting can also be delivered using artificial intelligence, through a chatbot (Dekker et al., 2020). By using a chatbot, the intervention can be tailored to the individual's needs, and can also be extended with other online psychological interventions aimed at improving mental health, such as cognitive behavioral therapy. We expect that such online tailored interventions would be sufficient for the large majority of the general population and could also be of (temporary) help for individuals with more severe problems, awaiting further professional psychological care.

To conclude, we propose that a life crafting intervention can help individuals to rediscover meaning in life, defined as a sense of purpose and significance (Martela and Steger, 2016), after this has been shattered in a grief-like situation. We expect that a renewed sense of meaning can help people cope with this collective trauma and hopefully resolve their grief over the loss of normalcy.

AUTHOR CONTRIBUTIONS

EJ, NZ, and MS equally contributed to the conceptual conception of the manuscript. EJ and NZ have written the draft of the manuscript. MS provided important intellectual input at all stages and reviewed and revised the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Panic During COVID-19 Pandemic! A Qualitative Investigation Into the Psychosocial Experiences of a Sample of Indian People

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The outbreak of COVID-19 has spread to the entire world and is severely affecting social psychology. We conducted semi-structured interviews on 59 subjects from India to investigate the impact of information, misinfodemics (spread of wrong information), and isolation on their psychology. We perform qualitative analysis on the data. Our findings reveal that flow of information leads to anxiety, caution, and knowledge; while misinfodemics cause panic, distrust, and confusion; and isolation creates cognitive dissonance (the state of having inconsistent thoughts, beliefs, or attitudes) and adaptability among masses. The encouraging part of our findings is that, as of now, the situation is far from the state of depression. Practically, our research calls upon the government to support the masses in fighting through the crisis by focusing on pointed psychological counseling. We contribute theoretically to the body of knowledge in the field of social psychology, which is studying the psychological interventions to avoid panic amid pandemic. Future researchers in the area would do well by detailing the psychological interventions required to contain the negative impacts of the pandemic on social psychology.

Keywords: COVID-19, social psychology, semi-structured interviews, cognitive dissonance, depression

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INTRODUCTION

The coronavirus disease (COVID-19), which emerged in Wuhan (China) in December 2019, has spread throughout the world, infecting 2.5 million people and causing 179,000 deaths (as on 21 April 2020) (Worldometers, 2020).[1] COVID-19, declared a pandemic by the World Health Organization in March 2020, is generating stress among masses across the world (World Health Organization, 2020). As it is a new virus, the mechanism of action of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is relatively novel and no cure is currently available.

[1] www.worldometers.info

COVID-19 is an ill-defined problem for the masses (Minda, 2015) and, therefore, people are likely to be influenced by fake news and myths, against which the WHO is actively coping. More than the disease itself, conventional media and social media channels are causing public stress (Depoux et al., 2020; Lima et al., 2020; World Health Organization, 2020). Given the highly contagious nature of the disease, patients are being quarantined or isolated immediately on being tested positive (Bobdey and Ray, 2020; Wang et al., 2020). Social relationships, interactions, and gatherings are integral to human life. However, due to the rapid spread of COVID-19, this critical component of human existence has been severely impacted and compromised, which has further increased stress and anxiety at the individual level. The absence of social interactions leads to overwhelming stress, depression, a state of panic, mental instability, and reluctance to work both at individual and community levels (Brooks et al., 2020). While medical and preventive interventions are of utmost importance at this stage, psychological interventions both at individual and social levels are incredibly critical as the human mind inevitably tries to bring structure to the sensory world (Minda, 2015).

Given the novelty of COVID-19 outbreak, the resultant responses, and actions needed to handle the crisis, this paper attempts to report the socio-psychological impact of the outbreak. The focus of this study is in line with Levin's ideas of focusing on the subjective perceptions of individuals (Fiske and Taylor, 2017) rather than performing an objective analysis.

India is the country with second largest population in the world. The outbreak of COVID-19 in India was rather late as compared to other countries, but it has picked up really fast and reached a critical stage as on date (**Figures 1**, **2**). Given the high density of population in the country, the spread of the virus may take a threatening position for the entire world.

The study aims at capturing and measuring the psychological impact of COVID-19 on individuals and their social environment. In addition to COVID-19 infection, the world at large is experiencing mental health crisis, to which India is no exception. The major stressors associated with COVID-19 are social isolation, job loss, threat of infection, etc. These stressors are observed to have an impact on mental well-being of individuals, which leads them to approach the psychologists. Therefore, for the purpose the study, we included psychologists as the prominent category, since they would be able to provide the information not only on their own behalf but also share the experiences of their clients. In India, service sector is one of the badly effected sectors due to COVID-19, as the overseas orders have fallen significantly leading to a threat of job losses (Dhama et al., 2020). Therefore, we have given fair representation to the service sector professionals, and software experts in our study. Businessmen faced the economic consequences of this pandemic and the prolonged lockdowns by incurring unprecedented losses, due to which we included businessmen as subjects in our study. The deep correction in stock markets was observed to cause panic among the financial investors in India. To include the viewpoint of financial investors, we recruited financial consultants. We also recorded the trauma of isolation by recruiting the quarantined people. Other essential services, which were working through this period included doctors, media persons, bankers, social workers, defense personnel, insurance agents, and housekeeping staff, leading us to recruit some participants from these services. We also recruited the professionals whose work suffered heavily during this period, and their jobs were put under risk. These included educationists, artists, and graphic designers. Since spiritual healing is extensively used in India for psychological counseling, we also recruited a spiritual healer.

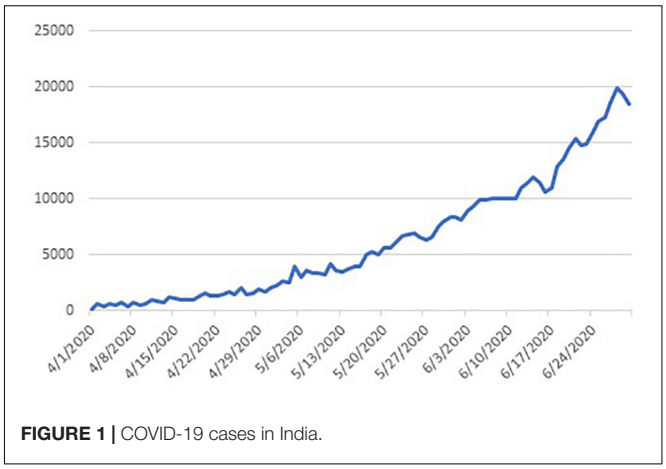

FIGURE 1 | COVID-19 cases in India.

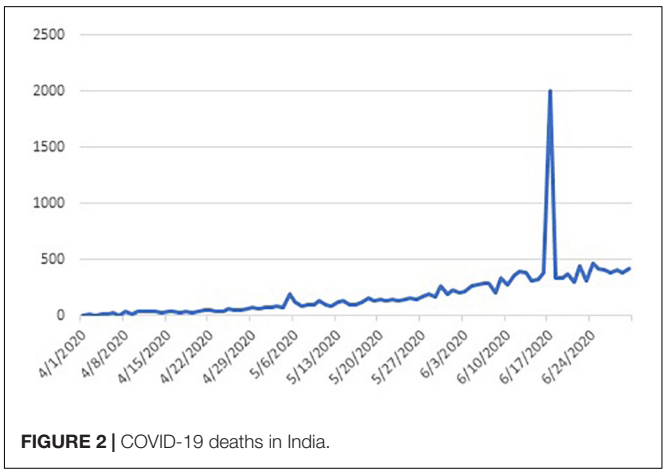

FIGURE 2 | COVID-19 deaths in India.

Based on the psychological challenges being reported by the above-mentioned classes of people, we attempt to address the following research questions.

> RQ 1: What is the impact of COVID-19 information presented by media on social psychology in India?
> RQ 2: What is the impact of misinfodemics (spread of an epidemic/disease through misinformation) on social psychology in India?
> RQ 3: What is the impact of quarantine and isolation on the psychology of Indians battling COVID-19?

We focused on the socio-psychological impact as the understanding of people's perception of COVID-19 is as important as the disease itself and accounts for the individuals' construction of the situation (Fiske and Taylor, 2017). By addressing the above research questions, we make a theoretical

contribution to the field of social psychology in line with the work of Levin. In addition, our findings are of practical relevance for the policymakers engaged in minimizing the negative impacts of the pandemic on social psychology in India and other nations.

Rest of the paper is organized as follows. The next section outlines the methodology of our study, the third section discusses our results, and the last section concludes.

MATERIALS AND METHODS

The methodology of our qualitative study is in line with the COnsolidated criteria for REporting Qualitative research (COREQ) guidelines. The COREQ checklist for the study is available as **Supplementary Annexure 2**.

Sampling

We used a qualitative design based on semi-structured interviews (on an organic schedule) using purposive sampling to carry out our research objectives. Using the data saturation strategy as suggested by Charmaz (2014), we stopped on learning (at 59 participant) that no new information or themes are emerging in the data (Guest et al., 2006, p. 59).

One of the authors of this paper is a clinical psychologist by profession, and had information about the psychological counsellors who were providing counseling services to the above categories of people during the pandemic. Through this network, key counsellors were identified and recruited for the study. Using the leads from these counsellors, as also some other relevant networks, professionals from other sectors were contacted through emails (as the physical interviewing was not possible due to lockdown). Our respondents included the following–

Psychologists	12
Service sector professionals	09
Software experts	09
Businesspersons	04
Financial consultants	03
COVID-19 positive and quarantined	02
COVID-19 negative but quarantined	04
Media professionals	03
Artists	02
Educationists	02
Social workers	02
Banker	01
Insurance advisor	01
Spiritual healer	01
Doctor	01
Graphic designer	01
Housekeeping staff	01
Defense personnel	01

Data Collection

The data were collected by a professional clinical psychologist (details available in **Supplementary Annexure 2**). As deductive qualitative approach allows the inclusion of many different kinds of data collection and analysis techniques, we used a thematic analysis to gain an in-depth understanding of the phenomenon of interest. The qualitative approach adopted was to delineate the psychological impact of isolation and COVID-19 information provided by media on social psychology in India.

Semi-structured interviews were conducted with 59 selected participants from India. The respondents were aware about SARS-CoV-2 and the COVID-19 pandemic and are under the state of lockdown since 26 March 2020. We interviewed the participants and asked open-ended questions expanded from the primary research questions. The participants expressed their experiences, views, and feelings about the impact of isolation as well as COVID-19 information presented by media. The interviews lasted for 30–45 min and were audio-recorded and transcribed verbatim.

Data Coding/Code Development

The unit of analysis was "interviews." The coding unit "sentences" was used throughout the coding phase. An attempt was made to establish relevance based on meaning rather than just frequency. The coding units were copied and pasted to the memo "coding process" and were read and checked for sense and contextuality. Following the five elements of a good thematic code, a code book was written to define each code using a label (name), definition of the theme, description that flags when the theme is likely to occur, inclusion and exclusion criteria, and examples of occurrences of the theme (refer to **Supplementary Annexure 1**) (Boyatzis, 1998). The coding scheme used was theory-driven.

Data Analysis

Deductive pattern seeking was used as a method of scientific reasoning. Within this context, we proposed that COVID-19 information presented by media leads to anxiety and knowledge enrichment among viewers, while isolation leads to cognitive dissonance and adaptability.

RESULTS AND DISCUSSION

Our study focused on examining the (a) impact of COVID-19 information presented by media on social psychology in India, (b) impact of misinfodemics (spread of an epidemic/disease through misinformation) on social psychology in India; and (c) impact of quarantine and isolation on the psychology of Indians battling COVID-19. We followed the stopping rule for qualitative investigations as advocated by Charmaz (2014). In line with Guest et al. (2006, p. 59), we continued to recruit the participants till new information or themes kept on emerging. From 57 participant, we started observing that the data saturation has arrived on all the themes other than cognitive dissonance. For the theme of cognitive dissonance (in response to the RQ3), the data saturation was observed at 59 participant, leading us to stop recruiting the participants.

In this section, we present the results and discuss them in accordance with the research questions. In addition, we present

the relevant quotes from the subjects with regard to the research questions and the themes in **Supplementary Annexure 1**. **Figures 3–5** are concept maps of the responses of subjects.

Impact of the Information About COVID-19 Presented by Media on Social Psychology in India

Based on the responses that were received from the subjects, the impact of COVID-19 information presented by media on the social psychology in India can be classified into three themes— (a) anxiety; (b) knowledge; and (c) neutral. These themes were identified based on the responses of the subjects in **Supplementary Annexure 1**.

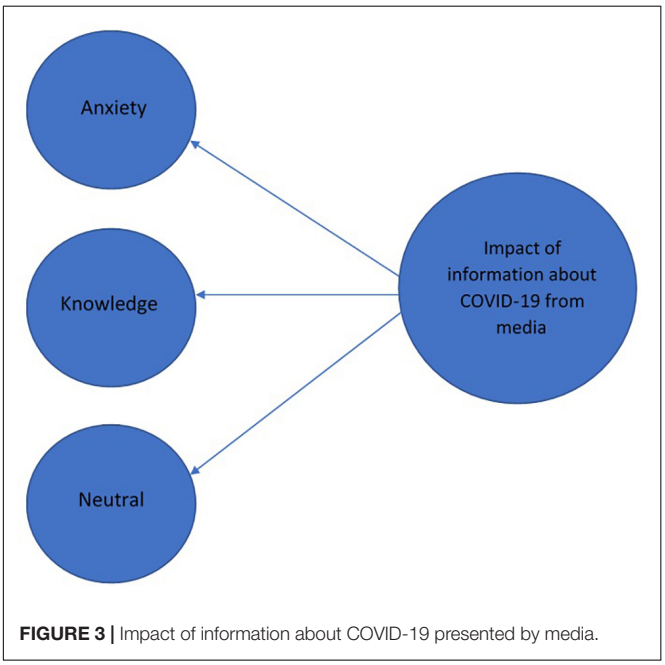

FIGURE 3 | Impact of information about COVID-19 presented by media.

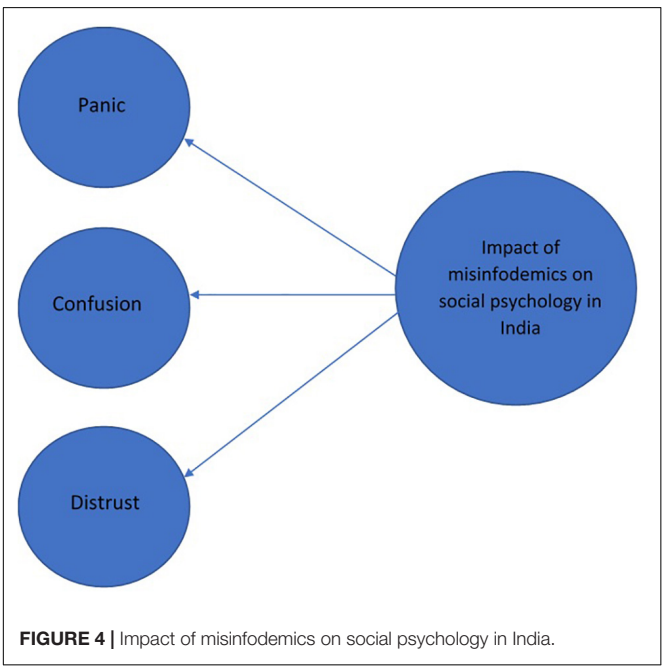

FIGURE 4 | Impact of misinfodemics on social psychology in India.

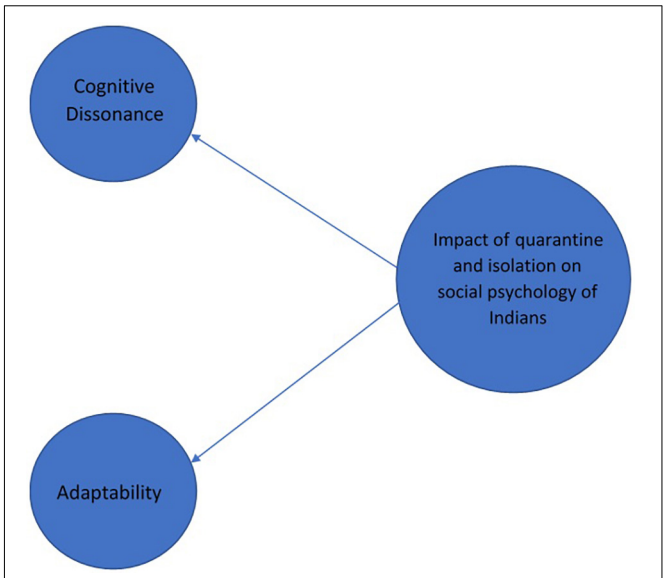

FIGURE 5 | Impact of quarantine and isolation on social psychology of Indians.

India is under lockdown (a 21-day lockdown, followed by an extension of 19 days) since 24 March 2020 (BBC News, 2020a,b), due to which the availability of physical sources of information are limited, underlining the role of media in sharing information regarding COVID-19 (Happer and Philo, 2013). Information shapes social psychology and public opinion, therefore, individuals having negative belief apropos media feel that misinformation causes anxiety and depression (Yuan et al., 2020). However, it is challenging to measure the myriad of misinformation (Nawrat, 2020). The disagreement among different sources of information leads to ambiguity in general public.

It appears that some of our respondents believe the information (**Supplementary Annexure 1**) and treat it as a significant contributor to their knowledge. According to them, information is a vehicle that helps masses sail through the crisis by serving as a liaison between people and the government. The information also cautions masses about the consequences of committing mistakes. Through experiential sharing, the media makes people appreciative of social distancing and makes them aware of the administrative and infrastructural arrangements. However, during these testing times, media needs to play a responsible role in creating public opinion, failing which, people may develop negative opinion toward this important pillar of society (World Health Organization, 2016).

India is broadly an informal economy filled with migrant labor (Chandrasekhar and Ghosh, 2020). The lockdown has resulted in job losses for thousands of migrant laborers, who were left with no option but to walk till their hometowns, leading to lockdown violations (Rising, 2020). Worries of the masses are

further aggravated by the fear of uncertainty regarding economic security resulting from the potential job losses due to lockdown and the long-term effects of COVID-19 (Chandrasekhar and Ghosh, 2020; Goyal, 2020).

Altogether, the impact of media on the social psychology of a majority of people was found to be negative (causing anxiety), while it was neutral (causing caution) and positive (causing knowledge enrichment) in a few cases. The role of media is immensely significant during these testing times as people need to be precisely informed about the do's and don'ts in order to be sufficiently prepared to deal with the pandemic. As a result, the negative and neutral feelings of anxiety and caution, respectively, may get transformed positively into knowledge enrichment (Fiske and Taylor, 2017). The policy interventions at the level of governmental and non-governmental bodies may be directed at ensuring the timeliness and precision of the information flow regarding COVID-19 (Roy, 2020).

Impact of Misinfodemics on Social Psychology in India

Misinfodemics refers to the spread of false information during a pandemic with or without any maleficent intention (Drexler, 2019). While the information is reliable for the most part, it can be inaccurate at times. The spread of misinformation worsens the impact of the pathogen and creates a feeling of uncertainty amongst individuals (Drexler, 2019; Banerjee, 2020). Furthermore, the uncertainty generates ambiguity and creates a situation of (a) panic, (b) confusion, or (c) distrust among masses.

In our study, we also observed that the respondents were agitated and frustrated, which is detrimental to their mental well-being. Concurrently, amidst the pandemic, conventional public health responses are not enough to supersede these contemporary digital sources. Online connectivity makes people xenophobic toward the infected ones, and they may take wrong medications that affect their physical as well as mental well-being. It is often found that the availability of precise and timely information plays a positive role in building a harmonious situation.

The lockdown of major economic activities in India has caused a steep fall in the agricultural, manufacturing, and service activities in the country (Bloomberg, 2020a; Business Today, 2020; BusinessLine, 2020; Goyal, 2020). The spread of unreliable information about lockdown and its impact on the national economy, the resultant job losses, and slowing down of the economy further affect social psychology in the country (Madhav et al., 2017; Bloomberg, 2020b; McKibbin and Fernando, 2020; Roy, 2020). This uncertainty adds fuel to the fire by causing chaos and confusion among masses, leading to irrational decision making. For instance, the misinformation regarding working of public transport in Mumbai led to a stampede at a train station (NDTV, 2020). All these factors are responsible for causing a feeling of distrust among masses, thus significantly hampering social psychology. Similarly, in the past also, misinfodemics have affected the treatment and renormalization of depression, even leading to suicides. Certain cases of suicide have also been reported in India as a result of the panic caused by COVID-19 (Ojha, 2020). It is indispensable for media to compile and publicize accurate information, and therefore, the masses need to exert some control over the information and forward it responsibly.

Impact of Quarantine and Isolation on the Social Psychology of Indians Battling COVID-19

Our findings reveal that quarantine and isolation are causing (a) cognitive dissonance or (b) adaptability in Indians. Amidst the pandemic, individuals are experiencing swelling of health, economic, and humanitarian crisis through every dimension of their social fabric. The way people bounce back from the state of cognitive dissonance to the state of adaptability as a result of the pandemic and restrictions resulting from the pandemic suggests that the society is moving toward a new normal Initially, the individuals were found to resist such a situation due to mobility constraints and the fear of no escape and losing their livelihood. However, in the course of time, it appears that they are willing to perform multiple tasks. Another fear among masses was the compulsion to stay together with their families without having any outlet to move out for long. This belief arouses the feeling of restlessness, confusion, frustration, and stress, due to which, people tend to lose trust in the system, leading to deterioration of their mental well-being.

On the positive side, these conditions have developed the idea of appreciative inquiry among masses, as they are able to appreciate that their captivation will effectively help in controlling the disease. Individuals, during self-quarantine, feel that social distancing has given them an opportunity for psychological explorations and developing their intelligence- and emotional-quotient. For instance, they have ample time to spend with themselves, their family, and in natural surroundings, and they are able to acknowledge the fact that psychological communication is the key to bonding. The masses are also able to admire the idea of achieving a work–life balance and look forward to innovative ways of working from home.

CONCLUSION

This paper contributes to the theoretical field of social psychology by addressing the subjective perceptions of our respondents, and holds practical significance by informing the policymakers on tackling the panic amid pandemic. The semi-structured interview-based qualitative analysis conducted through this study on a sample of 59 subjects revealed that information, misinfodemics and isolation emerge as three prominent factors impacting the social psychology of Indians during the COVID-19 outbreak. We found that flow of information leads to anxiety, knowledge, and neutral approach in India. The governments may address the flow of information in interest of transparency, so that the outcomes in the form of anxiety and neutral approach may shift toward knowledge, thereby leading to management of the pandemic in a more effective manner. The sources of information

in these critical times are limited, and the reliability of those is also questionable, which is reflected from the panic emerging from the misinfodemics. We suggest that to avoid panic in such critical times, the policymakers need to focus on misinfodemics, which are a result of fake news, in general. The encouraging fact of our study is that isolation is not observed to drive toward critical psychological patterns, such as depression. Rather, isolation drives Indians toward cognitive dissonance and adaptability, which is a sign of psychological strength. The governments need to plan the psychological interventions in such a way that the citizens can productively utilize the period of isolation.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

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All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

SUPPLEMENTARY MATERIAL

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OPINION
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Risk Factors and Mental Health Promotion Strategies in Children During COVID-19

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Keywords: risk factors, COVID19, mental health, children, strategies

Since 5 March 2020, the Italian government has ordered a nationwide school closure as an emergency measure to prevent diffusion of the infection. The emergency home-schooling plan has been strictly implemented thanks to the hard work of schools and teachers to create online courses. Furthermore, in a first step, public activities were discouraged, and now, they are firmly forbidden. Researchers have established that such measures should have both negative psychological and physical effects on children. Stressors, such as prolonged duration; fears of infection; frustration and boredom; inadequate information; lack of in-person contact with classmates, friends, and teachers; lack of personal space at home; and family financial loss can have even more problematic and lasting effects on children and adolescents (1).

Evidence suggests that when children are out of school (e.g., weekends and summer holidays), they are physically less active, have much longer screen time, have irregular sleep patterns, and have less favorable diets. Such negative effects on mental health are expected to be much worse when children are confined to their homes without outdoor activities and interaction with friends of the same age (3), which are essential for their normal psychological development and well-being. The uncertainty about the personal and global effects of COVID-19 is creating great concern, in addition to the specific psychological effect of quarantine (2). Some children might be separated from their parents due to the infection. Parental separation pushes children into a state of crisis and might increase the risk of psychiatric disorders, as well as a higher risk of developing mood disorders, psychosis, and death by suicide in adulthood (2). The age of the initial separation is known to be relevant to psychological development disrupting the ongoing attachment processes with significant outcomes if this happens in the first year after birth (3). In this rapidly changing situation, children are experiencing substantial changes to their daily routine. At the same time, they are exposed to large amounts of information and high levels of stress and anxiety in the adults around them (2). Sprang et al. (4) reported that children who were isolated or quarantined during the influenza A (H1N1) pandemic in 2009 were more likely to develop acute stress disorder, adjustment disorder, and pain. Conversely, anxiety in children and adolescents can also manifest itself in challenging externalizing behaviors, such as acting or arguing (3). In Sprang's sample, 30% of children who were isolated or quarantined met the clinical criteria for posttraumatic stress disorder (PTSD) (4). Adult concern about the implications of COVID-19 could impair their ability to recognize and respond to children's ideas or distress (4).

It should be stressed that children may respond in a different way to an outbreak depending on their age. In this respect, the National Child Traumatic Stress Network (NCTSN) has suggested some reactions according to age group, assuming that preschoolers might manifest fear of staying alone, bad dreams, speech difficulties, loss of bladder/bowel control, constipation, bed-wetting, change in appetite, increased temper tantrums, whining, or clinging behaviors. School age children (ages 6–12) might be irritable, plaintive, or aggressive; have nightmares or sleep/appetite disturbance; and show physical symptoms (headaches, stomach aches), withdrawal from peers, loss

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of interest, competition for the attention of parents, and forgetfulness of household chores and new information learned at school.

Lastly, adolescents (ages 13–18) may complain of physical symptoms (headaches, rashes, etc.), sleep/appetite disturbance, agitation, decrease in energy, or apathy, as well as ignore health promotion behaviors, isolate from peers and loved ones, be concerned about stigma and injustices or avoid/cut school. In this particular contingency, children are exposed to unexplained and unpredictable behavior, which can be perceived as a threat, resulting in a state of anxiety (3). Children are well-attuned to the emotional states of adults; indeed, a strong relationship was found between clinically significant levels of PTSD symptoms in parent respondents and their children; nearly 86% of responders had children who also met the clinical cut-off score (4).

Mental health responses to previous emergencies and disasters have included widespread psychological first aid, focusing on psychoeducation about normative reactions and coping strategies.

Promotional videos can be useful to motivate children to have a healthy lifestyle at home by increasing physical activities and having a balanced diet, regular sleep pattern, and good personal hygiene (1). These are expected to help maintain a daily routine and cope with this difficult moment. In the event of home confinement, parents are often the best and closest resource for children to ask for help; children need honest information about changes; when this information is absent, children try to make sense of the situation on their own (1, 2). They are constantly exposed to news related to the epidemic, so having direct conversations with children about these issues could mitigate their reactions, such as anxiety and panic. Close and open communication with children is also the way to identify any physical and psychological problems, comfort them, and resolve them (1). We agree with Liu and colleagues who propose that pediatric health professionals should receive training to facilitate early identification of children's mental health problems by learning to discern their normal and abnormal behaviors and to use rapid screening tools for mental health (3). Additionally, it is important to consider postpandemic surveillance of mental disorders among these children, remembering that the identification of PTSD or other mental health disorders in parents should trigger an investigation of behavioral health disorders in their family members.

AUTHOR CONTRIBUTIONS

CG, IA, FA, and JB wrote the manuscript. AZ and LL revised the manuscript. AS revised and write the manuscript. All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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SYSTEMATIC REVIEW
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A Systematic Review and Provisional Metanalysis on Psychopathologic Burden on Health Care Workers of Coronavirus Outbreaks

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Background: The new coronavirus (SARS-CoV-2) shows several similarities with previous outbreaks of Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS). Aim of this systematic review and meta-analysis is to provide evidence of the psychopathologic burden on health care workers (HCWs) of the first two deadly coronavirus outbreaks to get lessons for managing the current burden of COVID-19 outbreak.

Method: According to Cochrane Collaboration guidelines and the PRISMA Statement, the study quantified the effects of frontline work on mental health of HCWs. Major databases — Pubmed, Scopus, Embase, Medline, and Web of Science — were searched for observational and case-control studies evaluating mental health indexes reported by front-line work. This study computed the percentage of sample that reported clinically significant levels of psychiatric symptoms. Cohen's *d* was used for comparing mental health outcomes of health care workers directly involved in addressing pandemic emergency with a control group that was not directly exposed to such conditions. Pooled effect sizes (d_w) were estimated whenever at least three independent studies yielded data. Heterogeneity of findings and bias of publication were estimated as well.

Findings: Fifteen studies have been selected for a total of 7,393 HCWs. From 9.6% to 51% of HCWs reported symptoms of Post-Traumatic Stress Disorder (PTSD) and from 20% to 75% reported psychiatric symptoms, with a prevalence of anxiety and depression. From one to the three years after outbreak, from 2% to 19% reported PTSD symptoms and from 5% to 90% psychiatric symptoms. Interestingly, HWCs who were directly involved in pandemic emergency showed significantly higher depressive and anxious

symptoms (d_w = .66 (.46–.85); p <.001) than ones who were not directly exposed. Similarly, the direct involvement significantly affected the severity of PTSD symptoms (d_w = .30 (.21–.39); p <.001).

Conclusion: Health care professionals in general and most of all frontline workers showed an association with a likely risk of developing psychiatric disorders following outbreaks and for at least three years later. Mental health interventions for professionals exposed to COVID-19 need to be immediately implemented. Further studies are warranted to investigate long-term consequences carefully, and to look for mediating and buffering factors as well. The role of clinical psychologists and psychiatrists in delivering adequate interventions is critically important.

Keywords: Post-Traumatic Stress Disorder, anxiety, depression, psychological distress, "health care worker"

INTRODUCTION

Several viral diseases have emerged and impacted healthcare systems worldwide. Apart from the pure medical response, a major issue in dealing with viral pandemic is the human aspect.

The novel coronavirus infection (SARS-CoV-2) and related syndrome (COVID-19) was first identified in Wuhan, China, in December 2019 (1), with a declaration of pandemic on March 11, 2020 (2). Previous coronavirus outbreaks resulted in a major global public crisis. In November 2002, in China's Guangdong, Severe Acute Respiratory Syndrome (SARS-CoV) was first detected. It lasted 80 days (from mid-March 2003 till 31 May 2003) when Singapore was removed from the World Health Organization (WHO) list of SARS (3). SARS was characterized by atypical pneumonia and droplet transmission.

The SARS outbreak had an important concentration in health care settings and a large number of health care workers who have been infected, with an estimate of more than 20% of those who contracted the disease (3). During the SARS outbreak, more than 8,000 individuals in 29 countries were infected over 7 months (4).

After the emergence of SARS, the Middle East Respiratory Syndrome (MERS-CoV) was the second coronavirus infection resulting in a major global public health crisis. It first emerged in 2012 in Saudi Arabia (5, 6), with an outbreak infection occurring in Korea from May to December 2015. The virus caused a total of 2,279 cases from 27 countries, till the end of February 2019 (7), with health care workers who continue to be at higher risk of being affected (1).

The COVID-19 showed several similarities with the SARS, and MERS, about the clinical presentations, which can vary from asymptomatic infection to severe or fatal disease and it is highly transmissible. The most common onset symptoms of the COVID-19 include fever, dry cough, muscle pains, lethargy and fatigue. However, the spread of COVID-19 infection is much broader than SARS or MERS and involves larger numbers of patients (8). From now, COVID-19 killed a higher number of people than MERS and SARS together, in spite of a fatality rate around 2%, compared to a case fatality rate of around 10% for SARS, with 34% of affected people killed by MERS between 2012 and 2019 (9).

All the physicians and nurses embedded in emergency care are under extreme psychological pressure and are at high risk of developing psychological diseases, with protracted working hours and unexpected changes in the sort of work (10). This situation may result in severe psychological distress and could lead to burnout (11). The analysis of the psychopathologic burden of previous outbreaks may help to understand the likely consequences for HCWs of the current pandemic of COVID-19, to plan psychological interventions and prevent future negative outcomes.

The objective of our study is to provide a systematic review of the psychological and psychopathological burden on HCWs of the two first deadly coronavirus outbreaks (SARS and MERS).

METHODS

The objective of this systematic review is to analyze all observational studies realized on the burden on mental health of caring for patients affected by MERS and SARS. The case-control study design, adequacy of sample size, comparison and outcome measures have been all carefully analyzed to guarantee the right inclusion of selected studies.

Search Strategy

Electronic searches were conducted on the major databases in the field of health and social sciences — Pubmed, Scopus, Embase, Medline, and Web of Science — in order to include the broadest range of relevant literature.

The selection of the search terms is based on the clinical experience and the topic literature on mental health (12). The search was performed using Mesh terms/Keywords (depending on the database) with the same search strategy: "Health Worker" AND "Epidemic" OR "MERS" OR "SARS" OR "Outbreak" AND "Depression" OR "Anxiety" OR "Burnout" OR "PTSD" OR "Suicide".

The search was limited to English-written publications, and to the period from 2002 to April 2020. When the full text was not retrievable, the study was excluded. Study selection was performed by independent reviewers with research expertise in clinical psychology who assessed the relevance of the study for the objectives of this review (**Figure 1**).

An additional analysis of the reference list was performed in each selected paper as well. When the full text was not retrievable, the study was excluded. It has been selected a final number of fifteen studies.

Inclusion Criteria:

- Studies should report data on mental health indexes linked to epidemic infections (SARS, MERS).
- Studies with an analytical study design as defined by Grimes and Schulz (13) (i.e., an observational study with a comparison or control group).
- Studies adopting standardized and validated instruments to assess psychological factors.
- Studies written in English.

Exclusion Criteria:

- Case reports, reviews, Letters to the Editor.
- Number of subjects per group ≤5.
- Qualitative studies.

Data Extraction

Study selection was performed by independent reviewers with research expertise in clinical psychology (FG, FM, RF) who assessed the relevance of the study for the objectives of this review. This first round of selection was based on the title, abstract, and keywords of each study. If the reviewers did not reach a consensus or the abstract did not contain sufficient information, the full text was reviewed.

In the second phase (screening), full-text reports have been evaluated to detect whether the studies met the inclusion criteria (**Figure 1**). In the phase of eligibility, full texts have been retrieved, and a final check was made to exclude papers not responding to inclusion/exclusion criteria, and reaching the final consensus to decide the final number of studies to be selected.

A standardized data extraction form was prepared; data was independently extracted by two of the authors (FG and RF) and inserted in a study database (Cohen's k = .85) (14).

A process of discussion/consensus moderated by a third reviewer (GP) (15) resolved discrepancies between reviewers (for three studies).

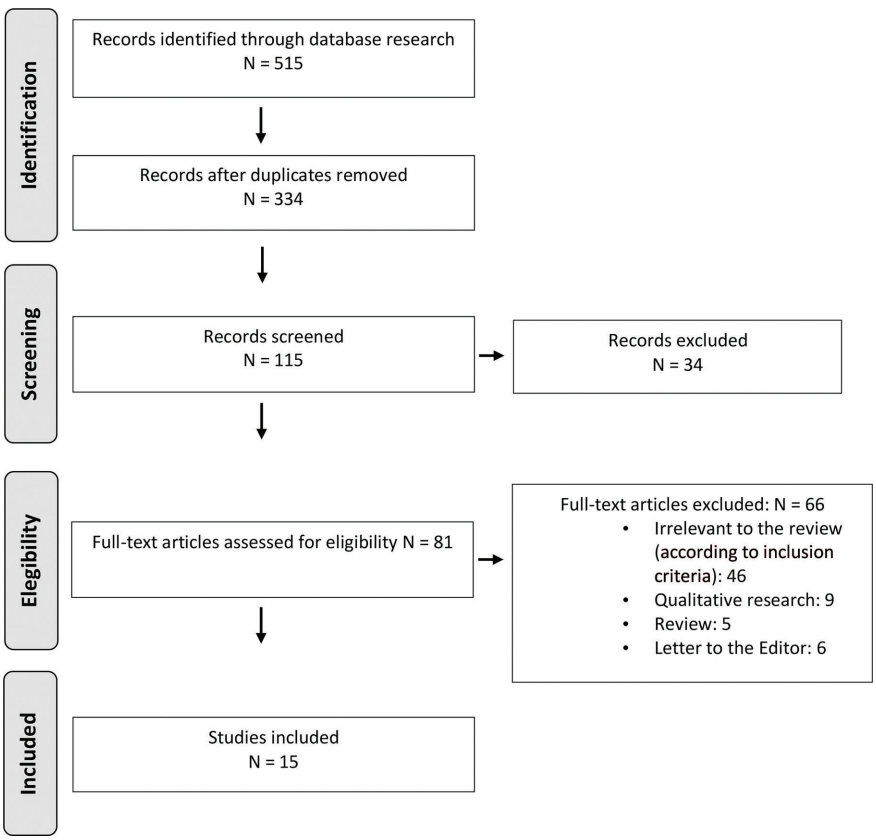

FIGURE 1 | PRISMA flow diagram of literature search and selection of publications.

Statistical Methods

A systematic analysis was conducted according to the Cochrane Collaboration guidelines (15) and the PRISMA Statement (16). The current review provided a quantitative approach for aggregating results of studies considering as the main outcomes the percentage of sample that reported clinically significant levels of overall and specific psychiatric symptoms (i.e., PTSD, depression and anxiety) (**Figures 2–4**) (for a description of cut-off scores see **Table 1**). Furthermore, this work aims at quantifying mental health consequences of the direct exposure to clinical management of pandemic emergency. Accordingly, meta-analytic procedures were conducted comparing levels of different mental health outcomes of health care workers directly involved in addressing pandemic emergency to a control group that was not directly exposed to such conditions. Cohen's *d* (32) was used as measure of effect size. Cohen's *d* was primarily calculated using descriptive statistics reported in the Results section of each study. Values of Cohen's *d* less than or equal to.20,.50, and.80 were interpreted as small, moderate, and large effect sizes, respectively (32). The overall pooled effect sizes (*dw*) for each mental health outcomes were estimated using the weighted mean of *d* value for each study (33, 34). The 95% confidence interval (CI) was computed, as was its significance according to the ratio of pooled effect size to the standard error (33, 34). Pooled effect sizes were estimated whenever at least three independent studies yielded data. Heterogeneity in effect sizes was computed using the *Q* statistic (34) and I^2 index (14, 35). Excel was used to compute these metrics.

Despite the small number of studies for each outcome, Egger's regression (i.e., the standard normal deviate [SND] is regressed against the estimate's precision, defined as the inverse of the standard error; SND = a + b × precision) (36) was performed to detect publication bias. These analyses were conducted using SPSS 22.

Risk of Bias

The current systematic review assessed quality of studies included using the rating scale developed by the National Institutes of Health for observational cohort and cross-sectional research designs (37). This scale is composed of 14 items rated on three levels (i.e., Yes; No; Cannot determine/Not applicable/Not reported [CD, NA, NR]) where a "no" or "undetermined" response indicates the presence of possible bias. The quality of each study was independently assessed by two authors (GP and FG), who reached a high inter-rater

Study	*N* exposed	N not exposed	*d* (95% CI)	Forest plot
Chan & Huak, 2004	108	555	.04 (-.30 – .37)	
Lin et al., 2007	69	26	.15 (-.30 – .61)	
Sim et al., 2004	97	180	.07 (-.18 – .32)	
Summary	271	761	.07 (-.11 – .25)	

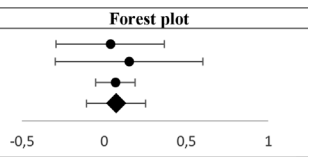

FIGURE 2 | Forest plot of overall psychiatric symptoms.

Study	*N* exposed	N not exposed	*d* (95% CI)	Forest plot
Chan & Huak, 2004	108	555	.02 (-.32 – .35)	
Chong et al., 2004	249	1008	.26 (.12 – .39)	
Lee et al., 2007	33	66	.88 (.44 – 1.31)	
Lee et al., 2018	196	163	.41 (.20 – .62)	
Lin et al., 2007	66	26	.44 (-.02 – .89)	
McAlonan et al., 2007	71	113	.63 (.33 – .94)	
Sim et al., 2004	97	180	.00 (-25 – .25)	
Summary	820	2111	.30 (.21 – .39)	

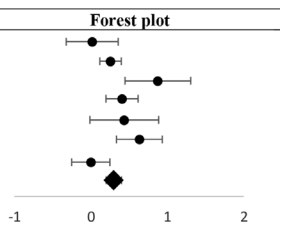

FIGURE 3 | Forest plot of PTSD symptoms.

Study	*N* exposed	N not exposed	*d* (95% CI)	Forest plot
Lee et al., 2007	33	66	.79 (.35 – 1.22)	
McAlonan et al., 2007	71	113	.80 (.49 – 1.10)	
Poon et al., 2004	534	1392	.44 (.12 – .76)	
Summary	638	1571	.66 (.46 – .85)	

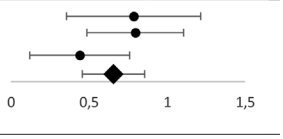

FIGURE 4 | Forest plot of depression and anxious symptoms.

TABLE 1 | Overview of selected studies.

Study	Sample description	Country	Disease	Study design	Timing	Assessment tools	Outcome measure	% of clinical distress	Effect size (95% CI)	Other significant findings
(17)	N=661(113 doctors; 548 nurses)	Singapore	SARS	Cross-sectional survey Case-control study: Direct exposure vs nondirect exposure	2-months after first case	GHQ-28(cut-off > 5)IES (cut-off >30)	Psychiatric symptoms PTSD symptoms	Psychiatric symptoms 27% (Doctors: 35%; Nurses: 25%) PTSD 19.2% (Doctors: 19.4%; Nurses: 19.3%)	Psychiatric symptoms Doctors: *d* = .14 (–.25–.53) Nurses: *d* = –.06 (–.29–.17) PTSD symptoms Doctors: *d* = –.02 (–.43–.39) Nurses: *d* = .05 (–.18–.28)	Clear communication of directives/precautionary measures (p=.020) and support from supervisors/colleagues (p=.003) are protective factors. No difference between doctors and nurses. No significant difference between those who were or were not exposed to SARS patients
(18)	N=1,257(676 nurses;139 doctors;140 health administrative workers; others health professionals)	Taiwan	SARS	Cross-sectional survey Case-control study Direct exposure vs nondirect exposure	6 weeks (during serious nosocomial infection)	Chinese Health Questionnaire (cut-off > 2) IES (cut-off not reported)	Psychiatric morbidity PTSD symptoms	75.3% psychiatric comorbidity	PTSD symptoms*d* = .26 (.12–.40)	-Differences between initial phase and second phase
(19)	N=271 HCWs; N=342 HCs	Hong Kong	SARS	Case-control study HCWs vs HC	During outbreak	PSS (cut-off not reported)	perceived stress	Not reported	Not available data	HCWs were not more stressed than healthy control subjects
(20)	N=139 (74% nurses; 15% employees; 11% clerical staff)	Toronto, Hamilton (Ontario)	SARS	Follow-up study	-one/two years after outbreak	SCID CAPS	Psychiatric disorders	5% any new onset of a psychiatric disorder 4% new episodes of Major Depression 2% new PTSD	Not available data	Any axis I diagnosis correlates with a previous psychiatric history (p=.02)(protective) association with years of health care experience (p=.03) and perception of hospital support and training (p=.03)
(21)	N=99 (63 nonhealth care workers vs 33 health care workers survivors to outbreak)	Hong Kong	SARS	Case-control HCWs vs HCs	–1 year after outbreak	GHQ-12 (cut-off > 3) PSS-10 IES-R DASS-21	Psychiatric morbidity Psychological distress PTSD symptoms Depressive and anxiety symptoms	Overall psychiatric morbidity 64% Health care workers 90.3% Nonhealth care workers 49.1%	Psychological distress *d* = .44 (.03–.85) PTSD symptoms *d* = .88 (.45–1.31) Depressive symptoms *d* = .70 (.27–1.13) Anxiety symptoms *d* = .87 (.44–1.30)	Health care workers: >depression(p<.01), >anxiety (p=.001), >PTSD symptoms (p=.05) -77.4% of female SARS survivors scored above the GHQ-12 threshold
(22)	N= 359 HCW (196 nurses, 30 doctors, 55 medical	South Korea	MERS	Cross-sectional survey and case-control	During outbreak and one month after	IES-R (cut-off > 25)	PTSD symptoms	51%	PTSD symptoms *d* = .40 (.20–.60)	Trend differences between nurses and doctors (p=.048)

(Continued)

TABLE 1 | Continued

Study	Sample description	Country	Disease	Study design	Timing	Assessment tools	Outcome measure	% of clinical distress	Effect size (95% CI)	Other significant findings
	technicians, 31 administrators, 8 pharmacists; 39 others)			study Direct exposure vs nondirect exposure						
(23)	N=92 (66 HCW in emergency department vs 26 HCW in psychiatric ward)	Taichung (Taiwan)	SARS	Case-control	-one-month after outbreak	CHQ-12 (cut-off > 3) Davidson Trauma Scale-Chinese version (cut-off > 40)	Psychiatric comorbidity PTSD symptoms	Overall psychiatric morbidity 47.7% PTSD symptoms 19.3%	Psychological distress *d* = .15 (–.29–.59) PTSD symptoms *d* = .44 (.00–.88)	-HCW of ED showed more PTSD symptoms than HCW of psychiatric ward (p<.05) -No difference in CHQ - 93% of medical staff considered the SARS outbreak as a traumatic experience.
(24)	*N*=549 hospital employees	Beijing	SARS	Cross-sectional survey	-3 years after outbreak	CES-D (cut-off > 25)	Depressive symptoms	Depressive symptoms 8.8%	Not available data	-having been quarantined (p<.001), high work exposure (p<.001), current stressful job (p<.001), high PTSD symptoms (p<.001) and pre-SARS trauma exposure (p<.01) significantly predicted high depressive symptoms.-Altruistic acceptance of SARS-related risk was negatively associated (p=.0005)
(25)	N=769 (73.5% nurses, 8.3% clerical staff, 2.9% doctors, 2.3% respiratory therapists)	Toronto, Hamilton (Ontario)	SARS	Cross-sectional survey Case-control Toronto Vs Hamilton	-19 months after outbreak	K10 (cut-off > 16) Maslach Burnout Inventory (cut-off > 27) IES (cut-off > 26)	Psychological distress Burnout PTSD symptoms	Psychological distress 37.5% Burnout 24.8% PTSD symptoms 11.1%	Psychological distress *d* = .34 (.13–.55) Burnout *d* = .33 (.12–.54) PTSD symptoms *d* = .31 (.00–.62)	Maladaptive coping and perceived adequacy of training with protection and support explained 18% of the variance in burnout. - Maladaptive coping and attachment anxiety, together with a protective effect of experience in healthcare, explained 31% of the variance in psychological distress.
(26)	N=184 (71 high-risk HCW and 113 low-risk) (2004)	Hong Kong	SARS	Case-control study	-during (2003) and one year (2004) after outbreak	PSS-10 DASS-21 IES-R	Psychological distress Depressive anxious symptoms PTSD symptoms	Not reported	Psychological distress *d* = .76 (.47–1.03) Depressive symptoms *d* = .75 (.26– 1.02) Anxiety symptoms *d* = .84 (.55–1.13) PTSD symptoms *d* = .63 (.34–.92)	-in 2003, equally high perceived stress levels (p=.176) -in 2004, perceived stress decreased only in low risk HCW (p<.05) -in 2004, no differences in perceived stress among doctors, nurses, and others -PTSD symptoms correlated with exposure to SARS (p<.001)
(27)	N=510	Toronto	SARS	Cross-sectional survey	-during outbreak	GHQ-12 (cut-off > 3)	Psychiatric symptoms	29%	Not available data	-45.1% nurses, 33.3% allied health care professionals, 17.4%

(Continued)

TABLE 1 | Continued

Study	Sample description	Country	Disease	Study design	Timing	Assessment tools	Outcome measure	% of clinical distress	Effect size (95% CI)	Other significant findings
										doctors, 18.9% staff not working in patient care
(28)	N=1926 (813 nurses; 141 doctors; 349 supporting staff; 230 administrative staff; 207 allied health workers; 186 others)	Hong Kong	SARS	Case-control Front-line health care workers vs Administrative Controls Contact with SARS Vs No contact with SARS	-two months during outbreak	STAI Maslach Burnout Inventory	Anxiety Burnout score	Not reported	Anxiety symptoms *d* = .41 (–0.2–.84) *d* = .47 (.37–.57) Burnout *d* = .61 (.19–1.03) *d* = .47 (.37–.57)	- Anxiety was higher among front-line HCW than administrative staff controls (p<.001). - Anxiety scores correlated (p<.001) with burnout scores among front-line HCW (*r*=0.58), controls (*r*=0.52), staff with contact with SARS patients (*r*=0.59), and staff without contact (*r*=0.56).
(29)	N=277 (91 doctors and 186 nurses)	Singapore	SARS	Cross-sectional survey Case-control study Direct exposure vs indirect exposure	4 months after outbreak	GHQ-28 (cut-off > 5) IES-R (cut-off > 3)	Psychiatric morbidity PTSD symptoms -	Psychiatric morbidity 20.6% PTSD symptoms 9.6%	Psychological distress *d* = .07 (–.18–.32) PTSD symptoms *d* = .00 (–.25–.25)	-No differences between doctors and nurses in the outcome measures
(30)	N=124 (41 doctors and 83 nurses)	Singapore	SARS	Cross-sectional survey	-6 months after outbreak	GHQ-28 (cut-off > 5) IES (cut-off >26)	Psychiatric morbidity PTSD symptoms	Psychiatric morbidity 18.8% PTSD symptoms 17.7%	Not available data	- Nurses reported higher morbidity rates
(31)	N=549 hospital employees	Beijing	SARS	Cross-sectional survey	3 years after outbreak	IES-R (cut-off >20)	PTSD symptoms	PTSD symptoms 10%	Not available data	-40% of PTSD symptoms continue to show symptoms after three years - altruism correlate with low PTSD

CAPS, Clinician-Administered PTSD Scale; CES-D, Center for Epidemiologic Studies Depression Scale; CHQ-12, Chinese Health Questionnaire-12; DASS-21, 21-item Depression Anxiety Stress Scales; ED, Emergency Department; GHQ, General Health Questionnaire; HADS, Hospital Anxiety and Depression Scale; HCW, Health Care Workers; IES, Impact of Events Scale; MERS, Middle East respiratory syndrome; MINI, Mini International Neuropsychiatric Interview; K10, Kessler Psychological Distress Scale; PSS-10, 10-item Perceived Stress Scale; SARS, Severe Acute Respiratory Syndrome; SCID, Structured Clinical Interview for DSM-IV; STAI, State-Trait Anxiety.

reliability (Cohen's k = .89). At the end of the evaluation, ratings of each study were summed up within each item in order to provide a quantitative approach to the assessment of risk of bias. Given the number of studies included in this review, the total score (i.e., 210) was divided in three subscales capturing strengths (i.e., Yes responses), biases (No responses) and qualities not applicable (NA response). For a detailed description of results of these procedures, see **Table 4**.

RESULTS

A total of 7,393 HCWs has been scrutinized by the all studies (**Table 1**). Descriptive analysis of the all studies are reported in **Table 2**. Data are drawn from survey with voluntary and anonymous participation with a response rate ranging from 19.9% to 92%. Only one study (20) determined the clinical picture of participants by a diagnostic interview by DSM criteria (12). The most part of the studies (17–19, 22, 23, 26–29) measured the level of psychological distress during or immediately after the outbreak. From 9.6% to 51% of HCWs reported symptoms of PTSD and from 20% to 75% reported the prevalence of anxiety and depression, respectively. The other studies (20, 21, 24, 30) rated psychological distress from one to three years after outbreak. PTSD symptoms were detected from 2% to 19% and from 5% to 90% reported psychiatric symptoms at follow-up. One study (38) reported in 19%–30% of HCWs significant levels of burnout. Only one study (19) comparing HCWs and healthy subjects did not report significant findings on the self-rating of perceived stress level. Only few studies compared the psychological burden of the outbreak comparing doctors and nurses: three did not find any differences (17, 26, 29), two reported a higher occurrence in nurses (28, 37) and the last one (22) a trend for nurses (**Table 1**).

TABLE 2 | Summary of descriptive statistics of studies included (*N* = 15).

Variable	*N*	%
Total sample	7,766	
Doctors	577	7.4
Nurses	3,171	40.8
Other health care workers	1,306	16.8
Not specified	2,712	35.0
Singapore	3	20.0
Taiwan	2	13.3
Hong Kong	4	26.7
Canada	3	20.0
South Korea	1	6.7
Beijing	2	13.3
SARS	14	93.3
MERS	1	6.7
Cross-sectional and case-control	7	46.7
Cross-sectional	4	26.7
Case-control	4	26.7
General psychiatric symptoms	8	53.3
PTSD symptoms	10	66.6
Depression and anxiety symptoms	4	26.7
General psychological distress	4	26.7
Burnout	2	13.3
Mean of clinically relevant psychiatric symptoms	8	35.92 (19.17–52.67)
Mean of clinically relevant PTSD symptoms	8	17.24 (7.02–27.47)
Mean of clinically relevant depression and anxiety symptoms	2	6.4 (1.70–11.10)

Some studies (17, 20, 24, 26, 38) analyzed the buffering factors for the burden of outbreak on psychological distress. Protective factors were clear communication of directives/precautionary measures, support and training from supervisors/colleagues, years of health care experience and altruism; risk factors for depression were having been quarantined, high work exposure, current stressful job, high PTSD symptoms and pre-SARS trauma exposure.

Considering aggregated results, eight studies showed that up to 35% (95% CI: 19.17–52.67) of HCWs reported clinically significant levels of general psychiatric symptoms during and after pandemic emergency. Interestingly, pooled effect size (d_w = .07 [−.11–.26]) did not highlight significant differences between HCWs who were and were not directly involved in addressing medical emergency. This evidence was consistent across studies included ($Q_{(2)}$ = .16; *ns;* I^2 = .00%). With respect to PTSD symptoms, the analyses found that 17% (95% CI: 7.02–27.47) of HCWs developed clinically significant symptoms of this conditions. Furthermore, the direct involvement in the management of pandemic emergency significantly affected the severity of PTSD symptoms (d_w = .30 (.21–.39); p <.001), even though the heterogeneity across studies were large (I^2 = 72.05%) and significant ($Q_{(6)}$ = 27.41; p <.01). Overall, clinically significant depressive and anxious symptoms were reported by up to 6% (95% CI: 7.02–27.47) of HCWs. Nevertheless, the HWCs who were directly involved in addressing pandemic emergency showed significantly higher depressive and anxious symptoms (d_w = .66 (.46–.85); p <.001) than ones who were not directly exposed to the medical emergency. This finding was consistent across studies ($Q_{(2)}$ = 2.93; *ns;* I^2 = 31.78%).

Ultimately, Egger's regression coefficients did not detect bias of publication for the previous indexes (**Table 3**). **Table 4** reported the rating of the risk of bias. Overall, the reviewed studies showed specific weaknesses in the participation rate, definition and measurement of exposure, and control of confounding variables. Anyhow, we must bear in mind that these real-world studies were performed in emergency contexts, and therefore their quality is acceptable though just sufficient from a methodological point of view.

TABLE 3 | Pooled effect sizes concerning the effects of direct exposure to pandemic emergency.

Outcome	*N* direct exposure	*N* control subjects	*N* studies	d_w (95%CI)	*Q* (df)	I^2	Egger's coefficient(95% bootstrap CI)
Overall psychiatric symptoms	271	761	3	.07 (−.11–.26)	.16 (2)	.00%	.58 (NE); *ns*
PTSD symptoms	624	1,948	7	.30 (.21–.39)***	27.41 (6)**	72.05%	1.56 (−25.28–10.39); *ns*
Depression and anxiety symptoms	638	1,571	3	.66 (.46–.85) ***	2.93 (2)	31.78%	2.15 (NE); *ns*

***p <.01; ***p<.001; NE, not estimated.*

TABLE 4 | Assessment of risk of bias (*N* = 15).

Criteria	Yes	No	NA/ NR
1. Was the research question or objective in this paper clearly stated?	14	0	1
2. Was the study population clearly specified and defined?	15	0	0
3. Was the participation rate of eligible persons at least 50%?	8	4	3
4. Were all the subjects selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants?	15	0	0
5. Was a sample size justification, power description, or variance and effect estimates provided?	0	14	1
6. For the analyses in this paper, were the exposure(s) of interest measured prior to the outcome(s) being measured?	8	7	0
7. Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed?	15	0	0
8. For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as continuous variable)?	0	15	0
9. Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	5	10	0
10. Was the exposure(s) assessed more than once over time?	1	14	0
11. Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	15	0	0
12. Were the outcome assessors blinded to the exposure status of participants?	1	0	14
13. Was loss to follow-up after baseline 20% or less?	0	1	14
14. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?	3	12	0
TOTAL SCORE	**100**	**77**	**33**

DISCUSSION

The COVID-19 pandemic presented as a significant challenge for healthcare services all over the world. The overload of healthcare systems for the burden of a new and unknown virus, the spread of diffusion, a significant lethality rate, and lack of definitive treatment protocols or vaccine represented some additional factors potentially influencing the psychological resources of HCWs.

Our findings evidence the likely link with mental problems of previous coronavirus outbreaks in terms of PTSD symptoms and other psychopathology (anxiety, depression, psychological distress) both in the acute phase and after a time interval in attenuated forms.

Unfortunately, almost all studies recruited convenience samples from well-defined, though small, populations reasonably due to this peculiar real-world research context. Beyond obvious problems of statistical power, sources of bias can be found in the insufficient measurement of the amount of exposure and in a poor evaluation of confounding variables (e.g. other sources of stress apart from working or not in high-risk settings, previous personal career, and so on). On the positive side, the reviewed studies highlight that evidence is not too dissimilar in various parts of the world, despite cultural and organizational differences. The most part of the studies adopted the Impact of Events Scale (IES) to detect PTDS symptoms, which have been diagnosed by a range of 20%–50% of health-care professionals. However, IES is a self-administered symptom scale to screen symptoms of PTSD. In addition, only one study (20) performed a vis-à-vis structured diagnostic interview and only 2% of subjects had a definite PTSD diagnosis after one year.

Possible psychopathological consequences of stress exposure include both specific sequelae (i.e. Adjustment Disorder, Acute Stress Disorder, Post-Traumatic Stress Disorder) and common mental disorders (e.g. Major Depressive Disorder, Generalized Anxiety Disorder, Substance-Related Disorders). Moreover, the emergence of a clinical condition among distressed individuals can be a new onset condition as well as a recurrence of previous disorders; finally, comorbid personality traits may play a role in the development of psychopathology among other predisposing factors (10). It is clear that a complete psychopathologic work-up should proceed with clinical interviews and psychometric tests, and self-administered tests on a voluntary basis may give only screening information. For this reason, we need studies assessing mental health of HCWs in a direct way, eventually adopting the cut-off of the screening tests to candidate people to the traditional procedure. Another critical point is the relevance of making follow-up study, because the cross-sectional design of most studies does not allow any prevision on the evolution of the clinical situation.

A rapid review on HCWs involved in COVID-19 pandemic (39) evidenced significant levels of distress, anxiety, depression and insomnia. Our study on previous coronavirus outbreaks adds a critical point, because we quantified the role of direct exposure to the risk of contagion (**Table 3**): if all HCWs showed a somewhat associated risk of developing psychiatric symptoms during outbreaks, only those in frontline showed a significant increased level of anxiety/depression and (then) PTSD. The wider study on HCWs involved in COVID-19 (40) had been performed in 34 hospitals of China and involved 1257 health care workers (68.7% response rate), with overall, 50.4%, 44.6%, 34.0%, and 71.5% of all participants reported symptoms of depression, anxiety, insomnia, and distress, respectively. The role of sleep disruption needs more studies, for the well-known link with psychopathology (41). Moreover, we need studies analyzing protective factors (both as institutional and personal ones) from the psychiatric outcome, to implement strategies of prevention.

A critical question is whether the health care workers who participated in these studies are representative of the entire

population of HCWs. Unfortunately, the psychological mechanism motivating an individual to participate or not to a voluntary survey is unknown. Response bias may be present if the nonrespondents were either too stressed/depressed and/or anxious to respond or not at all stressed/depressed and/or anxious and therefore not interested in this survey.

Lancee and coworkers (20) evaluated new-onset episodes of psychiatric disorders in a mixed sample of 139 HCWs by using the Structured Clinical Interview for DSM-IV and the Clinician-Administered PTSD Scale, one to two years after the SARS-1 outbreak in Ontario. They found rates of lifetime prevalence for any mental disorder before the coronavirus pandemic, which were comparable to the Canadian community samples, including a lifetime prevalence rate of PTSD even lower than that of civilian samples in North America. Only a few new-onset episodes of common psychiatric disorders were detected (5%) including just one case of PTSD specifically attributable to the SARS experience. This small investigation was performed on subjects who were still in service on a voluntary basis (roughly one in four agreed to participate), and a critical question is whether the HCWs who participated in this study are representative of their colleagues; so, it is not informative under an epidemiological perspective.

The current COVID-19 outbreak might represent a matchless opportunity to study the burden and buffering factors of pandemic virus for mental health. This, in the perspective of planning an intervention for future epidemic outbreaks, both from the side of public health services and for the implementation of education strategies also focused on working in emergencies (e.g. core curriculum in clinical/emergency psychology in school of medicine and nursing). We do not know how many of HCWs participating to the survey have had a specific training on psychological issues, but we know that a lot of them have been called to manage difficult clinical decisions with strong ethical meanings, to communicate bad news, to remain quarantined from their families and kids, while maintaining overloading rhythms of work. In Lombardy (the most part of the Authors work in Lombardy, the Italian region with the worst situation related to COVID-19) (42), some of HCWs had to face the emergency without being allowed to choice if work or not in COVID wards (sometimes with different sub-specialty expertise as the case of dermatologists or neurologists called to work in intensive care). In many cases, there was not any psychological training to work in emergency. It is clear that each factor may have had a role in predicting the level of psychological burden of the medical emergency on HCWs, and these factors should be controlled in future research. Providing psychological support to frontline workers takes over as a significant public mental health challenge over the coming weeks and months (43). Some evidence exists that altruistic acceptance of the own role (24) and institutional support and training (38) may have a role in buffering the psychopathologic outcomes. However, we need more studies on resilience factors in HCWs. Given the adverse impacts of experiencing burnout, psychological distress in the workplace, it is of great importance to investigate the potential factors and mechanisms that could enlighten the improvement of the mental health and maintenance of adequate proficiency of HCWs in the midst of the pandemic. The role of the spouses and/or familial support, capacity of self-help and using mindfulness techniques to cope with distressing situations, personality characteristics, institutional facilities (e.g. mental health support, availability of medical supplies) deserve further studies. Moreover, we need to address factors bolstering resilience. Among all the influential factors, social support is one of the protective factors for mental health for HCWs (44–46). A strong social support network can buffer feelings of isolation, strengthening resilience. Video calls and virtual meetings (or on-line group support) allow for maintenance of social relations while preserving physical distancing.

Other moderating interventions include delivery of general and medical supplies, limiting isolation to the shortest duration necessary, and emphasizing altruism as core value of the profession as much as a strong leadership with clear, honest and open communication to balance fears and uncertainties (47).

Proposals for delivering psychological support exist (48), with better chance of achieving psychological interventions when clinical psychology units are available within the hospitals (a rarity in Italy). Telemedicine may be an opportunity for offering supportive interventions intended to promote wellness and boost coping strategy (such as empathic listening, psychoeducation or supportive therapy) (47).

In synthesis, our review showed an association with a likely negative burden for mental health of HCWs in terms of PTSD symptoms and other psychopathology (anxiety, depression, psychological distress) both in the acute phase and, in some cases, after a time interval. Learning lessons from the current pandemic outbreak is imperative to prepare better strategies for new healthcare management models for the next generations of doctors, nurses and staff of health-care services.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

AUTHOR CONTRIBUTIONS

FG and RF ideated, wrote and called to collaborate the co-authors. GiP contributed to the theoretical building of the paper and wrote the parts on psychiatric issues, with a contribution in the selection of papers and quantification of the risk of bias. FR and FM made the bibliographic search. MC made the statistical analysis, giving some of the methodological indications. GaP, GS, MPC, AP supervised the all work, read and approved the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Italians on the Age of COVID-19: The Self-Reported Depressive Symptoms Through Web-Based Survey

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The pandemic of coronavirus disease 2019 (COVID-19) has affected the Italian community. The widespread use of quarantine had the desired impact of controlling the epidemic, although it caused many psychological consequences. To date, compliance of the Italian public with voluntary home quarantine has been very high, but little is known about the impact of psychological health on sociodemographic categories during the quarantine. The purpose of this study was to assess the prevalence of depressive symptoms in specific sociodemographic categories during the COVID-19 quarantine lockdown and the potential factors that contribute to, or mitigate, these effects. In the very early stage of the nationwide lockdown, 3,672 quarantined Italian adult residents (65% females, ranging from 18 to 85 years) participated in a web-based cross-sectional survey, including measures of depressive symptoms, which were measured by the Teate depression inventory, and state anxiety levels. The overall prevalence was 27.8% for moderate and 9.3% for severe levels of depressive symptoms. A generalized logistic model was used to identify the factors associated with mental health problems. Among these factors, sociodemographic variables (e.g., sex, age, employment status) and adherence to quarantine guidelines were analyzed. Females, younger people, students, singles, residents in northern Italy, people who were reluctant to adhere to quarantine guidelines, and people less worried about being infected with COVID-19 were at high risk of developing depressive symptoms during the COVID-19 epidemic, also after controlling for state anxiety. These findings showed that public levels of depressive symptoms did not increase the greater likelihood of being infected. Our study suggested that the monitoring of psychological outcomes for outbreaks could identify groups at higher risk of psychological morbidities due to the current pandemic in order to target future psychological interventions for implementation.

Keywords: anxiety, coronavirus disease 2019, depression, mental health, worry

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INTRODUCTION

The pandemic of coronavirus disease 2019 (COVID-19), caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2, previously known as 2019-nCoV) has affected the Italian community since late January. According to the Imperial College COVID-19 Response Team (Ferguson et al., 2020), cumulatively, 5.9 (1.9–15.2) million people had been infected as of March 28, giving an infection rate of 9.8% (3.2–25%) of the Italian population.

To contain the rapid spread of this pandemic, the Italian Government ordered nationwide lockdown by March 11: all public places were closed (included educational, religious, and public/cultural institutions, such as schools, universities, museums, and law courts), all public events and any form of congregation were banned, and a distance of at least 1 m had to be maintained (Government of Italy, 2020). All Italian people were in quarantine at home (#iorestoacasa) until May 4: people had to stay at home apart from essential tasks. The slowing growth in daily reported deaths in Italy was consistent with the significant impact of these restrictions. The effective reproduction number, Rt, dropped to close to 1 around the start of the lockdown, with 38,000 (13,000–84,000) deaths averted. The widespread use of quarantine had the desired effect of controlling the epidemic, this was also due to the fact that the compliance of the Italian public with quarantine guidelines had been very high (Carlucci et al., 2020).

Yet, the pandemic created a breeding ground for direct psychological consequences, suddenly throwing many individuals into daily lives filled with health threats, existential depression, and generalized stress (Holmes et al., 2020). A recent review of the psychological impact of quarantine, due to earlier outbreaks, suggested that there were high rates of negative psychological effects among the public, including post-traumatic stress symptoms, persistent depression, substantial anger, panic attacks, and suicidality (Liu et al., 2003; Maunder et al., 2003; Brooks et al., 2020).

Social distancing and isolation exacerbate the burden of stress, and often cause effects on immune, cardiovascular, and mental health because these measures frustrate the deep-seated human instinct to connect with others. On this point, social connection helps people to regulate negative emotions, remain resilient during difficult times, and cope with stress (Rimé, 2009; Hawkley and Cacioppo, 2010; Haslam et al., 2012; Doré et al., 2017; Jetten et al., 2017).

Remarkably, the mental impact of quarantine can depend largely on the characteristics of participants and the quarantine variables selected. As documented by Reynolds et al. (2008), Taylor et al. (2008), and Brooks et al. (2020), while compliance with quarantine guidelines requirements are significant factors behind a higher level of post-traumatic stress disorder (PTSD), healthcare workers were more likely to be affected than the public.

In Italy, in the early phase of quarantine (7–10 days after the decree of nationwide lockdown), deleterious consequences on the population's psychological health were analyzed in a nationally representative survey of 3,452 participants (Barari et al., 2020). Different demographic groups were struggling with different aspects of quarantine. Older adults expressed worry or anxiety, while those who were likely working parents (40–49 years) cited consistent economic distress and struggles with home-schooling and smart-working, compared to other groups. Younger people were struggling with increased boredom, perceived immobility, and conflicts within family, while vulnerable groups, like the elderly and health-compromised people, cited consistent loneliness relative to others. Overall, the average level of anxiety surrounding the crisis in the Italian population was high: no respondents reported being completely without anxiety.

According to Barari et al. (2020), the negative psychological consequences of the quarantine were beginning to wear on people and seemed likely to become more serious over time.

Further findings derived from an online survey (Mazza C. et al., 2020) showed the prevalence of psychiatric symptoms in 2,766 participants drawn from the general population from March 18 to 22 2020. Female gender, negative affect, and detachment were associated with higher levels of stress, anxiety, and depression. Having an acquaintance infected was associated with increased levels of both depression and stress, whereas a history of stressful situations and medical problems was associated with higher levels of anxiety and depression. Finally, those with a family member infected and young people who had to work outside their domicile presented higher levels of anxiety and stress, respectively.

Thus, it is important that the potential advantages of home quarantine are weighed against the possible mental costs (Rubin and Wessely, 2020; Torales et al., 2020). Quarantine as an efficacious public health measure also needs to lower the psychological strain associated with it.

Aims of This Study

Research evidence aims of this study were to explore (1) the likely effects of quarantine on mental health (anxiety and depressive symptoms), immediately after the nationwide lockdown issued by the Italian Government, and (2) the factors that contribute to, or mitigate, these consequences.

Among these factors, sociodemographic variables (gender, age, employment status, marital status, education, geographic area, and income per year), worry about being affected by COVID-19, and adherence with quarantine guidelines were analyzed. Depression was the principal outcome, while anxiety was used as a covariate, given its close association with depression (Clark and Watson, 1991; Barlow and Campbell, 2000).

MATERIALS AND METHODS

Sample and Procedure

Respondents were Italian quarantined adults aged 18 and older with access to a networked computer. An online cross-sectional study was conducted from March 21 to 26, immediately after the nationwide lockdown issued by the Italian Government on March 11 (#iorestoacasa). A virtual snowball sample via social media was used within a wider web-based study including other psychological measures (Carlucci et al., 2020).

This study has been approved by the Department of Psychological Sciences, Health and Territory, University of Chieti, Italy Review Board. Written informed consent was obtained from all the participants included in the study.

Measures

Sociodemographic Variables

General information concerning sex, age, education, marital status, geographic area and region, employment status, yearly income, and health status including history

of psychiatric illnesses and medical problems (e.g., hospitalizations) were collected.

Depression

The 21-item Teate Depression Inventory (TDI; Balsamo et al., 2014, 2018b), developed via Rasch analysis (Rasch, 1960), was employed to evaluate depressive symptoms in participants in the past 2 weeks. Respondent answers were measured on a 5-point Likert scale ranging from "*never*" to "*always*." Cronbach's α coefficient in our study was 0.90.

Anxiety

The 21-item state scale of the State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA) (Ree et al., 2008; Balsamo et al., 2016; Carlucci et al., 2018) was administered to evaluate cognitive (e.g., "I have trouble remembering things") and somatic (e.g., "My muscles are tense") symptoms of state anxiety. Individuals rated how often a statement was true in the past 2 weeks, from 1 "*not at all*" to 4 "*very much so*." Cronbach's α coefficient was 0.89.

Adherence to Quarantine Guidelines

Adherence to quarantine guidelines in response to the COVID-19 outbreak was measured by a global index composed of 11 items classified into preventive (i.e., handwashing with soapy water/alcohol-based solution) and avoidant (i.e., avoidance of gatherings in public or open to public places, handshaking) disease behaviors (Carlucci et al., 2020). Respondents were asked about the frequency of which they had carried out quarantine restrictions on a 5-point Likert scale from 0 "*never*" to 4 "*always*." Cronbach's α coefficient was 0.70.

Worry

Worry about being infected with COVID-19 was assessed by a single item drawn from a multidimensional questionnaire of risk perception for the COVID-19 infectious disease outbreak. Responses were classified according to three levels of worry severity: none ("*Not worried at all*"), moderate ("*Slightly worried*"), and quite a lot ("*Really worried*").

Data Analysis

Descriptive statistics were computed for sociodemographic characteristics, physical symptoms and health service utilization variables, knowledge and concern-related variables, precautionary measure variables, and additional health information variables. Prevalence of depressive and anxiety symptoms during the COVID-19 outbreak in the Italian population were also computed for sex and age. In line with similar studies (e.g., Giallonardo et al., 2020; Mazza C. et al., 2020; Wang et al., 2020), the TDI outcome score was categorized into "minimal," "mild," "moderate," and "severe" depression levels (Balsamo and Saggino, 2014). A STICSA-S score of 40 points or greater was indicated as the cut-off point for the presence of anxiety symptoms (Van Dam et al., 2013).

Sensitivity analysis was conducted using the Hmisc R package (Harrell and Dupont, 2006) in order to assess the power and sample size of ordinal outcomes under the proportional odds ordinal logistic model.

Next, generalized linear regression (GLMs) was applied to the explanatory model to analyze whether the severity of depression during the COVID-19 quarantine could be predicted by high levels of adherence to quarantine guidelines and worry about being infected with COVID-19, and by sociodemographic variables (Model 1), that resulted as significant in our previous study (Carlucci et al., 2020). Since depression was measured in terms of severity levels, we specified multinomial (ordinal) as the distribution and cumulative logit as the link function.

Predictors were selected according to a two-step process. Firstly, a potential set of considered variables were correlated with the outcome variable. All the potential variables that correlated significantly with the outcome were selected as predictors in the GLMs model. Hence, based on the test of model effects (Wald chi-square statistic and *p*-values), the predictors were compared (Guisan et al., 2002). Only the resulting significant predictors ($p < 0.05$) were retained in the model.

A Wald test (and its 95% confidence interval) based on robust estimates of the coefficients and covariance matrix were used to assess the models, and residual deviance as a goodness-of-fit statistic was applied to evaluate model overdispersion (McCullagh, 2018). The model with the deviance/df ratio closest to the unit was retained as the most parsimonious model (McCullagh, 2018).

In addition, due to the high comorbidity between depression and anxiety symptomatology (Clark and Watson, 1991; Barlow and Campbell, 2000), the model was re-estimated controlling for anxiety as the covariate (Model 2), in order to increase the ability to detect differences on dependent variables (depression severity levels) by an independent variable inserted as the covariate. Differences between the two models were interpreted in terms of unique contribution of any independent variable on depression severity symptoms. The data were statistically analyzed with SPSS for Windows 21.0 (IBM Corp, 2018). Statistical significance was set by *p*-values of less than 0.05.

RESULTS

Demographic Characteristics

The characteristics of the participants are shown in **Table 1**. Of the 3,672 respondents, 1,282 (34.9%) were male and 2,390 (65.1%) were female. The mean (±SD) age of the participants was 33.27 ± 14.29 years. A total of 45.2% of them were located in the south of Italy (N = 1660). Among these, 1,817 (49.5%) respondents held a high school diploma, while 1,535 (41.8%) held a higher education qualification (bachelor/master/doctorate). In terms of occupational status and income per year, 1,138 (31.20%) participants were students, 232 (6.3%) were healthcare workers, and 1,742 (47.4%) were employed. Concerning marital status, 2,249 (61.2%) participants were unmarried/single, 901 (24.5%) were married, 103 (2.8%) were divorced/separated, 366 (10%) were cohabiting, and 53 (1.4%) were widowed.

Most of the subjects had a high level of health: 2,616 (71.2%) were found to show no physical disease, while 24 (0.7%) were detected as "fragile," having more than three

TABLE 1 | Frequencies and percentages of the demographic characteristics of the study sample (*N* = 3,672).

Variables	n (%)
Sex	
Male	1282 (34.9)
Female	2390 (65.1)
Age	
18–29	1995 (54.3)
30–39	723 (19.7)
40–49	404 (11)
50–59	261 (7.1)
Over 60	289 (7.9)
Marital status	
Single	2,249 (61.2)
Married	901 (24.5)
Divorced/separated	103 (2.8)
Cohabiting	366 (10)
Widowed	53 (1.4)
Geographic area*	
North-west	897 (24.4)
North-east	338 (9.2)
Central	522 (14.2)
South	1,660 (45.2)
Islands	165 (4.5)
Employment status	
Unemployed	416 (11.3)
Retired	144 (3.9)
Student	1,138 (31)
Healthcare professional	232 (6.3)
Employee	1,742 (47.4)
Adherence to quarantine	
High	1,787 (48.66)
Low	1,885 (51.34)
COVID-19-related worry	
None	278 (7.57)
Moderate	1,068 (29.09)
Quite a lot	2,326 (63.34)

**Missing values n = 90 (2.5%).*

diseases, and with a long history of chronic medical illness. A total of 967 (26.3%) participants had previously carried out psychotherapeutic treatment. Among these, 97.2% of respondents had carried out at least one psychotherapy treatment (individual, family/couple, and/or group treatment), 20.9% had undergone psycho-pharmacological treatment, and 0.6% had participated in other psychological treatments.

Most (84.2%) of the participants spent their quarantine period with family members. A total of 1,787 (48.7%) were found to be highly adherent to quarantine guidelines, and 2,326 (63.34%) reported that they were worried about being infected with COVID-19.

A sample size of 3,672 was used for the statistical power analyses, and a 1:2 odds ratio was used as a baseline. The alpha level used for this analysis was $p < 0.05$. The *post-hoc* analyses showed that the statistical power for this study was 0.859. Thus, there was an adequate power at the moderate to large effect size level. An N of approximately 4,182 would be needed to obtain statistical power at the recommended 0.90 level (Cohen, 1988).

Prevalence of Depressive Symptoms, and State Anxiety During the COVID-19 Outbreak Stratified by Sex and Age

The overall prevalence was 6.4% for severe, 24.2% for moderate, 39.7% for mild, and 29.7% for minimal depressive symptoms. The overall prevalence of anxiety symptoms was 13.6%, using the cut-off of >40. Taking together, the prevalence of depressive symptoms and state anxiety severity was significantly higher in female participants, and those younger than 30 years compared to participants aged 31 years or older ($p < 0.001$, as shown in **Tables 2**, **3**). In addition, those who received psychotherapeutic treatment in the past reported higher severity levels of depressive [$\chi^2 = 45.58$ (3), $p < 0.001$] and anxiety [$\chi^2 = 47.43$ (1), $p < 0.001$] symptoms relative to the general public.

Predictors of Depressive Symptoms During the COVID-19 Outbreak

Preliminarily, nonparametric correlations (*Spearman's rho*) were performed in order to select independent variables as predictors in the GLMs. As expected, all the sociodemographic variables, as well as worry were found to correlate negatively with the outcome variable (depressive symptom severity levels) ranging from *rho* = 0.298 (age, $p < 0.01$) to *rho* = −0.040 (education, $p < 0.05$), except for sex and worry (*rho* = 0.113, $p < 0.01$ and 0.037, $p < 0.05$, respectively).

Parameter estimates of the generalized linear model and the exponentiated values of the coefficients [the "Exp(B)" column] are displayed in **Table 4**. The first model resulted in an underestimation of the data with no statistical association for education [$W\chi^2(df) = 3.19$ (3), $p = 0.372$], and income per year [$W\chi^2(df) = 7.306$ (3), $p = 0.063$] as predictors of depressive symptoms. To improve model fit, we discharged them and re-estimated the model. The Omnibus test [$\chi^2(df) = 526.21$ (20); $p < 0.001$], and residual deviance/df ratio (deviance/df = 1.038) of the re-estimated models suggested that the refined model fit significantly better than the proposed model (McCullagh, 2018). Female participants showed significantly higher depression scores compared to male participants (β = 0.490; SE = 0.068; $p < 0.001$), with a greater risk of depressive symptoms (odds ratio, 1.632 [95% CI, 1.427–1.866]). Participants aged from 30 years and above reported significantly lower levels of depression scores compared to the younger respondents (β = −0.647/−0.344; SE = 0.186/.101; $p < 0.001$), with a decreased risk of depressive symptoms (odds ratio range: 0.524/0.709 [95% CI, 0.363–0.755/0.581–0.864]). Likewise, widowed, cohabiting, and married participants were less likely to experience depressive symptoms than single/unmarried participants, with a decreased risk of depressive symptoms (odds ratio: 0.521 [95% CI, 0.400–0.679]). Concerning geographic area, participants living in the south of Italy had significantly lower depression scores

TABLE 2 | Prevalence of depressive severity levels, and state anxiety during the COVID-19 outbreak in the Italian population stratified by sex (*N* = 3,672).

		Total n (%)	Male n (%)	Female n (%)	χ^2	*P*-value
TDI severity levels	Minimal	906 (24.7)	381 (29.7)	525 (22.0)	47.79	<0.001
	Mild	1407 (38.3)	509 (39.7)	898 (37.6)		
	Moderate	1019 (27.8)	310 (24.2)	709 (29.7)		
	Severe	340 (9.3)	82 (6.4)	258 (10.8)		
STICSA-S[a]	No	2944 (80.2)	1108 (86.4)	1836 (76.8)	48.45	<0.001
	Yes	728 (19.8)	174 (13.6)	554 (23.2)		

TDI, Teate Depression Inventory; STICSA-S, State-Trait Inventory for Cognitive and Somatic Anxiety—State Scale. [a]STICSA-S was defined as individuals who scored ≥ 40 points (Van Dam et al., 2013).

TABLE 3 | Prevalence of depressive severity levels, and state anxiety during the COVID-19 outbreak in the Italian population stratified by age groups (*N* = 3,672).

		18–29 n (%)	30–39 n (%)	40–49 n (%)	50–59 n (%)	Over 60 n (%)	χ^2	*P*-value
TDI severity levels	Minimal	309 (15.5)	225 (31.1)	144 (35.6)	107 (41.0)	121 (41.9)		
	Mild	738 (37.0)	280 (38.1)	164 (40.6)	104 (39.8)	121 (41.9)	330.69	<0.001
	Moderate	679 (34.0)	165 (22.8)	85 (21.0)	46 (17.6)	44 (15.2)		
	Severe	269 (13.5)	53 (7.3)	11 (2.7)	4 (1.5)	3 (1)		
STICSA-S[a]	No	1525 (76.4)	595 (82.3)	349 (86.4)	224 (85.8)	251 (86.9)	42.69	<0.001
	Yes	470 (23.6)	128 (17.7)	55 (13.6)	37 (14.2)	38 (13.1)		

TDI, Teate Depression Inventory; STICSA-S, State-Trait Inventory for Cognitive and Somatic Anxiety—State Scale. [a]STICSA-S was defined as individuals who scored ≥ 40 points (Van Dam et al., 2013).

(β = −0.176; SE = 0.080; $p < 0.05$) compared to residents in the north-west, with a decreased risk of depressive symptoms (odds ratio: 0.839 [95% CI, 0.717–1.981]). Students (β = 0.360; SE = 0.118; $p < 0.01$) and healthcare professionals (β = −0.510; SE = 0.160; $p < 0.001$) were slightly and/or not depressed compared to unemployed participants, respectively. The first group displayed a decreased risk of depressive symptom severity (odds ratio: 0.600 [95% CI, 0.438–0.822]), while the latter showed a higher risk of depression symptoms (odds ratio: 1.358 [95% CI, 1.077–1.713]) compared to the unemployed. Next, those who reported to adhere to the quarantine guidelines had significantly lower levels of depressive symptoms those who were not adherent (β = −0.502; SE = 0.067; $p < 0.001$), with a decreased risk of depressive symptoms (odds ratio: 0.606 [95% CI, 0.531–0.690]). Lastly, participants less worried about being infected with COVID-19 (β = −0.517; SE = 0.127; $p < 0.001$) had significantly lower level of depressive symptoms than those who reported to be quite worried, with a decreased risk of depressive symptoms (odds ratio: 0.596 [95% CI, 0.464–0.765]).

As expected, a preliminary analysis showed that depression and anxiety symptoms shared approximately 38% of the common variance, as derived by the Spearman rho coefficient (rho = 0.62, $p < 0.001$). Thus, state anxiety, as measured by the state STICSA, as the covariate was inserted in our model (Model 2).

Compared to the previous model, no statistical differences were found in sex, age, and adherence level to quarantine guidelines groups when predicting depression symptom severity, when controlling for anxiety (see **Appendix A**). Statistically significant differences were maintained in depression symptom severity for marital status, geographic area, and occupational status groups, after controlling for anxiety.

In detail, divorced/separated participants were less likely to experience depressive symptoms compared to single people, with a significant decreased risk of depressive symptoms (odds ratio: 0.654 [95% CI, 0.434–0.983]). On the other hand, no statistical differences on depressive symptom severity was found in cohabiting participants compared to unmarried participants in the second model.

Concerning geographic area, the participants living in central Italy were found less likely to experience severe depressive symptoms (odds ratio: 0.794 [95% CI, 0.641–0.984]) compared to those living in north-west Italy, after removing anxiety effects. Far from the previous model, the healthcare professionals' group were not found to differ from other occupational groups in predicting high levels of depressive symptoms compared to unemployed participants. Interestingly, participants "moderately" worried about being infected with COVID-19 were more prone to experience high levels of depressive symptoms (odds ratio: 1.252 [95% CI, 0.953–1.643]) compared to participants who were "quite a lot" worried, after controlling for the state anxiety effect.

Predictors of Depressive Symptoms During the COVID-19 Outbreak in Subsample of Participants With Psychotherapeutic Treatment History

We fitted both the GLMs models (without and with anxiety as the covariate) in the subsample of participants with

TABLE 4 | Results of GLMs model 1 (*N* = 3,672).

Characteristic	Depressive symptoms						
	β	SE	Wald χ^2	Sign.	Exp(β)	95% CI Exp(β)	
Sex							
Female	0.490	0.068	51.343	0.001*	1.632	1.427	1.866
Male					1 (Reference)		
Age							
over 60	−0.647	0.186	12.044	0.001*	0.524	0.363	0.755
50–59	−0.607	0.160	14.271	0.001*	0.545	0.398	0.747
40–49	−0.488	0.128	14.384	0.001*	0.614	0.477	0.790
30–39	−0.344	0.101	11.632	0.001*	0.709	0.581	0.864
18–29					1 (Reference)		
Marital status							
Widowed	−0.760	0.271	7.815	0.005**	0.468	0.275	0.797
Cohabiting	−0.303	0.112	7.302	0.007**	0.739	0.593	0.920
Divorced/separated	−0.318	0.217	2.138	0.144	0.728	0.475	1.114
Married	−0.426	0.110	14.906	0.001*	0.653	0.526	0.811
Single					1 (Reference)		
Geographic area							
Islands	0.134	0.156	0.730	0.393	1.143	0.841	1.554
South	−0.176	0.080	4.823	0.028**	0.839	0.717	0.981
Central	−0.187	0.105	3.179	0.075	0.829	0.675	1.019
North-east	0.117	0.118	0.968	0.325	1.124	0.890	1.419
North-west					1 (Reference)		
Occupational status							
Employee	−0.141	0.104	1.823	0.177	0.868	0.707	1.066
Healthcare professional	−0.510	0.160	10.102	0.001*	0.600	0.438	0.822
Student	0.306	0.118	6.691	0.010**	1.358	1.077	1.713
Retired	0.014	0.223	0.004	0.949	1.015	0.655	1.572
Unemployed					1 (Reference)		
Adherence to quarantine							
High	−0.502	0.067	56.098	0.001*	0.606	0.531	0.690
Low					1 (Reference)		
COVID-19-related worry							
None	−0.517	0.127	16.463	0.001*	0.596	0.464	0.765
Moderate	−0.251	0.072	12.17	0.001*	0.778	0.675	0.896
Quite a lot					1 (Reference)		

$^*p < 0.001$; $^{**}p < 0.05$. The Exp(β) or Odds ratio and β values (95%Wald CI) were derived from generalized linear regression (logistic ordinal) COVID-19, coronavirus disease 2019.

a psychotherapeutic treatment history. No substantial differences were found in both the model's goodness of fit (deviance/df = 1.048 vs. 0.911). However, differences in the estimates and standard errors of the two models were found for the model with anxiety as the covariate vs. the model without the covariate (see **Appendix B**).

In line with models tested on the entire sample, in Model 1, female participants showed significantly higher depressive symptoms scores compared to male participants (β = 0.310; SE = 0.151; $p < 0.05$), with a greater risk of depressive symptoms (odds ratio, 1.364 [95% CI, 1.014–1.834]). Participants aged from 30 to 39 and 50 to 59 years reported significantly lower levels of depressive symptoms scores compared to the younger participants (β = −0.543/−0.696; SE = 0.187/0.339; $p < 0.05$), with a decreased risk of depressive symptoms (odds ratio range: 0.581/0.449 [95% CI, 0.403–0.839/0.256–0.971]).

Likewise, cohabiting (β = −0.526; SE = 0.193; $p < 0.01$) and married (β = −0.446; SE = 0.195; $p < 0.05$) participants were less likely to have experienced depressive symptoms compared to single participants, with a decreased risk of depressive symptoms (odds ratio: 0.591/0.640 [95% CI, 0.404–0.863/0.433–0.946]). Healthcare professionals (β = −0.797; SE = 0.280; $p < 0.01$) were less depressed compared to unemployed participants, with a decreased risk of depressive symptom severity (odds ratio: 0.450 [95% CI, 0.260–0.780]). Next, those who reported to adhere to the quarantine guidelines had significantly lower levels of depressive symptoms compared to those who were not adherent (β = −0.475; SE = 0.133; $p < 0.001$), with

a decreased risk of depressive symptoms (odds ratio: 0.622 [95% CI, 0.479–0.809]).

No statistical association was found for worry about being infected with COVID-19 and geographic area.

Surprisingly, in Model 2, no statistically significant differences were maintained in depression symptoms for the sex, marital status, and occupational status groups, after controlling for anxiety. Participants aged from 30 to 39 years reported significantly lower levels of depression scores compared to the younger participants ($\beta = -0.5.04$; SE = 0.194; $p < 0.01$), with a decreased risk of depressive symptoms (odds ratio range: 0.604 [95% CI, 0.413–0.884]). Concerning geographic area, the participants living in south Italy were less likely to experience severe depressive symptoms (odds ratio: 0.688 [95% CI, 0.493–0.962]) compared to those living in north-west Italy, after removing anxiety effects. As expected, participants "moderately" and "none" worried about being infected with COVID-19 were more prone to experience high levels of depressive symptoms (odds ratio: 1.757/1.722 [95% CI, 1.292–2.391/1.063–2.791]) compared to participants who were "quite a lot" worried, after controlling for the state anxiety effect.

DISCUSSION

Quarantine has been used extensively in all countries of the world to lower the spread of the COVID-19 infection and to protect individuals' health, at different times (Sohrabi et al., 2020).

Quarantine includes the separation and restriction of movement of people who have potentially been exposed to a contagious disease to ascertain if they become unwell, so reducing the risk of them infecting others. It is an unpleasant experience for those affected (Hiremath et al., 2020). Imposed isolation and separation from loved ones, loss of mental health needs (freedom, social contacts, stimulation), uncertainty over disease status, family conflict, and boredom can, on occasion, contribute to the onset of psychological disorders (Brooks et al., 2020). Due to the fact that the psychological impact of quarantine depends largely on the characteristics of participants and the quarantine variables selected, several sociodemographic characteristics have been selected here, with depressive symptoms measured by the TDI as the outcome. In the second model, anxiety, as measured by the STICSA state scale, was inserted as the covariate, given the close relationship with depression (Brooks et al., 2020).

About gender, depressive symptoms were more likely to occur in female participants, with a risk of developing depressive symptoms higher 1.6 compared to male participants in our sample. This finding was in accordance with studies by Qiu et al. (2020) and Wang et al. (2020) among the Chinese general population in the first 2 weeks following the outbreak, as well as Broche-Pérez et al. (2020) among the Cuban population. Also, among the Italian general population higher levels of psychological distress were reported in the female gender compared to their male counterparts (Ho et al., 2020; Mazza C. et al., 2020; Rossi et al., 2020).

Sex differences in depression were not caused by a higher prevalence of COVID-19 infection in women because mortality and vulnerability to the COVID-19 disease indicated that more men are dying from COVID-19 (Lancet, 2020). Thus, these differences seem to be caused by the fact that women carry a different kind of burden from this epidemiological emergency. Gender inequities disproportionately affect the well-being and economic resilience during lockdown. Households are under strain, but children and elderly care, as well as housework generally fall on women (Cluver et al., 2020). By increasing caregiving needs, COVID-19 has intensified the pressure on women to uphold prescriptive feminine norms. Women have to bear more of the burdens of providing additional support for children's distance learning, and alleviating children's emotional tedium, isolation, and anxiety of shelter-in-place (Rosenfeld et al., 2020).

In addition, increased intimate partner violence has grown during the quarantine due to COVID-19 because women are required to stay uninterruptedly with their partners and away from those people who can give help or at least validate their experiences and, particularly if these women live in small houses (Bradbury-Jones and Isham, 2020; Mazza M. et al., 2020; van Gelder et al., 2020). Indeed, some studies suggest that sudden forced proximity with their immediate household members is a risk factor for domestic violence, and aggression (Taylor et al., 2008; Brooks et al., 2020). In Italy, since the beginning of the COVID-19 quarantine, three domestic homicides and 11 murder-suicides have been registered to date.

Furthermore, while COVID-19 has coincided with greater rises in unemployment for women than men, the rise in unemployment for men remains substantial (Bureau of Labor Statistics, 2020).

About the age groups, depressive symptoms were most likely to occur in younger people (aged 18–29 years). With increasing age, depressive symptoms were less prevalent during the Italian lockdown due to the COVID-19 outbreak. Our results were similar to those from previous studies, such as a study during the SARS outbreak in Taiwan (Su et al., 2007), a study of horse owners quarantined because of equine influenza (Taylor et al., 2008), and one recent study during the COVID-19 epidemic in China (Huang and Zhao, 2020). As well, like gender, for this sociodemographic variable, the prevalence of the depressive symptoms in different age groups and the probability of risk of developing depressive symptoms depending on age do not relate to the greater likelihood of being infected.

Being elderly has been reported to correlate with adverse clinical outcomes, including hospitalization and mortality (Applegate and Ouslander, 2020; Zhou et al., 2020). Indeed, in Italy the mean age of COVID-19 patients who died was 81 years (Remuzzi and Remuzzi, 2020) and the case fatality rate was 16% from 60 to 79 years, 19.7% from 80 to 89 years, and 16% for 90 years and older (Livingston and Bucher, 2020). Despite this, respondents older than 60 years had the lowest risk for developing depressive symptoms compared to the younger age groups. In a population where loneliness and isolation have already been described as an epidemic (Luo et al., 2012), the impact of even short-term social distancing measures and the resulting distress did not influence the vulnerability to mental health issues (Jeste et al., 2020; Vahia et al., 2020). This finding is

in accordance with part of the literature. Although mixed results derive across current and previous studies on the association between participants' age and depression as a psychological outcome of health-related emergency (Hawryluck et al., 2004; Qiu et al., 2020), some authors reported that only young age was found to be associated with increased distress as a psychological outcome of the COVID-19 quarantine (Barari et al., 2020; Mazza C. et al., 2020) and of the SARS quarantine (Hawryluck et al., 2004). The higher psychological distress reported by the younger population could be due to their greater and uncontrolled access to the amount of information ("*infodemic*") through social media, which can easily trigger distress (Cheng et al., 2014).

As regards marital status, unmarried/single people were the most depressed group with quarantine policies in the event of this outbreak. It is plausible that single people had greater difficulty in relying on or obtaining the assistance of others during the Italian lockdown, thus are at risk of depressive symptoms and lower self-confidence more than cohabiting and married participants. This datum is in line with part of previous literature reporting that being married was protective for depression or associated with a lower risk of depressive symptoms (Inaba et al., 2005; Yan et al., 2011; Bulloch et al., 2017), although other studies conducted during the SARS outbreak suggested that demographic factors such as marital status, as well as living with other adults, and having children were not associated with psychological outcomes (Hawryluck et al., 2004; Mihashi et al., 2009).

As to geographic area of residence, people living in the south of Italy showed the lowest risk of developing depressive symptoms among all the groups, followed by participants from regions of central Italy compared to residents from northern regions and the islands. As expected, residents in the most severely affected regions are at the highest risk of developing depressive symptoms. Southern and central regions recorded a smaller number of deaths and diagnosed cases (1,812 and 2,730 deaths, respectively), compared to the north-east and north-west regions (6,935 and 21,009 deaths, respectively), where the disease spread first on a large scale. To explain this datum, it should be considered that the authorities introduced control measures in the northern regions (the "Red Zone"), before any other region and carried out extraordinary efforts to restrict the movement of people (Carlucci et al., 2020). In addition, residents from northern Italy were found less adherent to restrictive measures compared to the those from the south of Italy. People who have shown more adherence were found less at risk of depressive symptoms compared to people with less adherence (see under).

As for occupational status, this study highlighted students as suffering from the highest level of psychological distress among all the other groups, including the unemployed group. Also, in this case, the public's level of depressive symptoms did not increase with an increased probability of contracting the disease. Since the physical spaces of universities were closed, students' mental well-being was affected by the sudden interruption of social interactions. However, the possibility of having online lessons and maintaining social contacts through social networks would not explain the onset of the depressive symptoms compared to other groups, for example employees who had been laid off or were retired.

The reason for students' greater risk of depressive symptoms, reported also by Wang et al. (2020) among the Chinese population, could lie in a sense of uncertainty toward the future that this emergency, not only in health, but also in economic, social, and political areas, is eliciting all over the world (Chong et al., 2004; Wenzel et al., 2005; Tan and Enderwick, 2006).

Compared with other professions and the general population, healthcare workers were associated with a lower risk of psychological outcomes compared to the unemployed in our sample. "Learned helplessness"(Seligman, 1972) could explain why health professionals were the least depressed group. After being exposed to inescapable difficult events, people become passive and stop trying after being exposed to events such as uncontrollable bursts of noise (Alloy et al., 1984) and as a result show greater levels of anxiety and depression. On the contrary, health professionals, considered the real heroes of this emergency, were associated with a lower risk of psychological outcomes compared to unemployed participants. Through the practice of their profession, they felt more useful to society, despite their increased risk for infection and transmission (Al-Rabiaah et al., 2020).

After students, the unemployed were at a higher risk of depressive symptoms compared to the other groups (Stuckler et al., 2009; Reeves et al., 2012). This datum is inserted within the context of the COVID-19-related risk unemployment and economic losses and insecurity with the closure of community services and the collapse of industries negatively impacting the national economy. It should be a critical public health priority to prevent suicide. Indeed, during the most recent economic recession, a 1% rise in unemployment was correlated with a rise in the suicide rate of 0.99% in the United States (95% CI: 0.60–1.38, $p < 0.001$) (Reeves et al., 2012). Similarly, each percentage point increase in unemployment was accompanied by 0.79% rise in suicide (95% CI: 0.16–1.42, p = 0.016) in Europeans aged 65 years or less.

As to adherence, people with low adherence were more likely to exhibited depressive symptoms relative to people with a great level of adherence to COVID-19 preventive measures. As expected, adherence has been found to be a protective factor against mental health problems (Hawryluck et al., 2004; Koenig and Schultz, 2010; Brooks et al., 2020). Adopting the preventive behaviors contribute to lower the uncertainty of the epidemic progression which would cause higher psychological pressure on the public. As to worry about being infected with COVID-19, people with more worry were more depressed than people with a low level of worry.

As for the whole sample, also in the subsample of participants with psychotherapeutic treatment history, the same sociodemographic factors and behaviors that contribute to, or mitigate mental effects of the quarantine in terms of depressive symptoms were reported. However, when anxiety symptoms or concomitant stressful events were present in comorbidity, these participants were found to experience higher levels of worry associated with increased depression symptomatology, compared to the whole sample. Current evidence showed similar results. A history of stressful situations and medical problems was associated with a greater degree of depression and anxiety during

the COVID-19 quarantine in the Italian population (Hao et al., 2020). Again, psychiatric patients were significantly more likely to experience a higher degree of the negative mental impact of the outbreak, including stress, anxiety, and depression, compared to the general public (Hao et al., 2020).

CONCLUSION

During the COVID-19 quarantine outbreak in Italy, female participants, younger people, single people, students, people living in northern regions, and who were less compliant with quarantine guidelines and less worried about being infected with COVID-19 were at a high risk of displaying psychological issues. These findings suggest public levels of depressive symptoms did not increase with the greater likelihood of being infected. For example, although female and younger people reported a lower risk of COVID-19 infection, they experienced higher levels of depressive symptoms during the COVID-19 quarantine in Italy.

Therefore, ongoing monitoring of the psychological strain associated with outbreaks of epidemic-potential, life-threatening diseases should become routine as part of preparedness efforts worldwide by establishing early targeted mental health interventions. In other words, more vulnerable groups, likes those cited above, should benefit from personalized "morale-boosting" interventions. Or, intervention research could be valuable to combat amplifications of gender inequalities, particularly to address the added challenges women are likely to face. This research can provide timely insights for government agencies toward improving and safeguarding the psychological well-being of women, younger people, and categories of subjects at a higher risk of suffering from psychological distress on the occasion of subsequent waves of the spread of COVID-19 or other epidemic diseases. This study has several limitations. Firstly, the analyses presented here were derived from a cross-sectional design, thus it is difficult to make causal inferences. Secondly, given that the research was conducted in close temporal proximity to the period of the COVID-19 quarantine, a web-based survey method was necessary to recruit a convenience sample by avoiding possible infections. This limited sampling in our study. As a consequence, a self-selection effect may have occurred and should be considered with those people who were experiencing the greatest or least levels of distress responding to the survey (Saggino et al., 2017). In addition, participants were required to access the internet and to be familiar with online devices to respond, which suggests that they might be more educated, younger or/and have a higher socioeconomic status than the overall surveyed quarantined population. Thirdly, due to the uncontrolled occurrence of this health-related emergency, an accurate picture of the individual's psychological conditions before the COVID-19 outbreak was not conducted. Although it would been interesting to conduct pre-post analyses, these data could provide a baseline for future research on the psychological consequences of quarantine in the Italian population throughout the rest of the current COVID-19 pandemic. Fourthly, depressive and state anxiety symptoms were measured by means self-report inventories that are notably biased by response set, such as social desirability (Innamorati et al., 2014; Carlucci et al., 2015; Balsamo et al., 2018a,b). Thus, future research should include methods, such as observational methods and psychophysiological or behavioral assessment, in order to objectively record the levels of these mood states (Campbell and Fiske, 1959). Fifthly, the assessment of state anxiety could be completed or replaced by adding the specific fear of COVID-19 scale (Ahorsu et al., 2020; Broche-Pérez et al., 2020; Soraci et al., 2020). In addition, it should be acknowledged that the study was carried out was not sufficiently heterogeneous for sex, with marked female preponderance, and age sample, with a prevalence of juveniles. Hence, these findings may not translate accurately to the public at large.

Finally, it could not evaluate whether the outcomes considered in this study will be long-lasting after the COVID-19 outbreak. However, follow-up with these participants will continue in order to facilitate our understanding about how long these outcomes will last. A deeper understanding of how the epidemic affects Italians' psychological health by identifying which groups were at a high risk of psychological morbidities due to the current pandemic can help to guide and target future psychological intervention implementations.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Department of Psychological Sciences, Health and Territory, University of Chieti, Italy, Review Board. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

Both authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.569276/full#supplementary-material

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A Proactive Approach for Managing COVID-19: The Importance of Understanding the Motivational Roots of Vaccination Hesitancy for SARS-CoV2

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Importance: Vaccination hesitancy—the reluctance or refusal to be vaccinated—is a leading global health threat (World Health Organization, 2019). It is imperative to identify the prevalence of vaccination hesitancy for SARS-CoV2 in order to understand the scope of the problem and to identify its motivational roots in order to proactively prepare to address the problem when a vaccine eventually becomes available.

Objective: To identify (1) the prevalence of vaccination hesitancy for a SARS-CoV2 vaccine, (2) the motivational roots of this hesitancy, and (3) the most promising incentives for improving the likelihood of vaccination uptake when a vaccine does become available.

Design, Setting, and Participants: A cross-sectional sample of 3,674 American and Canadian adults assessed during the COVID-19 pandemic in May 2020.

Main Outcomes: Measures of vaccination intention (i.e., "If a vaccine for COVID-19 was available, would you get vaccinated?"), attitudes toward vaccines in general and specific to SARS-CoV2 using the Vaccination Attitudes Examination Scale, and incentives for getting vaccinated for those who reported they would not get vaccinated.

Results: Many American (25%) and Canadian (20%) respondents said that they would not get vaccinated against SARS-CoV2 if a vaccine was available. Non-adherence rates of this magnitude would make it difficult or impossible to achieve herd immunity. Vaccine rejection was most strongly correlated with mistrust of vaccine benefit, and also correlated with worry about unforeseen future effects, concerns about commercial profiteering from pharmaceutical companies, and preferences for natural immunity. When asked about incentives for getting vaccinated, respondents were most likely to report that evidence for rigorous testing and safety of the vaccine were of greatest importance.

Conclusions and Relevance: Vaccination hesitancy is a major looming problem for COVID-19. To improve vaccine uptake, it is imperative that the vaccine is demonstrated to the public to be rigorously tested and not perceived as rushed or premature in its dissemination.

Keywords: COVID-19, SARSCoV2, pandemic, coronavirus, vaccination, vaccination hesitancy, vaccination attitudes

INTRODUCTION

Vaccination hesitancy—the reluctance or refusal to be vaccinated—is among the top ten global health threats (World Health Organization, 2019). It is a major problem for seasonal influenza (World Health Organization, 2019), was a significant problem during the 2009 H1N1 pandemic (Bangerter et al., 2012), and may be increasing in recent years (Yaqub et al., 2014). Vaccination hesitancy is also a growing problem among healthcare workers (Maltezou et al., 2018). In order to proactively manage the COVID-19 pandemic, it is important to identify the prevalence of vaccination hesitancy for SARS-CoV2. A review of 12 studies found that the mean R_0 for COVID-19 virus is 3.28 (Liu et al., 2020), suggesting that the threshold for achieving herd immunity ($1–1/R_0$) is 70% (Fine et al., 2011). Since people who refuse vaccination are not randomly dispersed (i.e., they tend to occur in clusters) (Fine et al., 2011), more than 70% of people in a community would need to be vaccinated in order to achieve herd immunity.

Mandatory vaccination is unlikely to be a viable option in individualistic societies due to increasing anti-vaccination sentiment (Taylor, 2019). If vaccination hesitancy for SARS-CoV2 is prevalent, then it is important to identify the motivational roots (i.e., attitudes or reasons) underlying the reluctance (Hornsey et al., 2018) and ways to address these. Public education programs (e.g., "do it for the herd") can be helpful to some extent (Taylor, 2019); but, identifying motivational factors for vaccination hesitancy and then proactively tailoring public health messaging and incentives to address these factors prior to beginning an immunization program may improve overall vaccine uptake (World Health Organization, 2020).

The purpose of this study was to assess a population-representative sample of adults from the United States and Canada in order to identify (1) the prevalence of vaccination hesitancy for a SARS-CoV2 vaccine when one does become available, (2) the motivational roots of this hesitancy, and (3) the most promising incentives for improving the likelihood of vaccination uptake when a vaccine does become available.

MATERIALS AND METHODS

Design

A cross-sectional design was used in which participants completed an internet-based battery of questionnaires, including demographic questions and measures of vaccination intention, attitudes, and incentives.

Sample and Data Collection Procedures

Data were collected from May 6–19, 2020, from 3,674 adults recruited from communities in the United States (n = 1,772) and Canada (n = 1,902) using an internet-based self-report survey delivered in English by Qualtrics, which is a commercial survey sampling and administration company. Qualtrics maintains a pool of potential participants who have agreed to be contacted in order to respond to surveys. For the present study, Qualtrics selected and contacted participants to meet sampling quotas based on age, gender, ethnicity, socioeconomic status, and geographic region within each country to obtain a representative sample. Filters were used to eliminate data from careless or incomplete responses. Respondents received credit points for participation, similar to points in a credit card rewards program, which could be converted into currency. For the present study, respondents received credit points equivalent to US$7.00 for participating in the online study. All respondents provided written informed consent prior to completing the survey. All procedures followed were in accordance with the standards of the Helsinki Declaration. The research described in this article was approved by the Research Ethics Board of the University of Regina (REB# 2020-043).

Measures

Vaccination attitudes were measured using two versions of the Vaccination Attitudes Examination Scale (Martin and Petrie, 2017), assessing general vaccination attitudes and attitudes specific to SARS-CoV2. Both versions contain four subscales, including mistrust of vaccine benefit, worries over unforeseen future effects of the vaccine, concerns about commercial profiteering from the vaccine, and preference for natural immunity.

Regarding the assessment of vaccine uptake, vaccination is a binary event (i.e., a person does or does not get vaccinated); accordingly, participants answered a forced-choice yes/no question to measure vaccination intention: "If a vaccine for COVID-19 was available, would you get vaccinated?" A "don't know" or "uncertain" response option was omitted because it simply defers endorsing a decision.

Incentives for getting vaccinated were assessed only for people who responded "no" to the measure of vaccination intention (incentives were not assessed for "yes" responders because they were not in need of additional vaccination incentives). "No" responders were presented a list of 21 incentives (**Table 1**) and asked to rate whether each would increase their chances of getting vaccinated using a 5-point scale (0 = definitely would not, 4 = definitely would). The relative efficacy of each incentive was

calculated by computing the percentage of respondents who gave a rating of 3 or 4 ("probably would" or "definitely would").

RESULTS

A total of 43% of the sample were female, most (92%) were employed full- or part-time, and most (82%) had completed full or partial college. Most (69%) were Caucasian, with the remainder being Asian (12%), African American/Black (9%), Latino/Hispanic (6%), or other (5%). Only 2% of the sample reported being diagnosed with COVID-19, and only 3% were healthcare workers who might come into contact with patients infected with SARS-CoV2. Sample mean age was 53 years (SD = 15 years, range 18–94 years). According to American and Canadian census records, the population mean age (including children and adults) is approximately 40 years (Statistics Canada, 2020; United States Census Bureau, 2020). The mean age of sample is what would be expected from a population representative sample consisting only of adults.

In response to the question of whether participants would get vaccinated against SARS-CoV2, if a vaccine was available, 25% of Americans and 20% of Canadians said "no." Significantly more Americans than Canadians said that they would not get vaccinated, $\chi^2(df = 1) = 12.41$, $p < 0.001$. **Table 1** shows the correlations between vaccination intention (1 = no, 0 = yes) and negative attitudes toward vaccination. All of the negative attitudes toward a SARS-CoV2 vaccination, and vaccinations in general, were significantly correlated ($p < 0.001$) with the decision to not get vaccinated against SARS-CoV2. The largest correlation was between "no" to vaccination and mistrust of the benefit of a SARS-CoV2 vaccine. This correlation was significantly larger than all of the other correlations in **Table 1** ($p < 0.001$). These correlations were moderate-to-large in magnitude (rs > 0.30), according to Cohen's classification (Cohen, 1988).

According to Cohen's classification, correlations of 0.20 are considered small. Given the sample size, trivially small correlations (<0.20) were statistically significant. This was the case concerning the correlation between vaccination refusal and demographic variables, which were statistically significant but trivial in magnitude: Female gender $r = 0.10$, $p < 0.001$; age $r = 0.11$, $p < 0.001$; completed full or partial college education (vs. did not complete) $r = 0.10$, $p < 0.001$, unemployed r = −0.050, $p < 0.005$, minority status (vs. Caucasian) $r = -0.04$, $p < 0.05$.

For respondents indicating they would not get vaccinated against SARS-CoV2, **Table 2** shows the percentage who probably would/definitely would get vaccinated if incentives were provided. Consistent with the finding that the strongest correlate of vaccination refusal was concern about the benefit of the vaccine, the most efficacious incentives were those providing evidence that the vaccine was safe and efficacious. In other words, the most efficacious incentives were those that matched the motivational roots of vaccination hesitancy for a SARS-CoV2 vaccine. The least efficacious incentives involved promotions for vaccine uptake from social media, news media, or from community leaders.

TABLE 1 | Point-biserial correlations between the decision to not get vaccinated against SARS-CoV2 and negative attitudes about a SARS-CoV2 vaccine and vaccines in general.

Type of negative attitude	Concerning SARS-CoV2 vaccine	Concerning vaccines in general
Mistrust of vaccine benefit	0.64*	0.42*
Worry about unforeseen future negative effects	0.33*	0.33*
Concerns about commercial profiteering	0.43*	0.37*
Preference for natural immunity	0.43*	0.30*

*$p < 0.001$.

DISCUSSION

Anticipating and preparing for problems concerning vaccination adherence when a vaccine for SARS-CoV2 becomes available is

TABLE 2 | Respondents stating that they would *not* get vaccinated against SARS-CoV2 (n = 812): Percentage reporting that the following incentives would probably or definitely induce them to get vaccinated.

Incentive	% Probably or definitely would get vaccinated
If I was convinced that the vaccine had been rigorously tested	38
If I saw that enough people were safely vaccinated without negative side effects	36
If I saw that enough people who got the vaccine didn't get sick with COVID-19	34
If I saw that my friends and family didn't have negative side effects from the vaccine	34
If getting vaccinated was a requirement for my job	31
If I thought the health authorities were trustworthy	29
If I was convinced that getting vaccinated helped protect vulnerable members of my community	25
If getting vaccinated was required by my government	25
If a trusted health care worker told me to get vaccinated	22
If I knew that I was not being exploited by the pharmaceutical industry	19
If getting vaccinated was required for me to attend social or sporting events	19
If someone I knew died from COVID-19	18
I received a financial incentive	18
If I was assured that the government wasn't controlling the vaccine	17
If someone I knew got sick with COVID-19	16
If someone I knew was hospitalized because of COVID-19	16
If I received some other incentive (e.g., discount coupon)	8
If a news source that I trust promoted vaccination	8
If religious leaders in my community said I should get vaccinated	6
If my President or Prime Minister promoted the vaccine	6
If vaccination was promoted in my social media network	4

a critical step in managing the COVID-19 pandemic. Research suggests that greater than 70% of the population will need to be vaccinated against SARS-CoV2 to achieve herd immunity (Fine et al., 2011). Our research suggests that 25% of Americans and 20% of Canadians would reject a SARS-CoV2 vaccine, raising concerns that herd immunity might not be attained when a vaccine becomes available.

The degree of vaccination hesitancy found in the present study is broadly consistent with other studies that were published after our study had been completed. Studies conducted during March–April 2020, which was somewhat earlier than the present study (May, 2020), reported findings broadly similar to ours in terms of percentages of people who stated that they would not get vaccinated against SARS-CoV2: Italy (14%) (Barello et al., 2020), France (26%) (COCONEL Group, 2020), and Australia (14%) (Dodd et al., 2020). In a European survey in June, 2020, 24% of respondents stated that they were either unwilling or unsure about getting vaccinated (Neumann-Böhme et al., 2020). More recent surveys (August–September, 2020) in the United States and Britain suggest that upward of 50% of people would not get vaccinated (Bracken, 2020; McKie, 2020). Thus, vaccination hesitancy is an important and possibly growing problem.

Another concerning finding from the present study is that rejection of a SARS-CoV2 vaccine was associated with negative attitudes toward vaccination in general. If SARS-CoV2 persists during the forthcoming influenza season, then people might need to be vaccinated against both SARS-CoV2 and seasonal influenza. There could be devastating consequences, with widespread seasonal infection of both viruses, if people with negative attitudes about vaccination reject both vaccines. In our study, rejection of vaccination against SARS-CoV2 was correlated with a range of negative attitudes about a SARS-CoV2 vaccine, and vaccines in general, with the strongest correlation regarding mistrust about the benefits of a SARS-CoV2 vaccine. The public has been exposed to false hopes about COVID-19 treatments, such as the use of hydroxychloroquine (U.S. Food & Drug Administration, 2020), undermining confidence in the recommendations of community leaders. Our research suggests that exposure to authoritative information is a stronger incentive for vaccination than mere endorsements from community leaders or social media influencers.

Consistent with the present study, other studies appearing after our study had been completed have found that vaccination hesitancy is associated with negative attitudes toward a SARSCoV2 vaccine, including concerns about safety and efficacy (Fisher et al., 2020; Neumann-Böhme et al., 2020; Palamenghi et al., 2020), and doubts about the necessity for vaccination (Dodd et al., 2020). Findings from the present study, along with results from previous studies, have important implications for public policy. In order to maximize the uptake of a SARSCoV2 vaccine, when such vaccine becomes available, it is important to address the various anti-vaccination beliefs identified in the present study and in other recent investigations. Across studies, a commonly identified concern is that the risks might outweigh the benefits. Our research found that participants would be more likely to get vaccinated if they were persuaded that the vaccine had been rigorously tested (**Table 2**). In order to maximize vaccine uptake, health authorities need to reassure the public that vaccine development has followed all the preestablished guidelines and that the process of developing a vaccine has not been rushed. If the public perceives that health authorities are hastily rushing a SARS-CoV2 vaccine into production, then this would undermine public confidence and exacerbate vaccination refusal. Our findings suggest that the most important way of ensuring vaccine uptake is to provide the public with convincing evidence that a SARS-CoV2 vaccine has been rigorously tested, shown to be effective, and is not perceived as being rushed into production. Unfortunately, the vaccine production program by the U.S. Department of Health and Human Services is called "Operation Warp Speed"[1]. For people in the community who are worried that the vaccine production process has been excessively rushed, the name "Operation Warp Speed" sends a disturbing message; it suggests that due diligence has not been followed and that there has not been sufficient evaluation of the comparative risks and benefits. Mistrust of health authorities is an important deterrent to vaccination uptake (Taylor, 2019). Vaccination development and dissemination programs with more reassuring titles would be more likely to engage the public trust (e.g., calling the program "Operation Due Diligence" instead of "Operation Warp Speed").

The present study has various strengths and limitations. In terms of strengths, the sample was large and the study provides new information on barriers and incentives for people to get vaccinated against SARSCoV2. A limitation of the study is the cross-sectional nature of the design. It is possible that COVID-19-related vaccination attitudes may change over time, especially if governments or health authorities launch pro-vaccination public education programs. This remains to be investigated in future research. The question of whether vaccination attitudes differ across different ethnic or cultural groups also remains to be investigated. Additional research is also needed to investigate whether variables other than those investigated in the present study are association with vaccination hesitancy. Such variables might include health literacy and other individual difference variables. The question of whether the findings of the present study can be generalized across different countries and cultures also remains to be investigated.

Another limitation of this study is that political affiliation was not measured. Other surveys suggest that people who oppose a SARS-CoV2 vaccine are more likely have Conservative or Republican political affiliations than Liberal or Democrat affiliations in both the United States and Canada (Angus Reid Institute, 2020; Gallup, 2020). A further limitation is that we assessed vaccinations intentions rather than actual vaccination behaviors. This was unavoidable as a vaccine for SARS-CoV2 was not available at the time of this study. The study was conducted under the premise that it is more important to be proactive in addressing forthcoming vaccination problems than to be reactive in an attempt to deal with problems as they arise.

[1]https://www.hhs.gov/coronavirus/explaining-operation-warp-speed/index.html, accessed September 19, 2020.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by University of Regina Research Ethics Board. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

ST and GA contributed equally to this article in terms of study conceptualization, design, and procurement of funding. CL and MP organized data collection. RG contributed to the development of the assessment materials. ST analyzed the data. All authors contributed to the writing of the manuscript.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Psychotherapy During COVID-19: How the Clinical Practice of Italian Psychotherapists Changed During the Pandemic

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Aims: Italy was one of the first countries to be significantly affected by the coronavirus disease 2019 (COVID-19) pandemic, determining a unique scenario for Italian psychotherapists to consider changing the modality in which they deliver treatment. The present study aimed at studying which factors related to psychotherapists and their clinical practice had a major role in predicting two main outcomes: (1) the rate of interrupted treatments during lockdown and (2) psychotherapists' satisfaction with the telepsychotherapy modality.

Methods: An online survey was administered to licensed psychotherapists (n = 306), who worked mainly as private practitioners, between April 5 and May 10, 2020 (i.e., the peak of the pandemic in Italy).

Results: Psychotherapists reported that 42.1% (SD = 28.9) of their treatments had been interrupted, suggesting that Italy faced an important undersupply of psychotherapy during the lockdown. Using the Akaike information criterion (AIC) model selection, we identified three predictors of the rate of interrupted treatments: (1) psychotherapists' lack of experience with telepsychotherapy prior to the lockdown, (2) their theoretical orientation (with cognitive behavioral psychotherapists reporting a higher rate of interrupted treatments), and (3) patients' lack of privacy at home, as reported to the psychotherapists. Furthermore, we found four predictors of psychotherapists' satisfaction with the telepsychotherapy modality: (1) the rate of interrupted treatments, (2) psychotherapists' previous experience with telepsychotherapy, (3) their beliefs about the compatibility of telepsychotherapy with their theoretical orientation, and (4) their use of a video-conferencing modality, rather than telephone.

Conclusion: The following recommendations can help policy makers, professional associations, and practitioners in promoting the continuity of psychotherapy treatments during the COVID-19 outbreak and in future emergencies: (i) disseminating training programs for practitioners on telepsychotherapy, (ii) supporting patients to pragmatically access a private space at home, (iii) encouraging practitioners to use video-conferencing (instead of telephone) to deliver remote therapy, and (iv) increasing the acceptance of telepsychotherapy among both clinicians and the general public.

Keywords: telepsychotherapy, COVID-19, public health, remote psychotherapy, psychotherapy

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INTRODUCTION

Italy was one of the first countries to be severely affected by the coronavirus disease 2019 (COVID-19). Beginning on February 23, 2020, the Italian government took strong actions to restrict residents' freedom, aimed at reducing the contagion. The most severe of these restrictions was the imposition of a nationwide lockdown in early March. This lockdown caused unprecedented changes in daily personal and professional activities, forcing Italian residents to avoid unnecessary face-to-face interactions and social gatherings, as well as limiting their movement to the strictly necessary.

Along with other healthcare treatments, psychotherapy was not subject to the full government restrictions, with the exception of general precautions (i.e., as outlined in the Italian Ministerial Decree of March 8, 2020). However, while it remained possible to maintain in-person psychotherapy sessions, doing so was practically challenged in private clinics and public health systems, considering that face-to-face meetings could increase the risk of infection for both therapists and patients; thus, the National Council of Psychologists CNOP) explicitly invited psychologists and psychotherapists, as far as possible, to provide their professional services *via* digital devices to guarantee the continuation of previously active therapeutic treatments and to ensure the mental health support for diseases linked to pandemic and quarantine. Guidance and regulation for telepsychology in Italy was provided in a document on recommendations for telepsychology [National Council of Psychologists (CNOP), 2017], which did not forbid any online psychological practices, and provided specific guidelines regarding deontological norms, informed consent, privacy and correct identification of users, and emergency situations management (i.e., recommending therapist to obtain emergency numbers and contact details of places offering support that are close by the place where a patient logs in or telephones). The natural consequence of this extraordinary situation was that a primary element of psychotherapy – the setting – was subject to renewed reflection. Specifically, the crossroad at which psychotherapists found themselves was defined by a choice between using telepsychotherapy – which offered the possibility of continuing therapy – or temporarily interrupting treatment.

At this historical time, the continuity of care for psychological treatment is pivotal. A recent study by Brooks et al. (2020) documented an increase in mental health disorders due to the COVID-19 pandemic, including self-reported symptoms of anxiety and depression (16–28%), and stress (8%), frequently in association with a sleep disorder (Rajkumar, 2020).[1] Evidence suggests that telepsychotherapy could represent a safe and efficacious alternative to physical treatment during the pandemic (Swartz, 2020; Wind et al., 2020). Poletti et al. (2020) reviewed the results of 18 empirical studies in which psychotherapy was provided *via* synchronous web technology. Interestingly, the authors reported that telepsychotherapy was substantially equivalent to face-to-face psychotherapy in its efficacy for treating common mental health disorders (Poletti et al., 2020). In particular, research has found telepsychotherapy to be effective in treating anxiety (Catarino et al., 2018), depressive (Egede et al., 2015; Catarino et al., 2018), and posttraumatic symptoms (Wierwille et al., 2016). Of note, patients who attend telepsychotherapy treatments report similar perceived quality of life, satisfaction, and treatment credibility as those enrolled in face-to-face psychotherapy (Egede et al., 2015).

Conversely, despite the evidence for its effectiveness, negative attitudes about telepsychotherapy are prevalent (see also Varker et al., 2018). Survey studies have reported that approximately half of all respondent psychotherapists perceive telepsychotherapy as less effective than face-to-face psychotherapy (Gordon et al., 2015, 2016; Schulze et al., 2018). Indeed, there are ethical arguments against the seamless implementation of online therapy, including (1) privacy, confidentiality, and security issues, (2) therapist competence and need for special training, (3) communication issues specific to technology, (4) research gaps, and (5) emergency issues (Stoll et al., 2020).

Moreover, patients have been found to express a low willingness to use telepsychotherapy (Apolinário-Hagen et al., 2017; Hantsoo et al., 2017), especially when they have already experienced face-to-face psychotherapy (Hantsoo et al., 2017). General skepticism toward telepsychotherapy is also present and is particularly strong among practitioners. In a sample of 1,791 US psychotherapists, nearly 80% reported that they did not use telepsychotherapy within their own practice (Pierce et al., 2019). Overall, learning curves in the adoption of new e-mental health technologies by both patients and psychologists have progressed far more slowly than initially expected, thus tallying with the estimate that it takes, on average, 16 years for a healthcare innovation to be implemented (Rogers et al., 2017). However, this prevision has been dramatically disproved by the COVID-19 lockdown, which has led to significant and swift changes in clinical practice. This, in turn, has given rise to a unique opportunity to study the consequences of a sudden, large-scale, massive setting transition towards telepsychotherapy.

As Italy was one of the first countries to experience forced changes in clinical activities due to the COVID-19 pandemic, the aim of the present investigation was to provide a picture of the scenario and to delineate which factors played a pivotal role in promoting better telepsychotherapy interventions at this time. In doing so, the investigation sought to generate knowledge to guide other countries struggling with the pandemic. For this purpose, we focused on two outcomes: (1) the rate of interrupted treatments (i.e., failure in the implementation of telepsychotherapy treatments) and (2) psychotherapists' satisfaction with the telepsychotherapy modality. In particular, we collected information related to the psychotherapists (e.g., sociodemographic characteristics, theoretical orientation, and treatment modality), their clinical practice (e.g., their selected

[1]A growing body of literature found out the potential consequences of the COVID-19 pandemic scenario also in people with pre-existing mental health disorders (e.g., Moreno et al., 2020). For example, people with anxiety-related or mood disorders resulted in being significantly affected than others, reporting greater fear about the danger of contamination, socioeconomic consequences, xeno-phobia, and traumatic stress symptoms (Asmundson et al., 2020). Similarly, individuals at high clinical risk for psychosis may be prone to exacerbate psychological distress (DeLuca et al., 2020), as a result of heightened stress sensitivity and comorbid mental health problems (Boldrini et al., 2019).

modality for delivering remote psychotherapy sessions, previous experience with telepsychotherapy), and their general beliefs about telepsychotherapy (e.g., their perception of the compatibility of their theoretical orientation to the online modality), as these factors were thought to play a role in determining the selected outcomes.

MATERIALS AND METHODS

Study Design

An online survey designed in Qualtrics was administered to licensed psychotherapists in Italy, using snowball sampling techniques. Data were collected from April 5 to May 10, 2020 – during the peak of the pandemic in Italy, approximately 5 weeks from the beginning of the lockdown and just before the second phase of restrictions easement (e.g., to allow access to church services, weddings, salon services, and short-term hospitality without boarding).

Participation in the research was voluntary, and no incentives were provided. All participants provided informed consent by agreeing to the data protection declaration prior to starting the survey. The principles outlined in the Declaration of Helsinki were followed, ensuring anonymous participation through the administration of the informed consent format of the ethics committee of the University of Padua (GDPR EU 2016, pd. 196/03).

Description of Study Participants

A sample of 308 psychotherapists [84% female; mean age = 45.1 (SD = 10.2)] completed the survey. The geographical provenance of the respondents was pretty homogeneous (Northern Italy = 37%, Central Italy = 35%, Southern Italy = 28%). Participants had been registered psychotherapists in Italy for mean = 12.9 (SD = 8.5) years, and they typically (i.e., before the COVID-19 lockdown) treated an average of 21.8 patients (SD = 16.3) per month. Their psychotherapeutic orientations were as follows: psychodynamic (60.8%), cognitive behavioral (16.1%), systemic (8.6%), humanistic (11.7%), and integrated (2.27%). Individual psychotherapy was the preferred treatment modality of 49.1% of the clinicians; 32% saw mostly families and couples; and the rest (18%) specialized in group therapy. The enrolled psychotherapists performed their work mainly as private practitioners (58.4%), with most of the rest (32%) working in hospitals or mental health services in addition to private practice (see also **Figure 1**). Finally, the majority of the enrolled psychotherapists, under ordinary circumstances (i.e., before the COVID-19 lockdown), received clinical supervision: 38% received one supervision session per month, 36.3% received two to four sessions per month, and 5.34% received more than four sessions each month. The remaining psychotherapists (20.3%) received no supervisions. Information about the therapists' clinical practice is summarized in **Figure 1**.

Measures

The survey comprised 45 items in total, and it took respondents approximately 8 min to complete. Given the aim of the present study, we analyzed only a portion of all the items of the survey. In addition to collecting sociodemographic characteristics and information about the psychotherapists' working practices (as reported above), the survey also asked respondents to report the proportion of their interrupted treatments since the COVID-19 lockdown, as well as the relative proportions of their patients whom they currently treated face-to-face, *via* telephone, and *via* video-conferencing. Respondents were also asked to rate their personal beliefs about telepsychotherapy, in terms of its compatibility with their therapeutic orientation, and their personal satisfaction with it. Additional items evaluated respondents' previous experience with video psychotherapy and if their patients reported a lack of access to private space at home.

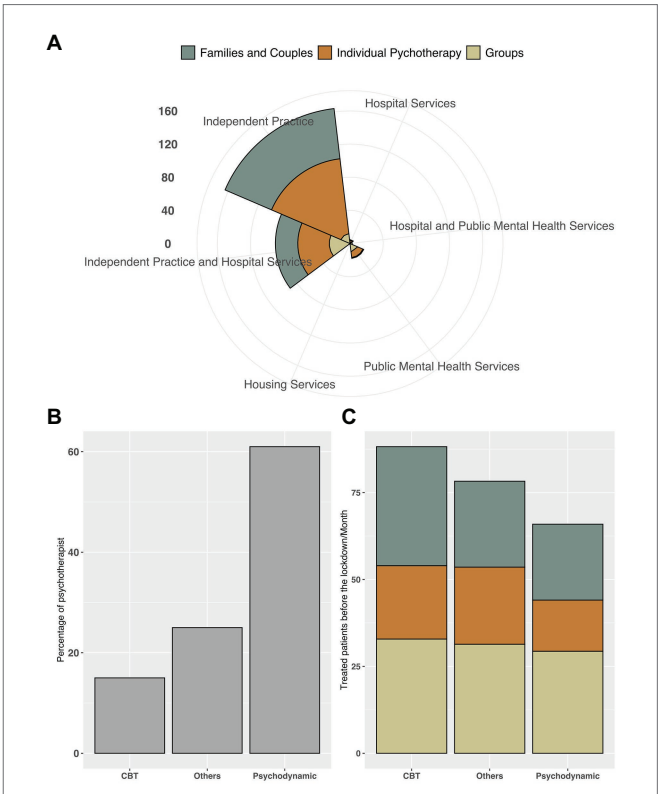

FIGURE 1 | The respective plots depict **(A)** the number of patients in treatment during the month prior to lockdown as a function of psychotherapists' work settings (i.e., independent practices, hospitals, public mental health, and housing services) and patient orientation (i.e., family and couples, individual, and group); **(B)** psychotherapists' theoretical orientations [i.e., psychodynamic, cognitive behavioral therapy (CBT), and "other"]; and **(C)** the proportion of patients in treatment in the month prior to lockdown, as a function of clinicians' theoretical orientation (i.e., psychodynamic, CBT, and "other") and patient orientation (i.e., family and couples, individual, and group).

Statistical Analysis

In the following analyses, we adopted a model selection strategy based on the Akaike information criterion (AIC; Wagenmakers and Farrell, 2004). The AIC (Akaike, 1973) is a powerful metric derived from information theory that identifies the relative quality of each model within a set of candidate models

(i.e., the lower the AIC, the higher the model quality, after controlling for model complexity).

Each full model was compared with simpler versions by removing predictors until an intercept-only model was reached. After identifying the best model (with the lowest AIC), we regressed participants' responses on the same set of regressors. Significant effects were explored with *post hoc* pairwise contrast using the Wald test, corrected for multiple comparisons using the false discovery rate (Benjamini and Hochberg, 1995).

The analyses were performed using the software R (2.13) with the lm function from the car package (Fox and Weisberg, 2019).

RESULTS

Changes in the Provision of Psychotherapy During the COVID-19 Lockdown

With respect to psychotherapists' changes in clinical practice during the COVID-19 lockdown, respondents reported that 42.1% (SD = 28.9) of their psychotherapy treatments were interrupted during the lockdown.[2] The remainder of their treatments was primarily delivered *via* online video [63.7% (SD = 38.3)] or telephone [29.1% (SD = 25.3)]. Only 7.2% (SD = 15.1) of their treatments were delivered face-to-face, while taking precautionary measures (e.g., wearing masks and gloves).

Predictors of a Higher Rate of Interrupted Treatments

The rate of interrupted treatments was estimated *via* a linear model. Data were fit to one model, which included respondents' therapeutic modality (individual vs. couples and families vs. groups), theoretical orientation [psychodynamic vs. cognitive behavioral therapy (CBT) vs. "other"], clinical experience (in years), previous experience with telepsychotherapy (frequent vs. rare vs. none), beliefs about the compatibility of telepsychotherapy with their own theoretical orientation (yes vs. no), and frequency of supervisions received before the outbreak (none vs. once vs. one to four vs. more than four per month), as well as patient's reported lack of privacy at home (yes vs. no) as predictive variables, as well as the interactions between these variables.[3]

Model comparisons showed that the best model for explaining the data observed for the rate of interrupted treatments included clinicians' previous experience with telepsychotherapy, clinicians' theoretical orientation, and patient's reported lack of privacy at home as predictive variables (AIC = 2,656.3, logL = −1,320.12, ΔAIC = 35.02).[4]

We regressed participants' responses to these sets of regressors and found a significant difference predicted by clinicians' previous experience with telepsychotherapy (b = −11.53, SE = 3.47, p = 0.001), suggesting that the rate of interrupted treatments was significantly lower when psychotherapists reported having frequently used telepsychotherapy prior to the COVID-19 outbreak (μ = 22.3; SD = 21.75); the opposite was true when psychotherapists reported having never used this modality (μ = 50.50; SD = 29.94). Notably, a significant difference was also present for psychotherapists who reported having used this modality rarely (μ = 39.54; SD = 26.40), compared to those who reported either frequent or no previous experience with telepsychotherapy. Furthermore, the model showed a significant difference depending on respondents' theoretical orientation (b = −12.04, SE = 4.75, p = 0.01), whereby those with a psychodynamic approach reported a lower rate of interrupted treatments (μ = 39.82; SD = 28.86), compared to those practicing CBT (μ = 48.6; SD = 31.11). However, this difference was not significant with those characterized as having an "other" clinical orientation. Finally, we found a significant effect of patients' reported lack of privacy at home (b = 10.37, SE = 3.77, p = 0.006), suggesting that psychotherapists with patients lacking private space at home (μ = 48.31; SD = 31.45) experienced a significantly higher rate of interrupted treatments compared to those who did not report the same issue (μ = 39.86; SD = 27.74; **Figure 2** and **Supplementary Table S1**).

Predictors of Therapists' Satisfaction With Telepsychotherapy

Participants' satisfaction was estimated *via* a generalized linear effect binomial model because the outcome variable (yes vs. no) was dichotomous. Data were fit in a model that included respondents' theoretical orientation (psychodynamic vs. CBT vs. other), clinical experience (in years), previous experience with telepsychotherapy (frequent vs. rare vs. none), beliefs about the compatibility of telepsychotherapy with their own theoretical orientation (yes vs. no), rate of interrupted treatments, dropped clinical supervisions (none vs. half vs. more than the half vs. all), use of the telephone, use of video-conferencing, and therapeutic modality (individual vs. couples and families vs. groups) as predictive variables, as well as the interactions between these variables.[5]

Model comparison showed that the model that best explained the data observed for perceived satisfaction included the rate of interrupted treatments, previous experience with

[2]Therapists were asked to consider the all number of patients treated before the lockdown and to report (on different sliders, which could vary between 0 and 100%) the percentages of (i) interrupted treatments, (ii) treatments currently delivered by video call, (iii) by telephone, and (vi) face-to-face. Thus, all the distributions reported in *Changes in the Provision of Psychotherapy During the COVID-19 Lockdown* should be interpreted as the means and standard deviations of the percentages reported by enrolled therapists to the number of patients treated before the lockdown.

[3]The full model for the rate of interrupted treatments was as follows: rate ~ theoretical orientation × clinical experience × experience with online × theoretical compatibility × supervision + patient's privacy (in Wilkinson notation).

[4]The ΔAIC was computed as the difference in AIC between the best ranked model and the null model, representing the difference in quality between the models.

[5]The full model for satisfaction was as follows: satisfaction ~ theoretical orientation + experience with online + theoretical compatibility + rate of interrupted treatments + dropped of supervision + telephone modality × clinical experience + video call modality × clinical experience + therapeutic modality (in Wilkinson notation).

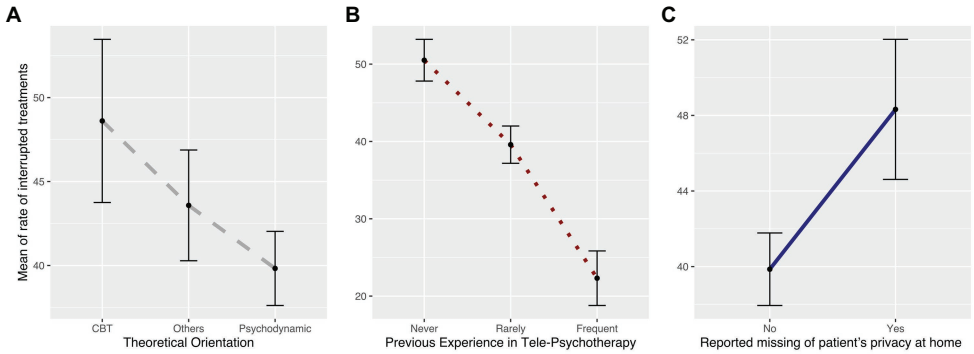

FIGURE 2 | The plots depict the parameters selected as the best predictors of the rate of interrupted treatments. In particular, they represent differences between **(A)** theoretical orientations (i.e., psychodynamic, CBT, and "other"); **(B)** psychotherapists' use of telepsychotherapy prior to the lockdown (i.e., none, rare, and frequent); and **(C)** patients' lack of privacy at home, as reported to psychotherapists (i.e., yes, no).

telepsychotherapy, theoretical compatibility, and use of video-conferencing as predictive variables (AIC = 305.5, logL = −146.618, ΔAIC = 2,386.01).

We regressed participants' responses to these sets of regressors and found a significant difference in satisfaction determined by psychotherapists' rate of interrupted treatments (b = −0.01, SE = 0.005, p = 0.02), whereby the more satisfaction they declared, the less dropout they reported. We also found a significant effect of previous experience with telepsychotherapy (b = 2.43, SE = 1.05, p = 0.02), indicating that psychotherapists who reported having frequently used telepsychotherapy prior to the COVID-19 lockdown had significantly higher satisfaction (μ = 0.97; SD = 0.16) than those who reported having never used this modality (μ = 59.35; SD = 29.94). Notably, a significant difference was also found for psychotherapists who reported having rarely used this modality (μ = 0.51; SD = 0.50), compared to those who had either frequent or no previous experience with telepsychotherapy. Furthermore, the model showed a significant effect of theoretical compatibility (b = 1.62, SE = 0.38, p < 0.001), suggesting that psychotherapists who perceived their theoretical orientation as compatible with the telepsychotherapy modality (μ = 0.69; SD = 0.46) were more satisfied than those who perceived their orientation as incompatible (μ = 0.26; SD = 0.44). The model also revealed a significant effect of the number of video-conference calls (b = 0.01, SE = 0.004, p = 0.01), showing that the more psychotherapists provided sessions *via* video-conferencing, the more satisfaction they reported (**Figure 3**; **Supplementary Table S2**).

DISCUSSION

The present study aimed at identifying the most significant factors in delivering psychotherapy during the COVID-19 lockdown in Italy. In this vein, we sought to both describe the situation for psychotherapy during the peak of the pandemic in Italy and provide guidance for countries still facing (or likely to face) a similar situation as that experienced in Italy.

The first outcome of the present study considered the rate of interrupted treatments (as reported by psychotherapists), suggesting the degree of failure in implementing telepsychotherapy. Psychotherapists reported that 42.1% of their treatments had been interrupted, suggesting that, during the COVID-19 lockdown, there was an important undersupply of psychotherapy. These data are even more surprising, because the majority of participants worked exclusively (58.4%) or mainly (32%) as private practitioner, so they could potentially quickly rethink their clinical practice without having to conform to the slower reorganization that impacted on public mental health services and hospitals. A similar reduction in psychotherapy was observed in Austria, where a decline in face-to-face sessions was compensated by a reported increase in telepsychotherapy in the early weeks of the COVID-19 lockdown – even though the increase was not sufficient to cover the full proportion of interrupted treatments (Probst et al., 2020). On the contrary, a survey study conducted in the Czech Republic, Germany, and Slovakia did not observe psychotherapy dropout during the pandemic (Humer et al., 2020). Notably, the present study was conducted during the peak of the pandemic, after the Italian government imposed strong limitations on personal movement; in contrast, no curfews existed in the aforementioned survey study at the time of data collection (Humer et al., 2020). This mismatch in the study conditions substantially limits our ability to compare findings.

The present analyses focused on identifying the predictive factors of treatment interruption, emphasizing that both therapists and patients play a role in this outcome. In particular, the model of best fit suggested that psychotherapists' lack of experience with telepsychotherapy prior to the lockdown was an essential factor in predicting the rate of interrupted treatments. It is reasonable to assume that a lack of experience with telepsychotherapy may have threatened clinicians' professional self-confidence (Poletti et al., 2020). Further, a lack of familiarity with using technology to provide video-conferencing psychotherapy (present in 43.8% of our sample) could have represented a barrier to providing remote treatment,

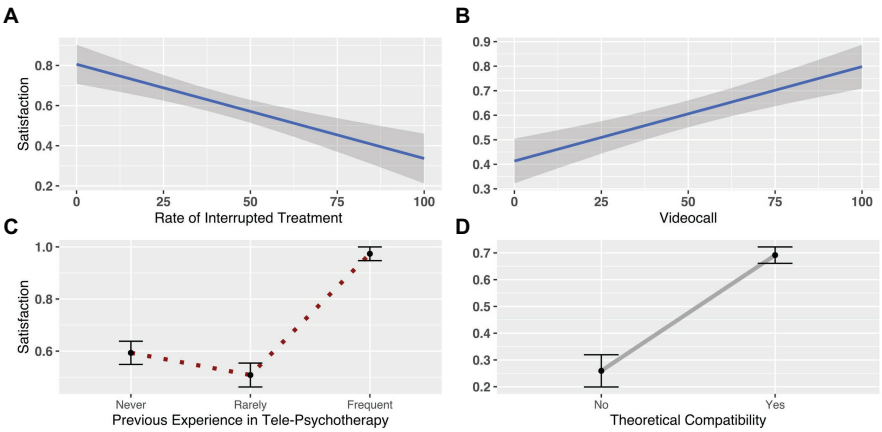

FIGURE 3 | The plots depict the parameters selected as the best predictors of differences in psychotherapists' satisfaction with telepsychotherapy. In particular, the respective plots represent the variation in perceived satisfaction according to **(A)** the rate of interrupted treatments; **(B)** the use of video-conferencing to deliver sessions; **(C)** psychotherapists' use of telepsychotherapy prior to the lockdown (i.e., none, rare, and frequent); and **(D)** psychotherapists' beliefs about the compatibility of telepsychotherapy with their theoretical orientation (i.e., yes, no).

as suggested by previous research (Rössler et al., 2011; Cipolletta et al., 2017; Etzelmueller et al., 2018). This finding is corroborated by evidence that therapists who have received specific training in delivering telepsychotherapy are more likely to adopt this treatment modality (Pierce et al., 2020). Given that COVID-19 may impact nearly everyone in the world, the need for psychological support is fundamental (Duan and Zhu, 2020). Thus, the dissemination of training programs on telepsychotherapy and video-conferencing technology by professional associations may be crucial for countries affected by the pandemic, in order to prevent an undersupply of psychotherapy treatment.

A secondary relevant aspect shown in our analyses related to patients. Although the information we obtained on patients' conditions was derived from psychotherapists, the data suggested that patients' reported lack of private space at home presented a significant barrier to the implementation of telepsychotherapy. According to this finding, the continuation of therapeutic work may require therapists to pragmatically discuss with their patients the incidental difficulties in achieving an intimate, reassuring, and safeguarded setting in which to participate in telepsychotherapy sessions.

Moreover, we found a significant effect of theoretical orientation on the rate of interrupted treatments, with psychodynamic therapists reporting a lower rate than CBT therapists. This result is unexpected, since previous studies have found CBT clinicians to be more accepting of telehealth interventions than psychodynamic therapists (e.g., Perle et al., 2012), and similar evidence is deducible from the higher number of studies on CBT delivered remotely (e.g., Egede et al., 2015; Zerwas et al., 2017; Catarino et al., 2018; Etzelmueller et al., 2018).

The second focus of the present investigation was psychotherapists' satisfaction with telepsychotherapy. As expected, the rate of interrupted treatments represented a negative predictor, as it implied a withdrawal of therapists' professional duties and consequent financial damage. Importantly, among the two different modalities for delivering remote sessions (i.e., telephone vs. video-conferencing), only the video-conferencing modality predicted therapists' satisfaction, suggesting that – although telephonic communication may provide a fast and easy method of providing remote care – whenever possible, therapists should choose video-conferencing technology over the telephone. Indeed, previous studies have reported the efficacy of this modality, explaining that it enables psychotherapists and patients in separate locations to see each other and interact in real time (i.e., "synchronously"; see Fletcher et al., 2018; Norwood et al., 2018, for reviews). This finding is also supported by experimental studies showing that the perceived distance between two interacting individuals modulates the empathic reaction between them (Schiano Lomoriello et al., 2018), which is a key ingredient of all psychotherapeutic interventions.[6]

Finally, therapists' attitudes and beliefs about telepsychotherapy played a significant role in qualitatively shaping their experiences of online sessions. In particular, we found that therapists who considered the online modality as incompatible with their theoretical orientation reported less satisfaction. Overall, there are no valid reasons to believe that a specific therapeutic orientation is more or less suitable for telepsychotherapy (Varker et al., 2018; Poletti et al., 2020). In fact, preliminary research has pointed to the efficacy of both CBT and diverse psychotherapeutic approaches, as delivered over an online modality (e.g., Dennis et al., 2020). Moreover, as brilliantly discussed by Swartz (2020), strategies for supporting patients during the COVID-19 pandemic can be found in virtually all psychotherapeutic disciplines. In this vein, therapists' reluctance

[6]As pointed out by Racine et al. (2020), another therapeutic concern is the assessment of patients' emotional states via telematic modality, especially about dissociation. Dissociative symptoms, which are challenging to assess even in natural therapeutic circumstances (e.g., Fagioli et al., 2015), could be more challenging to be identified using a video call, and barely impossible to identify via telephone.

to use technology for psychotherapy may be related to uninformed attitudes, rather than fundamental issues relating to this modality (Van Daele et al., 2020). National and international institutions hold the responsibility for increasing the acceptance of telepsychotherapy among both clinicians and the general public, especially in the current context, given that a surge in the demand for mental health resources is expected in the months following isolation (Gao et al., 2020).

Surprisingly, we did not find any effect of psychotherapists' clinical experience in predicting either the rate of interrupted treatments or therapists' satisfaction with the online treatment modality. We hypothesize that, given the high correlation between psychotherapists' age and clinical experience in our sample, this lack of evidence could represent a compensatory effect of the sample characteristics. Indeed, previous studies on psychotherapy treatments delivered *via* video-conferencing have shown that psychotherapists' familiarity with Internet technology promotes patients' compliance by limiting technical difficulties (e.g., brief interruptions or breakdowns in online communications; Etzelmueller et al., 2018) and that older age is associated with a lower dropout rate and better clinical outcomes (Catarino et al., 2018). In other words, younger therapists may encounter fewer technological barriers when delivering online sessions, whereas older therapists may benefit from their greater clinical experience, which allows them to better manage their patients during this potentially destabilizing transition in setting.

It is necessary to recognize the limitations of the present study. Notably, the enrolled psychotherapists performed their work mainly as private practitioners; thus, the generalizability of the present results should be limited to the changes in psychotherapy activities in the private practice. A further limitation relates to the cross-sectional design. Multiple measurement points in a longitudinal design would have the advantage of monitoring the provision of psychotherapy in Italy as the government restrictions eased. It should also be noted that the snowball technique used for recruitment may have produced a biased sample (e.g., the higher proportion of psychodynamic therapists may have been due to the therapeutic orientation of the authors). Finally, the study only analyzed psychotherapists' self-reports, and no objective data (e.g., health insurance information) were considered.

To conclude, **Table 1** reports key messages that can provide insight for countries struggling with the pandemic and offer specific guidance for policy makers, mental health institutions, professional organizations, and psychotherapists in promoting the continuity of psychotherapy treatment during the COVID-19 outbreak and in future pandemics.

TABLE 1 | Key message for practitioners.

During the peak of the lockdown in Italy, 42.1% of psychotherapy treatments were interrupted.

The following points are the factors we observed to limit the implementation of telepsychotherapy, followed by suggestions to help countries that are affected by the pandemic:

I. Therapists' lack of experience with telepsychotherapy.

→Disseminate training programs on telepsychotherapy.

II. Patient's lack of a private space to access telepsychotherapy sessions.

→Help and support patients to pragmatically access a private space.

III. Not using video-conferencing to administer telepsychotherapy (video-conferencing was the only remote modality found to predict therapists' higher satisfaction).

→Therapists should use video-conferencing to deliver remote therapy, where possible.

IV. Therapists' consideration of teletherapy as compatible with their theoretical orientation (those who did not report less satisfaction).

→Relevant associations should seek to increase the acceptance of telepsychotherapy among both clinicians and the general public.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics committee of the University of Padua. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

TB and AS developed the survey and wrote the first draft of the manuscript. AS analyzed the data. SS conceived the research study and contributed to the development of the survey. SS, VL, and FC contributed to the interpretation of the results and critically reviewed the final draft of the manuscript. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.591170/full#supplementary-material

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Demographic and Attitudinal Factors of Adherence to Quarantine Guidelines During COVID-19: The Italian Model

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In Italy, a large outbreak of coronavirus disease 2019 (COVID-19) occurred from 2020 January 30, before the World Health Organization has stated that it is a pandemic. The nationwide quarantine had the desired impact of controlling the epidemic, although had presented many challenges, given its large economic and social costs. Complete adherence to recommendations can potentially decelerate and reduce infectious disease outbreaks. To date, it is not clear how compliant the Italian public has been with voluntary home quarantine, neither which factors have influenced an individual's decision to comply with a quarantine order. The purposes of this study were to investigate the degree of the adherence to quarantine restrictions and the factors associated with the self-reported adherence. During the third week of the national lockdown, 3,672 Italian quarantined adult residents (65% females; range, 18–85 years) participated in an online cross-sectional survey focused on the risk perception of contracting COVID-19 and their reported adherence to quarantine protocols. Analysis of variance showed significant differences among demographic groups in tendency to comply with quarantine orders, with women, most educated people, residents of Southern Italy, middle-aged individuals, and health workers more likely to adhere to quarantine guidelines. As well, participants exhibiting the perception, anxiety, and susceptibility of risk of contracting COVID-19 disease were found significantly more likely to adhere to quarantine guidelines. The results of this study can help public health policy makers to recognize target populations for COVID-19 prevention and health education and to understand how inform communication strategies aimed at minimizing the impact and spread of the disease.

Keywords: adherence, risk perception, quarantine, confinement, coronavirus disease 2019

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INTRODUCTION

The novel coronavirus disease 2019 (COVID-19) had gained intense attention globally and continues to spread, posing a serious human pandemic threat (World Health Organization, 2020b). Given the lack of the proven vaccine, or efficacious treatments for infected people, the "killer" virus is arousing the sense of danger and uncertainty of its future course among health workers and the public.

After China, Italy has the second largest number of confirmed cases and was the first Western Republic affected by the COVID-19 spread (Saglietto et al., 2020). The Italian National Institute

of Health reported that between December 2019 and April 16, 2020, approximately 22,170 deaths occurred, 40,164 people were discharged or healed, and 168,941 million people were infected with COVID-19 on 1,046,910 tampons performed. In response to the rising numbers of suspected and diagnosed cases and deaths and to maintain the capacity of health systems to treat as many severe cases as possible, in Italy and in the world, a range of control measures had urgently adopted or are in the process of implementing, such as "isolation" and "quarantine," as non-pharmaceutical interventions tools to slow or prevent spread (Schabas, 2004; Bensimon and Upshur, 2007). The Italian government declared the national lockdown status, by March 11 to May 3: all public places were closed, and people have to stay at home apart from exercise, serious health issues, and other essential tasks (Government of Italy, 2020b). All the Italian people were in quarantine (#iorestoacasa).

Punitive legislation for travelers who make false health declarations and/or ignore these recommendations was established. Similar to pharmaceutical interventions, the effectiveness of quarantine interventions should be evaluated and monitored over time.

According to the Imperial College COVID-19 Response Team (Ferguson et al., 2020), the slowing growth in daily reported deaths was consistent with a significant impact of the containment and quarantine measure implemented several weeks earlier. The effective reproduction number, Rt, was dropped to close to 1 around the time of lockdown (March 11). This meant that 38,000 (13,000–84,000) deaths were averted.

At the time of writing, these measures had been extensively followed in public health of most nations, with a substantial impact in reducing transmission in countries with more advanced epidemics (Ferguson et al., 2020).

Successful use of these major non-pharmaceutical interventions requires a good organization of health services and mostly a good adherence to protocols by citizens. As Webster et al. (2020) stated, "Quarantine does not work if people do not adhere to it" (p. 3). However, little is known about which factors can increase the likelihood of general population adhering to quarantine orders in a Western republic, like the Italian one (Gernhart, 1999).

During major epidemics, social variables (gender, age, ethnicity, education level, marital status, working status) were found associated to self-quarantine guidelines (Bish and Michie, 2010; Webster et al., 2020). In addition, a psychological factor affecting the adherence to quarantine was identified in beliefs about potential health-specific harm, such as "risk perception." Risk perceptions are placed as core concepts in most theories of health behavior, including the Protection Motivation Theory (Rogers, 1975), the Health Belief model (Rosenstock, 1974), Theory of Planned Behavior (Ajzen, 1991), and the Extended Parallel Process model (Witte, 1992; for reviews, see Sutton, 1987; Weinstein, 1993, 2000).

Indeed, perceived likelihood, susceptibility, or severity has been found to shape or predict many health behaviors. In many studies, these dimensions of risk perception were associated with the compliance with physician-prescribed medical regimens, such as the vaccination behavior [for a meta-analysis, see (Brewer et al., 2007)], adherence to measures for preventing transmission of microorganisms in primary healthcare (Maroldi et al., 2017), adherence to effective measures in preventing HIV infection (Storholm et al., 2017), and adherence to mammography guidelines as screening for women at risk of breast cancer (Graves et al., 2008). Also, during past epidemics, such as Ebola, perceived risk has been found to both positively and negatively influence health behaviors (Bish and Michie, 2010; Ajilore et al., 2017).

In addition, according to the literature on risk perception (Adams, 1995), public concerns about risk are higher with novel threats and, when individuals do not feel in control of the risk, both factors relevant to an influenza pandemic. There is also evidence from this review that perceiving the disease to be more severe is associated with taking preventive and avoidant behaviors. This is the case of the COVID-19 emergency.

All the aforementioned theories highlighted the importance of perceptions of threat in determining a behavioral response and provide a framework to understand the findings of these studies.

In light of this literature and the advent of this current influenza pandemic, the purpose of this study was to investigate (1) the degree of the adherence to quarantine restrictions and recommendations in a large sample of quarantined Italian participants during the COVID-19 pandemic and (2) the factors associated with the self-reported adherence to these measures (or protective behaviors).

Based on the previous literature (Bish and Michie, 2010; Webster et al., 2020), sociodemographic variables, such as gender, age, education, health, and marital status, employment status and characteristics, and the risk perception (perceived risk of contracting COVID-19) were selected as factors that could influence the self-reported compliance with the quarantine guidelines.

In addition to sociodemographic variables, geographical region of residence was examined (North-east, North-west, Center, South, Islands). The regional structure of the Italian National Health Service translated into very diverse responses to the emergency from the regions, which have differentiated, by spread of the epidemic, the number of diagnosed cases and deaths (Remuzzi and Remuzzi, 2020; Spina et al., 2020). Participants from different countries are hypothesized to show different values in perceived risk of contracting COVID-19 and adherence to quarantine guidelines.

MATERIALS AND METHODS

Sample and Procedure

Respondents selected for this study were quarantined Italian adults 18 years or older with access to a networked computer. An online cross-sectional study was conducted using a virtual snowball sample through social media. The study has been recorded to the Ministry of Education, University and Research and approved by the Department of Psychological Sciences, Health and Territory, University of Studies "G. d'Annunzio" Chieti–Pescara, Italy, review board. Written informed consent was obtained from all individual participants included in the

study. This cross-sectional survey was conducted between March 21 and 26, 2020, the 2 weeks immediately after the lockdown was decreed by the Italian Government on March 9 (#iorestoacasa) (Government of Italy, 2020a). We received responses from 3,964 respondents. Of these, 292 respondents did not complete the questionnaires (>50% of the missing values).

Measures

Sociodemographic Variables

General information, sociodemographic variables (such as age, education, marital status, geographic area and region, employment status, and year income) including history of psychiatric illnesses and medical problems (e.g., physical/mental pathologies; hospitalizations), and diagnosis or suspect of COVID-19, as well as living environment during quarantine, were asked (e.g., household type and size). In addition, participants were asked to rate their physical symptoms during quarantine (e.g., fever, cough, difficulty in breathing). Participants' physical health status index was derived from history of chronic medical illness and number of pathologies (none = excellent, 1 pathology = good, 2 pathologies = poor, ≥3 pathologies = fragile). Questions about religious practices and religiousness were also included in the survey.

Primary Outcome

Adherence to quarantine guidelines carried out in response to COVID-19 infection was measured by 12 items classified into three categories: preventive, avoidant, and management of disease behaviors (Bish and Michie, 2010). The preventive behavior category was composed of six items, which include hygiene behaviors such as handwashing with soapy water or an alcohol-based solution, coughing or sneezing into a handkerchief (preventing the hands from coming into contact with respiratory secretion), cleaning surfaces with chlorine or alcohol disinfectant, wearing protective mask, keeping at least 1 m (or 3 feet) of distance. The avoidant behaviors category included five questions about the avoidance of gatherings in public or open-to-public places, handshaking and hugging, touching eyes/nose/mouth with hands, sharing of promiscuous use of glasses and bottles, doing and outdoor sport, and/or physical activities alone in public areas (**Appendix A**). Respondents were asked about the frequency whether they had carried out quarantine guidelines on a 5-point Likert scale (from 0 "never" to 4 "always"), respectively, for the preventive and avoidant categories. A global index of adherence to quarantine guidelines has been developed, by summing the answers to the items below. These behaviors are all decreed by law (Government of Italy, 2020a). In the present sample, Cronbach α was 0.696 [95% confidence interval (CI), 0.681–0.710].

Finally, a single item about the "taking antiviral drugs" has been included in the questionnaire as a management of disease behaviors category.

Risk Perception

A multidimensional questionnaire on risk perception of COVID-19 infectious disease outbreak has been implemented following the "Effective Communication in Outbreak Management" guidelines and using a standardized and revised version of the Ebola risk perception surveys (Richardus et al., 2015; see **Appendix A**). The risk perception questionnaire contains the following dimensions: (A) perception (eight items); (B) anxiety and susceptibility to the COVID-19 (three items); (C) intention to carry out the preventive measures (one item); (D) perception of seriousness (one item); and (H) motivating/hindering factors that determine the willingness to carry out preventive measures (one item). Risk questions were responded to on a 5-point Likert scale for the dimensions A to D, whereas for H, response options were in a multiple-choice format. In addition, perception (A) risk dimension was classified into four groups according to quantiles (very low, low, high, and very high). In the present sample, Cronbach α for the risk perception dimension was 0.808 (95% CI, 0.798–0.817).

Data Analysis

Descriptive statistics were calculated for sociodemographic characteristics, physical symptoms and health service utilization variables, contact history variables, knowledge and concern-related variables, precautionary measure variables, and additional health information variables. A series of independent-samples *t* test and analyses of variance (ANOVAs) were carried out to determine whether there is a statistically significant difference ($p < 0.05$) in the adherence to quarantine guidelines scores between levels of risk perception and demographic factors. Statistical analysis was performed using SPSS Statistic 21.0 (IBM SPSS Statistics). Effect sizes (ESs) for independent *t* test was calculated using the Hedges *g*, in order to provide a measure of ES weighted according to the relative size of each sample. The Hedges *g* ES was interpreted using Cohen (1988) convention as small (0.2), medium (0.5), and large (0.8). ESs for the ANOVAs were computed using the partial ω^2 (ωp^2). Partial ω^2 represented an unbiased alternative to partial η^2 (Olejnik and Algina, 2003). ωp^2 was interpreted according to Murphy et al. (2014) convention as small (0.01), medium (0.06), and large (>0.15).

RESULTS

Sociodemographic Data

Sociodemographic variables and levels of risk perception are shown in **Table 1**. More than half of the participants were females (65.1%), with an average age of 33.27 (SD = 14.29) years and with a high level of education (49.5% upper secondary school, 41.8% bachelor's degree), single (61.2%), Roman Catholic (73.2%), and located in the South of Italy (45.2%). The 31.20% were students, and the 47.4% of the participants were employed, with a yearly income of 10,000–30,000 €. Among these, 5.2% declared they had moved from one to another city in the previous weeks, due to pandemic. The 6.3% of our sample declared to be employed as healthcare professionals: 20.3% were physicians, 14.7% were nurses, and 4.7% were pharmacists.

Most participants were in quarantine with family (84.2%), 6.5% alone, and the remaining with colleagues/roommate/other familiars. Participants lived in apartments with balcony (74.2%), approximately within 80–150 mq (52.5%).

TABLE 1 | Descriptive and differences among sociodemographic variables and risk in adherence to quarantine Guidelines (n = 3,672).

Group	Descriptive		Adherence to quarantine guidelines		
Sex Variables	**Frequency**	**%**	**Mean**	**SD**	
Man	1,282	34.9	31.24	5.61	
Women	2,390	65.1	33.32	4.91	
					$t(3670) = -11.145$, $p < 0.001$, Hedges $g = 0.401$
Age (years)	**Frequency**	**%**	**Mean**	**SD**	***Post hoc***
(1) 18–29	1,995	54.3	31.50	5.41	1 vs. all 2 vs. 4
(2) 30–39	723	19.7	33.38	4.47	
(3) 40–49	404	11	34.17	4.89	
(4) 50–59	261	7.1	34.92	3.98	
(5) >60	289	7.9	33.84	5.64	
					$F(4;3667) = 54.334$, $p < 0.001$, $\omega p^2 = 0.054$
Education	**Frequency**	**%**	**Mean**	**SD**	
(1) Primary school	56	1.5	31.18	8.23	4 vs. all
(2) Lower secondary school	264	7.2	31.83	5.76	
(3) Upper secondary school	1,817	49.5	32.30	5.35	
(4) Bachelor/master/doctorate	1,535	41.8	33.12	4.86	
					$F(3;3668) = 10.228$, $p < 0.001$, $\omega p^2 = 0.007$
Marital status	**Frequency**	**%**	**Mean**	**SD**	
(1) Single	2,249	61.2	31.83	5.33	1 vs. 2, 3, 4 4 vs. 2, 3
(2) Married	901	24.5	34.07	4.84	
(3) Divorced/separated	103	2.8	34.81	4.38	
(4) Cohabiting	366	10	33.00	4.85	
(5) Widowed	53	1.4	32.83	6.42	
					$F(4;3667) = 36.097$, $p < 0.001$, $\omega p^2 = 0.036$
Geographic area	**Frequency**	**%**	**Mean**	**SD**	
(1) North-West	897	24.4	32.02	5.20	2 vs. 3 4 vs. 1, 2, 3
(2) North-East	338	9.2	31.33	5.20	
(3) Central	522	14.2	32.39	5.56	
(4) South	1,660	45.2	33.23	5.17	
(5) Islands	165	4.5	32.60	4.95	
Missing	90	2.5			
					$F(4;3577) = 13.96$, $p < 0.001$, $\omega p^2 = 0.014$
Health Status	**Frequency**	**%**	**Mean**	**SD**	
(1) Excellent	2,616	71.2	32.47	5.26	4 vs. 3
(2) Good	622	16.9	33.07	4.88	
(3) Poor	125	3.4	33.66	5.83	
(4) Fragile	24	0.7	30.63	8.83	
Missing	285	7.8			
					$F(3;3383) = 5.023$, $p = 0.002$, $\omega p^2 = 0.003$
Employment status	**Frequency**	**%**	**Mean**	**SD**	
(1) Unemployed	416	11.3	33.20	5.23	1 vs. 4 3 vs. all 5 vs. 4
(2) Retired	144	3.9	33.56	6.13	
(3) Student	1,138	31	31.20	5.48	
(4) Healthcare professional	232	6.3	34.97	4.09	
(5) Employed	1,742	47.4	32.96	4.95	
					$F(4;3667) = 38.073$, $p < 0.001$, $\omega p^2 = 0.038$

(Continued)

TABLE 1 | Continued

Healthcare professionals	Frequency	%	Mean	SD	
(1) Doctor	47	20.3	36.06	3.19	4 vs. 1, 2
(2) Nurse	34	14.7	36.35	3.70	
(3) Pharmacist	11	4.7	36.36	2.76	
(4) Rehabilitation Therapists	59	25.4	33.55	4.83	
(5) Psychologist	69	29.7	34.28	3.98	
Missing	12	5.2			
				$F(4;215) = 4.551$, $p < 0.001$, $\omega p^2 = 0.060$	

Income per year	Frequency	%	Mean	SD
0–10,000 €	502	13.7	33.06	5.09
10,000–30,000 €	1,193	32.5	33.10	4.86
30,000–50,000 €	214	5.8	33.69	4.76
>50,000 €	65	1.8	34.23	4.13
Missing	1,698	46.2		
				$F(3;1970) = 1.970$, $p = 0.116$

North-West (Piemonte, Lombardia, Liguria, Valle d'Aosta). North-East (Veneto, Friuli Venezia Giulia, Emilia Romagna, Trentino). Center (Toscana, Umbria, Marche, Lazio). South (Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria). Islands (Sicilia, Sardegna). Post hoc test = Tukey HSD. Not significant differences have been found between No Antiviral Drugs and Sociodemographic Variables, except for health status (Kruskal–Wallis = 13.347(3); p = 0.004).

Subjects were mostly healthy: 71.2% reported no physical pathologies, whereas 7% were detected as fragile and with a long history of chronic medical illness and several number of pathologies (e.g., diabetes or cancer, etc.). During this period of quarantine, 64.95% of the participants had reported no symptoms likely related to the COVID-19 infection, while the remaining has reported the following symptoms: cold (9.59%), feeling of weakness (8.22%), cough (7.5%), difficulty in breathing (1.44%), fever higher than 37.5°C (0.68%), and changes in taste/smell (0.14%).

Risk Perception and Adherence to Quarantine Guidelines

Participants exhibited an average perception of risk (Risk A), with a mean of 26.05 (SD = 5.89; range of scores, 8–40). In details, the perception of risk of contracting COVID-19 disease (Risk A) was homogeneously distributed across the four risk levels, from 30.8% of the participants perceiving very low risk to 20.6% of those perceiving very high risk (**Table 2**). As regards *anxiety* and *susceptibility* risk dimension (Risk B), 92.4% of the participants was found worried about getting COVID-19, from slightly to really worried; 95.6% perceived the *chances of getting COVID-19* from average to very high, *if* they did not *follow preventive measures adopted*; 91.5% of the respondents reported a medium to very high probability of getting COVID-19 within the next year, if they did not get vaccinated.

As regards the intention, 95.1% of the subjects expressed the willingness to carry out to follow the preventive measures without any doubt (Risk C), mostly driven from the following motivation factors (Risk H), from preventing the spread of COVID-19 (79.8%), avoiding to transmit COVID-19 to people close to me (75.7%), to considering the government actions helpful (30.6%) (**Table 2**). As for the perception of seriousness, 98.5% of the respondents perceived "The coronavirus emergency was quite and very serious threat on global health" (Risk D).

Information about COVID-19 emergency were sought by our respondents from the following media: 78.8% by radio or television newscasts, 69% from official channels (press releases, bulletins), 55.7% from social networks, 36.8% from newspapers (including its digital editions), and 12.8% from relatives and friends.

Adherence to Quarantine Guidelines

Respondents exhibited medium to high scores of adherence to quarantine guidelines as measured by a single interval index, with a mean of 32.59 (SD = 5.22; range, 0–44), with an average of quarantine duration of 15 days (SD = 6.64). A weak but significant positive association ($r = 0.035$, $p = 0.034$) was found between the adherence and the length of quarantine.

Within the preventive behaviors' category, covering the mouth or nose (when sneezing and/or coughing) and keeping at least 1 m of distance (also named social distancing measure) were the behaviors most always adopted by participants (78.5% and 70.6%, respectively), and then the use of handkerchief (54.5%), handwashing using soapy water or alcohol-based solution (40.8%), and wearing face mask (35.7%). Instead, the cleaning of surfaces represented the less frequent protective behavior (26.2% of "always" responses) of our respondents.

As avoidant behaviors, avoidance of gatherings (92.8%), of handshake/hug (76.8%), to do outdoor sports alone in public area (77.3%), and sharing of glasses and bottles (61.3%) were the most protective behaviors always adopted by our participants. Less importantly, avoidance to touch eyes/mouth with hands was adopted by 18% of the participants.

Finally, within the management of disease behaviors, only 0.9% of the participants take antiviral drugs even if not medically prescribed, and 5.4% with a medical prescription.

Reasons for going out declared by our respondents were as follows: 8.5% for working demands, 23.9% for receiving medical

TABLE 2 | Descriptive of risk perception dimensions (n = 3,672).

Group	Risk dimensions	Descriptive		Adherence to quarantine guidelines		
		Frequency	%	Mean	SD	*Post hoc*
Risk A) Perception						
(1) Very low		1,132	30.8	32.70	5.37	4 vs. 2, 3
(2) Low		888	24.2	32.08	5.17	
(3) High		897	24.4	32.37	5.36	
(4) Very high		755	20.6	33.31	4.98	
				$F(3;3668) = 8.337$, $p < 0.001$, $\omega p^2 = 0.006$		
Risk B) Anxiety and Susceptibility						
H*ow worried are you about getting COVID-19?* (Risk B1)						
(1) Not worried at all		44	1.2	28.41	8.38	5 vs. all
(2) Not worried		234	6.4	30.53	6.04	
(3) Slightly worried		1,068	29.1	31.35	5.19	
(4) Worried		1,540	41.9	33.03	4.90	
(5) Really worried		786	21.4	34.27	4.81	
				$F(4;3667) = 56.888$, $p < 0.001$, $\omega p^2 = 0.057$		
What are your chances of getting COVID-19 if you do not follow preventive measures adopted? (Risk B2)						
(1) Very low		45	1.2	32.64	5.39	5 vs. all
(2) Low		117	3.2	31.59	6.14	
(3) Average		451	12.3	31.03	5.99	
(4) High		1,399	38.1	32.13	5.03	
(5) Very high		1,660	45.2	33.48	5.00	
				$F(4;3667) = 26.358$, $p < 0.001$, $\omega p^2 = 0.026$		
If you don't get vaccinated. what are your chances of getting COVID-19 within this year?(Risk B3)						
(1) Very low		87	2.4	32.94	5.66	5 vs. all
(2) Low		226	6.2	32.21	5.60	
(3) Average		1,488	40.5	32.30	5.29	
(4) High		1,355	36.9	32.66	5.11	
(5) Very high		516	14.1	33.37	5.23	
				$F(4;3667) = 4.511$, $p < 0.001$, $\omega p^2 = 0.003$		
Risk C) Intention						
Do you intend to follow the preventive measures?						
	Absolutely not	5	0.1	27.20	11.30	
	Probably not	4	0.1	23.00	9.27	
	Probably yes	170	4.6	29.75	6.01	
	Absolutely yes	3,493	95.1	32.75	5.15	
Risk D) Perception of seriousness						
How severe do you think the coronavirus emergency on global health is?						
	Not serious at all	1	0.1	31.00	—	
	Not very serious	53	1.4	28.28	8.08	
	Quite serious	1,087	29.6	31.25	5.57	
	Very serious	2,531	68.9	33.26	4.88	
Risk H) Motivating/hindering factors						
*Why are you taking protective behaviors?**						
	I want to prevent the spread of COVID-19	2,930	79.8			
	I don't want to transmit COVID-19 to people close to me	2,779	75.7			
	COVID-19 can be dangerous	2,160	58.8			
	I feel responsible for my health	1,647	44.9			
	I trust the preventive measures are helpful	1,122	30.6			
	Authorities recommend them	370	10.1			
	I might regret it later if I don't take them.	357	9.7			
	I think I'm at risk COVID-19	161	4.4			
	Other people at home or at work are following them already	85	2.3			
	I'm often sick	75	2			
	I don't want problems with the law	6	0.2			
	Desire to return to normal	2	0.1			
	Civil responsibility	2	0.1			

**More than one options is possible. Post hoc test = Tukey HSD. No significant differences have been found between No Antiviral Drugs and Risk dimensions. Risk c-d-h dimensions contains zero/few cases in one or more category response and then discharged from mean/frequency analysis.*

treatments or for going to the pharmacy, 9.7% for essential necessities (to procure groceries), 1% for assisting families, and 5% for physiological needs of own domestic animal.

Differences in Adherence to Quarantine Guidelines

Differences among sociodemographic variables, as well as in risk perception dimensions, were found in adherence to protective measures scores. Means and standard deviations, group F/t tests, p values, and Tukey *post hoc* analysis were provided for each independent variable in **Tables 1**, **2**. Pairwise deletion techniques were applied to handling missing data.

As regards sex, women exhibited significantly higher levels of adherence to quarantine guidelines [$t(3670) = -11.145$, $p < 0.001$, Hedges $g = 0.401$] compared to the men.

A statistically significant difference was found between age groups as determined by one-way ANOVA [$F(4;3667) = 54.334$, $p < 0.001$, $\omega p^2 = 0.054$]. A *post hoc* test revealed that the 18- to 29-year age group scored statistically significantly lower ($p < 0.001$) compared to other age groups. Equally, the 50- to 59-year age group was statistically significantly higher ($p < 0.001$) in adherence scores compared to the 30- to 39-year group.

Participants with a high education showed the highest scores of adherences among the other levels of education [$F(3;3668) = 10.228$, $p < 0.001$, $\omega p^2 = 0.007$].

Significant differences in adherence within the marital status [$F(4;3667) = 36.097$, $p < 0.001$, $\omega p^2 = 0.036$] revealed that singles' ($p < 0.001$) adherence mean was statistically significantly lower than married, divorced/separated, and cohabiting status means. In addition, divorced/separated and married groups equally exhibited significant higher adherence ($p < 0.01$) compared to cohabiting people.

Differences of geographic area in adherence to quarantine guidelines [$F(4;3577) = 13.96$, $p < 0.001$, $\omega p^2 = 0.014$] revealed that participants from the Southern Italy showed statistically significantly higher level of adherence ($p < 0.01$) compared to the Central and North West/East areas, except for the Islands. Residents from Central Italy ($p < 0.05$) were statistically significantly higher in adherence levels compared to the North-East.

A slight but significant difference among adherence levels was found across health status variables ($p < 0.01$), where the fragile group ($p < 0.05$) showed the lowest mean, which was significantly lower compared to poor group.

Next, a statistically significant difference was found among the employment status [$F(4;3667) = 38.073$, $p < 0.001$, $\omega p^2 = 0.038$]; in details, students' mean ($p < 0.001$) was statistically lower compared to the other status. As expected, healthcare professional adherence mean ($p < 0.001$) was significantly higher compared the unemployed and employed. Because the healthcare professions category was quite broad, and not all categories are employed on the frontlines, a statistically significant difference among healthcare professionals was found [$F(4;215) = 4.551$, $p < 0.001$, $\omega p^2 = 0.060$]. A *post hoc* test revealed that rehabilitation therapists' adherence mean ($p < 0.01$) was statistically significantly lower than that of doctors and nurses. No statistically significant difference was found in adherence to quarantine guidelines for income for year groups.

A statistically significant difference between levels of risk perception A [$F(3;3668) = 8.337$, $p < 0.001$, $\omega p^2 = 0.006$] was found. A *post hoc* test revealed that the very high level of risk perceived ($p < 0.001$) was statistically significant compared to the high and low levels of risk perceived. The same trends in differences were found among risk anxiety [$F(4;3667) = 56.888$, $p < 0.001$, $\omega p^2 = 0.057$] and susceptibility levels [Risk B2, $F(4;3667) = 26.358$, $p < 0.001$, $\omega p^2 = 0.026$; and Risk B3, $F(4;3667) = 4.511$, $p < 0.001$, $\omega p^2 = 0.003$]. A *post hoc* test revealed that the last category was statistically higher compared to the previous ($p < 0.01$).

No statistical differences were found between the sociodemographic variables and antiviral drugs' protective behavior [except for health status, Kruskal–Wallis = 13.347(3); $p < 0.01$].

DISCUSSION

Italy was the first Western Republic affected by the COVID-19 spread (Saglietto et al., 2020). Despite the criticism about the lack of its scientific basis (Schabas, 2004; Bensimon and Upshur, 2007; Greenberger, 2018), the slowing growth in daily reported deaths in Italy was consistent with a significant impact of quarantine implemented several weeks earlier. Successful use of quarantine as a public health measure in a democratic society requires increasing the likelihood of people adhering to protocols.

A large sample of Italian quarantined adults showed very high rates of adherence to quarantine restrictions and recommendations, after 15 days of the national lockdown, due to COVID-19 pandemic.

Differences among sociodemographic variables indicated that women were more likely to carry out protective behaviors compared to men. Sex differences in mortality and vulnerability to the COVID-19 disease, observed also in Italy (China, 2019; Chen et al., 2020; Wenham et al., 2020), could be associated to different degrees of adherence to quarantine restrictions for gender, with women being more likely vigilant about preventive and avoidant behaviors.

As suggested by findings from previous studies regarding age and gender patterns of risk-taking behaviors (Pawlowski et al., 2008; Cobey et al., 2013), men are more likely to engage in risk-taking behaviors.

The pattern of findings for age is not straightforward. Italian youngest individuals (18–29 years) tended to be least adherent among all the age groups. Subjects aged 30–39 years had significantly lower levels of adherence compared to people aged 50–59 years. People older than 60 years had levels of adherence lower than those of the other age groups, except for the 18- to 29-year age group. Adherence seems to heighten with increasing of age until 59 years, after which the trend surprisingly reversed, with the over-60s reporting to adhere less to the quarantine guidelines, similarly to the 30- to 39-year group. The two extremes of the life span (very young: from 18 to 39 years

and seniors: 60+ years) have been found more reluctant to comply with the quarantine guidelines. If this is not a great problem for youngest people, it certainly is for the elderly, who are most particularly at risk of contracting the COVID-19 with fatal consequences. Older age has been reported associated with adverse clinical outcomes, including hospitalization and mortality (Applegate and Ouslander, 2020; Chen et al., 2020). Indeed, in Italy the mean age of the COVID-19 patients who died was 81 years (Remuzzi and Remuzzi, 2020), and case fatality rate was 16% from 60 to 79 years, 19.7% from 80 to 89 years, and 16% for 90 years or older (Livingston and Bucher, 2020). Reasons of this unexpected behavior (Lau et al., 2003; Leung et al., 2004, 2005; Quah and Hin-Peng, 2004; Tang and Wong, 2004) were, in elderly subjects of our sample, the loss of freedom to movement (57.4%) and renouncing to important habits, such as to going to the recreational club (47.4%). It seems that the management of daily time, the loss of real social contacts, and the difficulty accessing to "virtual" interactions via social networks can easily undermine compliance in this age group (Yip et al., 2010; Zhong et al., 2017). In a population where loneliness and isolation have already been described as an epidemic, the impact of even short-term social distancing measures merits careful and urgent study. As regards educational attainment, our findings indicated that increasing education was associated with adherence to quarantine restrictions, with people with high education showing highest scores of adherences among all the groups, in accordance with previous studies (Webster et al., 2020).

As regards marital status, single and widowed people are the least adherent group with quarantine policies in the event of this outbreak. This datum was in line with part of previous literature reporting that ever-married people had more compliance with quarantine policies compared to never-married people (Tang and Wong, 2004; Lau et al., 2007). It is plausible that these people had greater difficulty in relying on or obtaining the assistance of others.

As geographical area of residence, South of Italy showed the highest levels of adherence among all the groups, except for the Islands. Regions of Center of Italy were more likely to adhere with guidelines compared to North-East regions.

This datum is very interesting because Southern and Central regions had recorded minor number of deaths and diagnosed cases (938 and 10,452, 1,720, and 19,059, respectively), compared to North-East and North-West regions (4,582 deaths and 10,452 cases, and 14,652 deaths and 83,971 cases, respectively), which are the most severely affected areas, despite two considerations. First, the Italian Government implemented control measures in the Northern regions, before any other region, and carried out extraordinary efforts to restrict the movement of people at the expense of the Italian economy. Second, a huge number of people – mainly students attending universities in Northern Italy – came back from Po Valley to their families in the South just in the middle of the outbreak, representing potential factor able to accelerate the spreading of the viral infection.

Despite this, the greater spread of contagion was recorded in the North of Italy. Among other factors, the reason may lie also in less adherence of its residents toward the strict self- and forced-quarantine measure, compared to the rest of Italy.

The attitude of greater adherence of the respondents from Southern Italy could challenge cultural stereotypes about the alleged poor civic sense that southerners would have compared to northerners (Viesti, 2013).

As employment status, students showed the significantly lowest mean of adherence among all the other groups, consistent with findings of a previous study (Soud et al., 2009). Consistently with the data collected during this pandemic in China (Zhong et al., 2020), these differences could be ascribed to younger age.

Among occupational groups, healthcare workers showed significantly higher means of adherence compared to students and employed and unemployed people.

The adherence of healthcare workers to all the stringent occupational guidelines in the event of COVID-19 outbreaks is very critical because they are the occupational categories most at risk of contracting the virus during the COVID-19 epidemic (World Health Organization, 2020a). In Italy, because they have not been equipped promptly with self-protective equipment (PPE, such as gown, gloves, N95 masks, goggles, etc.), neither adequate nor sufficient IPC (infection prevention and control) training for respiratory pathogens had worked in life-threatening healthcare settings, with longer duty hours since February 20.

High fatality rates may occur in these health settings if widespread non-adherence to safety measures occurs, also for the risk of contagion and spreading the virus to their families, friends, or colleagues. At time of writing, in Italy around 10% (n = 16,050) of health care professionals have become infected, and 121 doctors have died (FNOMCeO, 2020).

Thus, as Remuzzi stated, "Our doctors and nurses are modern heroes in an unexpected war against a difficult enemy" (p.4) (Remuzzi and Remuzzi, 2020). Among healthcare professionals, physicians, nurses, and pharmacists exhibited significantly higher means of adherence to protocols compared with non-frontline health care workers, such as psychologists and rehabilitation therapists. This is also in line with previous experiences from severe acute respiratory syndrome/Middle East respiratory syndrome, showing frontline health professionals constitute a unique risk group compared with professionals working in second-line positions (Gardner and Moallef, 2015; Lee et al., 2018).

A weak but significant positive association was found between the self-reported adherence and the length of quarantine. This datum appears to be in line with the mixed evidences in literature on how the length of prescribed quarantine affects adherence to quarantine protocol (Webster et al., 2020).

People accounted for their compliance with the quarantine order on personal, ethical, social, or legal grounds. The most important reasons for complying were to prevent the spread of COVID-19 (79.8%) and to reduce the risk of transmission to others (75.7%). Also, the trust in government action to control the pandemic (e.g., "I trust the measurements to protect us from contracting COVID-19 are useful," "the authorities recommend them") is a crucial factor (40.2%). Importantly, even if the trust in the government is below average, the adherence of our participants to its recommendations is very high.

Differently to previous studies on past epidemics (Webster et al., 2020), ethical reasons were most uncommon with

our participants: only the 0.1% say that they complied with quarantine to be "good citizens" or to do their "civic duty." As well as, only 2.3% of the participants take protective behaviors for social norms toward COVID-19 prevention (e.g., agreement on the statement "other people at home or at work already follow measures to prevent against COVID-19") or for legal reasons were also cited ("I don't want problems with the law") (0.2%).

The reasons for not adhering to quarantine and negative aspects of adhering to quarantine were examined. Obstacles to compliance were in having in biased risk perception ("I don't think I'm at risk of contagion," "coronavirus is not so serious") (0.06% totally), or in attitude to general self-neglect ("I don't care about my health," "I never got sick") (0.06% totally).

Another kind of service needed by those in quarantine is psychosocial support to fight boredom and mute the stigma that could easily undermine compliance (DiGiovanni et al., 2004).

The most common negative experiences associated with the staying home were identified in the boredom deriving from being closed in the house (43.7%); renouncing to important habits (shopping, going to the gym, to the hairdresser/beautician, the recreational clubs, etc.) (74.3%); lacking of being free to movement, such as traveling for leisure or business (71.4%); the lack of a working environment (colleagues, routines, etc.) (29.7%); not being able to do something useful (26.8%); the inability to manage own daily time (25.8%); greater conflict in the family (14.8%); uncertainty about the future consequences (7.5%); forced and prolonged coexistence with unwelcome people (3.2%); and the imposition of such stringent rules (2.5%).

Lengthy confinement of people in their homes could also produce tensions within households that could become dangerous (Bish and Michie, 2010). Microsocial effects, such as ostracism within the family, questioning of the professional activity, and conflicts following selective sharing of information with relatives about risk exposure, can have an impact on intrafamilial relationships, when power relationships or preexisting conflicts put some members at a disadvantage (DiGiovanni et al., 2004; Johal, 2009).

The strength of this study lies in its large sample recruited during a critical period, the early stage of the COVID-19 outbreak in Italy. Nevertheless, the predominance of women and undergraduate students (who are generally young and perhaps have fewer responsibilities than adults who are employed full-time) and the small number of healthcare workers limit our ability to generalize these findings to a wider population. In addition, the sample recruitment approach through social media channels, due to the exceptional pandemic conditions, can have permitted the participation of only those who had a computer and computer literacy (probably excluding middle–old/old–old participants). However, features of our sample are similar to the others reported in already available studies carried out in the Italian context during the COVID-19 emergency (Barari et al., 2020; Mazza et al., 2020; Moccia et al., 2020). Another limitation of our study is related to the adoption of self-reported and not already validated questionnaires. Moreover, this survey has been translated into different languages with the aim of evaluating the impact of pandemic in other countries. It should also be noted that, given the public salience of these measures, it is likely that social desirability biased the self-reporting behaviors. Future studies should validate the compliance rates shown here for real-world observational data. For example, the registration in the questionnaire of possible arrests or sanctions in case of skipping the quarantine could provide objective measures of the adherence, as well as an implicit degree of responsibility of the population. Similarly, future research to understand how social (Saggino et al., 2017), religious (Carlucci et al., 2015), and economic factors, as well as personality factors (Innamorati et al., 2014), affect compliance with quarantine will be helpful in planning for future public health emergencies. Because there are likely to be cultural and societal differences in responses to a pandemic, some broad conclusions can be drawn from the evidence identified, but their applicability is likely to vary across country. Thus, caution should be given when generalizing the results of this study to other countries. International comparisons are therefore also greatly warranted.

CONCLUSION

Findings from previous researches suggested that some countries with quarantine still had problems with compliance, as evidenced by increasing fines and arrest penalties (Blendon et al., 2006). To increase compliance, public health authorities need to plan in advance. They should prepare trusted spokespeople to explain to the public the steps that need to be taken to halt the spread of the disease and stress the need for compliance and take the Italian model as example. With full population compliance with quarantine policies, the critical battlefront of the COVID-19 epidemic would shift to effective hospital infection control. As Saglietto stated, "We urge all countries to acknowledge the Italian lesson and to immediately adopt very restrictive measures to limit viral diffusion, ensure appropriate health system response, and reduce mortality, which appears to be higher than previously estimated, with a crude case-fatality rate of almost 4%" (p.1110) (Saglietto et al., 2020).

In this study, the perception of risk about contracting or spreading disease, associated with adherence to quarantine guidelines in Italian community, was also analyzed. To date, there are no studies on risk perception of infectious diseases COVID-19 in Europe. Therefore, this study makes an important contribution to the field and could be helpful for these countries that are hesitant to apply the quarantine protocols or which nowadays are evaluating its effects, due to a later spread of the contagion.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Department of Psychological Sciences, Health

and Territory, University of Studies "G. d'Annunzio" Chieti–Pescara, Italy, Review Board. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MB and LC designed the study and drafted the manuscript. LC conducted the statistical analyses. ID'A collected the data. MB, ID'A, and LC interpreted the data. All authors contributed toward revising the manuscript and agreed to be accountable for all aspects of the work.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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APPENDIX A

PERCEZIONE DEL RISCHIO
RISK PERCEPTION

(A) Percezione del Rischio/ Risk Perception (8-item);

- Penso che contrarrò il COVID-19 se entro in contatto con un paziente affetto da COVID-19.
  I think that I will contract COVID-19 if I come into contact with a COVID-19 patient.
- Penso che potrei contrarre il COVID-19 anche se non entro in contatto con un paziente affetto da COVID-19.
  I think that I might contract COVID-19 even if I do not come into contact with a COVID-19 patient.
- La mia salute sarà gravemente compromessa se contraggo il COVID-19.
  My health will be severely damaged if I contract COVID-19.
- Penso che il COVID-19 è molto più grave rispetto alle altre malattie respiratorie.
  I think that COVID-19 in more severe than any other respiratory diseases.
- Anche se mi ammalassi di un'altra malattia, non mi recherei in ospedale a causa del COVID-19.
  Even if I fall ill with another disease, I will not go to hospital because of COVID-19.
- Il COVID-19 causerà seri danni alla mia comunità.
  COVID-19 will inflict serious damage to my community.
- Il COVID-19 si diffonderà nuovamente in Italia un giorno o l'altro.
  COVID-19 may spread in Italy again someday.
- Penso che potrei contrarre il COVID-19 anche se non entro in contatto con una persona affetta da COVID-19 perché potrebbe essere asintomatica e ignara.
  I think I will contact COVID-19 even if I do not come into contact with a COVID-19 patient because he/she might be lack of symptoms or suspect nothing of them.

(B) Ansia e Suscettibilità/Anxiety and Susceptibility (3 item);

- Quanto sei preoccupato di contrarre il COVID-19?
  How worried are you about getting COVID-19?
- Che probabilità hai di contrarre il COVID-19 se non segui le misure preventive?
  What are your chances of getting COVID-19 if you do not follow preventive measures adopted?
- Se non dovessi essere vaccinato che probabilità avrai nel contrarre il COVID-19 entro questo anno?
  If you don't get vaccinated, what are your chances of getting COVID-19 within this year?

(C) Intenzione nel seguire le misure preventive/ Intention to carry out the quarantine guidelines (1 item);

- Hai intenzione di seguire le misure preventive?
  Do you intend to follow the preventive measures?

(D) Perception of seriousness (1 item);

- Quanto pensi che sia grave l'emergenza da coronavirus sulla salute mondiale?
  How severe do you think the coronavirus emergency on global health is?

(E) Fattori motivanti / ostacolanti che determinano la volontà di attuare le misure preventive
Motivating/hindering factors that determine the willingness to carry out preventive measures (1 item).

- Perchè esegui le misure preventive?
  Why are you taking preventive measures?
  - Sono spesso malato.
    I'm often sick.
  - Il COVID-19 può essere pericoloso.
    COVID-19 can be dangerous.
  - Mi sento responsabile della mia salute.
    I feel responsible for my health.
  - Penso di essere a rischio COVID-19.
    I think I'm at risk COVID-19.
  - Voglio prevenire il diffondersi del COVID-19.
    I want to prevent the spread of COVID-19.

- Non voglio trasmettere il COVID-19 alle persone a me vicine.
  I don't want to transmit COVID-19 to people close to me.
- Confido che le misure siano utili.
  I trust the preventive measures are helpful.
- Le autorità le raccomandano.
  authorities recommend them.
- Potrei pentirmene dopo, se non le eseguo.
  I might regret it later if I don't take them.
- Altre persone in casa o al lavoro, le seguono già.
  Other people at home or at work are following them already.
- Altro. . .
  Other. . .

ADERENZA
ADHERENCE

- Lavi le mani con acqua e sapone o con gel a base alcolica?
  Did you wash your hands using soapy water or an alcohol-based solution?
- Nei contatti sociali, mantieni una distanza di almeno un metro?
  When you had a social interaction, did you keep a distance no closer than six feet from the others?
- Starnutisci e/o tossisci in un fazzoletto evitando il contatto delle mani con le secrezioni respiratorie?
  Did you sneeze and/or cough in a tissue or elbow, preventing the hands from coming into contact with respiratory secretion?
- Eviti l'uso promiscuo di bottiglie e bicchieri?
  Did you avoid sharing bottles and cups for drinking?
- Eviti di toccare occhi, naso e bocca con le mani?
  Did you avoid touching your face, nose and mouth with your hands?
- Copri la bocca e il naso, se starnutisci e/o tossisci?
  Did you cover your mouth or nose when you sneeze and/or cough?
- Eviti strette di mano e abbracci?
  Did you avoid handshaking and hugging?
- Pulisci le superfici di casa o ufficio con disinfettante a base di cloro o alcol?
  Did you clean your home or office surfaces with disinfectant wipes or spray?
- Eviti assembramenti in luoghi pubblici o aperti al pubblico?
  Did you avoid gatherings in public places and avoid hosting gatherings in your home?
- Svolgi sport e/o attività motorie all'aperto da solo?
  Did you participate in outdoor sport and/or physical activities alone?
- Usi la mascherina?
  Did you wear a protective mask?
- Prendi farmaci antivirali e antibiotici?
  Did you take antiviral drugs or antibiotics?

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ORIGINAL RESEARCH
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COVID-19 Student Stress Questionnaire: Development and Validation of a Questionnaire to Evaluate Students' Stressors Related to the Coronavirus Pandemic Lockdown

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Clinical observations suggest that during times of COVID-19 pandemic lockdown university students exhibit stress-related responses to fear of contagion and to limitations of personal and relational life. The study aims to describe the development and validation of the 7-item COVID-19 Student Stress Questionnaire (CSSQ), a measurement tool to assess COVID-19-related sources of stress among university students. The CSSQ was developed and validated with 514 Italian university students. Exploratory Factor Analysis (EFA) was conducted with one split-half sub-sample to investigate the underlining dimensional structure, suggesting a three-component solution, which was confirmed by the Confirmatory Factor Analysis (CFA) with the second one split-half sub-sample (CFI = 0.95; TLI = 0.95; RMSEA = 0.06). The CSSQ three subscales measure COVID-19 students' stressors related to (1) Relationships and Academic Life (i.e., relationships with relatives, colleagues, professors, and academic studying); (2) Isolation (i.e., social isolation and couple's relationship, intimacy and sexual life); (3) Fear of Contagion. A Global Stress score was also provided. The questionnaire revealed a satisfactory internal consistency (Cronbach's alpha = 0.71; McDonald's omega = 0.71). Evidence was also provided for convergent and discriminant validity. The study provided a brief, valid and reliable measure to assess perceived stress to be used for understanding the impact of the COVID-19 pandemic lockdown among university students and for developing tailored interventions fostering their wellbeing.

Keywords: COVID-19, health psychology, pandemic lockdown, university students, validation

INTRODUCTION

The Coronavirus Disease 2019 (COVID-19) has been defined as an extreme health, economic and social emergency and it was declared a global pandemic by the World Health Organization on March 2020 (World Health Organization, 2020), resulting in lockdown and life restrictions in Italy as worldwide in the attempt to prevent and slow the spread of the virus.

Comparable previous emergencies, such as the SARS outbreak, were strongly demonstrated as spreading stress and inducing psychological disease in terms of depression, anxiety but also panic attacks, and even psychotic symptoms, delirium, and increased rates of suicidal (Xiang et al., 2020). These results have been recently confirmed with respect to the current COVID-19 pandemic (Brooks et al., 2020; Zandifar and Badrfam, 2020), particularly in terms of high levels of psychological distress (Qiu et al., 2020), depression (Wang et al., 2020), anxiety (Horesh and Brown, 2020; Lima et al., 2020; Rajkumar, 2020), fear and panic behaviors (Shigemura et al., 2020).

In this perspective, a review conducted by Brooks et al. (2020) on the psychological impact of quarantine periods and outbreak confinements in last decades (e.g., the SARS outbreak, the 2009 and 2010 H1N1 influenza pandemic) identified specific common experiences such as fear of contagion, fear and frustration related to inadequate supplies (e.g., basic necessities and medical supplies), sense of confusion due to inadequate quality of information from public health authorities, sense of isolation, frustration and boredom due to loss of usual routine and to reduced social contacts (Brooks et al., 2020).

Furthermore, the COVID-19-related containment measures imposed massive work and school closures, segregation and social distancing, deeply impacting on personal and relational life and exposing people to experience uncertainty, feelings of isolation, and sense of "losses" in terms of motivation, meaning, and self-worth (Williams et al., 2020).

In view of that, research made several efforts to better explore the psychological impact of the ongoing Coronavirus global outbreak, developing and validating specific tools.

In particular, the Fear of COVID-19 Scale (FCV-19S; Ahorsu et al., 2020; Soraci et al., 2020) and the Coronavirus Anxiety Scale (CAS; Lee, 2020a) were developed to assess, respectively, perceived COVID-related fear and anxiety. Moreover, the COVID-19 Peritraumatic Distress Index (CPDI; Costantini and Mazzotti, 2020; Qiu et al., 2020) was developed to assess the frequency of anxiety, depression, specific phobias, cognitive change, avoidance and compulsive behavior, physical symptoms and loss of social functioning.

Finally, the COVID-19 Stress Scales (CSS; Taylor et al., 2020) was developed to measure the psychological impact of COVID-19 in terms of danger and contamination fears, fears about economic consequences, xenophobia, compulsive checking and reassurance seeking, and traumatic stress symptoms.

Overall, the instruments reported above specifically addressed the impact of the COVID-19 outbreak in terms of psychological outcomes, without addressing and identifying specific sources of stress related to relational and daily life changes induced by the COVID-19 pandemic lockdown. Indeed, the COVID-19 pandemic-related experiences induced not only fears of contagion and social isolation but also significant modifications in several aspects of daily routine, mainly influencing (hindering or intensifying) all relationships, such as those with relatives, with the partner, with friends, with colleagues. Consequently, it emerged the need to develop instruments able to address not only the potential effects of isolation and fear of contagion but also of modifications of all significant relationships in daily life, so considering all potentially perceived sources of stress featuring the experience of pandemic lockdown.

Furthermore, in line with the transactional perspective (Lazarus and Folkman, 1984), stress is considered a dynamic relational process, which depends on the constant interplay between individual factors (e.g., age, gender) and situational factors, so requiring to take into account specificities of target populations when defining tools to evaluate perceived sources of pressure.

From this perspective, the academic context was deeply affected by the lockdown restrictions worldwide. Indeed, due to the massive closure of colleges and universities (United Nations Educational, Scientific and Cultural Organization, 2020), all the scheduled activities and events were postponed/annulled, campuses and students' accommodations were forced to evacuations, all the formal and informal interactions were shifted to online platforms, leading to a substantial change in students' customary life.

Different studies exploring factors associated to COVID-19 outbreak among university students highlighted high levels of anxiety and worries about academic delays and influence of the epidemic on daily life, due to the disruption in students' daily routine, in terms of activities, objectives and social relationships (Cao et al., 2020; Chen et al., 2020; Lee, 2020b; Sahu, 2020). Indeed, the quarantine hindered the possibility to experience the university life, impacting on academic studying (i.e., uncertainties related to annulment/delays of activities, difficulties in employment of online platforms for the distance learning), but also impairing the possibility to benefit from the relationships that may represent anchor in students' life, such as those with peers, colleagues, and professors (Lee, 2020b; Sahu, 2020). In addition, also considering the increasingly key role played by romantic relationships in the young population (Anniko et al., 2019), research also outlined the potential changes in couple' relationship, intimacy, and sexual life due to the COVID-19 pandemic (Li et al., 2020; Rosenberg et al., 2020).

Moreover, whether, on the one hand, the abovementioned relationships with partner, friends, peers, colleagues, and professors were subject to a radical reduction and standstill, on the one other hand, in most of the cases, relationships with relatives were deeply intensified. Indeed, the majority of students were forced to return back home, also resulting from the campus dormitory evacuations, inducing an increased exclusivity of interaction with relatives, potentially exacerbating frustration and conflicts. This particularly when considering students living in already disadvantaged conditions and/or suffering from abusive home experiences (Lee, 2020b).

Overall, whether it's clear that university students' life was subject to broad modifications, up to date, there are no specific tools to understand, comprehensively identify and assess specific sources of stress featuring university students' COVID-19-related experiences. This, however, could help in early recognize those students at higher risk for developing a significant psychological disease related to the pandemic lockdown, and, accordingly, provide timely and tailored interventions fostering their wellbeing.

Responding to this need, the present study aimed at proposing and validating a newly developed measurement tool to specifically assess sources of stress related to the COVID-19 pandemic lockdown among university students, namely the COVID-19 Student Stress Questionnaire (CSSQ).

Seven potential sources of stress have been hypothesized and operationalized. These sources have been defined as connected not only to fear of contagion and to experience of isolation but also to the potential abovementioned changes in students' daily life and routine. In particular, it was hypothesized that induced changes in academic studying and relationships with friends, partner, university colleagues, professors and relatives could constitute significant perceived COVID-19 pandemic lockdown-related sources of stress among university students.

Hypotheses and research questions to rigorously check the validity and reliability of the COVID-19 Student Stress Questionnaire (CSSQ) are listed in **Table 1**.

MATERIALS AND METHODS

Participants and Sampling

Online survey data were collected from 15 April to 15 May 2020 with students from the University of Naples Federico II. This period fully corresponded to the pandemic lockdown due to COVID-19 in Italy, and students were experiencing the consequences of university closures, with massive social restrictions. The participants were recruited through Microsoft Teams. Students were contacted and given all the information about the study, and they were asked their participation on a voluntary basis. All the participants were fully informed about the aims of the study and about the confidentiality of the data, and they were also assured that the data would be used only for the purpose of the research and refusal to participate would not affect their current and future course of study in any way. The study was approved by the Ethical Committee of Psychological Research of the University where the study took place (IRB:12/2020). Research was performed in accordance with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from each student prior to participating in the study. Every precaution was taken to protect the privacy of research subjects and the confidentiality of their personal information. Overall, 514 university students voluntarily enrolled in the study and completed online Microsoft Teams forms.

Measures

The questionnaire included a section dealing with background information (i.e., Gender, Age, Degree Program, Year of study), the proposed 7-item COVID-19 Student Stress Questionnaire, and a measure for psychophysical health conditions.

TABLE 1 | Research questions and hypotheses of the validation study.

Level of evidence and reliability	Number of research questions (R) or hypothesis (H)	Research question or hypothesis
Evidence based on construct validity		
	R1	Are all the items of the proposed COVID-19 Student Stress Questionnaire (CSSQ) relevant and appropriate in terms of the construct of COVID-19-related perceived stress among university students?
	R2	Is the CSSQ a uni-dimensional or multidimensional measure?
	H1	The data from this study reveal correlations, so that significant and coherent factors can be identified.
	H2	A factorial structure of the CSSQ can be confirmed.
Evidence based on convergent validity		
	H3	The standardized factor loadings, and the values of Composite Reliability and Average Variance Extracted of all factors are adequate.
	H4	There are moderate to strong correlations between the scales scores of the CSSQ and the standardized scales scores of the SCL-90-R.
Evidence based on discriminant validity		
	H5	The square root of the Average Variance Extracted of factors is above the correlations among the factors of the CSSQ.
	H6	There are moderate correlations among the CSSQ subscales scores, and strong correlations between the CSSQ subscales scores and the Global Stress score.
Reliability: internal consistency		
	H7	The CSSQ shows satisfactory internal consistency.

COVID-19 Related Sources of Stress Among University Students

The COVID-19 Student Stress Questionnaire (CSSQ) was specifically developed to assess university students' perceived stress during the COVID-19 pandemic lockdown. It consists of 7 items on a 5-point Likert scale ranging from zero ("Not at all stressful") to four ("Extremely stressful"). For the purpose of instrument design, perceived stress was operationalized based on transactional models of stress (Lazarus and Folkman, 1984). Each item was developed to cover different domains that could have been subject to variations due to the COVID-19 pandemic lockdown, and, therefore, that may be potentially perceived as sources of stress (i.e., risk of contagion; social isolation; relationship with relatives; relationship with colleagues; relationship with professors; academic studying; couple's relationship, intimacy and sexual life). The scale provides a Global Stress score ranging from 0 to 28.

Psychophysical Health Conditions

The Symptom Checklist-90-Revised (SCL-90-R; Derogatis, 1994; Prunas et al., 2010) was used to assess self-reported psychophysical health conditions. The scale comprises 90 items on a 5-point Likert scale ranging from zero ("Not at all") to four ("Extremely") and divided into nine subscales: Anxiety (10 items, Cronbach's $\alpha = 0.84$), Depression (13 items, Cronbach's $\alpha = 0.87$), Somatization (12 items, Cronbach's $\alpha = 0.83$), Interpersonal Sensitivity (9 items, Cronbach's $\alpha = 0.83$), Hostility (6 items, Cronbach's $\alpha = 0.80$), Obsessive-Compulsive (10 items, Cronbach's $\alpha = 0.82$), Phobic Anxiety (7 items, Cronbach's $\alpha = 0.68$), Psychoticism (10 items, Cronbach's $\alpha = 0.77$), and Paranoid Ideation (6 items, Cronbach's $\alpha = 0.76$). Participants were asked to indicate how much these problems have affected them during the past 4 weeks (e.g., Anxiety subscale: "Tense or keyed up", "Fearful"; Depression subscale: "Hopeless about future", "No interest in things"). The scale also provides a global index, namely the Global Severity Index (GSI). GSI is the sum of all responses divided by 90, and it indicates both the number of symptoms and the intensity of the disease (GSI Cronbach's $\alpha = 0.97$).

Data Analysis

For the validity testing of the CSSQ we used the European Federation of Psychologists' Association's (EFPA) standards and guidelines (Evers et al., 2013), which describe the standard method for validity testing by the following levels of evidence: 1) Construct validity; 2) Criterion validity: (a) Post-dictive or retrospective validity; (b) Convergent validity; (c) Discriminant validity. In the present study, validity evidence was examined in relation to Construct validity, Convergent validity, and Discriminant validity.

Evidence Based on Construct Validity

Evidence based on construct validity was examined to answer research questions 1 and 2 and to test hypotheses 1 and 2 (**Table 1**). To examine the validity of the COVID-19 Student Stress Questionnaire (CSSQ) we used a two-step analytic strategy. First, the entire study sample ($N = 514$) was split using a computer-generated random seed. According to the rules of thumb for sample size in factor analysis, the sample size for each sub-sample ($n = 257$) was considered adequate to explore the structure of the 7-item CSSQ (Comrey and Lee, 1992; Costello and Osborne, 2005; DeVellis, 2017). Construct validity was analyzed using Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA).

EFA was performed in the first split-half (Sub-sample A, $n = 257$) to explore the latent dimensional structure (R1 and R2) and to identify significant and coherent factors (H1). Principal Components Analysis (PCA) with oblique promax rotation was used. The choice of non-orthogonal rotation was justified on the hypothesis that the factors would be correlated. The factorability of the correlation matrix of the scale was evaluated by Kaiser–Meyer–Olkin (KMO) measure and Barlett test of sphericity. Criteria for extraction and interpretation of factors were as follows: eigenvalues > 1.0, Cattell's scree test and inspection of scree plot, communality ≥ 0.30 for each item and factor loading > 0.32 for each item loading on each factor (Costello and Osborne, 2005).

CFA was performed in the second split-half sub-sample (Sub-sample B, $n = 257$) to determine the goodness-of-fit of the extracted factor model (H2). Standard goodness-of-fit indices were selected *a priori* to assess the measurement models: χ^2 non-significant ($p > 0.05$), Tucker-Lewis Index (TLI > 0.95), Root Mean Square Error of Approximation (RMSEA < 0.08) and Comparative Fit Index (CFI > 0.95) (Hu and Bentler, 1998).

Evidence Based on Convergent Validity

Evidence based on convergent validity was explored to test hypotheses 3 and 4 (**Table 1**). Convergent validity was tested, first, by calculating standardized factor loadings, composite reliability (CR), and average variance extracted (AVE) of factors (H3). If the standardized factor loadings of a questionnaire are > 0.5 and statistically significant, and the values of CR and AVE of each factor are higher than 0.7 and 0.5, respectively, the questionnaire is considered as having a satisfactory convergent validity (Fornell and Larcker, 1981; Hair et al., 2010). Moreover, convergent validity was assessed by correlational analyses (Pearson's correlation coefficient) between the scales scores of the newly developed COVID-19 Student Stress Questionnaire and the standardized scales scores of the SCL-90-R (nine subscales and Global Severity Index) (H4). The effects size were interpreted following Cohen's thresholds ($r < 0.30$ represents a weak or small correlation; $0.30 < r < 0.50$ represents a moderate or medium correlation; $r > 0.50$ represents a strong or large correlation) (Cohen, 1988).

Evidence Based on Discriminant Validity

Evidence based on discriminant validity was explored to test hypotheses 5 and 6 (**Table 1**). Discriminant validity was evaluated by comparing the square root of the average variance extracted (SQRT AVE) with the correlations between latent constructs (H5). When the SQRT AVE is above the correlations among factors, a questionnaire is considered as having an acceptable discriminant validity (Fornell and Larcker, 1981). Furthermore, discriminant validity was also tested basing on the correlations

between the CSSQ subscales and the Global Stress scores using the Pearson's correlation coefficient (H6).

Evidence Based on Internal Consistency

Evidence based on internal consistency was explored to test hypothesis 7 (**Table 1**). Item means, standard deviations, and mean inter-item correlation (between 0.15 and 0.50) were evaluated (Clark and Watson, 1995). Moreover, for the reliability test, Cronbach's Alpha (Cronbach, 1951) and McDonald's Omega (McDonald, 1999) were used to assess the internal consistency of the questionnaire, considering $\alpha \geq 0.70$ (Santos, 1999) and $\omega \geq 0.70$ (McDonald, 1999) as indices of satisfactory internal consistency reliability (H7).

Finally, means, standard deviations, and ranges of the newly developed COVID-19 Student Stress Questionnaire (CSSQ) scales were calculated.

RESULTS

Characteristics of Participants

Characteristics of the total sample ($N = 514$) as well as of each sub-sample (A and B) are shown in **Table 2**. The total sample consisted of 372 women and 142 men, with a combined mean age of 19.92 ($SD = 1.50$) years. The sample was composed of students enrolled in Philosophy ($n = 10$, 1.9%), Modern Languages and Literature ($n = 44$, 8.6%) and Psychology ($n = 460$, 89.5%) degree programs; the majority of them were 1st year students (1st year $n = 400$, 77.8%; 2nd year $n = 46$, 8.9%; 3rd year $n = 68$, 13.3%).

Construct Validity

Construct validity (research question 1) was examined by conducting EFA and CFA.

Exploratory Factor Analysis

Exploratory Factor Analysis (EFA) using Principal Components Analysis (PCA) with oblique promax rotation was carried out to investigate the underlining dimensional structure of the CSSQ. The assessment of factorability showed that the Kaiser–Meyer–Olkin measure was 0.73 and Bartlett's test of sphericity was significant ($\chi^2 = 332.26$, df = 21, $p < 0.001$) indicating that the data were adequate for the factor analysis, supporting hypothesis 1. The examination of the scree plot produced a departure from linearity corresponding to a three-component result; the scree-test also confirmed that our data should be analyzed for three components, responding to research question two. The first three eigenvalues were 2.61, 1.20, and 1.00. The three-component solution explained a variance of 67.09% from a total of 7 items.

The first component (4 items, explained variance = 37.23%) was loaded by items referred to perceived stress related to relationships with relatives, relationships with colleagues, relationships with professors, and academic studying. We labeled this scale Relationships and Academic Life.

The second component (2 items, explained variance = 17.20%) was loaded by items referred to perceived stress related to social isolation and changes in couples' relationship, intimacy and sexual life due to the social isolation. We labeled this scale Isolation.

The third component (1 item, explained variance = 12.66%) was loaded by a single item referred to perceived stress related to the risk of infection, hence it was labeled as Fear of Contagion (**Table 3**).

Confirmatory Factor Analysis

Confirmatory Factors Analysis (CFA) was run to test hypothesis 2. The results supported the PCA findings (**Figure 1**) by demonstrating that the three-factors model ($\chi^2 = 4.52$,

TABLE 2 | Characteristics of study participants.

	Sub-sample A *n* = 257		Sub-sample B *n* = 257		Total Sample *N* = 514	
Characteristics	**Value**	**Range**	**Value**	**Range**	**Value**	**Range**
Gender [*n* (%)]						
Male	69 (26.8)		73 (28.4)		142 (27.6)	
Female	188 (73.2)		184 (71.6)		372 (72.4)	
Age [*Mean (SD)*]	19.95 (1.56)	[18–26]	19.92 (1.43)	[18–26]	19.92 (1.50)	[18–26]
Degree Program [*n* (%)]						
Philosophy	6 (2.3)		4 (1.6)		10 (1.9)	
Modern Languages and Literature	23 (8.9)		21 (8.2)		44 (8.6)	
Psychology	228 (88.8)		232 (90.2)		460 (89.5)	
Year of Study [*n* (%)]						
1st year	197 (76.7)		203 (79.0)		400 (77.8)	
2nd year	27 (10.5)		19 (7.4)		46 (8.9)	
3rd year	33 (12.8)		35 (13.6)		68 (13.3)	

TABLE 3 | COVID-19 Student Stress Questionnaire (CSSQ) exploratory factor analysis on first random split-half sample (n = 257).

Factors and Items	1	2	3	h^2
Factor 1: Relationships and Academic Life				
4. How do you perceive the relationships with your university colleagues during this period of COVID-19 pandemic?	**0.904**	−0.419	0.109	0.732
5. How do you perceive the relationships with your university professors during this period of COVID-19 pandemic?	**0.687**	0.240	−0.136	0.646
6. How do you perceive your academic studying experience during this period of COVID-19 pandemic?	**0.560**	0.381	−0.207	0.621
3. How do you perceive the relationships with your relatives during this period of COVID-19 pandemic?	**0.491**	0.180	0.271	0.441
Factor 2: Isolation				
7. How do you perceive the changes in your sexual life due to the social isolation during this period of COVID-19 pandemic?	−0.139	**0.838**	0.048	0.650
2. How do you perceive the condition of social isolation imposed during this period of COVID-19 pandemic?	0.088	**0.788**	0.128	0.722
Factor 3: Fear of Contagion				
1. How do you perceive the risk of contagion during this period of COVID-19 pandemic?	−0.003	0.122	**0.917**	0.885
Eigenvalue	2.61	1.20	1.00	
Percentage of variance	37.23	17.20	12.66	

Total variance explained = 67.09%. Cronbach's α = 0.71. Values in bold indicate major loadings. h^2 is item communality.

p = 0.79), comprising all the 7 items proposed, yielded good fit for all of indices (χ^2/df ratio = 0.56; CFI = 0.95; TLI = 0.95; RMSEA = 0.06).

Convergent and Discriminant Validity

Concerning Convergent validity, the standardized factor loadings of CSSQ items were all > 0.5 (see **Figure 1**) and statistically significant ($p < 0.001$). Moreover, the CR values were all > 0.7 (i.e., Relationships and Academic Life CR = 0.924; Isolation CR = 0.809; Fear of Contagion CR = 0.769). The values of AVE of all factors were > 0.5 (i.e., Relationships and Academic Life AVE = 0.637; Isolation AVE = 0.549; Fear of Contagion AVE = 0.649). Therefore, the standardized factor loadings, CR and AVE of factors were united to suggest that the CSSQ had strong convergent validity, confirming hypothesis 3.

Moreover, correlations with measures of psychophysical disease (SCL-90-R subscales and GSI) were carried out to further test convergent validity, showing that COVID-19 Student Stress Questionnaire scales and Global Stress scores revealed moderate to strong correlations with the SCL-90-R scales scores in the expected directions, and confirming hypothesis 4 (**Table 4**).

Concerning Discriminant validity, the square root of AVE values were compared with the correlations among factors. All the square root of AVE values (i.e., Relationships and Academic Life, SQRT AVE = 0.798; Isolation SQRT AVE = 0.741; Fear of Contagion SQRT AVE = 0.805) were above the correlation values (i.e., correlation between Relationships and Academic Life and Isolation, r = 0.645; correlation between Relationships and Academic Life and Fear of Contagion, r = 0.621; correlation between Isolation and Fear of Contagion, r = 0.660; see **Figure 1**), indicating suitable discriminant validity, and supporting hypothesis 5.

Furthermore, still concerning discriminant validity, intercorrelations between the three COVID-19 Student Stress Questionnaire scales and the Global Stress scores were also calculated. Intercorrelations ranged from 0.30 to 0.42, showing medium levels of correlation, while correlations of

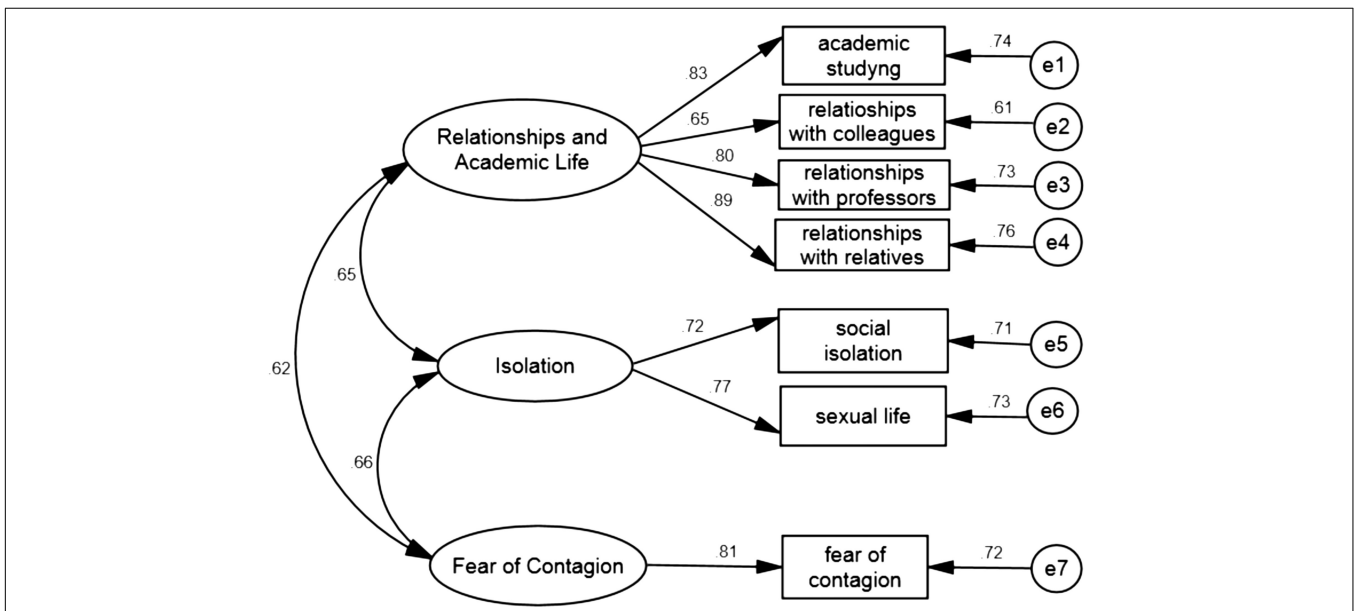

FIGURE 1 | Path diagram and estimates for the three-factor COVID-19 Student Stress Questionnaire on second random split-half sample (n = 257).

TABLE 4 | Correlations of the COVID-19 Student Stress Questionnaire (CSSQ) scales with SCL-90-R scales.

	COVID-19 Student Stress Questionnaire Scales			
SCL-90-R Scales	**Relationships and Academic Life**	**Isolation**	**Fear of Contagion**	**Global Stress**
Anxiety	0.450**	0.337**	0.533**	0.552**
Depression	0.494**	0.386**	0.393**	0.565**
Somatization	0.312**	0.313**	0.275**	0.393**
Obsessive-Compulsive	0.490**	0.262**	0.353**	0.500**
Interpersonal Sensitivity	0.457**	0.266**	0.378**	0.487**
Hostility	0.481**	0.354**	0.346**	0.532**
Phobic Anxiety	0.352**	0.154*	0.495**	0.405**
Paranoid Ideation	0.411**	0.309**	0.292**	0.456**
Psychoticism	0.372**	0.313**	0.428**	0.467**
Global Severity Index (GSI)	0.545**	0.405**	0.475**	0.624**

*$p < 0.05$; **$p < 0.01$.

TABLE 5 | Intercorrelations between the COVID-19 Student Stress Questionnaire (CSSQ) scales.

CSSQ scales	**Relationships and Academic Life**	**Isolation**	**Fear of Contagion**	**Global Stress**
Relationships and Academic Life	1			
Isolation	0.417**	1		
Fear of Contagion	0.344**	0.298**	1	
Global Stress	0.871**	0.757**	0.587**	1

*$p < 0.05$; **$p < 0.01$.

all COVID-19 Student Stress Questionnaire scales with Global Stress scores were high in size and significant, indicating that the questionnaire assessed different but related dimensions, and confirming hypothesis 6 (**Table 5**).

Item Analysis and Reliability

Mean scores for the single items varied from a maximum score of 2.01 (Item 2: "How do you perceive the condition of social isolation imposed during this period of COVID-19 pandemic?") to a minimum of 0.44 (Item 4: "How do you perceive the relationships with your university colleagues during this period of COVID-19 pandemic?"). SDs for the single items varied from 1.36 (Item 7: "How do you perceive the changes in your sexual life due to the social isolation during this period of COVID-19 pandemic?") to 0.75 (Item 4: "How do you perceive the relationships with your university colleagues during this period of COVID-19 pandemic?"). The mean inter-item correlation was 0.26, therefore it was satisfactory. Cronbach's alpha of the total scale was 0.71, while McDonald's omega coefficient was 0.71, confirming that the CSSQ had satisfactory internal consistency (hypothesis 7).

All the items of the CSSQ were presented in **Table 6**.

Table 7 displays items, means, standard deviations, and ranges of the CSSQ scales (Relationships and Academic Life, Isolation, Fear of Contagion) and the total score (Global Stress). Considering that high levels of COVID-19-related stress can be indicated by scores that are 1 SD above the mean (e.g., the 84th percentile) and low levels of stress can be indicated by scores that are 1 SD below the mean (e.g., the 16th percentile) of the distribution of the CSSQ scores, we can affirm that scores of 6 or below indicate low levels of perceived COVID-19-related Global stress, scores of 7–15 indicate average levels of perceived COVID-19-related Global stress, and scores of 16 or more indicate high levels of perceived COVID-19-related Global stress among university students.

DISCUSSION

The aim of the present study was to develop, validate and evaluate the psychometric properties of the 7-item COVID-19 Student Stress Questionnaire (CSSQ), a brief measure to assess sources of stress related to the COVID-19 pandemic lockdown among university students. Indeed, addressing specific sources of stress tailored to target populations foster efficacy in preventive efforts and interventions (Zurlo et al., 2013, 2017; Anniko et al., 2019).

Accordingly, responding to the widespread need for developing specific tools to understand the impact of the COVID-19 global pandemic among students (Cao et al., 2020; Lee, 2020b; Sahu, 2020), it was hoped this instrument could foster a timely identification of those students at higher risk for developing a significant disease related to the ongoing unique situation, and to deliver evidence-based and tailored interventions to promote their adjustment and wellbeing.

Findings highlighted that the proposed CSSQ possessed adequate factor validity, tapping three meaningful factors.

The first factor, labeled Relationships and Academic Life, comprised four items covering perceived stress related to relationships with relatives, relationships with colleagues, relationships with professors, and academic studying. Indeed, considering that students' daily routine have been subject to specific changes (Cao et al., 2020; Chen et al., 2020; Lee, 2020b), this first factor fostered a greater understanding of the dimensions characterizing these modifications among university students in terms of relationships and academic life.

From this perspective, the relationships with relatives should be carefully focused, considering the forced full-time cohabitation, with almost exclusive sharing time and spaces throughout all days. This also as a consequence of the closures of the campus and students accommodations, which forced several students to return back home, but also considering the great number of students already living with their parents, however under completely changed conditions.

In the same direction, since restrictions drastically impaired the possibilities to benefit from living the university life, university students may report growing disease connected to changes in relationships with colleagues and professors (that, during the COVID-19 pandemic, are only allowed through online platforms), but also increased suffering related to the

TABLE 6 | The COVID-19 Student Stress Questionnaire.

	Not at all Stressful	Somewhat stressful	Moderately Stressful	Very Stressful	Extremely Stressful
1. How do you perceive the risk of contagion during this period of COVID-19 pandemic? (Come vive il rischio di contagio durante l'attuale periodo di pandemia COVID-19?)	0	1	2	3	4
2. How do you perceive the condition of social isolation imposed during this period of COVID-19 pandemic? (Come vive la condizione di isolamento sociale imposta durante l'attuale periodo di pandemia COVID-19?)	0	1	2	3	4
3. How do you perceive the relatioships with your relatives during this period of COVID-19 pandemic? (Come vive le relazioni con i suoi familiari durante l'attuale periodo di pandemia COVID-19?)	0	1	2	3	4
4. How do you perceive the relationships with your university colleagues during this period of COVID-19 pandemic? (Come vive il suo rapporto con i colleghi universitari durante l'attuale periodo di pandemia COVID-19?)	0	1	2	3	4
5. How do you perceive the relationships with your university professors during this period of COVID-19 pandemic? (Come vive il suo rapporto con i docenti universitari durante l'attuale periodo di pandemia COVID-19?)	0	1	2	3	4
6. How do you perceive your academic studying experience during this period of COVID-19 pandemic? (Come vive la sua esperienza di studio universitario durante l'attuale periodo di pandemia COVID-19?)	0	1	2	3	4
7. How do you perceive the changes in your sexual life due to the social isolation during this period of COVID-19 pandemic? (Come vive i cambiamenti nella sua vita sessuale causati dall'isolamento durante l'attuale periodo di pandemia COVID-19?)	0	1	2	3	4
	____ +	____ +	____ +	____ +	____ +
	Global Score _____				

The Italian version is provided in brackets.

academic studying (e.g., fear of delays, difficulties in finding appropriate spaces to concentrate) (Cao et al., 2020; Lee, 2020b; Sahu, 2020).

The second factor, labeled Isolation, comprised two items exploring perceived stress related to social isolation and changes in sexual life due to the containment measures. From this perspective, in line with research emphasizing the strong weight of containment measures such as quarantine and social distancing on individuals' psychological health and wellbeing (Brooks et al., 2020; Horesh and Brown, 2020; Lee, 2020a; Williams et al., 2020), the second factor also captured the perceived disease and sense of loneliness derived from living this condition, often far from the loved ones (Sahu, 2020; Zhai and Du, 2020).

From this perspective, considering the specificity of the target population, it's not surprising that the confinement in itself and sexual life belonged to the same factor. Indeed, since students were more likely to still live with their families or they returned back home due to the pandemic, it's more probable that their couple' relationship, intimacy and sexual life were subject to significant restrictions due to the lockdown. However, these findings may be also due to the specific European context, considering that the average age of young people leaving the parental house is 25.9 (Eurostat, 2020), while in several other countries students use to leave home around 18 years for starting the college (Aassve et al., 2002; Crocetti and Meeus, 2014).

The third factor, labeled Fear of Contagion, comprised one item assessing perceived stress related to the risk of infection. The relevance of the latter dimension is, indeed, in line with previous studies on the key role played by the fear to be infected, the fear for others (e.g., relatives, friends) to become ill, as well as the fear to be a source of contagion for the others (Ahorsu et al., 2020; Brooks et al., 2020; Taylor et al., 2020).

TABLE 7 | Items, mean, SD and range scores of the COVID-19 Student Stress Questionnaire scales.

CSSQ Scales	Items	Mean ± SD	Range
Relationships and Academic Life	3, 4, 5, 6	4.95 ± 2.74	0–13
Isolation	2, 7	3.51 ± 2.05	0–8
Fear of Contagion	1	1.61 ± 1.12	0–4
Global Stress	All items	10.07 ± 4.52	1–22

Concerning convergent validity, the standardized factor loadings, and the values of AVE and CR were well above the threshold suggested by Hair et al. (2010), indicating that the variances were more explained by each factor and all of the items of each factor were consistent for measuring the same latent construct.

Furthermore, data revealed significant associations of all CSSQ scales scores with all the SCL-90-R standardized scales scores as well as with the Global Severity Index. This revealed how the specific sources of stress we have identified, covering changes in Relationships and Academic Life, perceived Isolation and Fear of Contagion, could have significant negative effects on perceived psychophysical health conditions among students. These results suggested the meaningfulness to adopt the proposed instrument also to foster the development of early interventions supporting students' adjustment and promoting their psychophysical health during and after the COVID-19 pandemic lockdown.

Concerning discriminant validity, the square root of AVE values were greater than the correlations coefficients between the factors, indicating that the three factors could extract more variance than the sharing among factors, so revealing a satisfactory discriminant validity. Moreover, intercorrelations between COVID-19 Student Stress Questionnaire scales (moderate in size) and correlations between the three scales and the Global Stress score (high in size) confirmed that the CSSQ assessed different but connected dimensions, so giving further support about the validity of the proposed tool to evaluate both perceived Global Stress and different sources of stress related to the COVID-19 pandemic. Therefore, both perceived levels of Global Stress and specific stressors should be carefully considered when defining interventions fostering students' wellbeing during the current COVID-19 crisis.

Finally, the evaluation of mean inter-item correlation, Cronbach's alpha and McDonald's omega confirmed that the CSSQ had satisfactory internal consistency.

In conclusion, this study demonstrated that the COVID-19 Student Stress Questionnaire is a 7-item multidimensional scale with satisfactory psychometric properties. Moreover, it is a good instrument to be used in assessing and allaying perceived COVID-19-related stress among university students.

Implications for Clinical Practice

The study sought to address the growing concerns arising from the challenges that students around the world are facing due to the COVID-19 pandemic and from its potential negative effects on their psychophysical health conditions, by providing a brief, valid and meaningful tool, namely the COVID-19 Student Stress Questionnaire (CSSQ).

The CSSQ presented here is a brief multidimensional tool, conceived to be helpfully used by members from different areas within universities (e.g., human resources, health units, student affairs) to promote a deeper understanding of the nature of COVID-19-related stressors perceived by students, in order to define tailored policies and support interventions.

In line with this, the CSSQ could be useful to early identify those students in need of psychological support. Indeed, due to the perceived risk of contagion, the consequent modifications of all significant relationships in daily life may induce, among university students, loss of contact with formal and informal support networks and growing risk of isolation. Therefore, it becomes pivotal to make all the possible efforts to assure careful monitoring of their perceived levels of stress and psychological wellbeing.

Finally, the adoption of the CSSQ in the clinical practice can significantly help social and health practitioners, serving as a monitoring and evaluation tool to define more tailored evidence-based counseling interventions. Indeed, since tapping different stressors that could have been experienced due to the COVID-19 outbreak (i.e., stressors related to Relationships and Academic Life, Isolation, and Fear of Contagion), the adoption of this tool can help to underline those areas requiring more attention within counseling interventions and to assess the effectiveness of the interventions by evaluating potential changes over time.

Limitations and Future Research

Despite these strengthens, some limitations need to be underlined. Firstly, the administering of the questionnaire was online, potentially limiting the enrollment in the study of those without Internet access. However, since the target population of Italian university students (taking into account both the age and the provision of distance learning during the COVID-19 pandemic), we consider this limitation could have influenced our results to a little extent. Secondly, the participant pool comprised a self-selected sample of students enrolled only in one university (i.e., students enrolled in Philosophy, Modern Languages and Literature, and Psychology degree courses) with a majority being female (and therefore, tests for gender differences were not possible). Further investigation on bigger and more representative samples is needed to confirm the results provided by the present study (e.g., a nationally representative sample with more male participants). Thirdly, the study relies on participants' self-reports, and, therefore, findings could be affected by the risk of social desirability bias. Future research could, hence, include a broader range of sources of data. Furthermore, future studies could also consider the meaningfulness to adopt newly developed COVID-19-related instruments (e.g., FCV-19S) to test concurrent validity. Indeed, at the time of study design and data collection, the Italian versions of these specific measurement tools were not available yet. Another limitation is the lack of available data for a more robust examination of reliability beyond internal consistency, such as test-retest. Consequently, future studies could be designed with the aim to also conduct test-retest analysis. Finally, cultural and social variables may have potentially influenced the construct of the questionnaire as well as it's convergent and discriminant validity. Consequently, further applications of this instrument in other countries are needed to allow gaining further information about sources of stress influencing students' wellbeing according to different countries worldwide.

Notwithstanding these limitations, this study provided researchers and practitioners with a brief, easily administered, valid and reliable measure to assess perceived stress among university students, so supporting efforts to understand the

impact of this unique global crisis and develop tailored interventions fostering students' wellbeing.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethical Committee of Psychological Research of the University of Naples Federico II. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MCZ: study conception and design, interpretation of data, drafting of manuscript, critical revision. MFCDV: analysis and interpretation of data, and drafting of manuscript. FV: acquisition of data, analysis and interpretation of data, and drafting of manuscript. All authors read and approved the final manuscript.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Stuck Outside and Inside: An Exploratory Study on the Effects of the COVID-19 Outbreak on Italian Parents and Children's Internalizing Symptoms

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The Covid-19 outbreak and the subsequent lockdown have profoundly impacted families' daily life, challenging their psychological resilience. Our study aimed to investigate the immediate psychological consequences of the pandemic on Italian parents and children focusing on internalizing and post-traumatic symptoms. We also wanted to explore the impact of possible risk and resilience factors, e.g., lifestyle and behaviors, emotional and cognitive beliefs, on parents and children's reaction to the emergency distress. An online survey was administered during the country's nationwide lockdown to 721 Italian parents of at least one child aged between 6 and 18 years. The respondent completed the survey for himself/herself and his/her child. The survey included socio-demographic items and validated questionnaires on parents' post-traumatic stress symptoms, depression and anxiety levels, and on children's internalizing problems. Parents were asked to fill the questionnaires twice: once referring to the current emergency condition and once recalling how they and their child felt a few months before Covid-19 outbreak. Multiple regression analyses showed that specific demographic characteristics (i.e., sex and age) and psychological factors of children and parents, such as fear of contagion and the opportunity to think about possible secondary positive effects of the pandemic, had a predictive value on the presence of internalizing symptoms of both parents and children. Moreover, parents' behaviors during the lockdown period (i.e., employment status and sport practiced) were significantly related to their own internalizing symptoms; these symptoms, in turn, had a strong and positive predictive value on children's internalizing problems. Besides, analyses of variance showed that internalizing symptoms of parents and children were significantly higher during the Covid-19 pandemic than before it started. In addition to showing a direct effect of the pandemic on the psychological health of parents and

children, the present results also give a series of important information on how parents perceive, and therefore influence, their children in this period of emergency. Our findings thus highlight the urgent need to provide parents with adequate support to take care of their own psychological wellbeing and to help their children coping with the direct and indirect effects of the pandemic.

Keywords: Covid-19, internalizing symptoms, parents, children, resilience

INTRODUCTION

The outbreak of the novel coronavirus SARS-Cov2 has led to a global health emergency with alarming implications, not only for individual and collective health, but also for emotional and social functioning (Dubey et al., 2020; Pfefferbaum and North, 2020). Children may be among the most exposed to the psychosocial consequences of the pandemic due to a major disruption in their daily life, and their immature ability to process the short- and long-term effects of the emergency. A better understanding of how children's psychological wellbeing has been affected and, more generally, how the family system has been impacted is required to find out protective and risk factors associated with mental health during the Covid-19 outbreak, and to deliver adequate support to parents and children in need.

As confirmed cases approached 110,000 patients across over 100 countries, the Covid-19 outbreak has been declared a pandemic by the World Health Organization (World Health Organization [WHO], 2020, Situation Report-51, 11th March 2020). One country after another adopted strict measures to limit the spread of the viral pneumonia, such as physical-distancing, and temporary closure of schools, universities and non-essential workplaces. Many governments indeed ordered a nationwide lockdown limiting movements of the entire population: people could not leave their home, except for a proven state of emergency or necessity. Italy was the first country in Europe to report a significant number of infections and to adopt restrictive measures. Schools and universities were closed in the worst affected regions of northern Italy in late February and, at the beginning of March, Italian prime minister announced a government decree imposing a nationwide lockdown (DPCM, 9th March 2020 in Gazzettaufficiale, 2020). The outbreak and the consequent lockdown had a profound economic and social impact and, as current literature is revealing, they significantly affected the mental health of general population: subsyndromal mental health concerns, such as depressive and anxiety symptoms, seem to be a common response to the pandemic (Rajkumar, 2020; Wang et al., 2020).

Monitoring the effects of Covid-19 outbreak across high-risk groups has become a priority and young people are likely to be among the most affected by the psychosocial consequences of the emergency (Fegert et al., 2020; Holmes et al., 2020). During Covid-19 outbreak, children's routine was drastically disrupted due to the closure of schools and lack of outdoor activities, resulting in limited connection with classmates and friends, absence of a day-to-day schedule, and increased sedentary behaviors and screen time (Xiang et al., 2020). Furthermore, children's immature ability to understand and process what was happening during and in the aftermath of the emergency made them even more vulnerable (Balaban, 2006). These arguments were supported by a preliminary study conducted in China (the first country where the epidemic developed), that reported the presence of psychological difficulties in children aged 3–18 years during the pandemic, with clinging, inattention, irritability and worries as the most severe symptoms (Jiao et al., 2020). Besides, during past epidemic diseases (i.e., N1H1, SARS, and Asian influenza), a high percentage of children who were isolated or quarantined developed acute stress and adjustment disorders: parents reported that nearly one-third of children who were quarantined met the clinical criteria for post-traumatic stress disorder (Sprang and Silman, 2013).

Overall, children exposed to emergencies and disasters can exhibit several negative psychological outcomes: they may develop internalizing problems as anxiety-related symptoms, e.g., excessive worries and fears, and depressive symptoms, e.g., becoming detached and numb, or somatic complaints, e.g., headache and stomachache (Balaban, 2006; Danese et al., 2020). It is important to bear in mind that most of these symptoms are transient, can be considered an expected reaction to intense distress, and may not require immediate clinical intervention (Danese et al., 2020). Nonetheless, we can assume that many children, during and after Covid-19 pandemic, may need special support and reassurance from their parents, as well as appropriate and simple information to understand what is happening, and they should be monitored to identify and prevent the possible development of more severe long-lasting disorders.

The direct engagement of children in systematic screening and assessment in the context of traumatic and distressing experiences should be preferred; though, if children cannot be observed directly, a widely used mean to assess the presence of children's behavioral and emotional symptoms is to ask caregivers to evaluate them, for example using the Child Behavioral Checklist Parent Report Form (Achenbach, 1991; Achenbach and Rescorla, 2001; Balaban, 2006). Although well validated, this method has been debated as parents' reports of their children's problems might be biased by their own psychopathology and by the sex of the child (Najman et al., 2001; Kroes et al., 2003). When possible, the mental health status of caregivers should be evaluated at the same time as children: many studies have shown that parental adjustments during emergencies are important predictors of children's mental health outcomes (McFarlane et al., 1987; Laor et al., 2001); moreover, one of the greatest risk factors for children to develop a psychopathology is having a parent with a psychiatric disorder (see e.g., Beidel and Turner, 1997;

Maciejewski et al., 2018). Both genetic and environmental factors seem to be involved in the familiar transmission of psychological disorders, but the exact nature of the underlying mechanisms remains still unclear.

During Covid-19 pandemic and the prolonged home confinement imposed, it is possible that children's problems may have been exacerbated by their parents' stress. Suddenly, most parents had to rearrange their schedule and find a new balance between their personal life, smart working organization, and children's management. This situation put them under great pressure, and the most vulnerable parents may have become too overwhelmed to find appropriate ways to be supportive caregivers and to address children's fears and insecurities, increasing the risk of children experiencing behavioral and emotional problems (Spinelli et al., 2020). Interestingly, during a past epidemic, Remmerswaal and Muris (2011) found that parents and children's fear of being infected were significantly correlated, and parents' fear was associated with the transmission of threat information to their offspring, which in turn was linked to children's fear of the disease (the link remained significant even when controlling for other sources of information, i.e., media, friends, school, or direct experience with the disease). Thus, parents could have a great influence on children's wellbeing in this period of emergency, and taking into account the whole family system becomes essential.

The main aim of the present study was to investigate the immediate psychological effects of Covid-19 pandemic and the consequent lockdown on children, as reported by their parents, and on parents themselves. We focused on internalizing and post-traumatic stress symptoms, controlling for those demographic factors that are most associated with their incidence (i.e., age and gender; Altemus et al., 2014). We expected that internalizing problems (i.e., behavioral and emotional problems, often occurring concurrently, with prominent anxiety, withdrawal, depressive and somatic symptoms unexplained by medical conditions; Achenbach et al., 2016) might have increased (with respect to normative data) during the health emergency in both parents and children (see e.g., Jiao et al., 2020; Wang et al., 2020) and that parents' difficulties might have had a negative impact on children's wellbeing (see e.g., Spinelli et al., 2020). Furthermore, little is known about which factors may be associated with parents and children's mental health during a health emergency. Therefore, we aimed at exploring the impact of possible risk and protective, resilience factors on parents and children's reaction to the emergency distress: such as lifestyle and behaviors (i.e., the amount of sport practiced by the parents, parents' employment status, and the number of children's close friends), and emotional and cognitive beliefs (i.e., parents' fear of being infected by SARS-Cov2 and parents' ability to broaden their biased attention on the pandemic crisis by thinking about its possible secondary positive effects or implications). Finally, parents and children's current wellbeing could have been partly influenced by their prior condition, thus we were also interested in incorporating a retrospective research design (i.e., asking parent participants to report on the basis of their memories). We thus asked parents to rate their own anxiety and depression problems, and those of their children, twice: once referring to the current emergency period, and once recalling how they and their children felt before Covid-19 outbreak.

MATERIALS AND METHODS

Participants and Procedure

An online survey among parents of, at least, one child aged between 6 and 18 years living in northern or central Italy was administered from April 16 to May 07, 2020, during the country's nationwide lockdown. A member of the parenting couple completed the survey for himself/herself and his/her child. The first part of the survey included a socio-demographic questionnaire (40 items) focused on how parents and their children were experiencing the health emergency. Next, participants completed 3 validated questionnaires on impact of events, depression and anxiety levels, and the internalizing problems of their children (i.e., symptoms of anxiety, depression and somatic complaints). Parents were asked to fill the questionnaires twice: once referring to the current health emergency (a condition called Cov) and once recalling how they and their children felt the months before Covid-19 outbreak, namely the last months of 2019 (a condition called PreCov). To help participants in the PreCov condition, the survey instructions explained to them that a useful way to remember how they (and their children) felt a few months earlier, could be to observe the photos of that period that the participants could have kept on their mobile phones. The order of presentation of the questionnaires was counterbalanced across participants (i.e., there were two possible sequences: Cov, PreCov or PreCov, Cov). The impact of event scale was only filled once with reference to the current health emergency.

Participants were initially recruited using word-of-mouth and through contacting school leaders and school teachers; the questionnaires were initially equally distributed in the two sequence orders. Then, participants were also recruited by snowball sampling overall resulting in 849 respondents though not perfectly counterbalanced in terms of the two questionnaires' sequence orders (see **Table 1**). Thus, we decided to take the sequence order factor into consideration in the data analysis. All data were collected using Google Forms. The procedures were approved by the local Ethics of the University of Udine and were in accordance with the Helsinki Declaration guidelines. All participants provided informed consent.

As mentioned above, 849 respondents completed the survey. After excluding parents with serious physical or psychiatric conditions (55 participants), parents of atypically developing children (53 participants), those who had been infected with Covid-19 (1 participant) or whose child was not between 6 and 18 years old (17 participants), and 2 respondents who had not completed the survey correctly, we obtained a sample of 721 healthy parents of typically developing children (mean age 42.80 $\pm$ 5.47 years; 103 males, 14.2%; mean age of children 10.08 $\pm$ 2.52 years; 372 males, 51.6%) on which we based the following analyses.

The sample was mainly composed of Italian parents (709, 98.3%), who were married (524, 72.6%); most of them had

TABLE 1 | Raw scores of participants.

	IES-R_Cov	HADS_Cov anxiety	HADS_Cov depression	CBCL_Cov anxiety	CBCL_Cov withdrawn/depressed	CBCL_Cov somatic complaints
Whole sample of respondents (age 42.80 years ± 5.47) *N* = 721	23.16 ± 15.71	6.06 ± 3.70	5.49 ± 3.67	5.14 ± 3.95	2.81 ± 2.84	1.58 ± 2.01
Sex_Parent ('0') = Female 85.71%	24.68 ± 15.90	6.38 ± 3.74	5.76 ± 3.68	5.31 ± 3.97	2.94 ± 2.87	1.71 ± 2.08
Sex_Parent ('1') = Male 14.29%	14.02 ± 10.66	4.14 ± 2.80	3.88 ± 2.20	4.12 ± 3.64	2.02 ± 2.47	0.81 ± 1.13
Sex_Child ('0') = Female 48.40%	23.87 ± 15.78	6.12 ± 3.75	5.61 ± 3.67	5.21 ± 3.90	2.69 ± 2.99	1.78 ± 2.10
Sex_Child ('1') = Male 51.60% (age whole sample: 10.07 years ± 2.52)	22.49 ± 15.62	6.01 ± 3.66	5.38 ± 3.68	5.08 ± 3.99	2.92 ± 2.68	1.40 ± 1.89
Sport ('0') = 0–1 h/day 70.46%	24.13 ± 16.14	6.41 ± 3.74	5.91 ± 3.69	5.22 ± 3.92	2.97 ± 2.88	1.67 ± 2.07
Sport ('1') = >1 h/day 29.54%	20.84 ± 14.39	5.23 ± 3.47	4.48 ± 3.45	4.95 ± 4.01	2.42 ± 2.69	1.38 ± 1.81
Work ('0') = none/suspended 42.86%	24.12 ± 16.42	6.31 ± 3.83	5.87 ± 3.71	5.45 ± 4.09	2.88 ± 3.06	1.72 ± 2.09
Work ('1') = remote/on site 57.14%	22.43 ± 15.13	5.88 ± 3.59	5.20 ± 3.62	4.91 ± 3.82	2.76 ± 2.66	1.48 ± 1.93
Fear ('0') = none/little 84.61%	21.25 ± 14.55	5.68 ± 3.57	5.25 ± 3.68	5.02 ± 3.88	2.83 ± 2.87	1.60 ± 2.06
Fear ('1') = much/very much 15.39%	33.61 ± 17.67	8.18 ± 3.72	6.81 ± 3.35	5.82 ± 4.23	2.69 ± 2.65	1.51 ± 1.65
BBA_1 ('0') = never/sometime 48.83%	26.02 ± 16.58	6.83 ± 3.84	6.48 ± 3.76	5.36 ± 3.84	3.04 ± 2.84	1.59 ± 2.05
BBA_1 ('1') = often/very often 51.17%	20.43 ± 14.33	5.33 ± 3.42	4.54 ± 3.32	4.93 ± 4.04	2.59 ± 2.82	1.57 ± 1.95
BBA_2 ('0') = never/sometime 36.48%	26.79 ± 16.78	7.01 ± 3.83	6.58 ± 3.77	5.50 ± 3.97	3.05 ± 2.90	1.53 ± 1.89
BBA_2 ('1') = often/very often 63.52%	21.07 ± 14.67	5.52 ± 3.52	4.86 ± 3.47	4.93 ± 3.92	2.67 ± 2.79	1.61 ± 2.06
Sequence ('0') = PreCov_Cov 32.73%	22.35 ± 15.74	5.97 ± 3.76	5.40 ± 3.52	4.43 ± 3.86	2.95 ± 2.89	1.45 ± 1.88
Sequence ('1') Cov_PreCov 67.26%	23.55 ± 15.69	6.11 ± 3.68	5.53 ± 3.75	5.49 ± 3.94	2.74 ± 2.81	1.64 ± 2.06
Friends_Child ('0') = 0–2 30.51%	22.10 ± 15.51	5.98 ± 3.69	5.80 ± 3.69	5.80 ± 4.32	3.25 ± 2.92	1.64 ± 1.95
Friends_Child ('1') = ≥3 69.49%	23.62 ± 15.78	6.10 ± 3.71	5.35 ± 3.66	4.85 ± 3.74	2.62 ± 2.78	1.56 ± 2.03
	IES-R_PreCov	**HADS_PreCov anxiety**	**HADS_PreCov depression**	**CBCL_PreCov anxiety**	**CBCL_PreCov withdrawn/depressed**	**CBCL_PreCov somatic complaints**
Whole sample of respondents (age 42.80 years ± 5.47) *N* = 721	N/a	5.19 ± 3.14	3.98 ± 3.22	4.56 ± 3.71	2.23 ± 2.62	1.33 ± 1.73
Sequence ('0') = PreCov_Cov 32.73%	N/a	5.47 ± 3.27	4.45 ± 3.15	5.41 ± 3.84	2.73 ± 2.66	1.47 ± 1.74
Sequence ('1') = Cov_PreCov 67.26%	N/a	5.05 ± 3.07	3.76 ± 3.24	4.15 ± 3.57	1.98 ± 2.56	1.25 ± 1.73

Raw scores (mean and standard deviation, SD) of questionnaires (completed with reference to the Covid-19 health emergency: Cov) for the whole sample of respondents (parents of children and adolescents aged 6–18 years who rated their own symptoms of post-traumatic stress, anxiety and depression and then rated those of their children) and by function of Sex (of parents and children), Sport, Work, Fear, Friends_Child and a "broadening of biased attention" on the pandemic crisis expressed in terms of participants' thinking about its possible secondary positive effects for one's life (BBA_1) and for the environment (BBA_2). Data of questionnaires filled in with reference to the period preceding the start of the Covid-19 outbreak (last months of 2019: PreCov) are reported in the bottom part of the table. N/a, not available. IES-R, Impact of Event Scale-Revised; HADS, Hospital Anxiety and Depression Scale; CBCL, Child Behavior Checklist. Sequence indicates the order with which HADS and CBCL questionnaire were compiled by parents [PreCov_Cov = Sequence ('0') and Cov_PreCov = Sequence ('1')].

1 or 2 children (194, 26.9 and 415, 57.6%, respectively) and had a high-school diploma or a higher education level (371, 51.4%). The majority of the sample was living in a village with <2,000 inhabitants (330, 45.8%) or a small city of 2,000–10,000 inhabitants (268, 37.2%), in a house with more than 125 sqm (364, 50.5%), and had access to a garden (633, 87.7%).

Measures

Socio-Demographic Questionnaire

A socio-demographic questionnaire was developed for the purpose of this study. The first part included 13 demographic questions about participants' age, sex, nationality, education, physical and/or psychiatric conditions, marital status, number of children, the characteristics of the place of residence, the characteristics of their house, i.e., its size and if it has an outdoor space, and the number of people with whom they were living. The second group of questions (5 items) focused on parents' lifestyle during the last 2 weeks: their employment status, the amount of time they spent every day practicing sport (range of possible answers: 0–>2.5 h per day) and with their child (<1–>5 h per day), the number of times they left home (0–>5 times) and the amount of time spent outside (<1–>4 h). Third, parents were asked to report their direct experience with the COVID-19 infection (6 items): if they had been tested with the swab, if they were positive, if they experienced COVID-19 symptoms, how much they feared being infected (no fear – very much fear of contracting the virus) and the amount of time they spent inquiring about the pandemic in the media since COVID-19 breakdown in China on January 2020 (<1–>2 h per day). Then, there were 14 questions regarding their child and his/her lifestyle before and during the pandemic: which child they were referring to (their only child, the firstborn, etc.) and why they had chosen him/her, the child's age, sex, nationality, grade attended, if he/she had a learning support teacher and why, if he/she had a physical or psychiatric condition, how many times per week he/she used (before the Covid-19 outbreak) to meet friends outside from school (<1–≥3 times a week), which sports he/she preferred, how many close friends he/she had (0–≥4 close friends) and the amount of time he/she spent every day with the respondent parent (<1–>5 h per day). Finally, there were 2 items that aimed at exploring if parents could broaden, in the past 2 weeks, their biased attention on the pandemic crisis by thinking about its possible secondary positive effects. This aspect was operationalized as having thought (never – very often) during the past 2 weeks of the health emergency about its possible related implications or opportunities for one's life, i.e., giving oneself more space or slowing down the frenetic pace of life, and for the environment, i.e., reducing pollution and undertaking in the future a more environmental friendly lifestyle.

Impact of Event Scale-Revised

After completion of the socio-demographic questionnaire, participants filled in three questionnaires. The Italian adaptation of the IES-R (Weiss and Marmar, 1996; Craparo et al., 2013) is a 22-item self-report measure of current subjective distress in response to a specific traumatic event. It comprises three subscales representative of the major symptoms clusters of post-traumatic stress: intrusion (item example: "I thought about it even when I did not mean to"), avoidance (item example: "I tried not to think about it"), and hyper-arousal (item example: "I found myself acting or feeling like I was back at that time"). The responses are rated on a 4-point Likert scale ranging from 0 (never) to 3 (very often). In the present study the participants were asked to refer to the symptoms of distress they may had experienced during the last week regarding the emergency of COVID-19 pandemic and the consequent restrictive measures adopted by the government. Overall sample Cronbach's alpha: IES-R = 0.93.

Hospital Anxiety and Depression Scale

The Italian adaptation of the HADS (Zigmond and Snaith, 1983; Costantini et al., 1999) is composed of two 7-item scales that assess emotional disturbance: one for anxiety (item example: "Worrying thoughts go through my mind") and one for depression (item example: "I look forward with enjoyment to things"). Each item is scored from 0 to 3, so the respondent can score between 0 and 21 for either anxiety or depression, with higher scores denoting higher levels of anxiety or depression. The participants of this study were asked to fill the HADS twice: once referring to the current health emergency (taking the last 2 weeks as a time reference) (the Cov condition) and once recalling how they felt the months before Covid-19 outbreak (the PreCov condition). Overall sample Cronbach's alpha: total HADS-Cov score = 0.87; total HADS-PreCov score = 0.84.

Child Behavior Checklist (6–18)

The Italian adaptation of the CBCL/6-18 (Achenbach, 1991; Achenbach and Rescorla, 2001; Frigerio, 2001) is a caregiver report form used to assess behavioral and emotional problems in children and adolescents aged 6–18 years. In the present study we used 3 syndrome scales: anxious/depressed (13 items; item example: "Cries a lot"), withdrawn/depressed (8 items; item example: "There is very little he/she enjoys"), and somatic complaints (11 items; item example: "Feels dizzy or lightheaded"). Each item is scored from 0 (not true) to 2 (very true or often true), and the sum of the scores of the 3 scales corresponds to the broader dimension of internalizing problems (higher scores denote higher internalizing problems). The participants of this study were asked to fill the CBCL/6-18 twice: once referring to their child's problems of the past 2 weeks (the Cov condition) and once recalling their child's problems the months before Covid-19 outbreak (the PreCov condition). Overall sample Cronbach's alpha: total CBCL-Cov internalizing score = 0.88; total CBCL-PreCov internalizing score = 0.87.

Data Analysis

Continuous measures were summarized reporting mean and standard deviation (SD) of raw scores for both the whole sample of respondents and separately for the two levels ('1' and '0') of each dichotomous variable considered in the following analysis (i.e., sex of the participant, sex of his/her child, amount of sport practiced by the parent, parent's employment status, parent's fear of contagion, parent's broadening of biased attention on the crisis regarding oneself and the environment, number of child's close friends, sequence of questionnaires: Cov, PreCov or PreCov, Cov) (**Table 1**).

The main analyses focused on the Cov condition and concerned a series of multiple linear regression models on continuous responses reported by the participants about: (1) their own levels of current post-traumatic stress (IES-R_Cov), anxiety (HADS_Cov Anxiety) and depression (HADS_Cov Depression)

and (2) their children's levels of current internalizing symptoms, in the three components of anxiety (CBCL_Cov anxiety), depression (CBCL_Cov withdrawn/depression), and somatic complaints (CBCL_Cov somatic complaints).

Dichotomous and continuous variables were introduced in the models at one single step of computation. In particular, for each of the three models concerning parents' stress and internalizing symptoms, we introduced: (1) four demographic variables, such as sex and age of both parents and their children (Age_Parent; Age_Child; Sex_Parent; Sex_Child); (2) two dichotomous variables concerning the amount of sport practiced each day during the past 2 weeks (Sport: 0–1 vs. >1 h per day) and the participants' current employment status (Work: unemployed or temporarily suspended vs. remote or on-site worker); (3) three dichotomous variables concerning the psychological factors of fear of infection (Fear: none or little fear vs. much or very much fear of contracting SARS-CoV2 virus) and a "broadening of biased attention" (BBA) on the pandemic crisis, which was reflected by participants' thinking about (never or sometimes vs. often or very often during the last 2 weeks of the health emergency) its possible secondary positive effects or implications: for one's life (for example giving oneself more space or slowing down the frenetic pace of life: BBA_1) and for the environment (for example reducing pollution and undertaking in the future a more environmental friendly lifestyle: BBA_2). Finally, a last dichotomous variable was included in the models reflecting the Sequence with which participants had to rate their own symptoms (and those of their children) of anxiety and depression. As already mentioned, there were two possible sequences: Cov, PreCov and PreCov, Cov. The impact of event scale (IES-R) was only filled once with reference to the current health emergency but the Sequence variable was maintained in the corresponding regression model.

With regards to parents' rate of children's internalizing symptoms, similar regressions models were ran. In particular, for each of the three models (CBCL_Cov anxiety, CBCL_Cov withdrawn/depression, CBCL_Cov somatic complaints) the same Age_Parent, Age_Child, Sex_Parent, Sex_Child, Fear, BBA_1, BBA_2, and Sequence variables were entered. Moreover, we included parents' total HADS_Cov scores (anxiety plus depression) and the number of close friends (Friends: 0–2 vs. at least 3), who parents reported their children had before the health emergency started. Sport and Work were excluded from the three models concerning children's internalizing symptoms.

For each regression model, significance, coefficient of determination (R^2), and model coefficients (Bs with their standard error –SE- and corresponding standardized values βs) were reported. Variance inflation factors (VIFs) were calculated to avoid multicollinearity in each regression model (i.e., VIF was considered too high if ≥5; in the analyses reported below no value exceeded 1.5). To avoid alpha-inflation the alpha-level was set to 0.01 in each regression model. Effect sizes for R^2 were considered small (0.02), medium (0.13) and large (0.26) (Cohen, 1988).

As secondary analysis, we compared parents' reported Cov and Pre_Cov anxiety and depression scores, both when they gave description of themselves and of their children (see bottom part of **Table 1** for the raw data concerning the Pre_Cov condition). We ran five mixed model ANOVAs with repeated measures including anxiety, depression and somatic complaints scores as within-subject variables at two levels (Time: HADS_Cov Anxiety vs. HADS_PreCov Anxiety; HADS_Cov Depression vs. HADS_PreCov Depression; CBCL_Cov Anxiety vs. CBCL_PreCov Anxiety; CBCL_Cov Withdrawn/Depressed vs. CBCL_PreCov Withdrawn/Depressed; CBCL_Cov Somatic Complaints vs. CBCL_PreCov Somatic Complaints) and Sequence (Cov_PreCov vs. PreCov_Cov) as between-subject variable. Overall, we used a statistical significance threshold of $p < 0.05$ in all ANOVAs and we reported effect sizes as partial eta squared (η_p^2). Effect sizes were considered small (0.01), medium (0.06) and large (0.14) (Cohen, 1988; Miles and Shevlin, 2001). The overall data were analyzed with Statistica 8 (StatSoft, Inc., Tulsa, OK, United States). The data that support the findings of this study are available from the corresponding author, upon request.

RESULTS

Descriptive Statistics of the Sample

Table 1 reports the raw scores of participants in all questionnaires used in the present study. Referring to the cut-off and norming groups for these questionnaires (IES-R: Creamer et al., 2003; Wang et al., 2020; HADS: Zigmond and Snaith, 1983; Costantini et al., 1999; CBCL 6-18: Achenbach, 1991; Achenbach and Rescorla, 2001; Frigerio, 2001) and considering the questionnaires filled in by parents with reference to the current Covid-19 health emergency (the Cov condition), the data showed that the mean scores for post-traumatic stress, anxiety and depression symptoms of parents and internalizing problems of children were within normal ranges when compared against normative data. Nonetheless, we found that many parents reported moderate to severe post-traumatic stress symptoms (195, 27.0%; IES-R score ≥ 33); elevated symptoms of anxiety (90, 12.4%; HADS Anxiety score ≥ 8); elevated symptoms of depression (64, 8.8%; HADS Depression score ≥ 8). As regard parents evaluation of children's internalizing problems, it emerged that a high percentage of children showed elevated anxiety (191, 26.4%; CBCL Anxious/Depressed T score ≥ 65) and depression (175, 24.2%; CBCL Withdrawn/Depressed T score ≥ 65) and, with less incidence, somatic complaints (65, 9.0%; CBCL Somatic complaints T score ≥ 65).

The socio-demographic questionnaire revealed that 309 parents (42.8%) were unoccupied or temporarily suspended from their job during the health emergency, and 130 parents (18.0%) had never left home or went outside once in the last 2 weeks. As regards participants' daily activities during the last 2 weeks, 213 (29.5%) reported to practice sport every day (1 or more hours per day). Finally, the vast majority (628, 87.1%) spent more than 5 h per day with their children, while, before the lockdown, only 254 parents (35.2%) reported spending that same time with their children. Of all respondents, 35 (4.8%) were tested with the Covid-19 swab and the response was negative (the only respondent who resulted positive to Covid-19 infection was excluded from the sample). Nevertheless, 12 respondents believed

they had been infected by the novel coronavirus (1.6%), and 60 participants (8.3%) affirmed that, in the last weeks or at the time they were filling the survey, they have had one or more Covid-19 related symptoms, such as fever, dry cough, pain muscle, nasal congestion, sore throat, diarrhea or pneumonia. Since the Covid-19 breakdown in China on January 2020, 210 parents (29.1%) have spent more than 2 h per day reading or watching the news about the health emergency on TV, newspapers or Internet (which may suggest the importance of understanding the possible effects of repeated media consumption during the crisis; Holmes et al., 2020). 111 parents (15.3%) reported being very afraid of being infected by the novel coronavirus. Finally, more than half of the parents reported that in the last 2 weeks they could broaden their attention on the pandemic crisis to consider some possible secondary positive effects such as the chance of giving oneself more space or slowing down the frenetic pace of life (369 respondents thought about it often or very often, 51.1%), and the chance to reduce pollution and undertake a more environmental friendly lifestyle (458 respondents thought about it often or very often, 63.5%).

Multiple Regression Analyses

In **Table 2**, regression analyses globally predicting post-traumatic, anxiety, depression and somatic symptoms of parents and their children (as rated by their parents) are presented. Each regression model was significant and the total variance explained generally reflected a medium effect size (Cohen, 1988; Miles and Shevlin, 2001). **Figure 1** reports a schematic representation of t-values (absolute values are reported) for each multiple regression coefficient. In relation to the dependent variable IES-R_Cov, measuring parents' symptoms of post-traumatic stress, the results showed that having high fear of being infected positively predicted IES-R_Cov scores. Reduced post-traumatic scores were instead predicted by a higher tendency to broaden biased attention on the crisis to think about its possible positive secondary effects for one's life (BBA_1) and for the environment (BBA_2).

With regards to HADS_Cov anxiety, the results indicated that, similarly to IES-R_Cov scores, to be female and have high fear of contagion positively predicted parents' anxiety scores, while BBA_1 and BBA_2 were negatively related with anxiety levels. Moreover, a negative marginal relation between the amount of sport practiced by parents in the last 2 weeks and HADS_Cov anxiety was also found.

As far as HADS_Cov depression is concerned, the results again showed the positive relations between being a female and having high fear of contagion and parents' depression scores, as well as the negative relation between depression symptoms and BBA_1 and BBA_2. Moreover, we found that the amount of sport practiced and the parents' employment status (on-site or remote work vs. suspension of work or unemployment) were negatively related to parents' level of depression.

Turning to how parents rated their children's levels of anxiety, depression and somatic complaints, the first regression model concerning CBCL_Cov Anxiety showed that parents rated their children as more anxious as they were considered to have less close friends. A strong positive relation between children's anxiety level and parents' total HADS_Cov scores (anxiety plus depression) was also found. Finally, an effect of Sequence was found: to have filled in the CBCL anxiety questionnaire referring first to the actual health emergency condition (CBCL_Cov Anxiety) and then considering the period before the Covid-19 outbreak (CBCL_PreCov Anxiety) positively predicted current anxiety symptoms of children as rated by their parents.

As far as CBCL_Cov Withdrawn/Depressed is concerned, the results highlighted again a strong positive relation with parents' total HADS_Cov scores and a negative relation with children's number of close friends. Remarkably, we found that parents' fear of contagion negatively predicted children's depression: to have none or little fear of being infected positively predicted children's level of depressive symptoms as reported by their parents.

Finally, with regards to CBCL_Cov Somatic complaints, the results further showed the strong and positive predictive value of parents' total HADS_Cov scores, as well as the negative relation with parents' fear of being infected.

In sum, the findings of the multiple regression analyses showed that specific psychological and behavioral factors of parents and children, such as fear of contagion, the opportunity to think about possible secondary positive effects of the pandemic and the number of children's close friends, had a predictive value on the presence of internalizing symptoms of both parents and children. Moreover, parents' behaviors during the lockdown period were significantly related to their own internalizing symptoms; these symptoms, in turn, had a strong and positive predictive value on children's internalizing problems.

Analyses of Variance

In the following analysis, we directly compared parents' reported Cov and Pre_Cov data for each HADS and CBCL subscale. For each measure, we ran a mixed model repeated-measure ANOVA considering the between-subject factor of Sequence (Cov_PreCov and PreCov_Cov) and the within-subject factor of Time (i.e., the two repetitions of a questionnaire). For parents' anxiety and depression symptoms (measured with the two subscales of the HADS questionnaire), both ANOVAs showed a significant main effect of Time [Cov > PreCov; $F(1,719) = 109.11$, $p < 0.01$, $\eta_p^2 = 0.131$ and $F(1,719) = 38.53$, $p < 0.01$, $\eta_p^2 = 0.051$, respectively for HADS Depression and Anxiety] and a significant Time × Sequence interaction with small effect sizes [$F(1,719) = 9.69$, $p < 0.01$, $\eta_p^2 = 0.013$ and $F(1,719) = 5.13$, $p < 0.03$, $\eta_p^2 = 0.007$, respectively for HADS Depression and Anxiety]. The interaction was due to the two sequences mainly differing in the PreCov condition in which scores were higher when this condition comes first (Sequence: PreCov_Cov) than second (Sequence: Cov_PreCov) (**Table 1** and **Figure 2**).

Similarly to parents' HADS data, for the CBCL, the three ANOVAs also returned a significant main effect of Time [Cov > PreCov; $F(1,719) = 48.01$, $p < 0.01$, $\eta_p^2 = 0.062$, $F(1,719) = 3.88$, $p < 0.05$, $\eta_p^2 = 0.005$ and $F(1,719) = 15.06$, $p < 0.01$, $\eta_p^2 = 0.021$, respectively for CBCL Withdrawn/Depressed, Anxiety and Somatic Complaints] and a significant Time × Sequence interaction with small (CBCL

TABLE 2 | Regression analyses predicting post-traumatic, anxiety, depression, and somatic symptoms in parents and children (rated by their parents).

	IES-R_Cov				HADS_Cov anxiety				HADS_Cov depression					CBCL_Cov anxiety				CBCL_Cov withdrawn/ depressed				CBCL_Cov somatic complaints			
Variable	***B***	***SE***	**β**	***t***	***B***	***SE***	**β**	***t***	***B***	***SE***	**β**	***t***	**Variable**	***B***	***SE***	**β**	***t***	***B***	***SE***	**β**	***t***	***B***	***SE***	**β**	***t***
	Model: $R^2 = 0.18$, $F(10,710) = 15.43$, $p < 0.001$				Model: $R^2 = 0.17$, $F(10,710) = 14.43$, $p < 0.001$				Model: $R^2 = 0.17$, $F(10,710) = 14.71$, $p < 0.001$					Model: $R^2 = 0.23$, $F(10,710) = 21.22$, $p < 0.001$				Model: $R^2 = 0.16$, $F(10,710) = 13.17$, $p < 0.001$				Model: $R^2 = 0.16$, $F(10,710) = 13.45$, $p < 0.001$			
Sequence	1.13	1.16	0.034	0.97	0.06	0.27	0.01	0.21	0.01	0.27	0.01	0.03	Sequence	1.01	0.28	0.12	3.63**	−0.07	0.21	−0.01	−0.34	0.16	0.15	0.04	1.11
Sex_Parent	−10.32	1.60	−0.23	−6.46**	−2.13	0.38	−0.20	−5.63**	−1.90	0.38	−0.18	−5.07**	Sex_Parent	−0.07	0.39	−0.01	−0.18	−0.11	0.30	−0.01	−0.38	−0.50	0.21	−0.09	−2.37+
Age_Parent	0.05	0.11	0.02	0.47	0.02	0.02	0.03	0.91	0.07	0.03	0.10	2.61*	Age_parent	−0.03	0.03	−0.05	−1.30	−0.07	0.02	−0.13	−3.48**	0.01	0.01	0.02	0.62
Work	−1.67	1.10	−0.05	−1.52	−0.50	0.26	−0.07	−1.93	−0.86	0.26	−0.12	−3.33**	Fear	−0.35	0.37	−0.03	−0.94	−0.76	0.28	−0.10	−2.72*	−0.57	0.20	−0.10	−2.90*
Sport	−0.58	1.21	−0.02	−0.48	−0.62	0.29	−0.08	−2.15+	−0.96	0.29	−0.12	−3.36**	BBA_1	0.40	0.30	0.05	1.33	−0.02	0.23	−0.01	−0.07	0.20	0.16	0.05	1.25
Fear	11.19	1.49	0.26	7.51**	2.19	0.35	0.21	6.19**	1.19	0.35	0.12	3.41**	BBA_2	0.04	0.31	0.01	0.14	0.05	0.24	0.01	−0.20	0.30	0.17	0.07	1.80
BBA_1	−3.47	1.23	−0.11	−2.81*	−0.91	0.29	−0.12	−3.12*	−1.34	0.29	−0.18	−4.65**	Sex_Child	−0.03	0.26	−0.01	−0.14	0.19	0.20	0.03	0.99	−0.35	0.14	−0.09	−2.51+
BBA_2	−3.94	1.27	−0.12	−3.09*	−0.98	0.30	−0.13	−3.23**	−0.99	0.30	−0.13	−3.30**	Age_Child	0.01	0.06	0.01	0.06	0.23	0.04	0.21	5.48**	0.02	0.03	0.03	0.70
Sex_Child	−1.27	1.07	−0.04	−1.18	−0.05	0.25	−0.01	−0.22	−0.16	0.25	−0.02	−0.62	Friends_Child	−0.95	0.28	−0.11	−3.33**	−0.67	0.21	−0.11	−3.14*	−0.10	0.15	−0.02	−0.66
Age_Child	−0.37	0.23	−0.06	−1.60	−0.16	0.05	−0.11	−2.96*	−0.17	0.05	−0.12	−3.12*	HADS_Cov_tot	0.27	0.02	0.46	12.66**	0.14	0.02	0.35	9.10**	0.11	0.01	0.38	10.03**

*+$p < 0.05$, *$p < 0.01$, **$p \leq 0.001$. IES-R, Impact of Event Scale-Revised; HADS, Hospital Anxiety and Depression Scale; CBCL, Child Behavior Checklist. Cov, completion of questionnaires with reference to the Covid-19 health emergency. Sequence indicates the order with which HADS and CBCL questionnaire were compiled by parents [PreCov_Cov = Sequence ('0') and Cov_PreCov = Sequence ('1')]. BBA_1 and BBA_2 refer to a "broadening of biased attention" on the pandemic crisis expressed in terms of participants' thinking about possible its secondary positive effects for one's life (BBA_1) and for the environment (BBA_2). BBA_1 was dichotomized with 'Never/sometime' as '0' and 'often/very often' as '1'; BBA_2 was dichotomized with 'Never/sometime' as '0' and 'often/very often' as '1'. The other dichotomous variables were entered as follow: Sex_Parent and Sex_Child were dichotomized with 'Male' as '1' and 'Female' as '0'; Sport was dichotomized with '0–1 h/day' as '0' and '>1 h/day' as '1'; Work was dichotomized with 'None/suspended' as '0' and 'remote/on site' as '1'; Fear was dichotomized with 'none/little' as '0' and 'much/very much' as '1'; Friends_Child was dichotomized with '0–2' as '0' and '≥3' as '1.'*

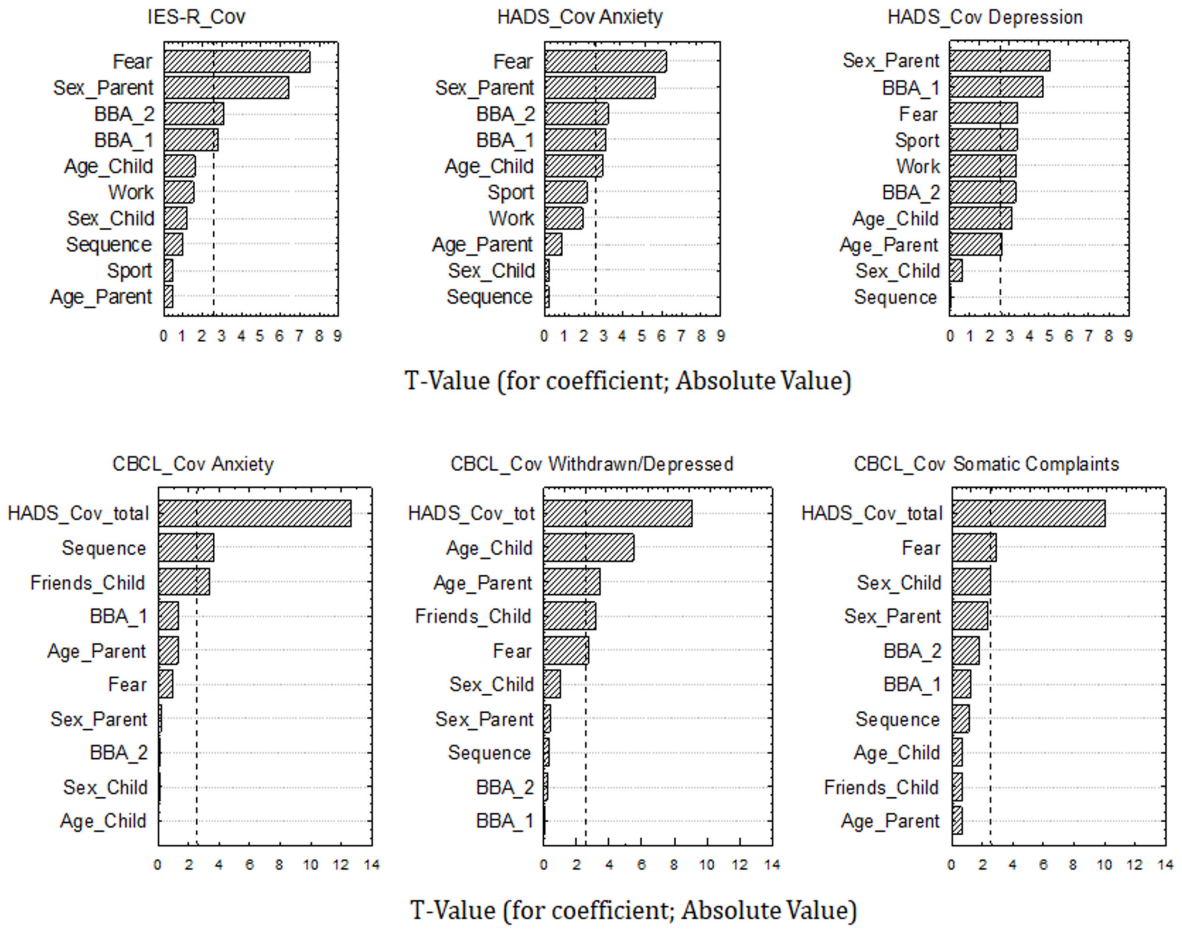

FIGURE 1 | Chart of *t*-values for multiple regression coefficients. *X*-axis refers to t-values (absolute values), *y*-axis refers to variables considered in each regression model [Sex and age of Parents and Children; parents' employment status –Work-; Fear of contagion; amount of sport practiced; the order with which HADS and CBCL questionnaire were compiled by parents: Sequence PreCov_Cov or Sequence Cov_PreCov; number of children's close friends; parents' total HADS_Cov score; and parents' "broadening of biased attention" on the pandemic crisis by thinking about its possible secondary positive effects for one's life (BBA_1) and for the environment (BBA_2)]. Vertical bar in each graph indicates significance level at $p < 0.01$. IES-R, Impact of Event Scale-Revised; HADS, Hospital Anxiety and Depression Scale; CBCL, Child Behavior Checklist. Cov, completion of questionnaires with reference to the Covid-19 health emergency.

Withdrawn/Depressed and CBCL Somatic Complaints) and large (CBCL anxiety) effect sizes [$F(1,719) = 14.56$, $p < 0.01$, $\eta_p^2 = 0.019$, $F(1,719) = 158.70$, $p < 0.01$, $\eta_p^2 = 0.180$, and $F(1,719) = 18.70$, $p < 0.01$, $\eta_p^2 = 0.025$, respectively for CBCL Withdrawn/Depressed, Anxiety and Somatic Complaints]. Similarly to parents' data, the interactions concerning CBCL Withdrawn/Depressed and Somatic Complaints were due to the two sequences differing in particular in the PreCov condition. By contrast, the effect for the CBCL Anxiety was due to a cross-over interaction as the two sequences also differed in the Cov condition: participants assigned to the Cov_PreCov Sequence rated their children having higher anxiety in the Cov vs. PreCov condition, while participants assigned to the PreCov_Cov Sequence rated their children having higher anxiety in the PreCov vs. Cov condition (see **Table 1** and **Figure 2**).

Overall, the findings obtained from the analyses of variance showed that, in general, internalizing symptoms of parents and children were reported to be significantly higher during the Covid-19 pandemic than before it started. Nonetheless, they also showed that the sequence with which parents had to rate their own anxiety and depression symptoms (and those of their children) significantly influenced their assessments.

DISCUSSION

The aim of this study was to investigate the immediate impact of the Covid-19 outbreak on families' mental health. We focused on internalizing symptoms, such as anxiety and depression, of the responding members of the parenting couples who evaluated their own symptoms (through the HADS and the IES-R questionnaires) and those of their children aged between 6 and 18 years (through the CBCL questionnaire). In order to have a self-reported baseline measure of these symptoms, participants had to fill in the questionnaires (HADS and CBCL but not IES-R) twice: once referring to the current health emergency

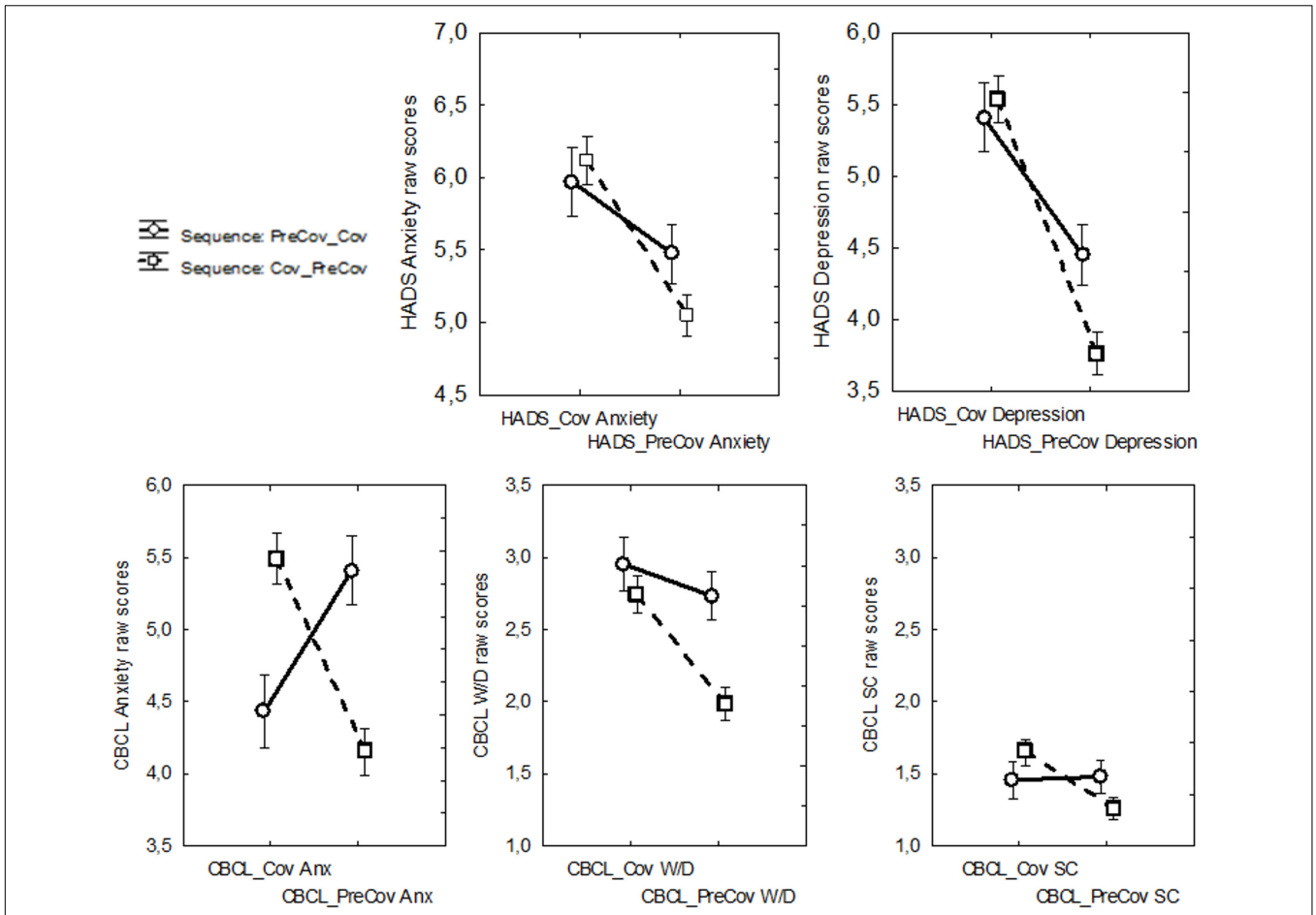

FIGURE 2 | Time (the two repetitions of a questionnaire in the Cov – with reference to the Covid-19 health emergency- and Pre_Cov - with reference to the period preceding the start of the Covid-19 outbreak- conditions) × Sequence (PreCov_Cov and Cov_PreCov) interaction obtained from mixed model repeated-measure ANOVAs for the measures (1) HADS (Hospital Anxiety and Depression) Anxiety, (2) HADS Depression, (3) CBCL (Child Behavior Checklist) Anxiety, (4) CBCL Withdrawn/Depressed, and (5) CBCL Somatic Complaints. W/D, withdrawn/depressed; SC, somatic complaints. Error bars indicate standard errors of the means.

(the Cov condition) and once referring to before it started (the PreCov condition).

The present findings suggest that most parents likely had enough psychosocial resources to respond to the pandemic emergency distress: in fact, present sample's mean levels of current anxiety, depression and post-traumatic stress did not differ from those of the normal population. Nonetheless, the results also suggest that the pandemic may still have affected the mental health of a considerable number of parents and children, contributing to raise their levels of internalizing problems. First, focusing on the Cov condition, we found that approximately a quarter of the parents reported moderate to severe post-traumatic stress symptoms while about one in 10 showed elevated symptoms of anxiety and depression. As regard parents' evaluation of children's internalizing problems, about a quarter of children was rated as having elevated anxiety and depression while about one in ten was rated as having clinically relevant somatic complaints problems. Moreover, internalizing symptoms of parents and children were globally reported to be higher during the Covid-19 pandemic than before it started.

Globally, these data corroborate previous findings highlighting the negative psychological impact of quarantine and lockdown periods, linked to both Covid-19 outbreak and other past health emergencies such as SARS, Ebola, H1N1 influenza pandemic, on mental health symptoms of both adults and children, including post-traumatic stress, depression, anxiety and emotional symptoms (Brooks et al., 2020; Di Giorgio et al., 2020, PREPRINT; Spinelli et al., 2020).

More specifically, the main analyses of the present study focused on the Cov condition and employed a series of multiple linear regression models carried out on parents and children's anxiety and depression symptoms and on parents' post-traumatic stress and children's somatic complaints symptoms. Most importantly, the results showed that to have much fear of being infected by the new coronavirus positively predicted post-traumatic, anxiety, and depression scores of parents. By contrast, having thought often or very often during the emergency (as happened to approximately half of the sample) about possible secondary positive effects or implications of the pandemic, negatively predicted parents' internalizing and post-traumatic

stress symptoms. To continue working and practicing sport during the health emergency also protected parents from internalizing problems (and in particular from depression).

The data on parents' internalizing symptoms suggest that fear of contagion is an important psychological factor that negatively impacts psychological well-being of healthy adult individuals, subject to isolation and confinement to prevent spread of the new coronavirus. This is in line with results of previous studies showing that fear of infection was a significant stressor during quarantine (see the reviews by Brooks et al., 2020) or, more generally but specifically related to Covid-19, that higher perceived risk of infection increased individuals' stress and anxiety (Simione and Gnagnarella, 2020). Of interest, in one study investigating the school's communities response to school closure during the H1N1 2009 influenza pandemic (Braunack-Mayer et al., 2013), it was found that the individuals who were more concerned about becoming infected or spreading the virus to others tended to be those with young children (or to be pregnant women). Unfortunately, in our study we did not ask details about why the participants were afraid of being infected (i.e., if they were afraid of infecting their children or older family members or being infected by them). Nonetheless, it is worth noting that, in our sample, increased levels of parents' internalizing problems were found in women and in the participants with younger children.

Taken together, our results suggest the need for psychoeducational and psychological support interventions that can reduce excessive fear of contagion in parents, even in those reasonably protected from fatal complications related to the SARS-CoV2 virus (such as the participants in our sample who were without serious clinical conditions and with an average age of about 40 years). Such interventions, which could be delivered online or through smartphone technology, could be designed to make fear manageable and not overwhelming. This could be obtained by means, for example, of cognitive-behavior and mindfulness-based therapies that may, on the one hand, challenge cognitive biases of individuals with exaggerate fear and perception of the risk of being infected and, on the other hand, help individuals to enhance stress management and reduce maladaptive coping strategies such as avoidance and excessive self-criticism (Fischer et al., 2020; Ho et al., 2020; Matiz et al., 2020). The effect of such interventions could therefore help diluting the direct negative effects of fear on the levels of anxiety and stress and depression of individuals, also indirectly affecting the quality of relationships of these people (see Simione and Gnagnarella, 2020 for similar arguments).

Physical activity and the possibility of continuing to work, from home or in the workplace, act as protective factors against the internalizing problems of the parents, especially in favor of depressive symptoms. On the one hand, these data corroborate and extend the results of other research, carried out both within the current health emergency and before it began (e.g., Schuch et al., 2016; Maugeri et al., 2020), demonstrating the positive impact of a physically and intellectually active lifestyle to relieve the symptoms of depression. On the other hand, the present findings suggest the importance of not giving up physical activity even during periods of isolation and social confinement, possibly underlining its importance through targeted psychoeducational and support interventions that, however, should be able to calibrate the right amount of exercise for each individual person, in terms of frequency, duration and intensity of physical activity (Carriedo et al., 2020), also taking into account the possible frustrations that could arise due to the restrictions imposed by the epidemic on physically more active people (Zhang et al., 2020).

What we called "broadening of biased attention" was another important factor that negatively predicted parents' internalizing problems and post-traumatic stress during the Covid-19 outbreak. This factor reflected the propensity of the parents to think, during the lockdown period, about possible secondary implications of the pandemic, both for their own life and for the environment, and could reveal an emerging element of resilience in the face of adversity (Smith et al., 2020). From this point of view, broadening of biased attention to the crisis by perceiving possible secondary implications can mean not being pervaded and overwhelmed by the uncertainty and stress connected to it; it can rather mean preserving and nurturing a system of meaning, individual but also shared with one's family, which can bring security and hope during the pandemic. Recent evidence suggests that a crucial aspect of family resilience in response to the Covid-19 pandemic would indeed be the optimization of a system of family beliefs that help the individuals in providing a framework of understating events related to the pandemic (Prime et al., 2020). Accompanying policies to help parents and families during these times of uncertainty will be crucial to identify vulnerability of some households, in order to work to promote paths toward greater capacity for resilience (Prime et al., 2020).

Turning to the regression analyses on children's internalizing symptoms (as rated by their parents), they primarily highlighted the high and positive predictive value of parents' current internalizing problems. Children were then evaluated as more depressed and with more symptoms of somatic complaints as their parents had no or little fear of contagion. In other words, the more afraid they were of the infection, the lower the depression and somatic complaints symptoms attributed to their children. These data confirm previously described associations between children and parents' psychopathological symptoms including depression (e.g., Sellers et al., 2013; Yap et al., 2014). Thus, parents' experience of symptoms of anxiety and depression during the health emergency was associated with the tendency to attribute similar symptoms to children. Nevertheless, specific symptoms that have to do with the withdrawal, depression and somatization of children seem less recognized by parents having much fear of being infected by the new coronavirus. One hypothesis could be that these parents find themselves excessively involved, and eventually overwhelmed, in their concerns and fear that they could not recognize specific experiences of their children. It is known that being emotionally overwhelmed by situations can compromise the ability to judge oneself, others and events (e.g., Izard, 2002). It is interesting to note that the fear of contagion did not play a predictive role with regard to the anxiety of children that perhaps was more manifest and externalized and thus observable by parents.

In line with these arguments, the direct comparison between parents' reported Cov and Pre_Cov data as a function of the order with which each questionnaire was completed showed that participants tended to report a smaller difference between Cov and PreCov symptoms of anxiety and depression when they first assessed the latter and then the former symptoms. This may suggest that parents' report of PreCov anxiety and depression tended to be influenced by the current emergency condition in which participants found themselves while they had to, for the first time (at least in the context of our survey), reflect on their psychological well-being and that of their children.

Beyond these interpretations, it is worth noting that fear of contagion had a different predictive role when parents evaluated themselves with respect to their children, just as the "broadening of biased attention" factor that mediated parents' internalizing symptoms but not those attributed to children. These data confirm that the perception of a child's internal experience reported by the parent is founded in a relationship composed of many characteristics both of the child and of the parent, as well as being influenced by factors such as, for example, the purpose of the evaluation and the contingent conditions under which the parent has the opportunity to observe the child (Smith, 2007). It is therefore not surprising that the variables that help explaining parents' self-perception may diverge, at least in part, from those playing a role in the assessment of children.

The observed findings extend to middle childhood and to internalizing problems previous findings of researches on the psychological sequelae of the Covid-19 pandemic that showed, in children of 4 years of age, an interplay between mothers' reported difficulties in regulating their own emotions and those of their children in inhibitory self-control (Di Giorgio et al., 2020 PREPRINT). Yet related to Covid-19 outbreak, another study carried out on Italian parents of 2–14 years old children (mean age = 7 years) has recently shown that the impact of lockdown on children's emotional and behavioral problems was mediated by their parents' individual and dyadic stress: the higher the parents' individual and dyadic stress, the more psychological problems children had (Spinelli et al., 2020). A hypothesis was put forward by these authors that lockdown made more difficult for parents to be supportive for their children and this could contribute to the manifestation of their problems. In line with this, previous findings showed that higher levels of anxiety and depression among youth is associated with weaker support from parents (Yap et al., 2014) and that children's perception of being rejected or accepted by their caregivers is linked to their psychological well-being (Khaleque, 2015).

Taken together, our and previous data indicate the importance of organizing psychological support interventions aimed at families that take into consideration the mental health of parents, but which also take into account the reduced personal resources of the children to face the many changes imposed by the pandemic (Sprang and Silman, 2013). For example, in order to reduce the negative impact of the pandemic on children, it appears necessary to help parents communicate effectively with their children regarding the restrictions imposed by the health emergency (Dalton et al., 2020; Spinelli et al., 2020). Moreover, parents should also be helped so that they can in turn generate hope and instill security in their children as well as, more practically, know how to negotiate family rules, rituals, and routines in the new balance imposed by the pandemic (Prime et al., 2020).

The observed findings need to be interpreted bearing in mind some study limitations that may be addressed by future research. The first limitation concerns the absence of a direct assessment and observation of children and the sole use of self-report measures, which rely on participants' capabilities to evaluate themselves, as well as being susceptible to desirable responding, acquiescence, and possibly biased by semantic understanding of the scales (Schwarz, 1999). Moreover, particular caution should be given in the interpretation of retrospective questionnaires, collected during emergency periods, before people have been able to restore a sufficient sense of security that may allow them to "decenter" from the current situation, possibly regaining greater clarity and objectivity in the assessments. In our study it is worth noting that we found significant and positive correlations between parents' current level of post-traumatic stress symptoms (IES-R_Cov) and their current (HADS_Cov total score and CBCL_Cov total Internalizing score), but also past assessments (HADS_PreCov total score and CBCL_PreCov total Internalizing score; all Rho > 0.29, $p < 0.001$).

Second, we compared the mean scores obtained by our sample at the IES-R with non-national normative data. Third, our sample lived in northern and central Italy and these areas were among the most affected by the new coronavirus infections; therefore, we cannot assume that our findings can be generalized to the whole Italian national population. Also, our choice to limit the aims of the present investigation to internalizing problems can be extended in future studies to children's externalizing behaviors. Of importance, we need to consider that internalizing symptoms, and possibly to a lesser extent externalizing behaviors, attributed to children by parents may be underestimated by them, as suggested by previous research in samples of non-clinical children (Smith, 2007). It would also be important that future longitudinal studies extend the current findings in order to monitor parents and children's changes in mental health on the basis of the progress of the various phases of the current and any future global health emergencies.

A final issue concerns the limited scope of our analyses, which did not deepen the exploration of possible intervening mechanisms also due to the possibility that the retrospective data collected could have been influenced by the current emergency situation. Future studies using mediation analysis may shed light on the mechanisms underlying the observed relationships between variables, e.g., whether parents' behaviors during the lockdown had mediated the relationship between parents' mental health before and during the pandemic as well as their views of their children's psychological health. Determining the mechanisms that explain the increased rates of internalizing problems will inform the policies used to manage the pandemic to achieve a better balance between infection control and mitigation of negative psychosocial effects (Holmes et al., 2020).

In conclusion, in addition to showing a direct effect of the pandemic on the psychological health of parents and children, the

present results also give a series of important information on how parents perceive, and therefore influence, their children in this period of emergency. Our findings thus highlight the urgent need to provide parents with adequate support to take care of their own psychological wellbeing and to help their children coping with the direct and indirect effects of the pandemic.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors upon request, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by local Ethics of the University of Udine. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

CC, SF, AM, AP, EV, PC, and FF contributed to conception and design of the study. AM, AP, and CC carried out the investigation. SF and CC organized the database, performed the statistical analysis, and wrote the first draft of the manuscript. All authors contributed to manuscript revision, read, and approved the submitted version.

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Novel Coronavirus Outbreak and Career Development: A Narrative Approach Into the Meaning for Italian University Graduates

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Introduction: In times of economic crisis, the literature shows that young people have always been in the high-risk category. The COVID-19 outbreak and the consequence on the economic level have increased the sense of uncertainty and precariousness experienced by young people. The current scenario has forced young people at the school-to-work transition point to re-think their career plans. Although the difficulties of the school-to-work transition already lead to distress and mental health problems in young people, the slowdown imposed by the coronavirus could add up to these difficulties. The present study aimed to explore the process of career development and career planning in the coronavirus era. Twenty Italian university graduates were involved.

Methods: A quantitative measure was used to evaluate the affective (positive/negative) experience. A narrative prompt was used to understand the individual dimensions of career planning. Cluster analysis was carried out by an unsupervised ascendant hierarchical method to explore the themes of the narration.

Results: Italian young adults have tended to experience negative affects in the recent weeks of quarantine. The themes highlighted in the narratives showed that Italian young adults experience feelings of fear, uncertainty, and anxiety about the post-pandemic future.

Conclusion: The results appear as a starting point to re-think possible interventions for this group post-lockdown and post-pandemic.

Keywords: COVID-19, young adult, mental health, unemployment, school-to-work transition, narrative approach, cluster analysis

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INTRODUCTION

The current coronavirus disease (COVID-19) has had a massive impact on the people in the world and on many dimensions of life. One of these concerns the economic fallout of the crisis on the people, young adults in particular. In times of economic and financial crisis, young people have always been in the category at risk. For example, after the 2008 economic crisis the NEET phenomenon (young not engaged in Education, Employment or Training) into EU-28 (EU NEET-rate, 28.8%, Eurostat, 2019) came to light. The latest report of the International Labor Organization (2020) highlights that young people represent the most vulnerable group when it comes to the social and economic impact of the virus pandemic. According to the International Labor Organization (2020), the COVID-19 economic crisis with its vast increases in

unemployment may result from significant exclusion of young people from the labor market.

Currently, the conditions imposed for the COVID-19 outbreak may increase the sense of uncertainty and precariousness experienced by young people.

The novel coronavirus has forced young people in school-to-transition points to re-think their career plans. From a theoretical point of view, individuals have an active role in the construction of their career paths. Consistent with life-span developmental psychology (Baltes et al., 1980; Lerner, 1982; Lerner and Tubman, 1991; Bates et al., 1998; Bynner and Parsons, 2002), career development constitutes a life-long process from childhood (e.g., Magnuson and Starr, 2000; Hartung et al., 2005, 2008; Watson and McMahon, 2008; Ferrari et al., 2015; Bakshi, 2017) through adolescence (e.g., Blustein, 1997; Skorikov and Vondrecek, 2007; Skorikov and Vondracek, 2011), adulthood (e.g., Lea and Leibowitz, 1992; Vondracek and Kawasaki, 1995), and old age (e.g., Bohlmann et al., 2018) affected by both personal and contextual factors.

Several studies have shown possible intrinsic dimensions (e.g., personality, Rossier, 2015; cognitive style, Rogers et al., 2008; goal-orientation, Grant and Dweck, 2003; career adaptability, Rottinghaus et al., 2005; Savickas and Porfeli, 2012; identity, Kunnen, 2013; personal interest, Lent et al., 2010; Nyamwange, 2016; self-efficacy, Howard et al., 2009; Fan et al., 2014; Guan et al., 2015; Hui and Lent, 2018), and extrinsic influences (social support, Seibert et al., 2001; Kracke, 2002; Wiesenberg and Aghakhani, 2007; peers, Steinberg et al., 1992; parents, Paa and McWhirter, 2000; Halpern, 2005; Greenhaus and Powell, 2006; Schultheiss, 2006; Marcionetti and Rossier, 2016; teachers and educators, Howard et al., 2009; Gokuladas, 2010; Cheung et al., 2013; Cheung and Arnold, 2014) that affect the career development process in life span. Moreover, other studies have highlighted that cultural aspects have an impact on career choices (Mau, 2000; Caldera et al., 2003; Wambu et al., 2017; Akosah-Twumasi et al., 2018; Hui and Lent, 2018; Tao et al., 2018).

Transversally, the context in which individuals construct their careers are changing over time. Therefore, different cohorts of adolescents will experience their career outcomes differently. Indeed, the construction of career plans follows changes in the environment. Several studies show that the context of youth transitions is critically important in determining their shape and their outcomes (Baltes et al., 1980; Bynner and Parsons, 2002; Bynner, 2012; Lerner and Tubman, 1991).

In this century characterized by uncertainty and instability of the labor market, employment insecurity, and fragmented career paths (Baruch and Bozionelos, 2011), the difficulties in school-to-work transition could lead to distress (Bjarnason and Sigurdardottir, 2003; Parola and Donsì, 2018, 2019; Fusco et al., 2019; Parola et al., 2019; Stea et al., 2019), anxiety, discouragement, and maladaptive behavior (Schwartz et al., 2005; Arnett, 2007; Reifman et al., 2007). Moreover, this condition could impact on mental health (McKee-Ryan et al., 2005; Paul and Moser, 2009; Parola and Donsì, 2018; Bartelink et al., 2019), quality of life (Forma et al., 2017; Kivijärvi et al., 2019), and life satisfaction (Santilli et al., 2017).

The COVID-19 pandemic could exacerbate the school-to-work transition and add further difficulties that concern the labor market, such as the economic crisis of companies, temporary closure of offices, and the blocking of new job hires. Along with this, the unpredictability of the future, post-COVID-19, must also be considered.

Furthermore, the recent psychological literature on COVID-19 showed that young people are the highest-risk category for mental illness (Cao et al., 2020; Huang and Zhao, 2020). Studies on the psychological impact of the coronavirus in China have shown a psychological effect as moderate-to-severe, and about one-third of the population reported moderate-to-severe anxiety (Wang et al., 2020). Few recent studies on the Italian context showed that young adults have experienced internalizing and externalizing health problems during quarantine (Parola et al., 2020). Alongside this, research on previous epidemics (i.e., SARS and MERS) showed a wide range of psychosocial impacts on people during outbreaks of infection, i.e., fear of falling sick, feelings of helplessness (Hall et al., 2008; Van Bortel et al., 2016) anxiety, post-traumatic stress symptoms, and anger (for a review, Brooks et al., 2020). Moreover, several studies have highlighted significant psychiatric morbidities in non-infected younger age during the SARS epidemic (Sim et al., 2010).

The community of vocational psychology has recently broken down the problem and launched a debate on the relationship between unemployment and/or unemployment risk and health in this coronavirus era (Blustein et al., 2020). As recommended by the authors, the need arises to give a voice to young people by focusing on their experiences through qualitative and quantitative research methods. It is urgent to explore the shifts in youths' sense of identity and their career aspirations, which may be dramatically affected by the crisis.

This study aims to understand the youth perception of how the pandemic could affect their work-transition. Therefore, the current study focuses on the construction of their career plans, the school-to-work transition, the future time perspective, and the health consequences in the coronavirus era. This is also an attempt to provide a contribution to developing psychological interventions that take into account the impacts of this situation on young people and their career plans. Indeed, counseling programs must always take into account changes in the context (Masdonati, 2019).

MATERIALS AND METHODS

Participants and Procedure

Twenty Italian university graduates took part in this study (M_{age} = 24.4, SD_{age} = 2.04; range 22–29). The sample included six males and fourteen females. Participants were Italians from a Southern region characterized by serious youth unemployment problems (28.8%, Istat, 2019). All students lived at parental homes in the data collection procedure.

Non-probability sampling was used. In line with the explorative nature of the study, and also with the complex current historical moment, the choice of non-probability sampling makes the design for collecting data more flexible. Non-probability

sampling techniques allow for drawing samples from a larger population without requiring a random selection. The specific characteristic of this sampling is the subjective judgments of the researchers that chose which units of the population to include (Henry, 1990; Tansey, 2007). Specifically, consistent with purposive sampling, young adults who would be reasonably likely to be moving into jobs were involved (Lincoln and Guba, 1985). The participants were recruited by asking guidance counselors and mentors of theses of the University of Naples Federico II.

Approval of the University Research Ethics Committee was obtained for collecting data. Due to COVID-19, students were enrolled online. Participants were informed about a complete guarantee of confidentiality and the voluntary nature of participation. Participants voluntarily accessed the online platform used for data collection. No time limit was handed out, giving freedom of expression to the participants. The respondents did not receive payment for their participation.

Measures

For this study, mixed methods were used. A quantitative measure in the form of self-report to evaluate affective experience (positive/negative) of young people in the COVID-19 pandemic, with qualitative ones, in the form of a narrative prompt to understand the subjective dimensions of career planning experience were used.

Positive and Negative Affect (PANAS; Watson et al., 1988; Terraciano et al., 2003): The instrument consists of 20 self-rating items corresponding to adjectives that describe different states, feelings, and emotional experiences linked to positive (PA; 10-items; e.g., "Excited," "Active") and negative affects (NA; 10 items; e.g., "Nervous," "Distressed"). Participants responded to each item on a 5-point Likert scale. Each rating seeks to measure the intensity of that specific feeling or emotion during a given timeframe for the participant from 1 (= *very slightly or not at all*) to 5 (= *extremely*). Simple amendments to the original instructions of the PANAS can be implemented to better address state fluctuations in PA and NA. In this study, participants were asked to rate their feelings "during the past few weeks."

Narrative Prompt (Pizzorno et al., 2014): The narrative method (McAdams et al., 2001) was chosen to collect the career stories of participants. The narrative written prompt was designed following Pizzorno and colleagues (2014). Individuals were asked to create their career stories, recall the past, analyze the present, and anticipate the future. The questions addressed were: "Where are you in your life, and how have you arrived there? Start from whatever point you like. Were there any turning points in this story? On these occasions, what choices did you make, what difficulties did you encounter, how did you take things forward? What are your projects for the future? Now that you have told me your story, do you think the current moment could influence the realization of your plans?"

Data Analysis

In the first step, preliminary analysis (means and standard deviations) on the quantitative data were carried out. Following Margherita and Tessitore (2019), the results of quantitative measures were used as an illustrative variable in the analysis of the interviews. Specifically, the results obtained by PANAS were dichotomized (PA and NA) according to the tendency of positive or negative affectivity of the participant and used as descriptive variables during the analysis of the interviews.

In the second step, the corpus of autobiographical narration was analyzed from data analyses of textual data (Lebart and Salem, 1994; Lebart et al., 1998) using the T-Lab software. The tools are the ones most used in health psychology (for a review, Mazzoni et al., 2018). The corpus was previously handled by customizing the dictionary through (a) lemmatization and (b) disambiguation of words. Lemmatization is the reduction of corpus words to their respective lemma. According to the linguistic issue, the entry corresponds to a lemma that defines a set of words with the same lexeme and the same grammatical category. The disambiguation allows for distinguishing the significant meanings among the different forms, i.e., the same graphic form but different meanings. Firstly, preliminary analysis of lexical richness were performed. Then, a cluster analysis (CA) through thematic analysis of elementary context was carried out by an unsupervised ascendant hierarchical method (bisecting K-means algorithm) characterized by the co-occurrence of semantic features (Karypis et al., 2000; Savaresi and Boley, 2001). The unsupervised clustering consists of the (a) construction of a data table context units x lexical units, (b) TF-IDF normalization and scaling of row vectors to unit length according to the Euclidean norm; (c) clustering through the method bisecting K-means and the measure of cosine coefficient; and (d) choice of the obtained partition and construction of a contingency table lexical units x clusters, χ^2 test, and correspondence analysis. In this phase, the dendogram allows us to check the tree structure of the various bisections and the characteristic words of each cluster.

The tool segments narratives into elementary context units (e.c.u.) classified according to the distributions of their lemmas in terms of co-occurrences. For this study, in line with the literature (Bolasco, 1999), to guarantee the reliability of statistical computations, a minimum frequency threshold to select lemmas was set at 3. Each thematic cluster, determined by an algorithm that uses the relationship between intercluster variance and total variance, and it takes as optimal partition the one in which this relationship exceeds the threshold of 50%, consisted of a set of keywords, which were ranked according to the decreasing value of chi-square.

Through cluster analysis, it was possible to construct and explore the contents of the narrations and allows them to map the specific topics of participants (Lancia, 2004, 2008). The clustering procedures allow for a better understanding of youth discussion topics (Santelli et al., 2018; De Stefano and Santelli, 2019; Felaco and Parola, 2020). Finally, the clusters and the illustrative variables in a factorial plane graphically showed the relationship between clusters and variables. Gender and PA/NA variables were used as illustrative variables.

RESULTS

The preliminary analysis of PANAS showed that the NA dimension was higher than the PA dimension (M_{NA} = 3.30,

SD_{NA} = 0.81; M_{PA} = 2.95, SD_{PA} = 0.64). The propensity of PA or NA dimensions showed that 65% of young people (n = 13) had experienced more negative affectivity in recent weeks, while 35% of young people (n = 7) more positive affectivity. These results were used as an illustrative variable in the analysis of the interviews.

The preliminary analysis of textual data showed that the corpus was constituted of 20 elementary contexts (e.c.), 754 lemmas, 6,249 tokens, and 744 types. In line with the propensity of PA or NA dimensions, the indexes of lexical richness showed 38.40% of the textual corpus contained the POS narrations and 61.60% of the NEG narrations.

The thematic analysis of elementary contexts produced 4 clusters (**Figure 1** and **Table 1**), named "Lack of Future" (10%, 2 e.c.), "Future Planning" (10%; 2 e.c.), "Career Paths" (10%; 2 e.c.), and "Dark Future" (70%; 16 e.c.).

The first cluster, "Lack of Future," included lemmas that refer to an uncertain future vision (lemmas "uncertainty," "insecurity"). The lemmas "instrument," "impotence," and "stop" described the impasse in which young people have found themselves, without those "instruments" to deal with the current situation. In addition to it, this condition impacts the mood and sense of loneliness felt (lemmas "mood," "loneliness").

Examples of e.c.u.:

"The heaviest thing in this condition is to have no security and feeling like every moment you have to question yourself, without having any instrument."

"The uncertainty of the future right now is the frequent feeling that I happen to be ridden with."

"Stuck at home, all I do is feel restless. Unfortunately, all we can do is surrender to the evidence of a future that we cannot build because it has been taken from us."

The second cluster, "Future Planning" described the future projects and aspirations of young people (lemmas "realization," "dreams," "plans") that are entwined to a desire for "normality," "opportunity," and "positivity."

Examples of e.c.u.:

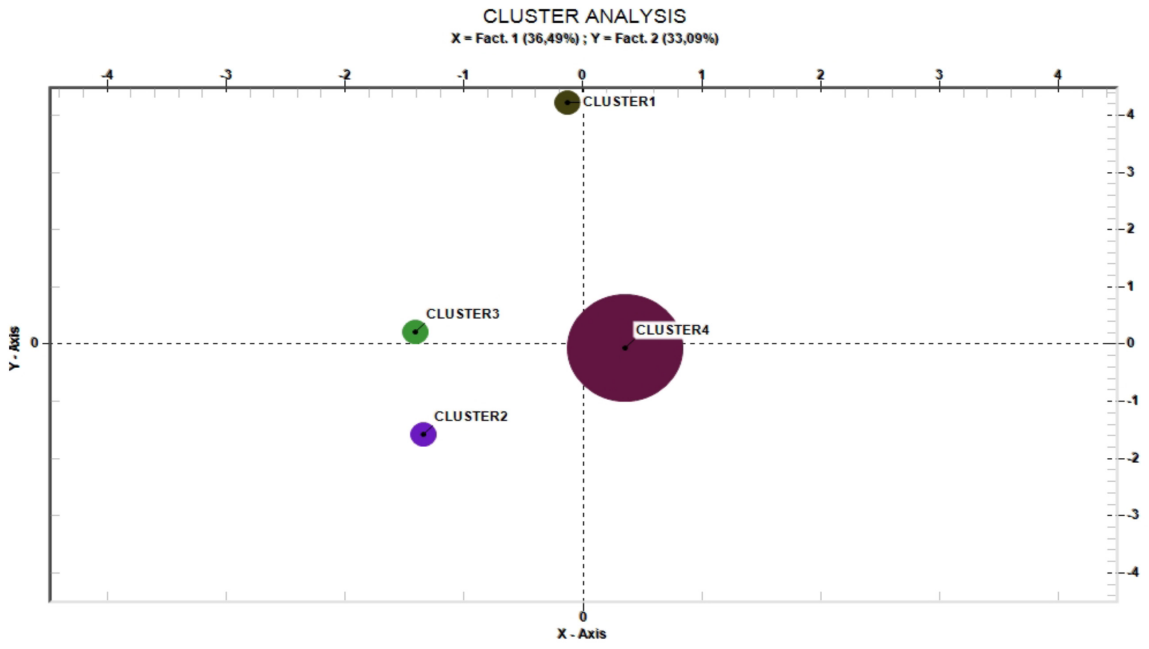
"I am worried about my plans given the situation we are experiencing nowadays, but I try to be positive thinking that everything will soon return to normal, and I will be able to carry out my plans."

"We will get back to normality and achieve what we have fought for in these years."

The third cluster "Career Paths" offered a reflection on the transition to the labor market. This cluster described the choices that these individuals had to make in building their careers (lemmas "degree," "studying"), also analyzing the "skills" acquired during their paths. It took into account how these skills could enhance a transition to the labor market. Moreover, the family dimension was considered (lemma "parents") as support in the career construction process.

Examples of e.c.u.:

"I just graduated. Studying is a revelation for me, although many times, I asked myself if I was attending the right faculty. The degree, however, allowed me to acquire the proper knowledge and skills to be able to work in the area that I have chosen for myself."



Note. Cluster 1 = Lack of Future (10%); Cluster 2 = Future Planning (10%); Cluster 3 = Career Paths (10%); Cluster 4 = Dark Future (70%).

FIGURE 1 | Cluster analysis. Cluster 1, Lack of Future (10%); Cluster 2, Future Planning (10%); Cluster 3, Career Paths (10%); Cluster 4, Dark Future (70%).

TABLE 1 | Clusters, associated lemmas, χ^2 values, and significance.

Clusters	Lemmas
Cluster 1 Lack of Future (10%)	Right now ($\chi^2 = 99.491$; $p < 0.001$); Heavy ($\chi^2 = 99.491$; $p < 0.001$); Instrument ($\chi^2 = 90.676$; $p < 0.001$); Uncertainty ($\chi^2 = 58.595$; $p < 0.001$); Insecurity ($\chi^2 = 48.847$; $p < 0.001$); Feeling ($\chi^2 = 42.574$; $p < 0.001$); Restlessness ($\chi^2 = 42.549$; $p < 0.001$); Resignation ($\chi^2 = 41.481$; $p < 0.001$); Stop ($\chi^2 = 32.787$; $p < 0.001$); Loneliness ($\chi^2 = 30.307$; $p < 0.001$); Impotence ($\chi^2 = 22.012$; $p < 0.001$); Mood ($\chi^2 = 20.012$; $p < 0.001$)
Cluster 2 Future Planning (10%)	Normality ($\chi^2 = 142.937$; $p < 0.001$); Opportunity ($\chi^2 = 37.787$; $p < 0.001$); Positive ($\chi^2 = 29.013$; $p < 0.001$); Realization ($\chi^2 = 16.685$; $p < 0.001$); Plans ($\chi^2 = 13.685$; $p < 0.001$); Degree ($\chi^2 = 10.286$; $p < 0.001$); Thinking ($\chi^2 = 9.935$; $p = 0.002$); Projects ($\chi^2 = 7.474$; $p = 0.006$); Dreams ($\chi^2 = 4.489$; $p = 0.034$); Living ($\chi^2 = 4.489$; $p = 0.034$)
Cluster 3 Career Paths (10%)	Faculty ($\chi^2 = 46.910$ $p < 0.001$); Collocation ($\chi^2 = 31.218$; $p < 0.001$); Choice ($\chi^2 = 16.182$; $p < 0.001$); Studying ($\chi^2 = 16.182$; $p < 0.001$); Obtaining ($\chi^2 = 7.474$; $p = 0.006$); Skills ($\chi^2 = 5.084$; $p = 0.024$); Interests ($\chi^2 = 5.084$; $p = 0.024$); Labor market ($\chi^2 = 5.084$; $p = 0.024$); Family ($\chi^2 = 5.064$; $p = 0.024$)
Cluster 4 Dark Future (70%)	COVID Spread ($\chi^2 = 99.491$; $p < 0.001$); Dark Future ($\chi^2 = 99.491$; $p < 0.001$); Anxious ($\chi^2 = 42.549$; $p < 0.001$); Opportunity ($\chi^2 = 29.013$; $p < 0.001$); Epidemic ($\chi^2 = 22.012$; $p < 0.001$); Reaching ($\chi^2 = 10.248$; $p < 0.001$); Slowing down ($\chi^2 = 5.084$; $p = 0.024$); Difficult ($\chi^2 = 5.069$; $p = 0.024$); See myself ($\chi^2 = 4.217$; $p = 0.024$); Life ($\chi^2 = 4.217$; $p = 0.024$)

"The instrumental support of my family, but also the emotional one, allowed me to carry on my choices, graduate, and get to where I am now."

The fourth cluster "Dark Future" presented the impact of COVID on the future, which, according to young people, has slowed down the transition to the labor market (lemma "slowdown"). The transition becomes even more "difficult" and the future "darker." Then, in this cluster lemmas that refer to the health condition of young people emerged. Young people described distress in situations and anxiety. The presence in this cluster of the lemmas "COVID Spread" could inform on the fact that young people consider the economic consequences of the coronavirus on their future as workers.

Examples of e.c.u.:

"I am anxious about the future and seeing how the situation will be after the crisis."

"Once we overcome COVID-19, what future will be there for us young people in the labor market?"

"The long-term effects of COVID-19 will be worse than those of the economic crisis that we are experiencing in recent years. We, young people, are always the ones who will pay the consequences."

"Before the pandemic, I started looking for work, I even had it, a real job, of those with a proper contract. Then everything stopped, they told me they don't know if they can hire me. They will let me know. Yes, but when? We really didn't need this pandemic."

"It is a very difficult period to manage emotionally. The pandemic is slowing down my plans. I can't see after the quarantine; I can't understand what will happen. I don't think the epidemic will make me change my personal and professional life plans, but it has certainly made their realization more difficult."

"This period of the pandemic has fueled even more of my fear of not being able to fulfill myself because with the economic crisis we are living with, and we will live with in the future. I believe that the working world can offer me, as well as everyone, even fewer opportunities."

"I am anxious about the future and seeing what the situation will be after the crisis."

The relationship between the clusters and gender variables showed that the elementary contexts associated with the female modality were present in the third cluster (15.38%) and the fourth cluster (69.23%); while the elementary contexts related to the male modality were present in cluster one (28.57%) and cluster four (71.43%).

The relationship between the cluster and the affected variables showed that the elementary contexts associated with the POS modality were present in cluster two (71.43%) and cluster three (28.58%); while the elementary contexts associated with NEG were present in cluster one (15.38%), cluster three (15.38%), and cluster four (69.23%).

DISCUSSION

The present study aimed to understand the experiences of the career planning of young people in the coronavirus era.

The quantitative data illustrated the current affect dimensions of young adults. Results showed that Italian young adults tended to experience negative affects in the recent weeks of quarantine. This evidence is in line with several studies that show the impact of epidemics on mental health (Brooks et al., 2020), and also with some studies that indicated higher levels of anxiety, distress, and depression in a young adults' sample (Cao et al., 2020; Huang and Zhao, 2020). Young people can represent a high-risk category for mental illness, and this was also confirmed by recent Italian studies (Parola et al., 2020; Rossi A. et al., 2020).

The quarantine condition has imposed significant limitations, forcing young people to stay at home with their parents, limiting sports activities, and the avoidance of any contact with friends with whom they regularly experience moments of conviviality at a young age (Benedetto et al., 2018); it has allowed online relationships as the only opportunity (Faccio et al., 2019; Boursier et al., 2020). The condition of inactivity and the mandated social distance have probably triggered a state of discomfort, distress, and loneliness among young people (Rossi et al., submitted).

The participants of this study were representatives of a section of young Italians. They had completed their university studies with the achievement of their degree shortly before the lockdown period. For the young people in the school-to-work transition phase, quarantine has also imposed a limitation on the time horizon, forcing aspirations and plans for the future to be blocked. This scenario has occurred at a time of difficulty for young people in the transition from school to the labor market, which already represents a risk factor for mental health

(McKee-Ryan et al., 2005; Paul and Moser, 2009), specifically in the Italian context (Parola and Donsì, 2018).

The analysis of the narrative data showed how young people are stuck in the present time, almost suspended, aware of their skills given by the years of training and university courses, but without knowing how and where to direct their strengths. Young people described distress, feelings of discomfort, and helplessness in uncertain situations in which they have no control. Results showed that young Italian adults experience psychological problems, feelings of impotence, restlessness, but also anxiety. Furthermore, these young people felt damaged by the pandemic's potential economic fallout. These findings were strongly shown in cluster 4, which contained 70% of the youth narratives. Moreover, this cluster grouped elementary content units of young people that have experienced more negative affectivity in the weeks before the administration.

The results appear as a starting point to re-think possible interventions for this risk-group. The need for preventive interventions to support career paths during this moment of emergency seems urgent. In this sense, the narrative fosters a mediation between young people and experience (Tessitore and Margherita, 2019, 2020; Felaco and Parola, 2020; Parola and Felaco, 2020). Following Blustein et al. (2020), counseling programs must take into account the difficulties that young people will encounter in the school-to-work transition after the pandemic. Interventions must be aimed at supporting the daunting challenge of this transition and recovering from the psychological and vocational fallout of this pandemic. Even more, interventions should guarantee a positive orientation toward future vision promoting hope and optimism (Ginevra et al., 2018; Santelli et al., 2018) and enhancing the development of effective coping strategies (i.e., career adaptabilities, Savickas, 1997).

Alongside this, interventions that facilitate help-seeking for young people and improve their well-being would be desirable. The risk is that young people, even after the lockdown implementation, will find themselves even more lost in career construction. Recent studies showed that a large number of young people avoid seeking psychological help (Sareen et al., 2007; Mannarini et al., 2017a, 2018, 2020; Mannarini and Rossi, 2019; Rossi and Mannarini, 2019; Rossi Ferrario et al., 2019; Rossi Ferrario and Panzeri, 2020). In this sense, guidance and counseling activities located in universities could play a central role in supporting young people in the recovery after the pandemic. Furthermore, the request for a clinical setting becomes urgent in situations of profound fear and anxiety (Sommantico et al., 2017; Merlo, 2019a,b; Settineri et al., 2019).

The present study is not free from limitations. First of all, the bias of the non-probability sampling techniques (e.g., the selection bias) that although allows the researcher to control the selection process severely limits the generalization of the results (Flick, 2011). Secondly, the small group of participants should be increased to make more generalizable results. Although the literature on qualitative research does not indicate the determination of sample size, several studies recommend a range of 20–30 interviews for grounded research and 15–30 interviews for case studies (Marshall et al., 2013). According to the general guideline of qualitative research (Boddy, 2016) in this study the sample-size depended to the scope of the study and nature of the topic (Morse, 2000), the contact time to be spent on each research participant for career interviews (Marshall et al., 2013), and the homogeneity of the population under consideration (Trotter, 2012). Furthermore, the sample was only composed of graduates who came from the Campania region in Southern Italy. Therefore, the sample is not representative of the Italian population. Results need to be replicated in other geographical areas (northern and southern region) to provide more robust data and determine their generalizability. Thirdly, the sample is not gender-balanced, and the discussion section did not concern the gender variables. Further studies with balanced samples are needed to determine gender influence over the thematic clusters that emerged. Moreover, the study does not take into account some dimensions that could be useful for a better understanding of young experiences. Future investigations can be oriented to investigate the role of social support (Ratti et al., 2017), specifically the parental support (Balottin et al., 2017; Manna and Boursier, 2018) and love relationships (Mannarini et al., 2013, 2017b; Margherita et al., 2018).

Despite the limitations, this study contributes new knowledge about young adults' perception of school-to-work transition in this historical moment. The current findings have several conceptual and practical implications that highlight the importance of providing tangible support to the transition from university to the world of work during this crisis. Moreover, from a methodological point of view, the study confirms the importance of the joint use of qualitative and quantitative methods in psychology. Using both a quantitative method and a narrative prompt yielded more in-depth information than either method alone would have yielded. The mixed methods have allowed, on the one hand, to quantitatively figure out the positive/negative affects related to the coronavirus through using the validated instrument; and, on the other hand, to understand the meaning given to the career paths and how coronavirus could impact on their school-to-work transition in depth, through the use of a narrative prompt.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because to ensure the privacy of the participants. Requests to access the datasets should be directed to Anna Parola.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Local Ethical Committee for research in Psychology of University of Naples Federico II. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AP contributed to the whole manuscript in each of its parts.

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Inoculating Against Fake News About COVID-19

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The outbreak of the SARS-CoV-2 novel coronavirus (COVID-19) has been accompanied by a large amount of misleading and false information about the virus, especially on social media. In this article, we explore the coronavirus "infodemic" and how behavioral scientists may seek to address this problem. We detail the scope of the problem and discuss the negative influence that COVID-19 misinformation can have on the widespread adoption of health protective behaviors in the population. In response, we explore how insights from the behavioral sciences can be leveraged to manage an effective societal response to curb the spread of misinformation about the virus. In particular, we discuss the theory of psychological inoculation (or *prebunking*) as an efficient vehicle for conferring large-scale psychological resistance against fake news.

Keywords: COVID-19, fake news, misinformation, inoculation, infodemic

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INTRODUCTION

The emergence of the novel coronavirus (SARS-CoV-2) in December of 2019 has quickly led to a global pandemic claiming hundreds of thousands of deaths worldwide already (Roser et al., 2020). In the absence of an effective treatment or vaccine, researchers have pointed out that managing the pandemic response will require leveraging insights from the social and behavioral sciences, particularly with regard to non-pharmaceutical interventions and containing the spread of misinformation about COVID-19 (Depoux et al., 2020; Habersaat et al., 2020; Van Bavel et al., 2020). In fact, the spread of misleading information about the virus has led the World Health Organization (WHO) to warn of an on-going "infodemic" or an overabundance of information—especially misinformation—during an epidemic (World Health Organization, 2020b; Zarocostas, 2020). This makes it harder for people to find trustworthy and reliable information when they need it. In this article, we ask three critical questions to help better inform societal response to the infodemic, namely; (1) what is the scope and reach of misinformation about COVID-19 in the general population, (2) what evidence is there to suggest that misinformation about the virus is undermining public support for—and the adoption of— preventative health behaviors; and (3) how can insights from psychology be leveraged to effectively manage societal response to help limit the spread of influential misinformation? In particular, in order to "immunize" people against the misinformation virus we draw on the theory of psychological inoculation and its real-world application.

MISINFORMATION ABOUT COVID-19

Misinformation about COVID-19 has proliferated widely on social media, ranging from the peddling of fake "cures," such as gargling with lemon or salt water and injecting yourself with bleach

(World Health Organization, 2020a), to false conspiracy theories that the virus was bioengineered in a lab in Wuhan (Andersen et al., 2020; Cohen, 2020), or that the 5G cellular network is causing or exacerbating symptoms of COVID-19 (BBC News, 2020). The conspiracy film "*Plandemic*" appeared online on May 4th of 2020, garnering millions of views and quickly becoming one of the most widespread examples of coronavirus-related misinformation (Cook et al., 2020). The video promotes dangerous health advice, for example, falsely suggesting that wearing a mask actually "activates" the coronavirus. Fake news about the virus has also been actively promoted by political elites, such as President Trump and Brazilian President Jair Bolsonaro, who falsely claimed that hydroxychloroquine is "working in all places" as a treatment against the virus (Constine, 2020). But misinformation about COVID-19 is not limited to information that is blatantly true or false, which widens the scope of the problem. For example, although the harms and benefits of hydroxychloroquine as a potential treatment are indeed being studied, there is currently no scientific consensus on its effectiveness (Geleris et al., 2020; Meyerowitz et al., 2020). Thus, even deciding what counts as misinformation about COVID-19 is a complicated matter, as insights into the causes of and treatments for the virus develop over time. Nonetheless, it is becoming increasingly clear that misinformation about COVID-19 is a common problem. For example, a poll by Ofcom in the United Kingdom found that almost half (46%) of the United Kingdom population reported exposure to fake news about the coronavirus (Ofcom, 2020). Similar results (48%) have been reported by Pew in the United States (Mitchell and Oliphant, 2020). In particular, amongst those exposed, nearly two-thirds (66%) reported seeing it on a daily basis, which is problematic as repeated exposure is known to increase belief in fake news (Pennycook et al., 2018). Although mass endorsement of conspiracy theories about the virus is not yet widespread, substantial minorities (typically about a third of the sample) in the United Kingdom and the United States report to believe that the virus is either manmade or produced on purpose by powerful organizations (Freeman et al., 2020; Roozenbeek et al., 2020b; Uscinski et al., 2020). Indeed, a YouGov survey found that about 28% of Americans and 50% of Fox News viewers think that Bill Gates is planning to use the COVID-19 vaccine to implement microchips in people (Sanders, 2020). Moreover, a recent analysis of the most viewed coronavirus YouTube videos found that over 25% of the top videos about the virus contained misleading information, reaching over 62 million views worldwide (Li et al., 2020).

HOW IS THE SPREAD OF MISINFORMATION HARMING SOCIETAL RESPONSE TO THE PANDEMIC?

Another emerging insight is that COVID-19 conspiracies and rampant misinformation can adversely impact the effectiveness of containment strategies. Indeed, misinformation about COVID-19 can fundamentally distort people's risk perception of the virus (Krause et al., 2020). This is important as risk perception has been linked to the adoption of COVID-19 preventative health behaviors (Dryhurst et al., 2020). A recent study by Uscinski et al. (2020) found that belief in conspiracies about the virus is associated with a propensity to reject information from expert authorities. Similar findings were reported by Freeman et al. (2020), who also noted a link between belief in COVID-19 conspiracies and an increase in vaccine hesitancy. For example, people who endorsed the conspiracy that the virus is bioengineered were less likely to report compliance with public health guidelines (e.g., staying at home) and were less likely to report to accept a COVID-19 vaccine (see also Imhoff and Lamberty, 2020). These effects are problematic because at present polls show that only 50% of Americans are willing to get a potential vaccine if one becomes available, which undermines the potential for herd immunity against the coronavirus (Cornwall, 2020). Importantly, misinformation about the virus has been shown to have other serious societal consequences as well. Recent reports have indicated that coronavirus misinformation has been linked to mob attacks, mass poisonings (Depoux et al., 2020), and acts of vandalism (Spring, 2020). In the United Kingdom alone, people have set fire to least 50 phone masts in response to the 5G conspiracy (BBC News, 2020) and research finds that belief in the 5G conspiracy is linked to violent intentions (Jolley and Paterson, 2020). In addition, an analysis of over 60 million geo-coded cell phones found reduced social distancing in pro-government areas after Brazil's president inaccurately portrayed the risks of COVID-19 (Ajzenman et al., 2020). Similar analyses have been conducted in the United States in response to political polarization over COVID-19 preventative health behaviors (Allcott et al., 2020), highlighting the disruptive potential of high-profile misinformation for both individual and societal well-being.

LEVERAGING INSIGHTS FROM PSYCHOLOGY: INOCULATING AGAINST COVID-19 MISINFORMATION

So far, little attention has been paid to insights from the social and behavioral sciences to combat misinformation about COVID-19, despite the ample availability of research to draw from Van Bavel et al. (2020). One insight that has emerged is that fact-checks tend to spread slower on social media than misinformation (Vosoughi et al., 2018), making it difficult for fact-checking to be effective on its own. A review by *Politico*, for example, found that Facebook's fact-checking efforts did little to prevent coronavirus conspiracies from being shared widely in private groups on the platform (Scott, 2020). Further complications arise from the "continued influence effect" of misinformation, which states that people may continue to believe misinformation even after it has been debunked (Ecker et al., 2010; Lewandowsky et al., 2012). In addition, while media literacy initiatives are important and can be effective under the right conditions (Bode and Vraga, 2015; Guess et al., 2020; Van Bavel et al., 2020), they are often expensive to develop, slow to roll out, and *reactive* rather than *proactive*.

In particular, given the practical challenges of fact-checking and the difficulty of correcting misinformation after the damage

is already done, researchers have started to explore *prebunking* (i.e., preemptive debunking). Because misinformation spreads through networks much like a real virus "infecting its host" and rapidly transmitting falsehoods from one mind to another, the natural antidote is a psychological vaccine against fake news (van der Linden and Roozenbeek, 2020).

Inoculation Theory

The theory of psychological inoculation takes the historic practice of vaccination in medicine into the realm of resistance to persuasion (McGuire, 1964). In a medical inoculation, a virus is weakened to the point where it will not make the person sick, but it will trigger protective responses, like antibodies. In a persuasion inoculation, a strong challenge (e.g., a conspiracy theory) is weakened to the point where it will not change the person's position—the person's healthy state—but it will trigger protective responses, like enhanced critical thinking (McGuire, 1964; Compton, 2013). In both contexts, a similar process is at work: exposure to weakened challenges leads to resistance to stronger challenges. In psychological inoculation, the weakened challenge often consists of two elements (Compton, 2013), namely; (a) a forewarning of a threat or attack on one's attitudes and (b) a preemptive refutation of counter-arguments (or prebunking). Preemptive refutation of misinformation weakens the misinformation, just as a medical vaccine is often comprised of weakened virus. For example, in a study on misinformation about climate change, participants were (a) forewarned that some political actors try to mislead people on the issue and (b) provided with facts and arguments to refute the misinformation—preemptively—that is, before they were exposed to a full dose of misinformation later on (van der Linden et al., 2017). The study found that the inoculation partially immunized people against climate misinformation (see also Maertens et al., 2020a).

A number of things happen during the inoculation process of resistance to influence. One of the most important is threat—the motivation to engage in resistance. In inoculation research, threat is a response to vulnerability (McGuire, 1964; Compton, 2013)—for example, when a preemptive inoculation message raises and refutes a persuasive attack (e.g., Banas and Richards, 2017), or when an inoculation message exposes reasoning fallacies (Cook et al., 2017). The cognitive and affective processes unleashed by threat are varied and powerful, including increased counterarguing (Pfau et al., 2006), increased attitude accessibility (Pfau et al., 2003), less psychological reactance against the inoculation-informed campaign (Richards and Banas, 2015), and more psychological reactance against attack messages (Miller et al., 2013). For conventional, *prophylactic* inoculation to take hold, the desired position needs to already be in place—a healthy state (Compton, 2013). This is the classic approach of inoculation theory. In the context of the coronavirus, this would imply protecting the attitudes of those people who are already following public health guidelines. Strengthening their attitudinal defenses will decrease the potency of misinformation attacks. However, a more recent approach within inoculation theory expands its efficacy to also include a *therapeutic* application—inoculation treatments that target an unhealthy state (Compton, 2020). New work in this latter area expands inoculation theory's reach by inoculating audiences who have already been "afflicted" with the informational virus. Therapeutic inoculation works by boosting immune defenses and decreasing the probability that people will spread the virus. For example, people with skeptical attitudes toward climate science can still benefit from inoculation against misinformation in the sense that they generate stronger attitudes toward the scientific consensus (Cook et al., 2017; van der Linden et al., 2017).

The health domain boasts a particularly strong record for inoculation theory—appropriately enough in the context of COVID-19. Much of this work has looked at how inoculation theory-informed public health messages could help shore up resistance to unhealthy pressures, like smoking cigarettes (Pfau et al., 1992) or binge drinking (Parker et al., 2010). More recently, inoculation work has explored ways of enhancing beneficial health behaviors, like committing to exercise programs (Dimmock et al., 2016) or strengthening vaccination intentions (Wong and Harrison, 2014), especially in response to conspiracy theories (Jolley and Douglas, 2017). For example, vaccination intentions only improved when participants were presented with anti-conspiracy arguments *prior* to exposure to the vaccination conspiracy theories but not when presented with counter arguments afterward.

Actively Inoculating Against Misinformation

Two further advances have been proposed in inoculation research that hold promise for the scalability and broad applicability of inoculation interventions, particularly in the context of misinformation: a renewed focus on active inoculations (McGuire and Papageorgis, 1961; Roozenbeek and van der Linden, 2018), and a shift in attention from inoculating against individual examples of unwanted persuasion (e.g., climate change or vaccination) to the manipulation *techniques* that underpin most fake news such as using emotional language (Brady et al., 2017), conspiratorial reasoning (Lewandowsky et al., 2013; van der Linden, 2015) or impersonating experts online (Goga et al., 2015). The idea behind active inoculation is to let people generate their own "antibodies." A practical application of active inoculation theory is the award-winning online browser game *Bad News*.[1] The game offers a simulated social media environment in which people take on the role of a fake news creator and learn about six common misinformation techniques over the course of six levels, or "badges" (for a detailed theoretical overview see Roozenbeek and van der Linden, 2019; van der Linden and Roozenbeek, 2020). The inoculation component in the game consists of a combination of (a) warnings about fake news and (b) pre-exposure to weakened doses of the techniques used in the production of fake news. Both processes can potentially increase the inoculation effect by facilitating retention in memory for longer periods of time (Pfau et al., 1997, 2005). Research has shown that *Bad News* significantly improves players' ability to resist misinformation techniques after gameplay, and increase players' confidence in

[1] www.getbadnews.com

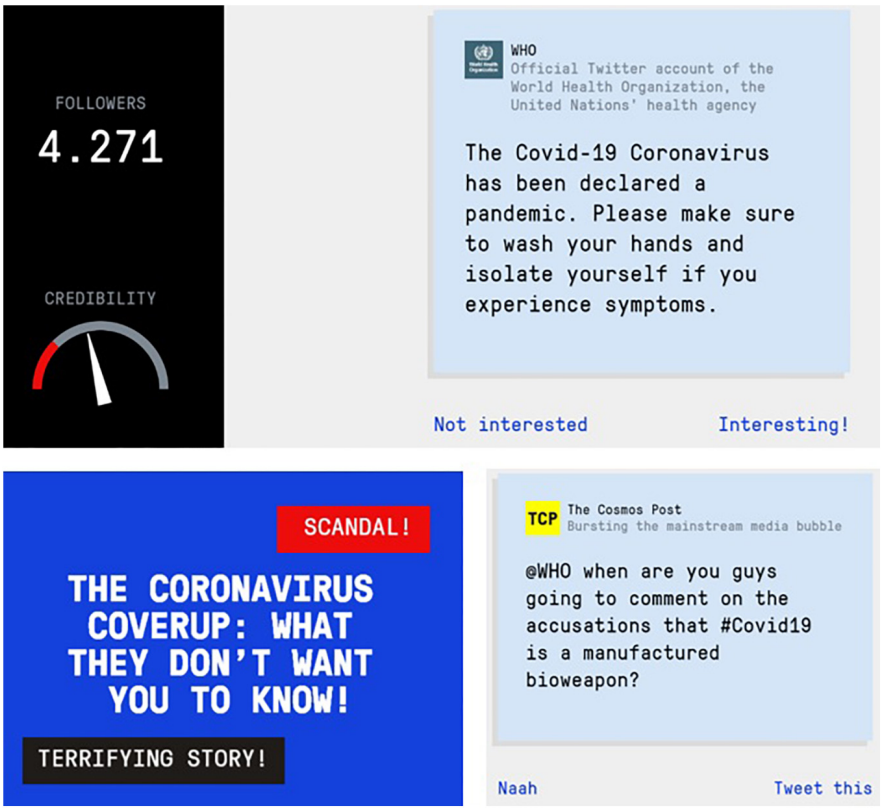

FIGURE 1 | Screenshots from the *Bad News* game about coronavirus (www.getbadnews.com). Images and links reproduced with permission from *Bad News*.

spotting misleading information (Basol et al., 2020). In addition, in collaboration with the United Kingdom Foreign Office, the game has been translated internationally and its effectiveness as an inoculation intervention has been replicated across five different language versions (Roozenbeek et al., 2020c). The inoculation effect itself can last for months (Pfau and Bockern, 1994), including with regular "top-ups" or "booster shots" following gameplay (Maertens et al., 2020b). In response to the outbreak of the coronavirus pandemic, we altered the *Bad News* game's "conspiracy" scenario to feature weakened doses of conspiracies about the virus. **Figure 1** shows a number of screenshots from the game. Players are tasked with inventing and spreading a fake conspiracy theory about COVID-19, and learn about the negative consequences of their actions in the form of replies by social media users in their network, thus exposing how misinformation is created, spread and shared.

The relatively easy adaptation of the *Bad News* game to immunize people against misinformation specifically about the COVID-19 pandemic highlights the potential to translate theoretical laboratory findings into scalable real-world inoculation interventions: the game is played by about a million people worldwide (Roozenbeek et al., 2020c), thus "inoculating" a large number of people who voluntarily navigate to the *Bad News* website. Importantly, it is not necessary for every single individual to receive the "vaccine": if enough people have developed antibodies against the techniques used to spread misinformation about COVID-19, in theory, societal herd immunity could be achieved.

CONCLUSION

Prevention is better than cure. This is true as much for diseases as it is for the spread of misinformation. Although the *Bad News* game is a useful tool, more work is needed to curb the spread of misinformation about COVID-19, including a multi-layered defense system against "post-truth" science denial (van der Linden, 2019) which will include effective debunking and real-time rebuttal in addition to inoculation (Schmid and Betsch, 2019). A practical application of inoculation theory in the context of COVID-19 misinformation is the new online game, *Go Viral!*,[2] developed in collaboration with the United Kingdom government and the WHO in which players learn to resist three manipulation techniques commonly used to spread misinformation about the coronavirus: fearmongering, the use of fake experts, and conspiracy theories. An open question in active inoculation research is the extent to which inoculation can boost *truth-discernment* skills, that is, not just the ability to spot and resist misinformation attacks but also the ability to better identify real or credible news (Guess et al., 2020; Roozenbeek et al., 2020a). Compton et al. (2016)

[2]The game can be played for free at www.goviralgame.com.

called for more "work that pushes forward our understanding of persuasion and has applied value as a health messaging strategy to help combat serious threats to healthy living" (p. 1). Promoting accurate beliefs about COVID-19, and encouraging healthier, safer behaviors related to COVID-19 prevention, would certainly answer this call. Indeed, COVID-19 health messaging can harness both ways in which inoculation theory is used to protect healthier beliefs and actions: building resistance to unhealthy influence, like conspiracy theories, and encouraging healthier behaviors, like social distancing and wearing a mask in public. We look forward to future research on both prophylactic and therapeutic applications of psychological inoculation in the context of COVID-19.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

AUTHOR CONTRIBUTIONS

SL and JR conceptualized the study and drafted the manuscript. JC co-authored the article and provided input on the final version of the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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frontiers in Psychology

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Traumatic Stress in Healthcare Workers During COVID-19 Pandemic: A Review of the Immediate Impact

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The disease caused by respiratory syndrome coronavirus 2 (SARS-CoV-2) called COVID-19 resulted in a pandemic that has demanded extraordinary physical and mental effort from healthcare workers. This review provides an overview of studies that have explored traumatic stress in healthcare workers and associated factors between January and May 2020. The focus is on the most relevant literature investigating the prevalence of trauma- and stressor-related symptoms. Articles were selected from PubMed and PsycINFO databases using the search terms, "healthcare workers," "COVID-19," and "posttraumatic stress" in different combinations and with various synonyms. Among the seven studies that fulfilled our criteria, five assessed traumatic stress response, one assessed acute stress symptoms, and one focused on vicarious traumatization. Overall, the available findings highlight the presence of trauma-related stress, with a prevalence ranging from 7.4 to 35%, particularly among women, nurses, frontline workers, and in workers who experienced physical symptoms. Future studies should clarify the long-term effects of the COVID-19 pandemic on the mental health of healthcare workers, with particular focus on posttraumatic stress disorder.

Keywords: trauma, acute stress, vicarious traumatization, COVID-19, healthcare workers

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INTRODUCTION

The World Health Organization (WHO) declared COVID-19 as a pandemic on March 11, 2020, when infections and deaths began to increase exponentially worldwide. The first cases were reported during December 2019 in Wuhan, China (WHO, 2020).

This virus belongs to the coronavirus family, which can cause respiratory infections in humans that resemble the common cold, as well as lethal illness similar to that associated with Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS; Carver and Phillips, 2020). The symptoms of the new respiratory syndrome coronavirus 2 (SARS-CoV-2) can be fever, cough, tiredness, pains, nasal congestion, headache, and conjunctivitis, but they can also include pneumonia, acute respiratory syndrome, kidney failure, and death. Transmission is believed to occur *via* droplets (Carver and Phillips, 2020; Lechien et al., 2020; WHO, 2020). By May 22, 2020 the number of global confirmed infections and deaths had reached ~4,893,000 and ~323,000, respectively (WHO, 2020). Such an extraordinary event will have long-term effects on mental health according to previous studies of epidemics and quarantine (Maunder et al., 2006; Brooks S. K. et al., 2020; Kisely et al., 2020). The COVID-19

pandemic is classifiable as a traumatic event of exceptional magnitude that transcends the range of normal human experience with exposure to risk of death (Dutheil et al., 2020). These aspects can trigger psychopathologies such as acute stress disorder (ASD) and posttraumatic stress disorders (PTSD). Healthcare workers (HCWs) have been faced with unprecedented demands, both professionally and personally, in efforts to manage a disease with unclear etiology and pathology, no cure, no vaccine, and a high mortality rate. They are obliged to make difficult ethical decisions and function professionally under conditions of fear for themselves and their loved ones (Dutheil et al., 2020; Gavin et al., 2020; Kisely et al., 2020; Wong et al., 2020).

The aim of this review is to provide an overview of studies focusing on traumatic stress in HCWs during the COVID-19 pandemic.

MATERIALS AND METHODS

Research Approach

In order to determine the immediate impact of COVID-19 among HCWs in terms of stress- and trauma-related symptoms (TRSs), a scoping review was conducted in line with existing PRISMA guidelines. A scoping review may summarize the findings related to constructs examined with heterogeneous methods and identify the aspects that future research should focus on (Tricco et al., 2018).

Search Strategy

A literature search was conducted in the first 2 weeks of May 2020 in the following bibliographic databases: PubMed and PsycINFO. The databases were queried using the following strings (using Boolean operators): ("healthcare workers" OR "health care workers") AND ("COVID-19" OR "SARS-CoV-2") AND ("mental"); ("healthcare workers" OR "health care workers") AND ("COVID-19" OR "SARS-CoV-2") AND ("stress"); and ("healthcare workers" OR "health care workers") AND ("COVID-19" OR "SARS-CoV-2") AND ("post-traumatic stress"). The last run was conducted on May 17, 2020. With the use of this search string, 99 titles were identified between January and May 2020 (see **Figure 1** for the flow diagram of article selection).

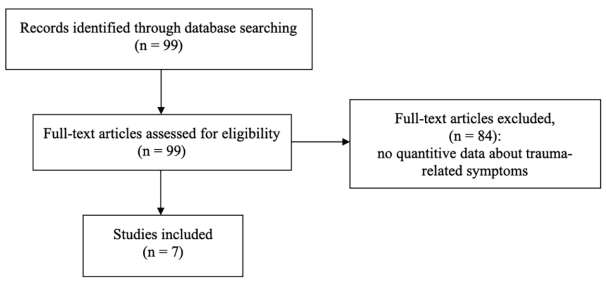

FIGURE 1 | Flowchart of articles selection.

Reports were also extracted using cross references, but in this way no additional article has been found.

Eligibility Criteria

This review aimed to identify peer-reviewed academic articles that aimed to provide a measure of stress- or trauma-related symptoms. All types of peer-reviewed papers (original research articles, commentaries, letters to editors, and reviews) that were published in English were eligible for inclusion in this review. Exclusion criteria were as follows:

1. Papers referring to data on the impact of previous epidemics.
2. Papers that did not include validated measures to investigate stress- or trauma-related symptoms.
3. Studies that used *ad hoc* constructed surveys or qualitative methods.
4. Studies that included only the general population. However, the studies that used the general population as a comparison group for the HCWs have been included in the present review.
5. Papers published but not peer reviewed or under review at the time the search was carried out.

Study Selection

Study selection was done by two authors (AB and MDT) who read the full text of all publications to screen for eligibility, because most of these articles did not include the abstracts (i.e., letter to editor and commentaries).

After the initial search, another co-author (AR) performed the literature search again, following the steps described in the study selection section above, to ensure that no records were missed and/or excluded during the selection process.

Disagreements on the inclusion or exclusion of publications were discussed by all authors until agreement was reached.

Data Extraction

The characteristics of all included studies were extracted by one author (AB). Data items that were extracted from each included study were author and year of publication, sample and country of origin, instruments used to measure stress- and trauma-related symptoms and other psychological variable, trauma-related results, and other main results.

RESULTS OF SELECTION

Table 1 and **Appendix A** summarize the main findings of the included articles. Five studies proceeded in China, one was in Singapore and one was a study of Singapore and India. All studies used self-report questionnaires disseminated through online surveys and had a cross-sectional study design. Three studies sampled only doctors and nurses, three included ancillary HCWs in hospitals such as pharmacists, physiotherapists, technicians, administrators, clerical staff, and maintenance workers, and one analyzed the general public and frontline and non-frontline nurses (nFLNs). All studies found higher percentages of females (64.3–82.7%) and nurses (up to 82.7%),

TABLE 1 | Summary of trauma-related results of the included studies.

Authors	Samples (n) – location	Instrument	Trauma-related results
Chew et al. (2020)	HCWs (906) – Singapore (480) and India (426)	IES-R†	7.4% (67) exceeded cut-off for TRSs; 7.5 and 7.3% of HCWs from Singapore and India, respectively. Thirty-four total respondents had moderate to severe symptoms.
Kang et al. (2020)	Medical staff (994): doctors (183) and nurses (811) – China	IES-R*	People with physical symptoms were more likely to screen positive. Mean (SD) IES-R scores are 6.1 (4.4.), 22.9 (4.8), 39.9 (5.4), and 60 (9.8) in groups with subthreshold, mild, moderate, and severe mental disturbance, respectively.
Lai et al. (2020)	Medical staff (1257): doctors (493) and nurses (764) – China	IES-R*	Exposure to infected persons increased for each group. 71.5% (899) had TRSs; levels were moderate to severe in 35% (440): 163 (33%) physicians and 277 (36.2%) nurses. Being female, intermediate professional titles and frontline work were associated with severe TRSs; working outside Hubei province was associated with lower risk of TRSs.
Li et al. (2020)	FLNs (234), nFLNs (292), and general public (214) – China	Vicarious traumatization questionnaire	Scores were significantly lower for FLNs than general public and nFLNs. No significant difference was found between general public and nFLNs. nFLNs had significantly increase scores than FLNs.
Tan et al. (2020)	HCWs (470) Singapore	IES-R†	7.7% (36) screened positive for TRSs. IES-R scores were significantly higher for non-medical, than medical staff with means (SD) of 9.4 (10.1) and 5.8 (9.2), respectively.
Xiao et al. (2020)	Medical staff (180): doctors (82) and nurses (98) – China	SASR	Mean (SD) SASR score was 77.6 (29.5). Social support and self-efficacy scores were negatively correlated with stress scores; anxiety scores were positively correlated with stress scores; SARS scores were positive correlated with sleep quality scores.
Zhang et al. (2020)	HCWs (1563) – China	IES-R*	73.4% had TRSs. Comparisons on impact of event between individuals with and without insomnia: sub-clinical (3.4 vs. 39.7%), mild (23.9 vs. 42.7%), moderate (42.7 vs. 15.8%), and severe (30 vs. 1.7%) TRSs.

FLNs, frontline nurses; HCWs, healthcare workers; IES-R, Impact of Event Scale – Revised; nFLNs, non-frontline nurses; SASR, Stanford Acute Stress Reaction questionnaire; SD, standard deviation; and TRSs, trauma-related symptoms.[*]*Cut-off > 26. Scores: normal/sub-clinical (0–8), mild (9–25), moderate (26–43), and severe distress (44–88).*
[†]Cut-off > 24 for clinical relevance of trauma-related symptoms. Scores: normal (0–23), mild (24–32), moderate (33–36), and severe (>37).

with average ages ranging from 26 to 40 years (Chew et al., 2020; Kang et al., 2020; Lai et al., 2020; Li et al., 2020; Tan et al., 2020; Xiao et al., 2020; Zhang et al., 2020).

The studies examined acute stress reaction (n = 1), vicarious traumatization (n = 1), and traumatic stress (n = 5). Their findings are discussed below.

Acute Stress Reaction

Xiao et al. (2020) investigated acute stress response among medical staff. Acute stress reaction is an anxious response, which in its most serious cases can be accompanied by manifestations associated with reliving the traumatic event or signs of reactivity (Walton et al., 2020). In accordance with the criteria of fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), a diagnosis of ASD requires at least nine of 14 symptoms, including negative mood, intrusion, dissociation, avoidance, and arousal (such as sleep difficulties, irritability, and inattention), that were initiated or worsened shortly after the event (Bryant, 2018). The study of Xiao et al. (2020) was conducted during the 1st month of the COVID-19 outbreak in China and the Stanford Acute Stress Reaction (SASR) questionnaire was used. This questionnaire evaluates consequential symptoms of traumatic events with higher scores corresponding to higher levels of stress-related symptomatology (range 0–150; Cardeña et al., 2000). The average score of for SASR was 77.6. Social support and self-efficacy scores correlated negatively with stress scores, and positive correlations were identified between anxiety and stress scores and between stress and sleep quality scores in that study. The main objective of that study was to determine the effects of social support on sleep quality among doctors and nurses, considering several other psychological aspects. Associated with this, social support indirectly affected the sleep quality of HCWs, reduced stress and anxiety levels and improved self-efficacy, while confirming that high levels of stress (with high anxiety levels and low self-efficacy) reduce sleep quality (Xiao et al., 2020).

Vicarious Traumatization

Li et al. (2020) investigated levels of vicarious traumatization in frontline and non-frontline nurses and in a general population. The concept of vicarious traumatization, also defined as secondary traumatic stress, includes various traumatic conditions, in which psychological abnormalities are related to the sympathy of HCWs toward people who are primarily traumatized. The symptoms associated with vicarious traumatization are loss of appetite, fatigue, sleep disorders, irritability, inattention, fear, and interpersonal conflict, which often remain at sub-clinical levels (Sabin-Farrell and Turpin, 2003; Li et al., 2020). The questionnaire adopted in their study comprised physiological and psychological dimensions. The psychological dimension included items associated with emotional, behavioral, and cognitive responses, and life beliefs. The results suggested that

the general public, frontline and non-frontline nurses suffered from vicarious traumatization, but between-group differences emerged. Frontline nurses (FLNs) had significantly lower scores than the other two groups, which did not significantly differ. In addition, married, divorced, or widowed nurses had more severe symptoms than unmarried nurses.

These results might be explained by the fact that the frontline nurses were composed of voluntarily selected professionals, who were trained with sufficient psychological preparation, with a middle-level professional title, and with work experience. Furthermore, the increased vicarious traumatization of nFLNs, as well as of general public, would derive from the sympathy and worry felt for COVID-19 patients and frontline workers, who instead sympathize only with patients and are more experienced about pandemic (Li et al., 2020).

Considering the recognition of the propensity of frontline nurses to suffer from vicarious traumatization (Taylor et al., 2016), it is essential to pay attention to the psychological health of these professionals, but also to take care of nFLNs, according to the findings of the study of Li et al. (2020).

Traumatic Stress

Five selected studies investigated the psychological impact of COVID-19-related trauma in HCWs using the Impact of Event Scale – Revised (IES-R; Chew et al., 2020; Kang et al., 2020; Lai et al., 2020; Tan et al., 2020; Zhang et al., 2020). The IES-R is a 22-item scale (range 0–88) that measures intrusive, avoidance, and hyperarousal symptoms typical of trauma. It is relatively independent from trauma- and stress-related disorders included in DSM-5, but considering that it examines symptoms in PTSD, it has often been used to identify this disorder (Wu and Chan, 2003). Chinese studies interpreted the IES-R scores as follows: normal/sub-clinical (0–8), mild (9–25), moderate (26–43), and severe distress (44–88), with a cut-off of 26 (Wu and Chan, 2003; Kang et al., 2020; Lai et al., 2020; Zhang et al., 2020). In contrast, studies conducted in Singapore and India evaluated IES-R scores as follows: normal (0–23), mild (23–32), moderate (33–36), and severe (>37), with a cut-off of 24 indicating possible PTSD (Creamer et al., 2003; Chew et al., 2020; Tan et al., 2020). These studies included 470–1,563 respondents (Tan et al., 2020; Zhang et al., 2020).

Lai et al. (2020) conducted a hospital-based survey that was stratified for the region where the participants worked. The IES-R scores showed that 899 (71.5%) of 1,257 physicians and nurses had traumatic stress symptoms and the level was moderate/severe in 440 (35%) of them. Specifically, 163 (33%) physicians and 277 (36.2%) nurses had clinically relevant symptoms (Lai et al., 2020).

Furthermore, women, nurses, and those working in Wuhan reported more severe symptoms of trauma stress and worse outcomes for anxiety, depression, and insomnia, with respect to men, physicians, and those working in Hubei outside Wuhan and outside Hubei. In particular, being women and having an intermediate technical title were associated with increased anxiety, depression, and TRSs. Being a frontline worker, directly engaged in the diagnosis and treatment of patients infected with COVID-19, was an independent risk factor for higher scores not only at the IES-R, but also at other measures used in the study (Lai et al., 2020). These prevalences were similar to those of Zhang et al. (2020), who found that 73.4% of HCWs respondents had IES-R scores ≥9, indicating the presence of traumatic stress symptoms. The main objective of that study was to determine the prevalence of insomnia and associated factors, the authors compared the levels of psychological impact of the event between HCWs with and without insomnia. Individuals with insomnia reported a significantly higher psychological impact compared to those without insomnia (symptoms of traumatic stress based on IES-R: moderate 42.7 vs. 15.8% and severe 30 vs. 1.7%; Zhang et al., 2020).

Kang et al. (2020) conducted a study on the mental health of HCWs, exploring also their psychological needs and access to mental health services. The HCWs were assigned to four groups (1–4) based on scores for depression, anxiety, insomnia, and traumatic stress. Groups 1, 2, 3, and 4 had subthreshold, mild, moderate, and severe disturbances (36, 34, 22.4, and 6.2% of the sample, respectively) and mean IES-R scores of 6.1, 22.9, 39.9, and 60, respectively. These findings indicated that group 4 was exposed to possible COVID-19 positive persons more often, had less access to psychological material and worse self-perceived health status, than the other three groups. Ultimately, that study showed that exposure to infected patients negatively impacted mental health, which in turn influenced subjective perception of physical health. Access to mental health services had a partial mediating effect between the risk of contact with COVID-19 positive patients and the mental health of the respondents (Kang et al., 2020).

The prevalence data differed in other countries. Tan et al. (2020) found that only 7.7% of their respondents screened positive for TRSs. In addition, the percentage was higher among non-medical, than medical personnel (10.9 vs. 5.7%). The authors assumed that the scores were lower than those found in studies of previous epidemics because the medical personnel might have been more mentally prepared due to previous experience (Tan et al., 2020). The results of the study by Chew et al. (2020) were similar; 7.4% of the total sample of HCWs exceeded the IES-R cut-off (Singapore, 7.5%; India, 7.3). Like to the finding of Chew et al. (2020) and Kang et al. (2020) associated having physical symptoms with an increased probability of high scores for trauma-related stress. A possible explanation for this result is that nonspecific symptoms, such as headache, sore throat, cough, breathlessness, lethargy, myalgia, and loss of appetite, are also part of the symptomatology of milder forms of COVID-19 infection (Chew et al., 2020; Lechien et al., 2020).

Thus, the presence of TRSs differed according to IES-R in these studies, with prevalence ranging from 7.4 to 35% (Chew et al., 2020; Lai et al., 2020).

DISCUSSION

To the best of our knowledge, this is the first review on the issue of COVID-19 trauma- and stress-related symptoms in

HCWs. Other literature reviews of previous epidemics and/or the COVID-19 pandemic have focused on generic psychological distress and/or anxiety and depressive symptoms. Meta-analyses have found a high prevalence of anxious and depressive symptoms among HCWs, especially among women and nurses (Pan et al., 2020; Pappa et al., 2020). In addition, a series of recent reviews highlighted that risk factors, such as being female, younger, being a nurse, lack of adequate protective equipment, and exposure to infected people, have been found to be associated to TRSs in previous epidemics (Brooks S. K. et al., 2020; Kisely et al., 2020; Rajkumar, 2020; Spoorthy, 2020; Walton et al., 2020).

Regarding the recent COVID-19 outbreak, the available studies show an important presence of COVID-19 trauma and stress-related symptoms in the general population and in patients (Bo et al., 2020; Rajkumar, 2020; Ren et al., 2020; Wang et al., 2020). However, to date, only few studies have analyzed this specific aspect in HCWs.

The psychological traumatic impact of COVID-19 in frontline and non-frontline HCWs is a great issue, as emerged by almost all the included studies (Kang et al., 2020; Lai et al., 2020; Xiao et al., 2020; Zhang et al., 2020). Contrasting results seem to emerge only in the studies of Lai et al. (2020) and Li et al. (2020), which found a different prevalence of TRSs between frontline vs. non-frontline HCWs. However, this discrepancy could be explained considering the different constructs the two studies examined and the heterogeneity of the samples they enrolled.

The present review highlighted an important impact of the COVID-19 pandemic on the mental health of HCWs. The prevalence of clinically relevant TRSs ranged from 7.4 to 35% (Chew et al., 2020; Lai et al., 2020), while in Chinese general population the prevalence of TRSs is ~7% (Ren et al., 2020; Wang et al., 2020). The differences among these results could be explained by different contagion rates and pressure on health care systems, the different incidence of the risk factors and different of access to psychological support. Particularly, being female, younger, a frontline worker, a nurse, having less work experience, exposure to infected people, poor social support, difficult access to psychological material, insomnia and physical symptoms are all risk factors for traumatic symptoms in HCWs (Chew et al., 2020; Kang et al., 2020; Lai et al., 2020; Xiao et al., 2020).

Furthermore, the multiple sources of distress that face HCWs are important to consider, such as concern about the spread of the virus, their own health, the health of their loved ones, and changes in the work environment (Cacchione, 2020; Gavin et al., 2020; Lai et al., 2020; Menon and Padhy, 2020; Neto et al., 2020). The HCWs are also at risk for moral injury, that is psychological distress derived from actions (or the impossibility of implementing actions) that violate their personal ethical and moral codes (Greenberg et al., 2020; Williamson et al., 2020). All these aspects contribute to the possibility that HCWs develop psychopathological disorders such as PTSD, severe depression, and substance abuse (Brooks S. K. et al., 2020). Future studies should clarify the long-term effects of the COVID-19 pandemic on the mental health of HCWs, with particular focus on PTSD.

However, HCWs that appear to be less at risk or who have mild traumatic stress symptoms should also be considered (Chew et al., 2020; Kang et al., 2020; Li et al., 2020; Tan et al., 2020). For example, Kang et al. (2020) showed that HCWs with low levels of mental health disturbances expressed the need to improve their skills to mitigate mental distress, both for themselves and for others.

Early symptoms of psychological trauma, together with symptoms of anxiety, depression, and insomnia, must be recognized, so that appropriate interventions can consider the organizational needs of HCWs, risk and protective factors, and possibly include actions to promote post-traumatic growth (Brooks S. et al., 2020; Conversano et al., 2020; Romeo et al., 2020; Shah et al., 2020; Shanafelt et al., 2020). The literature suggests that people exposed to trauma can experiment with positive responses, reconsidering their values and appreciating their lives more as well as their work in emergency situations. These aspects can be fostered by psychological interventions (Xu et al., 2016; Brooks S. et al., 2020).

This review has some limitations, due both to the limited number of studies specifically investigating post-traumatic symptoms of COVID-19 on HCWs, and to the methodological differences (e.g., cross-sectional design) of the selected studies themselves.

AUTHOR CONTRIBUTIONS

AB, MDT, AR, and LC conceived and designed the review. AB, MDT, and AR carried out the literature searches and screening. AB and LC wrote the manuscript. All authors concluded the results, discussed and approved the final version of the manuscript.

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Motherhood in the Time of Coronavirus: The Impact of the Pandemic Emergency on Expectant and Postpartum Women's Psychological Well-Being

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The birth of a child is a critical and potentially stressful experience for women, entailing several changes both at the individual and interpersonal level. This event can lead to different forms of distress, ranging in intensity and duration. Many studies highlighted medical, psychological, and social variables as risk factors potentially influencing the onset or aggravation of perinatal maternal conditions. The current pandemic emergency and the restrictive measures adopted by local governments to prevent the spread of the coronavirus infection may negatively affect mothers-to-be and new mothers potentially increasing the likelihood of anxiety, depressive or post-traumatic symptoms to develop. Moreover, the forced quarantine combined with the limited access to professional or family support may increase feelings of fatigue and isolation. The present study aims to investigate women's psychological well-being during pregnancy and in the first months after childbirth, integrating the evaluation of some traditionally studied variables with the specificities of the current situation. 575 Italian women have been administered an online self-report questionnaire assessing the presence of anxiety disorders, depressive and post-traumatic symptoms as well as the expectations toward childbirth (for mothers-to-be) or the subjective experience of childbirth (for postpartum women). Findings revealed a higher percentage of women than that reported in the literature scored above the clinical cut-off both during pregnancy and postpartum on a series of measures of psychological well-being, thus demonstrating that this period was perceived as particularly challenging and stressful and had significant impact on the women's well-being. Moreover, some socio-demographic, medical, and pandemic-related variables, especially the lack of presence and support from one's partner during labor and delivery as well as in the first days postpartum was found to predict women's mental health. These findings suggest the need for developing specific interventions targeted at women who cannot benefit from the support of their partners or family.

Keywords: expectant mothers, new mothers, COVID-19, restrictive measures, psychological well-being

INTRODUCTION

The birth of a child represents a critical experience in a woman's life, entailing several changes both at the individual (physical and psychological) and interpersonal level (Lawrence et al., 2008; Guzzo and Hayford, 2020). This experience may negatively impact on individual well-being, leading to several forms of distress and/or diseases including anxiety, mood and post-traumatic stress disorders (Paulson and Bazemore, 2010; Meltzer-Brody et al., 2017; Mohamied, 2019; Pellowski et al., 2019).

Most of the literature has focused on postpartum adjustment, however a growing body of research has progressively investigated women's well-being also during pregnancy (Molgora et al., 2020a). Both pregnancy and childbirth can be considered as potentially stressful, even traumatic, events requiring women to cope with changes in their lifestyles, habits, and even in their self-image and identity (Molgora et al., 2018). Moreover, it is important to underline that the psychological well-being of expecting mothers can influence their subjective experience of childbirth (Molgora et al., 2020b), as well as the medical-obstetric aspects of labor and delivery, for example in terms of prolonged labor and greater likelihood of undergoing operative deliveries or cesarean-sections (Fenaroli et al., 2016).

Psychological Well-Being of Expectant Mothers

Previous research on pregnant women has extensively studied the impact and prevalence of antenatal anxiety and depression reporting high rates of such conditions across various countries (Biaggi et al., 2016; Falah-Hassani et al., 2017; Nasreen et al., 2018; van de Loo et al., 2018). In this respect, although differences have been reported across studies due to the methodological approaches used, the prevalence of anxiety disorders among pregnant women has been found to be approximately 15% (Dennis et al., 2017). Antenatal depression, on its side, has been reported to affect 10–20% of expectant mothers—depending on the different cut-off scores used in the studies (Zaers et al., 2008; Pampaka et al., 2018; Sunnqvist et al., 2018).

Furthermore, during pregnancy many women develop a severe fear of childbirth; this latter is a clinical condition characterized by several symptoms (sleep disorders, panic attacks, etc.) which greatly impair women's ability to conduct their everyday life while also negatively affecting their ability to cope with labor and childbirth (Fenwick et al., 2009; O'Connell et al., 2017; Molgora et al., 2018). Although past research on this topic reported a great variability in prevalence rates, according to different cut-off scores and other methodological choices, the meta-analysis by O'Connell et al. (2017) estimated a prevalence of severe (i.e., clinical) fear of childbirth among 14% of pregnant women.

Several variables have been considered to be associated with fear of childbirth and overall maternal well-being, in this respect, different risk factors have been detected, both at an individual and interpersonal level. Some demographical dimensions (e.g., age, level of education, parity, etc.) have been investigated with contrasting results. For example, some studies reported multiparous mothers to be at higher risk of distress (Lainer and Jonson-Reid, 2014; Bassi et al., 2017), whereas other studies found nulliparous women to be at greater risk for severe fear of childbirth (Rouhe et al., 2008). Furthermore, distressing experiences occurring before or during pregnancy (e.g., serious physical illness, loss of a loved one, etc.) as well as a variety of medical-obstetric variables prior to and during pregnancy (e.g., previous miscarriages, high risk pregnancy, etc.) have been found to impact on pregnant women's mental health (e.g., Devlin et al., 2016; Furtado et al., 2018). Again, a personal history of mental illness prior to pregnancy has been reported to increase the risk of developing a psychological disorder during pregnancy, thus underling the continuity of psychological disorders (Cox et al., 2014; Biaggi et al., 2016).

At an interpersonal level, many studies have highlighted the association between expectant mothers' psychological well-being and relational variables, specifically quality of the couple relationship and social support, both during pregnancy and delivery (Lukasse et al., 2014; Figueiredo et al., 2018; Poggi et al., 2018): the lack of social support both from one's partner or extended network has been found to be one of the most important predictor of antenatal anxiety and depression (Biaggi et al., 2016). Specifically, partner's support resulted to mediate the relation between pregnant women's concerns and their psychological well-being (Ilska and Przybyła-Basista, 2017). Moreover, the social support perceived by mothers during pregnancy represented a protective factor against postpartum depression while also reducing the negative aspects of the experience of childbirth (Tani and Castagna, 2017).

Psychological Well-Being of Postpartum Women

Research on postpartum women has identified a wide range of clinical conditions that may impact on their well-being following childbirth: from the more common baby blues, that is a physiological and transitory condition (Rezaie-Keikhaie et al., 2020), to more severe conditions, such as anxiety and mood disorders, puerperal psychosis, and post-traumatic stress disorder (Paulson and Bazemore, 2010; Meltzer-Brody et al., 2017; Mohamied, 2019; Pellowski et al., 2019). Specifically, the prevalence of anxiety spectrum disorders has been found to be around 10% (15% for anxiety symptoms) (Dennis et al., 2017), whilst depressive symptoms have been reported in 10–22% of mothers, depending on the different cut-off scores used in the studies (Zaers et al., 2008; Pampaka et al., 2018; Sunnqvist et al., 2018). Moreover, a considerable number of women have been reported to have had a negative childbirth experience, specifically, the study by King et al. (2017) reported that about one-third of the women in the sample described their childbirth as very negative or traumatic. Finally, postpartum PTSD was found to be around 6% at 6 weeks postpartum and around 15% at 6 months postpartum (Zaers et al., 2008), while another study (Yildiz et al., 2017) reported a 4% mean prevalence of postpartum PTSD in community samples, and a 18.5% prevalence among high-risk groups.

Several variables have been analyzed in association with maternal psychological health postpartum. First, mothers' subjective experience of childbirth has been found to predict their postpartum well-being (MacKinnon et al., 2017; Molgora et al., 2020b). The quality of this experience can be shaped by numerous variables (e.g., medical, demographical, psychological, social) that have been analyzed as risk/protective factors (Fenaroli et al., 2016, 2019). For example, fear of birth, the use of epidural analgesia, and the duration of the expulsive phase have been found to significantly predict the mothers' experience of birth (Fenaroli et al., 2019). Considering the interpersonal dimension, women who received more intra-partum support and care, especially from their partner, had shorter labors, a more positive birthing experience characterized by higher levels of satisfaction, and a better postnatal psychological functioning (Collins et al., 1993; Hodnett, 2002; Hodnett et al., 2011; Michels et al., 2013). Mothers' psychological health is a key variable that needs to be carefully considered given the impact of maternal well-being on the quality of their first interaction with the newborn, on the baby development as well as on the overall family functioning (Choi et al., 2017; van de Loo et al., 2018).

Psychological Well-Being During the Covid-19 Pandemic

Starting from December 2019, the Covid-19 pandemic has affected several nations around the world. A growing number of studies have investigated the psychological impact of this pandemic on the general population reporting an increase of emotional distress and social disorders following the outbreak, especially among women (e.g., Rajkumar, 2020; Thapa et al., 2020). In particular, a previous Italian nationwide study, carried out during the first period after the Covid-19 outbreak and aimed at investigating the social and psychological impact of the pandemic, reported a widespread decrease in psychological well-being, especially among women younger than 50 and with previous health risk factors (Favieri et al., 2020).

Specifically, the outbreak and the restrictive measures enforced by local governments to prevent the spread of the coronavirus infection can be considered as additional major stressors for mothers-to-be and postpartum women, whose vulnerability is potentially increased by this specific situation, thus leading to detrimental effects on their psychological well-being (Thapa et al., 2020). Most of the studies published in the last months on the effect of the Covid-19 pandemic on pregnancy and childbirth have mainly focused on medical conditions and risk factors and have attempted to pinpoint the measures and clinical recommendations required to contain the Covid-19 spread (e.g., Chen et al., 2020; Liang and Acharya, 2020). The scant literature that has addressed the psychological impact of the Covid-19 pandemic on expectant and postpartum women has found higher levels of anxiety and depressive symptoms among participants when compared to similar cohorts assessed before the outbreak (Ceulemans et al., 2020; Lebel et al., 2020; Liu et al., 2020; Patabendige et al., 2020). An Italian study investigating the psychological effects of the pandemic on pregnant women found a significant change in their expectations toward pregnancy and childbirth as well as an increase in their concerns and distress, especially if they had a previous history of psychological distress in press (Ravaldi et al., 2020). Furthermore, women showed significant concerns mainly related to the risk of coronavirus infection and to the fear of consequent complications for themselves and the fetus and were more likely to complain about insufficient antenatal support (Haruna and Nishi, 2020). In this respect, it is important to underline that the pandemic has had an effect on both antenatal care as well as on birth management and postpartum care (Coxon et al., 2020). During the pandemic, and especially during the lockdown period, pregnant and postpartum women have experienced a limited access to their formal and informal support network, thus facing new and unforeseen struggles potentially putting their mental health in jeopardy. The presence of a support network has, in fact, been widely recognized as a crucial protective factor for prospective mothers and postpartum women alike (Friedman et al., 2020; Huschke et al., 2020). The importance of such support is particularly relevant in family centered cultures, such as the Italian one, where – also thanks to the geographic proximity – children tend to turn to their parents for support also during adulthood (Scabini, 2000). For example, an Italian study by Agostini et al. (2014) found that women with low levels of social support were more likely to experience depressive symptoms.

The Italian Situation

Italy has been the first European–and more generally Western country–to report some coronavirus cases. The outbreak occurred in late February in Northern Italy and, since then, the local government has adopted a series of restrictive measures to contain the pandemic that have been considered among the strictest in Europe.

In particular, on February 23 the Italian government issued the first decree (D.L. n.6, 23/2/2020) establishing quarantine red-zones around the most severely hit Northern cities. People living in the area were forbidden to exit while those living outside were denied access, moreover, people were invited to remain at home unless absolutely necessary. On March 9, a new government order (D.P.C.M. 9/3/2020) was issued, extending the quarantine zone to the whole national territory: gatherings of more than two people were prohibited and companies invited to encourage working from home. On March 11 all shops and factories selling or manufacturing non-necessary goods were closed. On March 20 a new government order (D.P.C.M. 20/3/2020) enforced further limitations: parks and gardens were closed to the public and physical activity was allowed only within the premises of one's house. On April 10 the Italian prime minister announced that the above-mentioned restrictions would be enforced until May 3, the official end of the first phase of the emergency.

Besides these restrictions that affected the whole population forcing millions of people to change their habits, routines and lifestyle, pregnant and postpartum women had to face further limitations. While such restrictions varied greatly across regions and even within the same region, all the hospitals adopted some sort of limitations that impacted on pregnant and postpartum women. More specifically, women could not attend antenatal classes; both non-urgent pre- and post-natal screenings and

checkups were canceled or postponed; women had to attend visits unaccompanied; hospital access to fathers at postpartum was either completely forbidden or greatly limited and in many cases prospective fathers were denied access during childbirth and delivery; finally, some women were denied access to epidural analgesia due to medical staff being occupied with facing the pandemic emergency.

The Current Study

The present study aims at investigating Italian women's psychological well-being during pregnancy and in the first months after childbirth. To reach this aim, our research integrates the evaluation of some traditionally studied variables that are known to influence childbirth and delivery with the investigation of some variables strictly related to the coronavirus emergency. In particular, we will consider some psychological outcomes (i.e., anxiety symptoms, depressive symptoms and fear of childbirth for pregnant women, and anxiety symptoms, depressive symptoms, post-traumatic stress disorders and subjective experience of labor and delivery for postpartum women) and assess the role of several factors (anamnestic and personal information, relational variables, contextual variables), both related and unrelated to the current emergency, in predicting these outcomes.

In particular, it is possible to assume that the usual distress several women undergo due to the important and critical experience of motherhood would be amplified by the pandemic. Indeed, this situation has already been demonstrated to have had a negative impact on prospective mothers' and postpartum women's psychological well-being. Specifically, previous studies on Italian women found higher level of anxiety symptoms (Saccone et al., 2020) along with increased concerns and fears about childbirth (Ravaldi et al., 2020) among pregnant women. Moreover, international studies found greater rates of depression, anxiety and stress among mothers of infants and young babies (Cameron et al., 2020). Considering these preliminary results, we can hypothesize that pregnant and postpartum women are at greater risk of developing anxiety, depression, or post-traumatic symptoms. Such adverse outcomes may occur due to being infected or having a family member infected with the virus, experiencing the hospitalization or the death of a loved one, the increase of household and caregiving tasks, isolation, financial instability, domestic violence or abuse following the quarantine, and uncertainty about the future (Shah et al., 2020).

MATERIALS AND METHODS

Participants and Procedure

The present cross-sectional study involved 575 Italian expectant mothers and postpartum women. Participants were recruited through social media (i.e., Facebook and Instagram) and invited to fill-in an online anonymous questionnaire. Data were collected between March 1, 2020 and May 3, 2020 (the so-called phase 1 of lockdown, characterized by the exceptionally strict measures adopted to prevent coronavirus spread). Inclusion criteria were: being above 18 years of age, being fluent in Italian, and being either pregnant or having had a baby for less than 6 months.

After receiving a short presentation of the research goals and proving their informed consent, all participants were asked to fill in a questionnaire on the platform Qualtrics. Informed consent forms and all the study materials have been approved by the Institutional Review Board of the authors' institution.

Seven hundred eighteen questionnaires were collected: 130 were excluded because of missing or incomplete data, another 13 women were excluded because they did not fit inclusion criteria (i.e., their child was older than 6 months). The final sample comprised 575 women, 389 pregnant women and 186 postpartum women.

Measures

In order to study the impact of the Covid-19 pandemic outbreak and of the above-mentioned restrictive measures on pregnancy and childbirth, researchers developed a questionnaire that was disseminated online. Besides gathering socio-demographic data (i.e., age, education, job title, parity, etc.), data on psychological well-being (i.e., number and type of stressful life events experienced at the time of data collection, such as economic problems, work problems, bereavements; number and type of previous psychological disorders (such as eating disorders, drug addition, alcoholism), and basic information regarding the pregnancy (i.e., mode of conception, number and type of complications occurred, type of pregnancy, etc.) and delivery (i.e., type of delivery, occurrence of health risk for the mother or the baby, access to epidural analgesia, etc.) were collected.

Furthermore, the questionnaire also included some questions specifically pertaining the Covid-19 emergency. Specifically, participants were asked if they or one of their family members had resulted positive to Covid-19, if their partners continued to commute to work during lockdown, if their partners were present (or if they believed they would be present in the case of pregnant women) at childbirth and if they could (or they believed they would be allowed to) visit them at the hospital. Moreover, mothers were asked about their access to epidural analgesia as well as to some form of family or professional support (specifically, the question asked: "When your baby will be born, will you receive help from someone?" and the possible answers were: my mother, my father, my mother-in-law, my father-in-law, another relative, a professional nurse, a doula, a babysitter, other). All the questions included in the questionnaire (except one, which has not been analyzed in the current study) were multiple choice. Lastly, the questionnaire included several measures (see below) of maternal well-being.

More specifically, all the women who took part in the research completed the following instruments:

State-Trait Anxiety Inventory–STAI, Y form (Spielberger et al., 1983; Italian validated version by Pedrabissi and Santinello, 1989).

This instrument is largely used to measure state and trait anxiety. It is composed of 40 items on a four-point Likert scale (20 items for trait anxiety and 20 items for state anxiety), with a total possible range of scores of 20–80 with higher scores indicating higher anxiety levels. Internal consistency was good

for both the state (Cronbach's alpha = 0.95 for both expectant and postpartum women) and trait (Cronbach's alpha = 0.91 and 0.92, respectively for expectant and postpartum women) subscales. Based on previous studies on the Italian pregnant population (Giardinelli et al., 2012; Vismara et al., 2016), a cut-off score of 40 or higher was used to identify both state and trait clinical anxiety.

Edinburgh Postnatal Depression Scale–EPDS (Cox et al., 1987; Italian validated version by Benvenuti et al., 1999).

This instrument, originally developed to screen for postpartum depression has been validated and is currently used also during pregnancy (Kozinszky and Dudas, 2015). The scale is composed of 10 items on a four-point Likert scale, with a 0–30 total possible range of scores: the higher the score, the higher the depressive symptoms. Internal consistency was good (Cronbach's alpha = 0.87 for both expectant and postpartum women). According to Gibson et al. (2009), a cut-off value of 13 or higher was used to distinguish clinical depression.

Pregnant women were administered the following instrument:

Wijma Delivery Expectancy Questionnaire–WDEQ(A) (Wijma et al., 1998; Italian validated version by Fenaroli and Saita, 2013).

This instrument measures expectations regarding childbirth, and in particular fear of childbirth, through 33 items on a six-point Likert scale. In the present study, we used the validated 14-item Italian version of the scale that has been proven to work better with the Italian population (Fenaroli and Saita, 2013; Molgora et al., 2018, 2020a). For this version, the total score ranges from 0 to 70: the higher the score, the more negative the expectations and the greater the fear toward childbirth. Internal consistency was good (Cronbach's alpha = 0.90). Although to date there is no unique cut-off value identified as the gold standard to screen for clinical (i.e., severe) fear of childbirth, based on some studies that reported intense fear as falling in the top quartile of the continuous measure (Fenwick et al., 2009), values equal or above 35 were considered indicators of a severe fear (Molgora et al., 2020a).

Postpartum women were administered the following instruments:

Wijma Delivery Experience Questionnaire–WDEQ(B) (Wijma et al., 1998; Italian validated version by Fenaroli and Saita, 2013).

This instrument measures the childbirth experience through 33 items on a six-point Likert scale. As for the WDEQ(A), in the present study, we used the validated 14-item Italian version of the scale, whose total score ranges from 0 to 70: the higher the score, the more negative the subjective experience. Internal consistency was good (Cronbach's alpha = 0.91). Similarly to the antenatal version of the instrument, a total score of 35 or higher was considered as the cut-off to distinguish severe fear.

Perinatal PTSD Questionnaire–PPQ (DeMier et al., 1996; Callahan et al., 2006; Italian not validated version by Di Blasio et al., 2009, 2015; Ionio and Di Blasio, 2014).

This instrument was developed to assess post-traumatic symptoms related to the experience of childbirth; specifically, the scale measures intrusiveness or re-experiencing, avoidance behaviors, hyperarousal or numbing, as well as feelings of guilt. The original version is composed of 14 items measured on a dichotomous scale while the revised version uses a five-point Likert scale, with a total score ranging from 0 to 56, with higher scores indicating more severe PTSD symptoms. This study uses the modified version of the scale which, although not validated in Italian, has already been used in a previous study (Di Blasio et al., 2015) showing good consistency (Cronbach's alpha ranged from 0.85 to 0.88). Internal consistency was good (Cronbach's alpha = 0.78). According to Callahan et al. (2006), a score of 19 or higher identifies high-risk mothers.

Data Analyses

First, descriptive statistics were performed for each of the two samples separately: mean scores were calculated for age and frequencies were computed for variables such as education, job title, psychological disorders, stressful life events, etc. Measures of anxiety, depression, postpartum PTSD, and childbirth experience were dichotomized using cut-off values suggested by previous relevant studies. Those cut-off values were used to determine the percentage of women falling above the clinical range for each of the constructs under analysis.

Secondly, the expectant and postpartum mothers group were compared with respect to the socio-demographic and medical-obstetric variables as well as with respect to scores on depression and anxiety. Independent samples *t*-tests, Mann–Whitney and chi square tests were used according to the type of variable and its measurement scale.

After these preliminary steps, the two samples were analyzed separately given both the distinctive features characterizing the two conditions as well as the difference in sample size. Specifically, chi-square tests were run on both samples to investigate the relation between measures of anxiety, depression, postpartum PTSD, expectations toward or experience of childbirth and some demographic or medical-obstetric variables that are known to influence such relation. Further chi-square tests were performed on both the expectant and the postpartum mothers samples to assess the differences between women falling above the clinically significant range for the above-mentioned scales (i.e., STAI, WDEQ(A) and (B), PPQ, and EPDS) and those falling below the cut-off with respect to variables measuring the impact of the restrictions adopted to prevent the spread of coronavirus. Dummy coded versions of the dependent variables (with zero indicating the absence of a clinically relevant condition and one indicating a clinically relevant score) were used in the above-mentioned analyses. *p* values resulting from these analyses have been corrected for multiple testing using the Holm–Bonferroni method.

Finally, a set of hierarchical logistic regressions were performed on the expectant and postpartum women sample separately. Specifically, total scores for STAI, EPDS, PPQ, WDEQ(A) and (B) were entered as dependent variables in the various equation models performed. Unlike we did for chi-square tests, in this case total scores for anxiety, depression, fear and experience of childbirth, as well as postpartum PTSD were used. The choice of using continuous instead of dummy variables was determined by the willingness to retain the maximum data variability. Each of the above-mentioned variables was regressed against a set of independent variables including demographic, medical and obstetric data, as well as data regarding the impact of the pandemic emergency on the women's life. Specifically,

a three-step multiple regression procedure was used in which each criterion variable was regressed on the predictor variables in blocks. Demographic factors as well as data concerning the women's medical and psychological general condition (i.e., number of stressors, number of previous psychological conditions) were entered in the first step, followed by dimensions related to pregnancy (e.g., number of complications, etc.) and childbirth (e.g., presence of risks for the mother or the child's health, etc.). Finally, factors measuring the impact of the Covid-19 pandemic on the women's experience or expectations (e.g., perceived likelihood of father being present at delivery and during hospital stay or actual presence of father at delivery and hospitalization) were entered in the third block. Our choice was motivated by the fact that the first block contained basic variables regarding the women's demographics and well-being irrespectively of their condition, the second block included all the variables related to pregnancy and childbirth while the third block incorporated all the measures of the effect of Covid-19 pandemic on expectant and postpartum women.

RESULTS

Descriptives and Comparison Between Expectant Mothers and Postpartum Women

Pregnant women's mean age was 32.9 (SD = 4.3), 63.2% (246) of women were married to the father of their child, 35.7% (139) were cohabiting and the remaining 0.8% (3) were either single or separated/divorced. 53.2% (207) of the pregnant women in our sample did not have other children whereas 45.2% (176) were multiparous. Only a very small proportion of women (4.6%, 18) claimed that they or one of their immediate family members had resulted positive to coronavirus. Most of the women's partners (62.1%) were working from home while the remaining 38.8% were continuing to commute to work during lockdown. With respect to medical appointments and checkups, 80.5% of the women in our sample declared that they were undergoing regular doctor visits while 15.2% stated that their appointments were canceled or rescheduled due to the Covid-19 emergency. Similarly, 8.7% (34) of the women in our sample were told that they could not use epidural analgesia due to the lack of medical staff caused by the coronavirus outbreak. Finally, 7.5% of the women were told their partners could not be present during childbirth and 47.0% were unsure about their partners' presence at delivery due to the restrictive measures adopted to contain the Covid-19 spread. Similarly, 13.9% of women believed their partners would not be allowed to visit them during hospitalization.

With regards to postpartum women, mean age was 33.01 (SD = 4.19), 109 (58.6%) women were married to the father of their child while the remaining 77 (41.4%) were cohabiting, 53.8% (100) of the women did not have other children whereas 45.2% (84) had at least one more child. Similarly to what happened for pregnant women, only six (3.2%) postpartum women stated that they or one of their family members had resulted positive to Covid-19. With regards to fathers, 34.9% of women declared that their partners continued working during lockdown, 21% declared that their partners were not admitted during childbirth and 10.8% stated that they were not admitted during hospital stay.

Other data regarding women's education, job title, number and type of current stressors (independent from the coronavirus emergency), number and type of previous mental disorders, and number and type of complications during pregnancy are reported in **Table 1**.

The two samples (i.e., pregnant women and postpartum women) did not differ with regards to the socio-demographic variables investigated. Specifically, no difference between the two groups was found for age ($M_{pregnantwomen}$ = 32.90, SD = 4.32; $M_{postpartum}$ = 33.01, SD = 4.19) [$t(569) = -0.291$, $p = 0.37$], education [$U = 34126.00$, $p = 0.26$], job title [$\chi^2(5, 573) = 2.82$, $p = 0.73$], and whether they had other children [$\chi^2(1, 567) = 0.01$, $p = 0.95$].

Moreover, the two groups did not differ with regards to number of psychological disorders [$U = 34857.00$, $p = 0.45$] or stressful life events [$U = 32082.00$, $p = 0.14$] experienced in their lives and to whether they, or one of their immediate family members, had tested positive to Covid-19 [$\chi^2(1, 561) = 0.524$, $p = 0.47$].

With reference to anxiety, 64.0% (249) of expectant mothers and 57.7% (98) of postpartum women scored above the clinically significant range for state anxiety, data regarding trait anxiety revealed that 44.0% (171) of pregnant women and 46.2% (86) of postpartum fell above the cut-off score. Moreover 34.2% (133) of expectant women and 26.3% (49) of postpartum women had clinically significant levels of depression as measured by the EPDS scale. 31.7% of postpartum women reported a negative childbirth experience while 51.2% of expectant women had negative expectations regarding birth. Finally, postpartum PTSD scores were above the cut-off value in 16.7% of cases. Independent samples *t*-tests comparing state and trait anxiety and depression scores in pregnant women vs. postpartum women did not reveal any significant difference between the groups.

Although no differences between expectant mothers and postpartum women were found for anxiety and depressive symptoms, subsequent analyses have been run separately for each of the two samples given the specificity of each condition and the difference in sample size.

Psychological State of Expectant Mothers: Non-Covid Related Risk Factors

With regards to pregnant women, a set of chi square analyses were performed to explore the relationship between state anxiety, trait anxiety, fear of childbirth, and depression and a number of variables that are known to influence such relation (i.e., the presence of previous child(ren); the presence and number of past psychological disorders, the number of stressors experienced at the time of data collection, the number of complications occurred during pregnancy, etc.).

Pregnant women having more than one child [$\chi^2(1, 342) = 10.35$, $p = 0.008$] and those having suffered from

TABLE 1 | Descriptive statistics for pregnant women and postpartum women.

	Pregnant w.		Postpartum w.	
	N	%	*N*	%
Education				
Middle school diploma	19	4.9	6	3.2
Professional course license	10	2.6	3	1.6
High school diploma	125	32.1	53	28.5
University degree	173	44.5	96	51.6
Postgraduate Masters/PhD	52	13.4	25	13.4
Other	9	2.3	3	1.6
Job title				
Freelance professional	61	15.7	26	14
Employed	234	60.2	120	64.5
Unemployed	39	10.0	12	6.5
Housewife	28	7.2	13	7
Student	4	1.0	3	1.6
Other	22	5.7	11	5.9
Stressors (not related to Covid-19)				
Financial problems	62	15.9	22	11.8
Work problems	70	18.0	24	12.9
Personal health problems	2	0.5	2	1.1
Health problems of a family member	25	6.4	19	10.2
Death of a family member/close friend	18	4.6	9	4.8
Other	25	6.4	10	5.4
Number of stressors				
1	86	22.1	41	22
2	40	10.3	10	5.4
3	7	1.8	2	1.1
Previous psychological disorders				
Mood disorders	81	20.8	43	23.1
Anxiety disorders	158	40.6	71	38.2
Eating disorders	59	15.2	32	17.2
Alcohol abuse	7	1.8	7	3.8
Drug abuse	5	1.3	8	4.3
Other	3	0.8	3	1.6
Number of previous psychological disorders				
1	120	30.8	68	43.0
2	64	16.5	27	36.6
3	14	3.6	5	14.5
4	2	0.5	3	2.7
5	3	0.8	3	1.6
Complications during pregnancy				
Risk of miscarriage	46	11.8	28	15.1
Ectopic pregnancy	6	1.5	7	3.8
Placental abruption	29	7.5	13	7,0
Hyperemesis gravidarum	94	24.2	38	20.4
Gestational diabetes	27	6.9	21	11.3
Other	23	5.9	17	9.1
Number of complications				
1	125	32.1	62	33.3
2	32	8.2	17	9.1
3	7	1.8	2	1.1
4	1	0.3	1	0.5

previous psychological disorders [$\chi^2(5, 348) = 20.17$, $p = 0.008$] were more likely to experience state anxiety. Similar results were found for EPDS scores, with multiparous women [$\chi^2(1, 356) = 7.46$, $p = 0.05$] and those having suffered from previous disorders [$\chi^2(5, 362) = 21.3$, $p = 0.009$] being more likely to be psychologically depressed. With regards to trait anxiety, only the presence of previous psychological disorders scored significantly, with pregnant women suffering from two or three previous disorders being more likely to fall above the clinical cut-off [$\chi^2(5, 345) = 45.48$, $p < 0.000$]. With regards to fear of childbirth, none of the above-mentioned variables was significant.

Psychological State of Expectant Mothers: Covid-Related Risk Factors

Following, further chi square tests were run to investigate the relation between the above said measures of psychological disorders (i.e., STAI state, STAI trait, WDEQ(A), and EPDS) and some variables connected to the Covid-19 pandemic and the subsequent restrictions imposed on the population. Specifically, relations between depression, childbirth expectations, state and trait anxiety and perceptions regarding access to epidural analgesia, postpartum support, possibility for fathers to be present at delivery and to visit the mother during hospitalization were investigated, together with father going vs. not going to work regularly during lockdown. Results showed that pregnant women who believed their partner could not be present at childbirth along with those who were unsure about the father being allowed to enter the delivery room were more likely to suffer from state anxiety [$\chi^2(2, 348) = 15.44$, $p < 0.000$] and to have intense fear of childbirth [$\chi^2(2, 364) = 9.08$, $p = 0.007$]. Similarly, women who believed their partner would be denied visitation and those who were not sure whether their partners would be allowed access to the hospital rooms were more likely to fall in the clinically significant range for state anxiety [$\chi^2(2, 337) = 12.99$, $p = 0.012$]. Lastly, pregnant women who believed they would not have access to any form of family or professional support after childbirth were more likely to suffer from state anxiety [$\chi^2(1, 347) = 8.01$, $p = 0.025$].

Psychological State of Postpartum Women: Non-Covid Related Risk Factors

Similar analyses were conducted also on the postpartum women sample. More specifically, dummy scores for depression, quality of childbirth experience, postpartum PTSD, state and trait anxiety were measured against number of stressful events experienced in ones' life, number of previous psychological disorders, presence of children, number of complications during pregnancy, access to epidural analgesia, presence of complications at childbirth for the mother or the child. Results showed that new-mothers who had experienced psychological disorders earlier in their lives were more likely to suffer from trait anxiety [$\chi^2(5,166) = 38.25$ $p = 0.000$], postpartum depression [$\chi^2(5, 174) = 23.00$, $p = 0.000$] and postpartum PTSD [$\chi^2(5, 154) = 12.11$, $p = 0.007$]. Moreover, mothers who experienced two or three complications during pregnancy were more likely to fall in the clinically significant range for postpartum PTSD [$\chi^2(4, 154) = 9.36$, $p = 0.05$] and to

have perceived childbirth as a negative event [$\chi^2(4, 179) = 13.58$, $p = 0.009$]. The same was true for mothers who experienced some sort of health risk during delivery: these women were more likely to develop a postpartum PTSD [$\chi^2(1, 154) = 4.95$, $p = 0.026$] and to have negative memories of childbirth [$\chi^2(1, 179) = 8.57$, $p = 0.033$].

Psychological State of Postpartum Women: Covid-Related Risk Factors

As it was the case for pregnant women, relations between depression, childbirth experience, postpartum PTSD, state and trait anxiety and Covid-19-related variables were also explored. In this case, women whose partners had not been present during delivery were more likely to experience both clinically significant state [$\chi^2(1, 167) = 4.45$, $p = 0.035$] and trait anxiety [$\chi^2(1, 166) = 6.84$, $p = 0.009$] as well as to develop a postpartum PTSD [$\chi^2(1, 154) = 4.58$, $p = 0.032$]. Postpartum women whose partners continued working regularly during lockdown also showed a greater likelihood of suffering from state anxiety [$\chi^2(1, 167) = 5.28$, $p = 0.022$].

Effects of Specific (Covid-Related) and Non-specific Factors on Pregnant Women

After having explored the relations between anxiety, depression, expectations/experience of childbirth, postpartum PTSD and a series of psycho-social and health related variables both independent from and connected to the current pandemic situation and the restrictions adopted by the Italian government to contain the coronavirus outbreak, we decided to run a set of separate hierarchical logistic regressions for each of the two samples to assess whether and to what extent such variables contributed to pregnant and postpartum women falling in the clinical vs. non-clinical range.

With regards to pregnant women, four separate hierarchical logistic regression were run to evaluate the prediction of state and trait anxiety, depression, and fear of childbirth from presence of other children, number of stressors in one's life, number of previous disorders, complications during pregnancy, prospective access to epidural analgesia, fathers' employment status (i.e., whether the prospective father was going to work regularly during lockdown), perceived likelihood of fathers being present at delivery and during hospitalization. In all the four regressions number of stressors, number of previous disorders and presence of other children were entered in the first block, number of complications and prospective access to epidural analgesia were entered in the second block, while Covid-19 related variables (i.e., father going to work regularly during lockdown, perceived likelihood of father being present at delivery and during hospitalization) were entered in the third block. Results are presented in **Table 2**.

With regards to state anxiety, all the three models tested proved to be statistically significant ($p < 0.000$), however, only presence of other children, presence of two stressful events in one's life and presence of up to three previous disorders are capable of predicting anxiety scores across all the three models. Specifically, having more than one child, experiencing two stressful live events at the time of data collection and having suffered from up to three previous psychological conditions have all proven to be significantly and positively related to an increase in state anxiety (see **Table 2**). The final model including the above-mentioned predictors accounts for 17% of the variance, $F(16, 341) = 4.13$, $p < 0.000$.

Similar results were obtained when trait anxiety was considered, with all the three regression models being statistically significant and the third accounting for 20.2% of the total variance. Again, having more than one child and having suffered from up to three disorders in the past resulted in an increase in trait anxiety scores for pregnant women.

With regards to depression, those women having more than one child and having suffered from up to three psychological conditions had also higher depression scores in step one. Similar results were found for step two and three. Moreover, in step three women who did not believe their partner would be present during childbirth obtained significantly higher depression scores ($\beta = -0.137$, $p = 0.013$). The final model accounted for 15.3% of the variance, $F(17, 355) = 3.59$, $p < 0.000$.

Finally, when fear of childbirth was considered only the first ($p = 0.038$) and third ($p = 0.014$) models proved to be statistically significant. Presence of other children and of two previous psychological conditions were positively correlated with fear of childbirth both in step one and three of the equation; moreover, when "beliefs about the presence of the prospective father at childbirth" was added to the equation in the third block, it also proved to have a significant effect on WDEQ(A) scores. Specifically, women who believed their partner would be able to assist them during childbirth reported significantly lower level of fear ($\beta = -0.154$, $p = 0.007$). The final model ($p = 0.014$) accounted for 8.8% of the total variance.

Effects of Specific (Covid-Related) and Non-specific Factors on Postpartum Women

Similarly to what had happened for pregnant women, four separate hierarchical regression were performed on the postpartum women's sample. Total scores on state and trait anxiety, depression, experience of childbirth and postpartum PTSD were regressed on a linear combination of variables investigating socio-demographic data, pregnancy- and delivery-related issues. More specifically, presence of other children, number of stressors in one's life at data collection, and number of previous psychological problems were entered in the first block; complications during pregnancy, access to epidural analgesia, presence of health risks for the mother or the child during delivery were added in the second block, and fathers' employment status (i.e., whether new-fathers had gone to work regularly during lockdown), presence of father at delivery and hospitalization, presence of a support network after childbirth were analyzed in the third block. Results are shown in **Table 3**.

With regards to state anxiety, all the three models proved to be significant ($p < 0.000$). Having suffered from up to two psychological conditions in the past significantly correlated with

anxiety scores across the three models. Incremental of F scores revealed that the addition of postpartum support in step three resulted in a significant increase in R^2 ($\Delta R^2 = 0.01$, $\Delta F = 1.67$, $p = 0.001$). In other words, new-mothers who had suffered from previous psychological disorders in the past tended to be more anxious ($\beta_{disorder1} = 0.221$, $p = 0.007$; $\beta_{disorder2} = 0.340$, $p = 0.000$) whereas women who could count on the support of either a family member or a professional figure after delivery were significantly less anxious ($\beta = -4.23$, $p = 0.019$). Similar results were obtained for state anxiety: women having experienced up to three disorders in the past also had higher trait anxiety scores ($\beta_{disorder1} = 0.265$, $p = 0.001$; $\beta_{disorder2} = 0.464$, $p = 0.000$,

TABLE 2 | Pregnant women–Hierarchical Regression Analyses for STAI State, STAI Trait, EPDS, and WDEQ(A).

	Model	STAI State	STAI Trait	EPDS	WDEQ(A)
Block 1	Other children (0 = No, 1 = Yes)	0.005*	0.003*	0.046**	0.048**
	Stressor 1	0.118	0.121	0.279	0.824
	Stressor 2	0.030**	0.081	0.465	0.402
	Stressor 3	0.315	0.925	0.251	0.187
	Disorders 1	0.023**	0.000*	0.005**	0.059
	Disorders 2	0.000*	0.000*	0.000*	0.039**
	Disorders 3	0.000*	0.000*	0.007*	0.058
	Disorders 4	0.857	0.530	0.462	0.328
	Disorders 5	0.221	0.206	0.993	0.503
	R^2	0.143	0.187	0.100	0.049
	F	6.179	8.43	4.28	2.00
Block 2	Other children (0 = No, 1 = Yes)	0.005*	0.003*	0.046**	0.043**
	Stressor 1	0.090	0.114	0.350	0.865
	Stressor 2	0.029**	0.103	0.558	0.453
	Stressor 3	0.325	0.986	0.284	0.193
	Disorders 1	0.018**	0.000*	0.005*	0.077
	Disorders 2	0.000*	0.000*	0.000*	0.049
	Disorders 3	0.002*	0.000*	0.009*	0.087
	Disorders 4	0.879	0.484	0.435	0.327
	Disorders 5	0.220	0.190	0.968	0.458
	Epidural analgesia (0 = No, 1 = Yes)	0.885	0.187	0.325	0.482
	Complications pregnancy 1	0.951	0.790	0.871	0.378
	Complications pregnancy 2	0.294	0.856	0.931	0.779
	Complications pregnancy 3	0.242	0.503	0.056	0.683
	R^2	0.150	0.193	0.126	0.059
	ΔR^2	0.007	0.006	0.026	0.010
	ΔF	0.672	0.598	2.034	0.713
Block 3	Other children (0 = No, 1 = Yes)	0.007*	0.004*	0.035**	0.198
	Stressor 1	0.141	0.117	0.049**	0.041**
	Stressor 2	0.023**	0.093	0.373	0.837
	Stressor 3	0.528	0.873	0.492	0.394
	Disorders 1	0.013**	0.000*	0.468	0.311
	Disorders 2	0.000*	0.000*	0.003*	0.058
	Disorders 3	0.002*	0.000*	0.000*	0.047**
	Disorders 4	0.859	0.457	0.011**	0.117
	Disorders 5	0.278	0.223	0.403	0.369
	Epidural analgesia (0 = No, 1 = Yes)	0.898	0.180	0.980	0.479
	Complications pregnancy 1	0.804	0.689	0.311	0.498
	Complications pregnancy 2	0.303	0.899	0.614	0.587
	Complications pregnancy 3	0.210	0.499	0.899	0.835
	Father at work (0 = No, 1 = Yes)	0.345	0.725	0.059	0.711
	Father at delivery (0 = No, 1 = Yes)	0.123	0.107	0.054	0.263
	Father during hospitalization (0 = No, 1 = Yes)	0.201	0.907	0.706	0.829
	R^2	0.169	0.202	0.153	0.088
	ΔR^2	0.019	0.008	0.027	0.029
	ΔF	2.433	1.116	3.57	3.65

*Significant at $p < 0.01$; **significant at $p < 0.05$.*

TABLE 3 | Postpartum women–Hierarchical Regression Analyses for STAI State, STAI Trait, EPDS, WDEQ(B), and PPQ.

	Model	STAI State	STAI Trait	EPDS	WDEQ(B)	PPQ
Block 1	Other children (0 = No, 1 = Yes)	0.079	0.457	0.972	0.077	0.136
	Stressor 1	0.301	0.044**	0.598	0.267	0.025**
	Stressor 2	0.557	0.994	0.489	0.012**	0.647
	Stressor 3	0.253	0.252	0.224	0.239	0.793
	Disorders 1	0.006*	0.000*	0.002*	0.045*	0.066
	Disorders 2	0.000*	0.000*	0.000*	0.024*	0.000*
	Disorders 3	0.103	0.001*	0.057	0.981	0.247
	Disorders 4			0.486	0.638	
	R^2	0.166	0.288	0.202	0.125	0.174
	F	4.366	8.82	5.02	2.91	4.29
Block 2	Other children (0 = No, 1 = Yes)	0.075	0.287	0.834	0.039	0.200
	Stressor 1	0.198	0.044**	0.474	0.385	0.053
	Stressor 2	0.411	0.772	0.524	0.022**	0.401
	Stressor 3	0.432	0.331	0.320	0.107	0.980
	Disorders 1	0.004*	0.000*	0.003*	0.088	0.062
	Disorders 2	0.000*	0.000*	0.000*	0.137	0.000*
	Disorders 3	0.088	0.002*	0.077	0.747	0.805
	Disorders 4			0.921	0.873	
	Complications pregnancy 1	0.031*	0.179	0.144	0.953	0.872
	Complications pregnancy 2	0.443	0.651	0.482	0.114	0.549
	Complications pregnancy 3	0.155	0.285	0.422	0.227	0.009*
	Complications pregnancy 4	0.183	0.224	0.986	0.812	0.819
	Epidural analgesia (0 = No, 1 = Yes)	0.402	0.264	0.528	0.067	0.687
	Health problems childbirth (0 = No, 1 = Yes)	0.345	0.922	0.144	0.322	0.013**
	Baby health problems childbirth (0 = No, 1 = Yes)	0.144	0.635	0.181	0.002	0.310
	R^2	0.234	0.323	0.241	0.217	0.250
	ΔR^2	0.069	0.035	0.039	0.092	0.077
	ΔF	1.884	1.078	1.13	2.609	1.98
Block 3	Other children (0 = No, 1 = Yes)	0.115	0.381	0.918	0.022	0.188
	Stressor 1	0.232	0.058	0.589	0.450	0.050**
	Stressor 2	0.407	0.783	0.593	0.015	0.478
	Stressor 3	0.470	0.348	0.284	0.083	0.811
	Disorders 1	0.007*	0.001*	0.004*	0.099	0.122
	Disorders 2	0.000*	0.000*	0.000*	0.225	0.001*
	Disorders 3	0.075	0.002*	0.080*	0.663	0.552
	Disorders 4			0.953	0.994	
	Complications pregnancy 1	0.051	0.219	0.152	0.955	0.896
	Complications pregnancy 2	0.521	0.755	0.526	0.100	0.413
	Complications pregnancy 3	0.173	0.299	0.483	0.176	0.011**
	Complications pregnancy 4	0.236	0.272	0.781	0.969	0.894
	Epidural analgesia (0 = No, 1 = Yes)	0.559	0.393	0.719	0.048	0.954
	Health problems childbirth (0 = No, 1 = Yes)	0.324	0.855	0.102	0.256	0.015**
	Baby health problems childbirth (0 = No, 1 = Yes)	0.229	0.519	0.299	0.001	0.188
	Father at work (0 = No, 1 = Yes)	0.411	0.790	0.308	0.154	0.261
	Father at delivery (0 = No, 1 = Yes)	0.212	0.215	0.049**	0.021**	0.018**
	Father during hospitalization (0 = No, 1 = Yes)	0.700	0.677	0.847	0.386	0.198
	Postpartum support (0 = No, 1 = Yes)	0.019**	0.732	0.255	0.220	0.619
	R^2	0.248	0.332	0.275	0.250	0.284
	ΔR^2	0.014	0.009	0.034	0.033	0.034
	ΔF	1.666	0.503	1.712	1.66	1.56

**Significant at $p < 0.01$; **Significant at $p < 0.05$.*

$\beta_{disorder3}$ = 250, p = 0.002). Moreover, in this case, the fact of having experienced one stressful life event at the time of data collection significantly impacted on anxiety levels only in model one (β = 0.140, p = 0.044). and two (β = 0.141, p = 0.044) but was not significant in model three (β = 0.136, p = 0.058) (see **Table 3**).

When depression was considered, analyses revealed that new-mothers who had experienced up to two previous conditions had higher EPDS scores and this was true in all the three models (third model $\beta_{disorder1}$ = 0.229, p = 0.004; $\beta_{disorder2}$ = 0.393, p = 0.000). At the same time, mothers who could count on the presence of their partner during delivery showed significantly lower levels of postnatal depression (β = −0.147, p = 0.049). The final model including the above-mentioned variables explained 27.5% of the variance.

With regards to childbirth experience, the presence of two concurrent stressful life events significantly impacts on WDEQ(B) scores and this variable plays a significant role across the three models (third model $\beta_{stressor2}$ = 0.192, p = 0.015). On the contrary, the presence of up to two previous disorders resulted to be related to WDEQ(B) scores only in model one ($\beta_{disorder1}$ = 0.158, p = 0.045; $\beta_{disorder2}$ = 0.186, p = 0.024) while not being significant in model two ($\beta_{disorder1}$ = 0.133, p = 0.088; $\beta_{disorder2}$ = 0.123, p = 0.137) and three ($\beta_{disorder1}$ = 0.129, p = 0.099; $\beta_{disorder2}$ = 0.101, p = 0.225). While not being significant in the first model (β = 0.132, p = 0.077), the presence of other children becomes significant in the second (β = −0.132, p = 0.039) and third (β = −0.180, p = 0.022) model, showing that multiparous women have lower scores with respect to childbirth experience and, thus, perceive it as less negative. The same happens for epidural analgesia: while not being significant in the second step (β = −0.148, p = 0.067) of the model, this variable is significant in the third (β = −0.161, p = 0.048) (see **Table 3**). Therefore, the possibility of using epidural analgesia resulted in a significantly more positive evaluation of the experience of childbirth. The presence of problems for the baby's health during delivery (β = 0.251, p = 0.001) was also positively correlated with an increased perception of childbirth as a negative event. Lastly, women who could count on the presence of their partner during delivery scored significantly lower than those who were alone (β = −3.068, p = 0.021). The final model accounted for 25% of the variance.

With regards to postpartum PTSD, the presence of one stressful life event at the time of data collection resulted significant only in step one (β = −0.175, p = 0.025) and three (β = −0.151, p = 0.050). The presence of two previous psychological conditions, on the contrary, was positively and significantly correlated to PPQ scores across the three models (first model $\beta_{disorder2}$ = 0.386, p = 0.000; second model $\beta_{disorder2}$ = 0.327, p = 0.000; third model $\beta_{disorder2}$ = 0.312, p = 0.001). Moreover, the presence of three complications as well as the presence of problems for the baby's health during delivery were also related to an increase in PPQ scores in model two ($\beta_{complications3}$ = 0.227, p = 0.009); ($\beta_{babyhealthproblems}$ = 0.207, p = 0.013) and three ($\beta_{babyhealthproblems}$ = 0.204, p = 0.015). In other words, new-mothers who had experienced past psychological disorders, those who experienced numerous complications or whose baby's health was at risk during childbirth were more likely to have higher postpartum PTSD scores. Finally, those mothers whose partners were present at childbirth scored significantly lower for postpartum PTSD (β = −0.230, p = 0.018). The final model including all the above-mentioned variables accounted for 28.4% of the variance.

DISCUSSION

Findings of this study confirmed that expectant and postpartum women's psychological well-being can be influenced by several factors. Specifically, alongside some widely investigated dimensions that have proven to have an impact on mothers' mental health (e.g., socio-demographic variables, previous psychological disorders, etc.), also specific pandemic-related factors (i.e., the restrictive measures enacted by the government to prevent and contain the spread of the coronavirus infection) have been found to shape the experience of motherhood, thus confirming our hypothesis as well as previously published studies findings (Ravaldi et al., 2020; Saccone et al., 2020; Thapa et al., 2020) that the responses enacted to prevent the spread of the virus are putting pregnant and postpartum women's mental health in jeopardy.

First of all, a high percentage of women, both during pregnancy and in the postpartum, reported scores above the clinical cut-off for several measures of well-being. Moreover, such scores are higher than those reported in previous studies on the same topic. Although a certain variability among the various studies due to methodological choices has to be acknowledged, the prevalence of anxiety spectrum disorders was found to be around 15% in pregnant women and 10% in new-mothers (15% for anxiety symptoms) (Dennis et al., 2017); when our sample is considered, 44–64% (considering respectively trait and state anxiety) of pregnant women and 46.2% (trait anxiety)–57.7%(state anxiety) of postpartum women scored above the clinical cut-off for anxiety symptoms. Similar findings were found for depressive symptoms: depression rates reported in the literature range from 10 to 20% for pregnant women (depending on the different cut-off scores used in the studies) and from 10 to 22% for new-mothers (Zaers et al., 2008; Pampaka et al., 2018; Sunnqvist et al., 2018), however our participants showed clinically significant depressive symptoms in a much greater proportion: 34.2% during pregnancy and 26.3% at postpartum. Such figures are extremely relevant, especially if we consider that the highest possible threshold reported in the literature (i.e., 13 or above) has been used as the cut-off value for depression in the current study. When anxiety and depressive symptoms are compared, this study confirms that anxiety is usually more prevalent than depression among expectant mothers as already found in previous studies (Nasreen et al., 2018; van de Loo et al., 2018). However, while depression and anxiety symptoms are quite common among pregnant and postpartum women, the women in our sample were significantly more at risk for developing anxiety and depressive symptoms; these findings suggest that the pandemic and the measures adopted to fight its spread have had a negative impact on expectant and postpartum women' well-being, thus constituting an additional

risk factor for this specific population. We can hypothesize that social isolation, lack of support and control over one's health may have negatively impacted women's outcomes. Specifically, support both during pregnancy and in the postpartum have been found to be protective factors against depression (Collins et al., 1993; Hodnett, 2002; Hodnett et al., 2011; Michels et al., 2013; Goodman and Leiferman, 2016); similarly, an external health locus of control has been found to be associated with depressive symptoms in postpartum women (Richardson et al., 2012; Mollard, 2015).

Again, in our sample, fear of childbirth was above the cut-off value for more than half of expectant mothers, while 32% of postpartum women reported a negative childbirth experience. Research on this topic reported a great variety among fear of childbirth scores depending on the cut-off scores used and on some other methodological variables; however, the meta-analysis by O'Connell et al. (2017) estimated the presence of a severe (i.e., clinically significant) fear of childbirth in 14% of pregnant women. With regards to new-mothers, King et al. (2017) reported that about one-third of women describe their childbirth as very negative or traumatic, with a percentage that is in line with our study.

Finally, while postpartum PTSD scores ranged from 6% at 6 weeks postpartum to around 15% at 6 months postpartum in Zaers et al. (2008) study and from 4% for community samples to 18.5% in high risk samples as reported by Yildiz et al. (2017), our data show a percentage as high as 16.7%, thus assimilating the women in our sample to a high risk population. These findings suggest that fear, hyperarousal and other stress-related symptoms have been a constant in many women's lives, potentially affecting their ability to take care of themselves and their child(ren).

Overall, women who gave birth or were pregnant during the acute phase of the current pandemic are at greater risk of developing depressive, anxiety or post-traumatic symptoms and of experiencing intense fear toward childbirth and this may lead to more complicated labors, greater pain at childbirth as well as to an impaired capacity of taking care of the baby while also affecting the overall family stability (Goodman and Leiferman, 2016, Molgora et al., 2020). In this scenario, both personal (especially the parity condition and the presence of previous disorders) and situational variables (especially the presence of the fathers both during labor and delivery, as well as during hospital stay) were found to predict mothers' psychological mental health both during pregnancy and in the postpartum, distinguishing between clinical and non-clinical conditions on the investigated dimensions of psychological well-being.

Specifically, as for pregnant women, our results showed how multiparous women and those having suffered from previous psychological disorders were more likely to report anxiety and depressive symptoms, confirming previous studies (Cox et al., 2014; Lainer and Jonson-Reid, 2014; Biaggi et al., 2016; Bassi et al., 2017). Furthermore, expectant mothers who believed their partner could not be present at childbirth as well as those who believed their partner would be denied visitation were more likely to report higher levels of state anxiety symptoms or a severe fear of childbirth. Similarly, pregnant women who believed they would not have access to any form of family or professional support after childbirth were more likely to suffer from state anxiety. These results further confirm the crucial role social variables-especially the partner's presence and support both during labor and delivery and in the postpartum (also in terms of mothers' expectations)-have on expectant women's psychological well-being (Lukasse et al., 2014; Biaggi et al., 2016; Figueiredo et al., 2018; Poggi et al., 2018).

As for postpartum women, our findings confirmed previous studies reporting that women who had experienced psychological disorders earlier in their lives were more likely to suffer from postpartum psychological distress and, in particular, anxiety, depression and PTSD (Cox et al., 2014; Biaggi et al., 2016). Moreover, postpartum women who experienced several complications during pregnancy were more likely to report postpartum PTSD and to report a negative experience of labor and delivery. This result is in line with other studies that have found an association between medical-obstetric dimensions of pregnancy and the subjective experience of childbirth as well as postpartum mental health (Devlin et al., 2016; Fenaroli et al., 2016, 2019; Furtado et al., 2018). Finally, women whose partners had not been present during delivery were more likely to experience both postpartum anxiety symptoms (state and trait) and PTSD thus underling the importance of (intra-partum and postpartum) partners' support in preventing postpartum psychological distress (Collins et al., 1993; Hodnett, 2002; Hodnett et al., 2011; Michels et al., 2013; Tani and Castagna, 2017). On a similar note, previous studies (Kainz et al., 2010) have underlined the importance of prospective fathers or other caregivers during labor, explaining that these figures have a key role in infusing mothers with feelings of empowerment and well-being. It is within such framework that the association between fathers' commuting to work and mothers' anxiety can be understood: those women whose partners continued working regularly during lockdown showed a greater likelihood of suffering from state anxiety as they could not count on their daily support and they were constantly exposed to the risk of being infected thus adding an element of uncertainty and stress to an, already stressful, situation. In this respect, previous studies have demonstrated that women were extremely worried about themselves, their babies or one of their loved ones being infected with the virus and this resulted in an increased stress and fear (Cameron et al., 2020; Saccone et al., 2020).

Overall, these results underlined differences between primiparous and multiparous women, both during pregnancy and in the postpartum: women who already have other children seem to be more vulnerable than those who do not. We can suppose that the presence of other children made it more difficult for women to cope and manage everyday chores around the house, especially during the lockdown with all the schools being closed and the didactic activities provided at a distance. Due to the extremely severe measures adopted by the government, Italian mothers often found themselves to simultaneously take care of the house, help their children with school and carry out their work from home, thus multiplying their efforts and strains. The limitations imposed by the government during the first phase of lockdown (that is when data were collected) greatly hindered the women's possibility to access to formal and informal support, thus potentially increasing feelings of

isolation and fatigue which lead to the development of anxiety and mood disorders.

This study presents several limitations. First, it is a cross-sectional study that assesses expectant and postpartum women well-being only during the initial phase of the outbreak (the lockdown period). Thus, it is not possible to know whether the effects of the restrictive measures enforced by the Italian government will have long-lasting effects on the women's well-being. Another methodological limitation concerns the data collection: data in this study have been collected online and this may affect the comparability with other studies using data collected in person. However, several other studies (Mott et al., 2011; Koletzko et al., 2015) have already used online surveys and did not report any difference in terms of the severity of the symptoms registered. Moreover, while the online modality might discourage some women from seeking help, it certainly helps in terms of reducing social desirability.

Another limitation has to do with the fact that the presence of a formal or informal support network has not been investigated in terms of its potentially moderating effect on the variables under investigation. Future studies might consider the possibility of investigating the effect of mediating and moderating variables. Finally, only a very limited number of women and their immediate family members resulted positive to Covid-19, thus making it impossible to conduct further analyses on the effects of contracting the virus on maternal well-being.

Despite these limitations, the present results clearly show that the pandemic emergency and the restrictions imposed on the population greatly impacted on prospective mothers' and postpartum women's well-being putting their mental health and emotional stability at stake. It is widely known that pregnancy and puerperium are extremely delicate moments in a woman's life: not only women are called to re-negotiate their own identity and integrate the maternal role into their established role set (Rubin, 1975), they also enter a condition in which an increased attunement to their babies happens at the cost of their own self and often causes a general decline in their cognitive functions (Davies et al., 2018). Whether we call it "baby brain" (Davies et al., 2018) or "primary maternal preoccupation" (Winnicott, 1956), this particular state entails greater emotional instability and fragility as well as an increased need for protection. This is particularly true during stressful events, such as the ones experienced during a pandemic. In this perspective, it is key that health care facilities and medical staff keep under great consideration the role played by the support network in predicting both pregnant women and new-mothers' well-being. Specifically, pregnant and postpartum women should be granted the presence of a companion of choice during delivery and in the first days after childbirth, as also suggested by the World Health Organization (2016). Not only granting such support results in better maternal outcomes but it has also been reported to favor bonding between all family members (Child and Family Research Partnership, 2014; Carvalho Coutinho et al., 2016). Moreover, the present study seems to suggest the need for developing specific interventions targeted at women who cannot benefit from the support of their partners or family.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Institutional Review Board of the Catholic University of Sacred Heart of Milan. The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

Both authors contributed to prepare the study design and reviewed, and approved the entire manuscript. SM wrote the introduction and the discussion sections. MA performed the analyses and wrote the methods and the results sections.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Psychological Impact of the Civil War and COVID-19 on Libyan Medical Students: A Cross-Sectional Study

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Objective: We aim to determine the psychological status of medical students during the COVID-19 outbreak and civil war in Libya.

Methods: A cross-sectional study was conducted among medical students from 15 medical schools between April 20 and May 1, 2020. The demographic characteristics, generalized anxiety disorder 7-item (GAD-7) scale, and patient health questionnaire (PHQ-9) results were collected.

Results: Of the 3,500 students, 2,430 completed the survey. The mean (± SD) score of anxiety symptoms determined by the GAD-7 was 7.2 (5.1). A total of 268 (11%) students had a GAD-7 score of ≥15, which is indicative of moderate to severe anxiety. A total of 1,568 (64.5%) students showed different degrees of anxiety: mild, 910 (37.5%); moderate, 390 (16%); and severe, 268 (11%). Anxiety was significantly associated with living status and internal displacement ($P < 0.05$). The mean (+ SD) score of depressive symptoms determined by the PHQ-9 was 9.7 (6.3). A total of 525 (21.6%) students had a PHQ-9 score of ≥15, which is indicative of moderate to severe depression. A total of 1,896 (88%) students were diagnosed with mild (PHQ ≥ 5) depression. Suicidal ideation was present in 552 patients (22.7%). Depression was only statistically associated with the year of study ($P = 0.009$).

Conclusion: These data highlight that medical students in Libya are at risk for depression, especially under the current stressful environment of the civil war and the COVID-19 outbreak.

Keywords: depression, PHQ-9, anxiety, GAD-7, medical student, COVID-19, SARS-CoV-2, civil war

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INTRODUCTION

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was identified in the city of Wuhan, Hubei Province, China in December 2019 (Chan et al., 2020; Zhou F. et al., 2020; Zhou P. et al., 2020). It causes severe viral pneumonia that has been designated COVID-19. Since December 2019, it has spread rapidly, and the World Health Organization (WHO) declared it a worldwide pandemic in February 2020 (Mahase, 2020; World Health Organization, 2020). On August 26, 2020, the WHO announced that 23.9 million people were infected and more than 820,000 had died (Dong et al., 2020; Huang et al., 2020).

Because of COVID-19, medical schools have suspended their function and closed for this period, and some countries have applied social distancing measures and curfews. These preventive measures may have increased stress and psychological pressure on medical students as they are unable to complete their studies and are at high risk of being infected with SARS-CoV-2 (Lai et al., 2020; Li et al., 2020; Reger et al., 2020; Wang et al., 2020). Addressing potential stressors during this time is important; possible disease exposure, economic privatization, and decreased social support may carry an increased risk for suicide and decreased mental and physical performance (Chandratre, 2020; Ullah and Amin, 2020).

Medical students are at higher risk of depression and anxiety for several reasons, including mentally and emotionally demanding medical school programs (Wolf, 1994), financial pressure, high workload, and sleep deprivation. In addition, exposure to sick and dead people can have a negative impact on their mental health (Wolf et al., 1988; Guthrie et al., 1998; Williams et al., 2005; Sreeramareddy et al., 2007; Boland et al., 2016). These demanding conditions put students in high stress positions, with anxiety being reported in one-third of medical students worldwide, especially those who reside in the Middle East and Asia (Quek et al., 2019). Other studies have reported a prevalence of up to 65.5% for anxiety and 66.5% for depression outside of North America (Hope and Henderson, 2014).

Medical schools in Libya use the 7-year program, comprising a preparatory year of biomedical science, followed by a 5-year program of 3 years of basic science and 2 years of clinical science, and 1 year of mandatory internship training.

Since 2011, Libya has suffered from several civil wars and conflicts with militias, causing increased insecurity and financial crises, as well as the kidnapping, rape, and killing of innocent people (Zeiton, 2011). Furthermore, the lack of funds for mental health services puts Libyan people at higher risk of mental disorders (Charlson et al., 2012; Abuazza, 2013; Rhouma et al., 2016), especially in large cities. Conflicts in the country have caused more than 217,000 people to be internally displaced, according to the United Nations Refugee Agency (UNHCR) report (Miller and Rasmussen, 2010; Reed et al., 2012; Newnham et al., 2015; UNHCR, 2020). In addition, they have affected the medical education system in Libya, several medical schools were temporarily closed for several periods during the war, which resulted in delays in the graduation and medical education of thousands of medical students. These stressors can have substantial negative effects on the psychological statuses of students.

Since the emergence of the first case of COVID-19 in Libya on March 24, 2020 (Elhadi et al., 2020a), the number of COVID-19 cases has substantially increased in many cities, with up to 11,834 confirmed cases and more than 210 deaths by August 26, 2020. The unpreparedness of the Libyan healthcare system toward the COVID-19 pandemic, which can be explained by the large number of cases and shortage of medical supplies, as well as the ongoing conflict, have placed an increased burden on Libyan medical students and the general population; the civil war has caused a financial crisis and reduced the ability of the healthcare system to provide adequate training opportunities for newly graduated medical students (Elhadi and Msherghi, 2020; Elhadi et al., 2020b). This, coupled with the closure of medical schools during the COVID-19 pandemic, along with extended electrical blackout issues, may have resulted in substantial frustrations and increases in anxiety and depression among medical students, especially for those in high-conflict areas or who were internally displaced from their homes.

Today's medical students are tomorrow's doctors; therefore, their mental wellbeing is crucial. However, few studies have addressed the impact of the COVID-19 pandemic on the mental health of medical students (Cao et al., 2020; Soled et al., 2020; Ullah and Amin, 2020). There is an urgent need to perform high-quality research and collect data on the effects of the COVID-19 outbreak on mental health (Holmes et al., 2020). Therefore, we aimed to determine the psychological status of medical students during the COVID-19 outbreak and civil war in Libya and determine factors associated with depression and anxiety among Libyan medical students.

MATERIALS AND METHODS

Study Design

This is a cross-sectional study of medical students from 15 medical schools and colleges in Libya, located in the main cities. Data were collected from April 20, 2020 to May 1, 2020. Data were collected in paper and electronic forms using anonymous surveys that were sent to medical students by email and through the social media groups of medical students. The questionnaires were anonymous to ensure the reliability and correctness of the data, and were sent to more than 3,500 medical students. To avoid observer and selection bias, the survey was blinded: for the paper survey, the students completed the survey anonymously without identifiable data and left the completed paper survey at a designated collection point in each medical school to avoid any potential bias. For the online version, the students were asked to fill out the survey anonymously without identifiable data.

Study Participants and Settings

Active medical students who were currently enrolled in medical schools were included, while those who were not currently enrolled in medical school were excluded. Those with a previous history of mental illness or missing data were excluded from the study. Students of any age and gender were included. The survey was conducted in the following cities: Tripoli, Al-Zawia, Misrata, Sebha, Gharyan, Albayda, Benghazi, Al-Khums, Tarhuna, Alzintan, Tobruk, and Sabratha.

Study Tools

The questionnaire was divided into three parts. The first part contained demographic characteristics, including age, gender, year of study, availability of steady financial sources, living status (living alone or with family), presence of friends or family infected with COVID-19 infection that they know, and occurrence of internal displacement due to the civil war.

The second part was comprised of the generalized anxiety disorder 7-item (GAD-7) scale. This tool includes questions

regarding seven anxiety symptoms and their frequencies within the last 2 weeks. It has a specificity of 82% and a sensitivity of 89% (Spitzer et al., 2006; Toussaint et al., 2020), and has been validated in several previous studies and has excellent internal consistency (Cronbach's α = 0.83–0.93). In each of the questions students were asked to rate symptoms using a 4-item Likert scale of 0 (not at all), 1 (several days), 2 (more than half of the days), and 3 (nearly every day), with a total score of 0–21 (Ruiz et al., 2011; Johnson et al., 2019). A score of 0–4 was regarded as normal, 5–9 was regarded as mild, 10–14 was regarded as moderate, and 15–21 was regarded as severe (Kroenke et al., 2007). A GAD-7 score of ≥15 was regarded as the cutoff score to detect anxiety symptoms (Spitzer et al., 2006).

The third part consisted of the patient health questionnaire (PHQ-9), which is a validated 9-item questionnaire to assess depression severity in individuals. It has a specificity of 85% and a sensitivity of 88% (Levis et al., 2019). Each of the 9-item questions rates depression using a 4-item Likert scale of 0 (not at all), 1 (several days), 2 (more than half the days), and 3 (nearly every day), with a total score of 0–27 (Kroenke et al., 2001). A score of 0–4 was regarded as minimal, 5–9 was regarded as mild, 10–14 was regarded as moderate, 15–19 was regarded as moderately severe, and 20–27 was regarded as severe (Urtasun et al., 2019). A PHQ-9 score of ≥15 was regarded as the cutoff score to detect depressive symptoms (Kroenke et al., 2001; Levis et al., 2019).

Statistical Analysis

The independent-samples *t*-test was used to determine if there was a significant difference between the means of the two groups. The chi-square test for association was used to determine the association between categorical groups. Spearman's rank-order correlation was used to determine the association between continuous/ordinal variables. A *P*-value of less than 0.05 was considered statistically significant. Statistical analyses were performed using IBM SPSS Statistics for Windows (Version 25.0).

Ethical Standards

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committee on human experimentation with the Helsinki Declaration of 1975, as revised in 2008. Ethical approval for this study was obtained from the Bioethics Committee at the Biotechnology Research Center in Libya. All participants provided consent before participating in the study.

RESULTS

Demographic Characteristics

A total of 2,430 out of 3,500 students completed the survey. Of these, 1,327 (54.6%) were from the University of Tripoli. The mean age of the study participants was 23.30 ± 2.61 years, and 734 (30.2%) students were in the 5th year of their medical course. The vast majority (1,919 out of 2,430 [78.97%]) were female, and 511 (21.03%) were male. **Table 1** provides the demographic characteristics of the study participants.

Mental Health Assessments

Anxiety

Anxiety symptoms were assessed using the GAD-7 scale, and participants were classified into four grades, as shown in **Table 2**. The GAD-7 score ranged from 0 to 21, with a median of 6 (IQR, 4–10), while the mean (+ SD) score of anxiety symptoms determined by the GAD-7 was 7.2 (5.1). A total of 268 (11%) students had a GAD-7 score of ≥15, which is indicative of

TABLE 1 | Characteristics of students in the study.

Variable	Total *n* = 2,430	Female *n* = 1,919	Male *n* = 511	*P*-value
Age (mean ± SD)	23.30 ± 2.61	23.33 ± 2.59	23.18 ± 2.67	0.118
Current year of study:				
Preparatory year	71	51 (2.7)	20 (3.9)	<0.001**
Year 1	262	207 (10.8)	55 (10.8)	
Year 2	258	188 (9.8)	70 (13.7)	
Year 3	345	253 (13.2)	92 (18)	
Year 4	540	460 (24)	80 (15.7)	
Year 5	734	581 (30.3)	153 (29.9)	
Internship	220	179 (9.3)	41 (8)	
Steady financial income				
Yes	854	673 (35.1)	181 (35.4)	0.883
No	1,576	1,246 (64.9)	330 (64.6)	
Living status		1,859 (96.9)	472 (92.4)	<0.001**
With family	2,331		39 (7.6)	
Alone	99	60 (3.1)		
Family member and/or friend has COVID-19				0.016*
Yes	45	29 (1.5)	16 (3.1)	
No	2,385	1,890 (98.5)	495 (96.9)	
Internal displacement				0.063
Yes	294	220 (11.5)	74 (14.5)	
No	2,127	1,692 (88.5)	435 (85.5)	
PHQ-9 score (mean ± SD)	9.76 ± 6.34	9.86 ± 6.31	9.38 ± 6.44	0.913
GAD-7 score (mean ± SD)	7.22 ± 5.08	7.35 ± 5.06	6.75 ± 5.13	0.848

*Significant at P < 0.05. **Significant at P < 0.001.*

TABLE 2 | Frequencies and percentages of grades of depression and anxiety.

Category	Grade	Frequency	Percentage (%)
Depression (PHQ-9)	Minimal (0–4)	534	22
	Mild (5–9)	855	35.2
	Moderate (10–14)	516	21.2
	Moderately severe (15–19)	289	11.9
	Severe (20–27)	236	9.7
Anxiety (GAD-7)	Normal (0–4)	862	35.5
	Mild (5–9)	910	37.5
	Moderate (10–14)	390	16
	Severe (15–21)	268	11

moderate to severe anxiety. However, according to the GAD-7 grades categories, 862 (35.5%) medical students had no signs or symptoms of anxiety. While 1,568 (64.5%) had different degrees of anxiety: mild, 910 (37.5%); moderate, 390 (16%); and severe, 268 (11%). **Table 3** demonstrates the relationship between the baseline characteristics and different degrees of anxiety. Anxiety was significantly associated with living status and internal displacement ($P < 0.05$). Students living alone had a higher prevalence of anxiety. In addition, students internally displaced due by the civil war were more statistically associated with anxiety symptoms than were non-displaced students. The gender, age range, year of study, having a steady financial income, and having family members or friends infected with COVID-19 were not statistically associated with anxiety symptoms ($P > 0.05$). Spearman's correlation was used to assess whether there was a relationship between anxiety score and study characteristics, and there was no statistically significant correlation between the anxiety score determined by the GAD-7 scale and the age ($r_s = -0.030$, $P < 0.141$). However, there was a statistically significant negative correlation between the anxiety score and the year of study ($r_s = -0.41$, $P = 0.042$).

TABLE 3 | Univariate analysis of medical students' anxiety regarding the COVID-19 pandemic.

Variable	Total *n* = 2,430	Anxiety symptoms (GAD-7 ≥ 15)	No anxiety symptoms (GAD-7 < 15)	χ 2	*P*-value
Gender				2.21	0.137
Male	511 (21)	47 (17.5)	464 (21.5)		
Female	1,919 (79)	221 (82.5)	1,698 (78.5)		
Age				1.47	0.224
<24	1,266 (52.1)	149 (55.6)	1,117 (51.7)		
≥24	1,164 (47.9)	119 (44.4)	1,045 (48.3)		
Current year of study:				5.58	0.472
Preparatory year	71 (2.9)	6 (2.2)	65 (3)		
Year 1	262 (10.8)	33 (12.3)	229 (10.6)		
Year 2	258 (10.6)	28 (10.4)	230 (10.6)		
Year 3	345 (14.2)	45 (16.8)	300 (13.9)		
Year 4	540 (22.2)	63 (23.5)	477 (22.1)		
Year 5	734 (30.2)	76 (28.4)	658 (30.4)		
Internship	220 (9.1)	17 (6.3)	203 (9.4)		
Steady financial income				0.187	0.066
Yes	854 (35.1)	91 (34)	763 (35.3)		
No	1,576 (64.9)	177 (66)	1,399 (64.7)		
Living status				3.969	0.046*
With family	2,331(95.9)	251 (93.7)	2,080 (96.2)		
Alone	99 (4.1)	17 (6.3)	82 (3.8)		
Family member and/or acquaintance has COVID-19				0.957	0.328
Yes	45 (1.9)	7 (2.6)	38 (1.8)		
No	2,385 (98.1)	261 (97.4)	2,124 (98.2)		
Internal displacement				12.18	<0.001*
Yes	294 (12.1)	50 (18.7)	244 (11.3)		
No	2,127 (87.9)	218 (81.3)	1,918 (88.7)		

*Significant at $P < 0.05$.

Depression

The PHQ-9 scale assessed depression and participants were classified into five grades, as shown in **Table 2**. The PHQ-9 score ranged from 0 to 21, with a median of 9 (IQR, 5–14), while the mean (+ SD) score of depressive symptoms determined by PHQ-9 was 9.7 (6.3). A total of 525 (21.6%) students had a PHQ-9 score of ≥15, which is indicative of moderate to severe depression. Additionally, 855 (35.2%) of the medical students had mild (PHQ 5–9) depressive symptoms. Suicidal ideation was present in 552 (22.7%) students, as follows: 342 (14.1%), several days; 90 (3.7%), more than half of the days, and 120 (4.9%), nearly every day. **Table 2** provides the frequencies of each grade of depression according to the PHQ-9 categories. Depression was only statistically associated with year of study ($P = 0.009$), where medical students in higher years of study had a higher prevalence of depressive symptoms compared to those in earlier years. However, gender, age range, steady financial income, living status, internal displacement, and having a family member or friend infected with COVID-19 were not statistically associated with depressive symptoms ($P > 0.05$). Spearman's correlation was used to assess whether there was a relationship between the PHQ-9 depressive score and age and year of study. The results showed that there was a statistically significant negative correlation between the year of study and depression score ($r_s = -0.76$, $P < 0.001$). For the age of the participants, there was a statistically significant negative correlation between age and depression score ($r_s = -0.054$, $P < 0.008$). **Table 4** presents the depression grades of study participants in association with COVID-19.

DISCUSSION

The COVID-19 pandemic and civil war in Libya has likely had psychological effects on medical students, which can be demonstrated by the high level of anxiety and depression shown in this study. The study determined the psychological status of medical students during the civil war conflicts and the COVID-19 pandemic in Libya. The results demonstrated that 64.5% of students had different degrees of anxiety. Of these, about 11, 16, and 37.5% reported severe, moderate, and mild anxiety symptoms, respectively. In addition, 21.6% had moderate to severe depression symptoms, and suicidal ideation was present in 552 (22.7%) participants.

The high level of anxiety and depression might be related to the civil war (Wells et al., 2011), and overwhelming and exacerbating news that increases their fear of the virus (Ayittey et al., 2020), transmission to family or friends, virus complications, and psychological pressure due to quarantine and isolation (Burtscher et al., 2020; Cao et al., 2020; Molica et al., 2020; Xiao, 2020).

Libyan medical students are exposed to high levels of psychological stress owing to civil war conflicts, resulting in a

TABLE 4 | Univariate analysis of medical students' depression regarding the COVID-19 pandemic.

Variable	Total n = 2,430	Depressive Symptoms (PHQ-9 =15)	No Depressive Symptoms (PHA-9 <15)	χ 2	*p*-value
Gender				2.25	0.134
Male	511 (21)	98 (18.7)	413 (21.7)		
Female	1,919 (79)	427 (81.3)	1,492 (78.3)		
Age				3.32	0.68
<24 =24	1,266 (52.1)	233 (44.4)	931 (48.9)		
	1,164 (47.9)	292 (55.6)	974 (51.1)		
Current year of study:				17.06	0.009*
Preparatory year	71 (2.9)	16 (3)	55 (2.9)		
Year 1	262 (10.8)	59 (11.2)	203 (10.7)		
Year 2	258 (10.6)	52 (9.9)	206 (10.8)		
Year 3	345 (14.2)	100 (19)	245 (12.9)		
Year 4	540 (22.2)	106 (20.2)	434 (12.9)		
Year 5	734 (30.2)	157 (29.9)	577 (30.3)		
Internship	220 (9.1)	35 (6.7)	185 (9.7)		
Steady financial income				0.13	0.717
Yes	854 (35.1)	181 (34.5)	673 (35.3)		
No	1,576 (64.9)	344 (65.5)	1,232 (64.7)		
Living status				1.95	0.16
With family	2,331 (95.9)	498 (94.9)	1,833 (96.2)		
Alone	99 (4.1)	27 (5.1)	72 (3.8)		
Family member and/or acquaintance has COVID-19				2.44	0.118
Yes	45 (1.9)	14 (2.7)	31 (1.6)		
No	2,385 (98.1)	11 (97.3)	1,874 (98.4)		
Internal displacement				1.64	0.2
Yes	294 (12.1)	72 (13.7)	222 (11.7)		
No	2,127 (87.9)	453 (86.3)	1,683 (88.3)		

**Significant at P < 0.05.*

higher prevalence of anxiety and depression. It is important to note that 294 of the medical students who answered the survey have been internally displaced owing to living in a conflict zone. These students have had to leave their homes and move to a relative's house or their families have had to find another place to live temporarily. This increases psychological stress; these students' families will be under higher financial pressure owing to them being forced to rent, and due to the fact that these students are at high risk of being kidnapped or killed and their home and belongings stolen or destroyed in the conflict.

A previous study conducted on Chinese college students during the COVID-19 outbreak demonstrated that 0.9, 2.7, and 21.3% had severe, moderate, and mild anxiety, respectively (Cao et al., 2020); this is lower than our study findings. However, Cao et al. (2020) focused on undergraduate students with no emphasis on the year of study, which varies according to our study findings, as it can play a role in terms of anxiety and depression levels; medical students in higher study years display greater stress and anxiety due to the increased work and study load (Chandavarkar et al., 2007). According to our study, having family members or friends infected with COVID-19 was not significantly associated with anxiety, which is not consistent with previous reports (Cao et al., 2020; Ren et al., 2020). A previous meta-analysis of 69 studies on anxiety among medical students found a pooled prevalence of anxiety of 33.8%, which is similar to our study; the study demonstrated a higher prevalence among Middle Eastern and Asian medical students, which might be due to cultural issues and the stigmatization of mental disorders (Quek et al., 2019).

Our study showed that depression symptoms were associated with the year of the study; those in a higher year of their studies demonstrated a higher prevalence. This is similar to previous studies in Nepal, India, Pakistan, and Thailand, which have also reported that students in higher academic years demonstrated a higher prevalence of psychological morbidities (Supe, 1998; Saipanish, 2003; Shaikh et al., 2004; Sreeramareddy et al., 2007).

Our study showed that 525 (21.6%) of the students were depressed, and suicidal ideation appeared in 552 (22.7%). A previous study in Vietnamese students, which was regarded to have a higher prevalence rate than previous reports, indicated a 15.2% prevalence of depression and 7.7% prevalence of suicidal ideation (Pham et al., 2019). In a recent study among 2,562 Saudi medical students with a similar gender distribution, a total of 15.9% were found to have moderately severe (PHQ-9 = 15–19) depressive symptoms, while 11.6% had severe (PHQ-9 = 20–27) depressive symptoms, which is similar to our results (Alharbi et al., 2018). In a study conducted in the United Arab Emirates, 32.1% of medical students showed evidence of psychiatric distress (Ahmadi et al., 2012). Using the depression, anxiety, and stress scale (DASS-21), another study on Syrian medical students found that the prevalence of depressive symptoms was up to 60.6% and that of anxiety 35.1%, which were higher than those in our study. They also found a higher prevalence among those with "insufficient" personal income (Al Saadi et al., 2017). In Iraq, prevalence of anxiety and depression of 62.5 and 52.1%, respectively, using the DASS-21 questionnaire, were reported (Rasheed and Hussein, 2019). Both Iraq and Syria have similar life stressors to those in Libya, with higher prevalence of anxiety and depression among medical students.

In a systemic review and meta-analysis of 167 cross-sectional studies and 16 longitudinal studies regarding medical students' depression and suicidal ideation, a prevalence of depression of between 9.3 and 55.9% was revealed across the studies. The pooled prevalence of suicidal ideation was present in 11.1% of the students among the included studies (Rotenstein et al., 2016) which is lower than our study where we found that 22.7% of participants have suicidal ideation.

The strengths of this study are in its adequate sample size and wide representation from 15 different universities and colleges around Libya. Moreover, this study focused on medical students' anxiety and depression during the COVID-19 pandemic, with special emphasis on several factors, such as internal displacement,

financial, and conflict-related factors that are relevant to the students' current state, with special circumstances regarding the civil war and ongoing conflict.

One of the limitations of this study is its cross-sectional design, which prevents the building of causal relationships. Another limitation is the predominance of the female gender in the study, which may affect the distribution of the results. Furthermore, there might be a selection and interview bias, as the medical students received the survey by email and social media. In addition, this study did not address other factors, such as family history of mental illness, nor other socio-demographic factors, such as emotional trauma.

CONCLUSION

Our study highlights that the mental health of medical students in Libya is at risk, especially under the stressful conditions of the civil war and COVID-19 outbreak. In addition to the COVID-19 pandemic, this can be attributed to several factors, including the year of study, age, psychological stress due to the civil war, living with family members or friends with COVID-19, internal displacement due to conflict, and living either with family or alone. These stressors may have long-term effects on their future careers as doctors, which necessitates combined efforts and determined actions to support medical students and provide help for their families. The government should implement strategies aimed at providing mental health support for students to improve healthcare outcomes and decrease the risk of suicide, training attrition, and long-term mental illness during this critical time.

DATA AVAILABILITY STATEMENT

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

ETHICS STATEMENT

The study was approved by the Bioethics Committee at the Biotechnology Research Center in Libya.

AUTHOR CONTRIBUTIONS

ME analyzed, interpreted the data, and wrote the first draft of the manuscript. Each author took part in the design of the study, contributed to data collections, participated in reviewing the manuscript. All authors read and approved the final manuscript.

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Ahead of the Curve: Responses From Patients in Treatment for Obsessive-Compulsive Disorder to Coronavirus Disease 2019

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Alongside concern about the physical health impacts of the coronavirus disease 2019 (COVID-19) crisis, public health officials have also raised concerns about the potential for massive mental health impact. This has led many to wonder, how are individuals with obsessive-compulsive disorder (OCD), and especially those with contamination fears, doing in the era of COVID-19? We present data from eight patients in our residential treatment program for OCD who were admitted prior to any COVID-19 restrictions and continued in treatment at the facility during the pandemic. Much like the general population, our patients varied in the ways they were impacted by COVID-19, yet the majority experienced improvements in OCD symptoms despite the context. This is not to downplay the many ways in which our patients were personally affected by COVID-19. Rather our patients' relatively resilient responses mirror our program's treatment model, which emphasizes exposure and response prevention (ERP) within the complementary framework of acceptance and commitment therapy (ACT). The intention of this article is to challenge the notion that by definition this population will fare worse than the general public or that ERP cannot proceed effectively during this time. In contrast, we underscore that effective OCD treatment can and should continue in the era of COVID-19.

Keywords: obsessive compulsive disorder, anxiety, COVID-19, coronavirus, acceptance and commitment therapy, exposure and response prevention, resilience

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INTRODUCTION

Coronavirus disease 2019 (COVID-19) was identified on December 31, 2019 and has become a global pandemic (World Health Organization, 2020) that has resulted in over 4 million positive cases and over 146,000 deaths in the United States alone (Centers for Disease Control and Prevention, 2020). Alongside physical health concerns, public health officials have raised concerns about the potential for massive mental health impact based on increased stress associated with fear of contracting/transmitting the virus and substantial changes to routine, financial ramifications, and social isolation (Holmes et al., 2020; Pfefferbaum and North, 2020; Yao et al., 2020). Initial data validate concerns regarding these negative mental health impacts among the general population (Ipsos MORI, 2020; Qiu et al., 2020), medical workers (Lu et al., 2020), college students (Cao et al., 2020), and individuals living in regions heavily impacted by COVID-19 (Liu et al., 2020).

This has led many to wonder, how are individuals with obsessive-compulsive disorder (OCD), and especially those with contamination fears, doing in the era of COVID-19? Myriad articles written by popular press and professional organizations have speculated about this topic and offered suggestions (Anxiety and Depression Association of America, 2020; Fontenelle and Miguel, 2020; International OCD Foundation, 2020; Rosman, 2020). The authors of the current article are clinicians and researchers at a residential treatment program for severe OCD. Frequently, we have heard comments from colleagues in the broader psychology and health fields such as "must be an interesting time to work with OCD," "your poor patients must be really struggling," or "how do you even do treatment right now when everyone has OCD?" The implication is that people with OCD are especially struggling to cope with the current COVID-19 realities, even for individuals currently in treatment.

To some degree, these assumptions are intuitive given that difficulty tolerating uncertainty (which is highly salient in this unprecedented global pandemic) is a hallmark feature of OCD (Obsessive Compulsive Cognitions Working Group, 2005) and 40–50% of individuals with OCD report concerns about germs or contamination (Pinto et al., 2008; Matsunaga et al., 2010). Moreover, existing literature suggests that obsessive-compulsive contamination and/or health anxiety symptoms are associated with greater anxiety about prior public health concerns among university-affiliated samples (Wheaton et al., 2012; Blakey et al., 2015; Blakey and Abramowitz, 2017).

However, the impact of the current pandemic on individuals with a diagnosis of OCD remains unclear. COVID-19 is unprecedented in modern history in its scope and impact on daily routine and behaviors (Callaway et al., 2020; Pew Research Center, 2020). Given recent public health directives to wash hands, sanitize items, and monitor symptoms frequently, it is reasonable to hypothesize that obsessive-compulsive symptoms might increase for individuals in the community who do not ordinarily engage in these behaviors. What is unclear is to what extent the current global pandemic results in a clinically meaningful exacerbation of OCD among individuals who already struggle with these symptoms in the absence of a pandemic. More importantly, in our minds, is the question of whether it is possible for individuals with OCD to cope adaptively (e.g., by engaging in treatment) during this time.

The assumption that all patients with OCD are uniquely struggling is discordant with our experiences working within a treatment context. We are not alone in our anecdotal impressions that many patients are doing well (Rosmarin, 2020) and that individuals who have engaged in treatment for OCD may be uniquely well-positioned to weather the COVID-19 storm with resilience (Morse, 2020). At the broader societal level, it has been noted that COVID-19 has the potential for positive impacts on mental health and wellbeing, including increased time for exercise, healthy eating, family, and friends (Delgado, 2020).

Given these mixed hypotheses about the impact of COVID-19 on the population we serve, we present both quantitative and qualitative data from eight patients in our residential treatment program. Given the unforeseen nature of this crisis, we did not (nor could we have) systematically design the optimal research methodology to study this question. We acknowledge that ours is not necessarily a representative nor random sample, as we were required to sharply reduce our census, and discharge decisions were based on geography, patients' desires to remain in treatment, and perceived ability to benefit. Nonetheless, rather than leave to speculation, our goal was to bring the empirical data that we do have to bear on the question of how patients in residential treatment for OCD have responded to the ongoing pandemic.

As such, we present data from patients who were (1) admitted prior to COVID-19 restrictions (January 6, 2020–February 24, 2020) and had the experience of our program per usual, and (2) continued in the program throughout a number of COVID-19 impacts (discharged April 7, 2020–May 22, 2020), including a no-visitor policy, being required to stay on unit, mask requirements for patients and staff, changes to meals and their delivery, significant reduction in census to maintain social distancing, and news of confirmed positive COVID-19 staff cases. Typical programming included 2–4 h daily of exposure and response prevention (ERP), four groups daily based on cognitive-behavioral and acceptance and commitment therapy (ACT), and meetings with a behavior therapist (2–3x/week), a family therapist (1x/week), and a psychiatrist (1x/week). Average length of stay was 83.9 days (SD = 17.2, range = 58–106). Patients completed weekly measures of OCD severity (Yale-Brown Obsessive Compulsive Scale, YBOCS; Goodman et al., 1989), quality of life (Quality of Life Enjoyment and Satisfaction Questionnaire, QLES; Endicott et al., 1993), and worry (Penn State Worry Questionnaire-Abbreviated, PSWQ-A; Crittendon and Hopko, 2006). Patients also completed the Dimensional Obsessive–Compulsive Scale at admission to characterize symptom presentation(s) (Abramowitz et al., 2010). Data were collected *via* a larger project that received institutional review board approval and for which patients provided informed consent.

HOW HAVE PATIENTS IN RESIDENTIAL TREATMENT FOR OCD FARED IN THE ERA OF COVID-19?

Mean YBOCS at admission was 23.62 (SD = 6.82, N = 8), corresponding to moderate to severe OCD. **Figure 1** displays patient-reported OCD severity, quality of life, and worry across treatment and suggests that most individuals experienced OCD symptom improvement despite the context of COVID-19. Changes in quality of life and worry were variable across and within patients. Follow-up data were available for five patients (M = 36.4 days after discharge, SD = 8.7, range = 35–49) and generally suggested stability of treatment effects (**Table 1**).

To further support our descriptive, visual, and qualitative data, we examined slopes of each indicator using mixed models to provide quantitative, group-level measures of effect. Mixed models are advantageous for examining longitudinal data in small samples relative to other analytic methods because they maximize power (Muth et al., 2016) and were examined using *nlme* in R (Pinheiro et al., 2019). Similar to individual-level

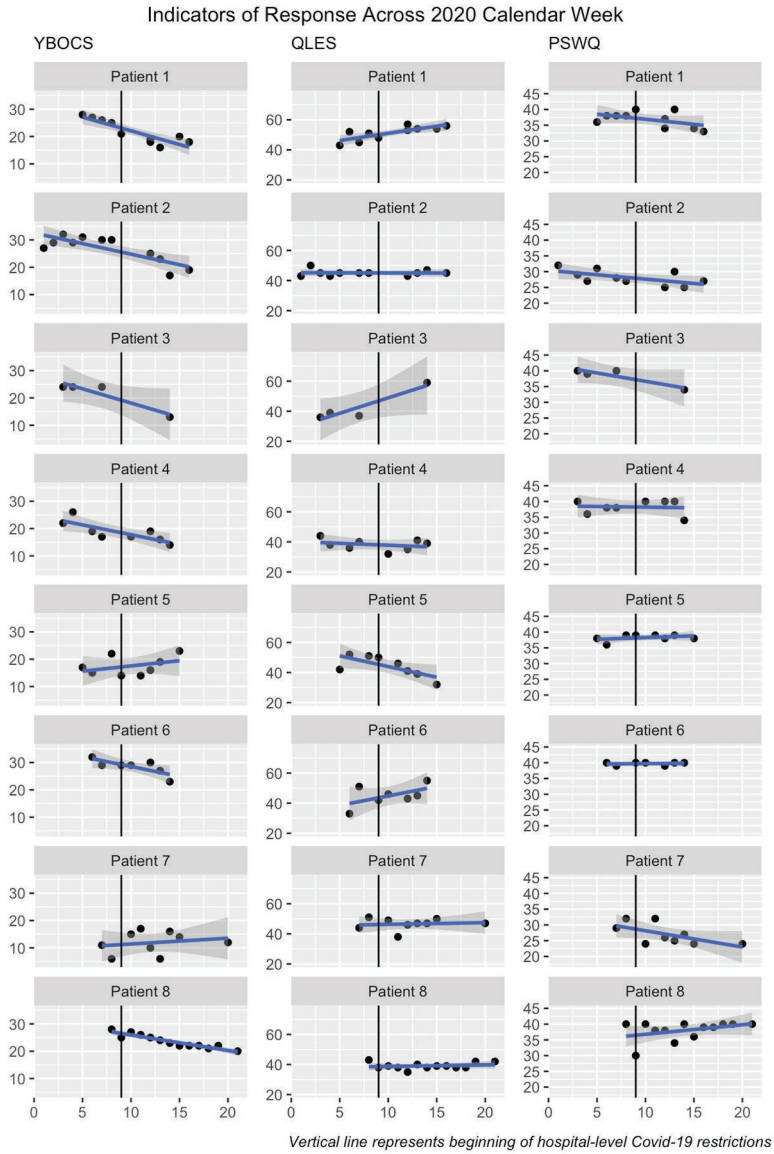

FIGURE 1 | Indicators of response across 2020 calendar week. YBOCS, Yale-Brown Obsessive Compulsive Scale; QLES, Quality Of Life Enjoyment and Satisfaction Questionnaire; PSWQ, Penn State Worry Questionnaire-Abbreviated. Data were visualized with *ggplot2* in R (Wickham et al., 2016).

visualization, these group-level analyses indicated that patients' OCD symptoms declined [$B = -0.50$, SE = 0.15, $t(64) = -3.42$, $p = 0.001$]. On average, there were no changes in quality of life [$B = 0.30$, SE = 0.30, $t(64) = 1.02$, $p = 0.313$] or worry [$B = -0.14$, SE = 0.09, $t(63) = -1.47$, $p = 0.147$].

To provide a rough context for how patients in our program respond in the absence of a pandemic and to account for seasonal effects on mental health (Tan et al., 2017), we examined the same indicators among patients ($N = 10$) who admitted and discharged in the comparable 2019 calendar weeks. Mean YBOCS at admission was 27.50 ($SD = 6.59$). Mixed models indicated that patients' OCD symptoms declined [$B = -0.70$, SE = 0.18, $t(95) = -3.93$, $p < 0.001$]. On average, there were no changes in patients' quality of life [$B = 0.24$, SE = 0.15, $t(90) = 1.56$, $p = 0.122$] but worry did decrease [$B = -0.38$, SE = 0.07, $t(87) = -5.06$, $p < 0.001$].

INDIVIDUAL CASE VIGNETTES

To contextualize individual-level data (**Table 1**; **Figure 1**), we briefly describe each patient's treatment trajectory and response to COVID-19.

Patient 1

This patient presented with symmetry and exactness concerns, perfectionism, harm obsessions, and need to understand. For years, they had avoided phone calls or videoconferencing because

TABLE 1 | Indicators of treatment response and baseline symptom presentation.

	YBOCS			QLES			PSWQ			DOCS (Baseline only)				
Patient	**BAS**	**END**	**FU**	**BAS**	**END**	**FU**	**BAS**	**END**	**FU**	**Total**	**Cat 1**	**Cat 2**	**Cat 3**	**Cat 4**
Patient 1	28	18	18	43	56	56	36	33	33	54	11	7	17	19*
Patient 2	27	19	18	43	45	46	32	27	27	14	13*	0	1	0
Patient 3	24	13	--	36	59	--	40	34	--	25	0	10	15*	0
Patient 4	22	14	15	44	39	42	40	34	36	30	7	0	13*	10
Patient 5	17	23	--	42	32	--	38	38	--	24	11*	2	9	2
Patient 6	32	23	22	33	55	48	40	40	40	60	17	20*	15	8
Patient 7	11	12	--	44	47	--	29	24	--	14	11*	0	0	3
Patient 8	28	20	8	43	42	40	40	40	34	58	15	15	16*	12
M	23.6	17.8	16.2	41.0	46.9	46.4	36.9	33.8	34.0	34.9	10.6	6.8	10.8	6.8
SD	6.8	4.3	5.2	4.1	9.3	6.2	4.3	5.8	4.7	19.4	5.2	7.7	6.8	6.7

**indicates primary symptom domain.*

YBOCS, Yale-Brown Obsessive Compulsive Scale; QLES, Quality Of Life Enjoyment And Satisfaction Questionnaire; PSWQ, Penn State Worry Questionnaire-Abbreviated; DOCS, Dimensional Obsessive-Compulsive Scale; comprises four categories. Category 1: Concerns about germs and contamination [shaded due to potential relevance to coronavirus disease 2019 (COVID-19)]. Category 2: Concerns about being responsible for harm, injury, or bad luck. Category 3: Unacceptable thoughts. Category 4: Concerns about symmetry, completeness, "just right." BAS, baseline; END, endpoint; FU, follow up. DOCS are presented for baseline only.

of fears of not being able to "control the content." The increasing emphasis on using phone/videoconferencing for treatment amid the pandemic was both highly triggering for this patient and provided motivation to address this issue. This patient reported increased anxiety when staff and patients were required to wear masks, as it triggered their end-of-the-world obsessions, but they were able to implement appropriate coping skills and reported feeling happy about socializing with peers despite masks. By discharge, the patient was able to consistently use audio/video communication for treatment and socially, reporting feeling happy that they were able to connect with their support system in these ways.

Patient 2

This patient presented with contamination symptoms around exposure to everyday chemicals that may alter their existence. The patient expressed little concern about contracting COVID-19 although found that the requirement to increase use of hand sanitizer and soap provided a push toward exposure, as these substances were triggers. The patient reflected that they noticed their parent, who does not have OCD, engaging in behaviors that appeared reassurance seeking and ruminative, and found it interesting that they were able to provide feedback to their parent about the function of these behaviors. This patient continued to make treatment progress before and during the onset of COVID-19 changes.

Patient 3

This patient presented with harm obsessions, perfectionism, scrupulosity, social anxiety, and eating disordered symptoms around food and exercise. The onset of COVID-19 elevated both normative and OCD worries, but also provided opportunities for fuller engagement with treatment goals. This patient's employer was affected by the pandemic, and they reported worrying about how coworkers would pay bills. Upon learning that a unit staff member tested positive, the patient experienced anxiety about not knowing who the staff member was (due to privacy policies) and about potential exposure to that staff member. The patient was anxious about receiving pre-packaged meals and not being able to go to the gym, but was able to be more flexible around these behaviors. Their clinicians noted that the patient remained fully engaged in treatment despite these increased anxieties and spent more time thinking about how to engage in activities with meaning and enjoyment.

Patient 4

This patient presented with harm obsessions and contamination fears resulting in vomiting. Additionally, not-just-right experiences, superstitious obsessions, and agoraphobia symptoms were endorsed. As their ultimate feared consequence within the contamination realm centered on illnesses causing vomiting, COVID-19 was not significantly triggering (beyond the universal anxiety associated with navigating the pandemic). As the pandemic progressed and unit restrictions intensified, the patient was unable to continue public transportation exposures. Even as these restrictions were implemented, they continued to make significant progress and refocused their exposures to target symptoms around vomiting, harm, and food-related obsessions.

Patient 5

This patient presented with concerns around perfectionism, intrusive thoughts, and contamination. The patient reported COVID-19 related stressors and increases in anxiety throughout the pandemic, including feeling hyper-aware of physical symptoms, worry that their partner would be less available due to pandemic-related increased work hours, learning that coworkers had been laid off, and having family members with the virus become seriously ill. The patient reported that these concerns caused them to feel distracted, cry, and experience difficulty sleeping. Nonetheless, throughout this time, exposure coaches rated the patient as highly engaged in perfectionism-related and interoceptive exposure exercises.

Patient 6

This patient presented with fears of rejection, intrusive thoughts, emetophobia, and panic symptoms. When the program reduced patient census due to COVID-19 restrictions, the patient expressed sadness and increased panic due to their closest peers discharging and concern that they would not have people with whom to connect and practice being vulnerable. They described feeling overwhelmed by the impact of COVID-19 on their community, including family members becoming ill. Nonetheless the patient identified positive ways to engage with family and valued activities to maintain structure following discharge and generally remained focused on treatment.

Patient 7

This patient presented with primary skin picking disorder in the context of family stressors along with a variety of "not just right" experiences. The patient exhibited an increase in skills and a decrease in skin picking over the first 3 weeks in treatment. The patient and treatment team were beginning to plan for exposures in the patient's home, but these were paused due to COVID-19 restrictions. Given this limitation and throughout various COVID-19 related changes, this patient expressed concern that they may not receive optimal treatment and considered discharging and returning post-COVID-19 yet ultimately decided to stay. The patient discharged 1 week prematurely due to exhibiting potential symptoms of COVID-19. Overall, the patient made good progress despite setbacks during stressful events and notably completed home-based exposures *via* a newly-developed virtual treatment program following discharge.

Patient 8

This patient presented with harm and contamination symptoms, including fear of bodily fluids and contracting disease. The patient progressed through treatment relatively fluidly despite COVID-19 related changes to their plan. For example, the patient discontinued exposures of brushing against people in crowded areas and shifted instead to similar imaginal exposures. Rather than resisting hand washing following exposure to household surfaces, the patient practiced washing their hands for 20 s and then moving forward to other activities. The patient's therapist noted that the patient "does not seem overtly concerned about the coronavirus" even after another member of the patient's treatment team tested positive. The patient mentioned feeling as though the social connection and activities provided through the program structure were helpful in managing symptoms.

CONCLUSION

Much like the general population, our patients with OCD varied in the ways they were impacted and responded to emerging COVID-19 related events. For some individuals, COVID-19 actually provided opportunities or motivation to more fully engage in exposure (Patients 1, 2) or other treatment goals (Patient 3). At the same time, some patients did encounter COVID-19 related exacerbation of symptoms (Patient 5) or required modifications to their treatment plan due to increased restrictions (Patients 4, 7, and 8). Most commonly, however, patients experienced COVID-19 related stressors due to general societal, familial, and economic consequences of a global pandemic (Patients 3, 5, 6, and 7). For these reasons, it is perhaps unsurprising that patients did not on average experience a significant reduction in worry during COVID-19 (in contrast to treatment effects for 2019 data).

Overall, our data do not support the notion that our patient population uniquely and universally struggled in the face of COVID-19. This is not surprising to us as clinicians. Common refrains we heard echoed from patients at the peak of COVID-19 disruptions were "this is what we've been training for!" and "we have other things that we're worried about." Typically said in a lighthearted way, these statements are illustrative of how our patients have responded: with appropriate in-group humor, fostering a "we're all in this together" attitude, with resilience and acceptance of the present realities. This is not to downplay the ways our patients were personally affected by COVID-19 nor their corresponding experiences of anxiety, fear, and sadness, or the fact that COVID-19 can exacerbate OCD symptoms when aligning with one's obsessional content.

Our patients' responses may mirror our program's treatment model, which emphasizes ERP within the complementary framework of ACT (Twohig et al., 2018). The emphasis in ACT is on having inner experiences without trying to control or push them away (Twohig, 2009). Instead, we can choose to engage in value-driven behaviors despite the context of difficult thoughts and feelings (Twohig, 2009). Through ERP, our patients learn to intentionally approach situations that trigger anxiety and uncertainty with curiosity and openness, with an overarching clinical goal to foster resiliency and flexibility. We have seen our patients embrace this idea even (especially) in the era of COVID-19 in how they utilize their time in treatment and plan for return home amid ongoing restrictions.

There has been much discussion of potential silver linings of COVID-19 at the societal level (Delgado, 2020), and this was true for some of our patients, such as increased opportunities for exposure to avoided situations. Data on the extent to which silver linings have come to fruition in the general public has been mixed (Gallup, 2020). While our patients reported mixed impacts, it is notable that we did not observe massive or consistent declines in quality of life. Most patients did see continued improvements in OCD symptoms, underscoring that effective OCD treatment can and should continue despite COVID-19 (Krompinger et al., 2020).

We appreciate that questions about how our patients are doing during COVID-19 typically stem from a place of caring and concern. So too, however, must we be aware of stigma and implicit assumptions that our patients with OCD may fall apart or cease to function adaptively during this time. It is important to acknowledge the resilience our patients possess, and recognize that the treatment principles patients must master to overcome their symptoms uniquely position

them to cope with situations of unprecedented uncertainty. By acknowledging these facts, we challenge the potential effects of stigma, such as relegating those with OCD to the "sick" or "fragile" role.

It is important to note that our patients were engaged in intensive treatment and thus received significant support and in-person socialization. For some patients, their initial targeted avoidance behaviors (i.e., hand washing) were now prescribed by the CDC and as such, adaptations made to their plans on the fly were thoughtful and in keeping with the underlying principles of ERP. Thus, our setting provides an optimal context and we do not mean to imply that our findings generalize to all individuals with OCD. Rather, we challenge the notion that by definition this population will fare worse than the general public or that ERP treatment cannot proceed effectively because "everyone has OCD."

This pandemic is not over, and continued research on patient longer-term responses is being conducted by our group and others. Meanwhile, we recommend that clinicians continue to encourage individuals with OCD to seek treatment. Given the benefit of social support from other individuals with OCD, we also encourage people with these symptoms to access any number of clinician-led or peer-led support groups available online. The International OCD Foundation[1] is a good place to start.

[1]https://iocdf.org/

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Partners Healthcare System Institutional Review Board. The patients/participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

JMK wrote the initial draft of the manuscript, analyzed the quantitative data, and incorporated co-author feedback. All authors provided treatment for the patients described in the manuscript and contributed to the conceptualization of the manuscript. NK and MS contributed to writing the case vignettes. NK, DA, MF, and JN provided written feedback on manuscript drafts. NK, DA, and MF contributed to the introduction and conclusion. All authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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ORIGINAL RESEARCH
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Adversity History Predicts Self-Reported Autonomic Reactivity and Mental Health in US Residents During the COVID-19 Pandemic

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Background: The spread of the COVID-19 virus presents an unprecedented event that rapidly introduced widespread life threat, economic destabilization, and social isolation. The human nervous system is tuned to detect safety and danger, integrating body and brain responses via the autonomic nervous system. Shifts in brain-body states toward danger responses can compromise mental health. For those who have experienced prior potentially traumatic events, the autonomic threat response system may be sensitive to new dangers and these threat responses may mediate the association between prior adversity and current mental health.

Method: The present study collected survey data from adult U.S. residents (n = 1,666; 68% female; Age M = 46.24, SD = 15.14) recruited through websites, mailing lists, social media, and demographically-targeted sampling collected between March and May 2020. Participants reported on their adversity history, subjective experiences of autonomic reactivity, PTSD and depression symptoms, and intensity of worry related to the COVID-19 pandemic using a combination of standardized questionnaires and questions developed for the study. Formal mediation testing was conducted using path analysis and structural equation modeling.

Results: Respondents with prior adversities reported higher levels of destabilized autonomic reactivity, PTSD and depression symptoms, and worry related to COVID-19. Autonomic reactivity mediated the relation between adversity and all mental health variables (standardized indirect effect range for unadjusted models: 0.212–0.340; covariate-adjusted model: 0.183–0.301).

Discussion: The data highlight the important role of autonomic regulation as an intervening variable in mediating the impact of adversity on mental health. Because of the important role that autonomic function plays in the expression of mental health vulnerability, brain-body oriented therapies that promote threat response reduction should be investigated as possible therapeutic targets.

Keywords: coronavirus, COVID-19, autonomic nervous system, polyvagal theory, PTSD, depression, worry, trauma

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INTRODUCTION

On January 21, 2020, the Centers for Disease Control and Prevention announced the first confirmed case of the 2019 Novel Coronavirus (2019-nCoV) in the United States (1). Following this initial case, the virus spread rapidly throughout the country. Due to the drastic global spread of the virus the World Health Organization labeled the outbreak as a pandemic on March 11, 2020 and a national emergency was declared in the U.S. on March 13 (2, 3). The spread of the COVID-19 virus is an unprecedented event that rapidly introduced the threat of loss of life, severe illness, unemployment, economic destabilization, and social isolation. The danger, uncertainty, and social seclusion all have a potential to jeopardize well-being and mental health, with preliminary data and projections pointing to elevated rates of mental illness and distress (4, 5). Research, health policy, and intervention implementation all require information on factors that impact mental health vulnerability and resilience during this time (6) as well as identifying mechanisms through which mental health is challenged.

The human nervous system is tuned to detect safety and danger, integrating the body and brain through the autonomic nervous system [ANS, (7–9)]. The ANS is crucial for coordinating brain and body functions in safe contexts and promoting defensive bio-behavioral reactions during threat (10–14). The ANS forms efferent (motor) and afferent (sensory) connections that are integrated throughout the brainstem, spinal cord, and body organs. These circuits promote maintenance and reactivity in a range of physical functions such as cardiac output, sweating, breathing, and digestion. Shifts in physiological states toward danger-responses inhibit safety-related functions throughout the body. These shifts, particularly in the long term, can compromise emotional and physical health, influencing cognitive and emotional processes through pathways that connect higher level brain regions with the brainstem (15, 16).

The polyvagal theory describes how the structural and functional organization of human threat response systems are rooted in phylogenetic heritage (7, 8, 16, 17). The emergence of mammals was marked by the integration of ANS pathways with circuits that regulate social communication, forming a neuroanatomical social engagement system that dampens defense responses via the ventral vagal pathway of the parasympathetic nervous system and promotes affiliative social interactions. As proposed by the theory, danger detection can trigger withdrawal of the social engagement system, which can promote responses that include mobilization and immobilization (e.g., shut down). Mobilization states, in the absence of the active social engagement that down-regulates defenses, provide a neural platform for fight and flight behaviors. These mobilization states can contribute to chronic anxiety or irritability. Immobilization states, in turn, provide a platform for withdrawal and depression. Both defensive strategies have adaptive value for protecting the individual from certain types of threat, but interfere with co-regulation and feelings of safety.

Dampened parasympathetic activity is associated with depression, anxiety, and post-traumatic stress disorders (18–21). Although there are many external influences on the ANS, the most direct evidence supporting a causal association between the ANS and mental health come from vagal nerve stimulation (VNS), which uses an electrical current to stimulate vagal afferent pathways that lead from the periphery to the brainstem. There is now substantial evidence that vagal nerve stimulation can improve depression symptoms (22, 23) and modulate anxiety and fear (24, 25), supporting a causal connection between autonomic signaling and emotional well-being.

Prior experience with adversity may sensitize a nervous system toward more pronounced mental and physical health changes in response to danger (15, 26–28). In humans the ANS is developmentally sensitive to safety and threat cues and highly responsive to environmental conditions (29–31). This sensitivity promotes a potential mechanism for how adverse experiences may re-tune nervous systems and alter threat responses to future dangers. Thus, the individual's autonomic state might function as an intervening variable determining whether cues of threat are buffered or function as potent disruptors.

Children and adults with a history of childhood maltreatment are more likely to have blunted parasympathetic activity (32, 33). Dampened parasympathetic activity is associated with post-traumatic stress disorders (19), and can be seen in adults with a maltreatment history even when they do not meet clinical diagnostic criteria for PTSD (27, 32). Evidence for a causal pathway between child maltreatment and autonomic regulation has been demonstrated through randomized intervention studies. In one study, children living in Romanian orphanages with access to physical needs but lacking in emotional caregiver connection exhibited low parasympathetic activity and less flexibility in response to challenges, but those who were randomized into foster care that provided greater emotional interpersonal connection developed autonomic activity much like their peers who had never been institutionalized (34). In a recent study of children referred to Child Protective Services for maltreatment, children developed better parasympathetic flexibility in response to challenges when their caregivers were randomized into a parenting sensitivity intervention compared to peers in a control condition (35).

Taken together, theory and empirical evidence reviewed above supports the possibility that prior adversity could help shape autonomic reactivity in response to threats, which may increase worry in response to danger, and the risk of developing PTSD and depressive symptomology. Those with a prior adversity history are at risk for higher threat-response autonomic activity at rest and stronger responses to threatening challenges (36–38). Recent longitudinal data from a cohort study show that stressful life events measured prior to the pandemic are predictive of emotional distress in young adults (39). The COVID-19 combination of life threat, economic destabilization, and social isolation create a particularly challenging environment for the nervous system, placing individuals at risk of mental and physical problems and exacerbation of pre-existing conditions (40).

Using a combination of social media recruitment and targeted online panels data collection, this cross-sectional survey study sought to examine the relations between prior adversity, autonomic reactivity, mental health, and concerns about the coronavirus during the first months of the pandemic

among U. S. residents (March–May 2020). The specific aim was to examine whether self-reported autonomic reactivity mediates the relationship between prior adversity and current depression/PTSD symptomatology and worry during the COVID-19 pandemic. Based on prior literature, we hypothesized that self-reported autonomic reactivity would be related to previous adversity, current mental health, and worry about COVID-19, and that it would be mediate the relationship between these variables.

MATERIALS AND METHODS

Procedure

The protocol was approved by Indiana University's Institutional Review Board. All participants provided informed consent for the study. Data collection was conducted online from March 29 to May 13, 2020. The study recruited from a general population with inclusion criteria being that participants must be 18 years or older. Recruitment was conducted via social media postings on Twitter, Facebook, Instagram, Reddit, and email lists. Additional recruitment oversampling for male, low income, and non-Caucasian responders in the U.S. was conducted via Qualtrics Panels. Qualtrics Panels consist of respondents who have signed up to participate in online surveys in exchange for incentives including cash, airline miles, and gift cards and can be targeted by demographic categories. Participants who completed the survey through Qualtrics Panels were paid according to their compensation agreement with the service. Paid commercial online panel data has been found to have similar scale internal reliability estimates and effect sizes between variables compared to conventional sampling techniques (41). In the United States, samples recruited by Qualtrics are most demographically similar to a national probability sample compared to other online sampling services (42).

The study landing page, which was linked directly from recruitment advertisements, was accessed 5,240 times. Of these, 3,817 individuals consented to participate. Data quality analysis was conducted by automated checks for poor quality responses and manual inspection. Responses with large sections of identical responses for any one survey section were flagged and checked for plausibility, internal consistency, comparison to item response patterns in prior studies. Responses that did not meet these requirements or had a completion time faster than 25% of the median completion time were excluded.

Measures

Previous Adversity

The Adverse and Traumatic Experiences Scale (43) was created to inquire about a range of adverse and traumatic experiences that had been included in other measures including the ACES (44), Trauma History Questionnaire (45), Life Events Checklist for DSM-5 (46), and Brief Trauma Questionnaire (47). Thus, the measure asks about childhood adverse experiences, childhood maltreatment, other person maltreatment, life-threatening situations, sudden deaths of close ones, and personal health situations. To test study hypotheses, adverse experiences relating to physical health were excluded because of the elevated risk of serious illness due to COVID in those with prior medical conditions. Thus, respondent-reported prior adverse events of maltreatment, life-threatening situations, and sudden deaths of close ones were summed to create an adversity score (range: 0–19).

Self-Reported Autonomic Reactivity

The Body Perception Questionnaire Short Form [BPQ-SF; (48, 49)] was used to measure self-reported experiences of reactivity in organs and tissues that are regulated by the autonomic nervous system. The BPQ-SF has been found to have good psychometric properties, convergent validity with similar measures, and consistent factor structure across samples [(50); Kolacz et al., in preparation; Cerritelli et al., under review]. The combined autonomic reactivity subscale assesses the typical experience of the reactivity of functions above the diaphragm (e.g., sweat in armpits) and gastrointestinal functions (e.g., constipation, indigestion) on a 5-point Liker-type scale (ranging from "never" to "always"). Raw scores were transformed into T scores based on previously collected norms (49). Higher scores on the subscale are indicative of destabilized autonomic reactivity and associated with lower parasympathetic activity, higher resting heart rate, and less parasympathetic and sympathetic flexibility in response to a challenge (Kolacz et al., in preparation).

Post-traumatic Stress Disorder Symptoms

PTSD symptoms were measured using the PTSD Checklist-Civilian Version (51), a 17-item self-report measure assessing level of re-experiencing, avoidance, and hyperarousal related to experiencing a traumatic event. It has been found to have good internal stability, test-retest reliability, convergent validity, and temporal stability (52). The items were developed to correspond to DSM-IV-TR criteria for PTSD (53) and measure problems in response to stressful life experiences over the past month using a five-point Likert-type scale (0 = not all, 1 = a little bit, 2 = moderately, 3 = quite a bit, 4 = extremely). On the PCL-C, endorsement of at least one re-experiencing item, at least three avoidance items, and at least two hyperarousal items is suggestive of symptoms that may meet PTSD diagnosis (54).

Depression Symptoms

The Patient Health Questionnaire-2 was used as a depression screener (55, 56). The instrument inquires about frequency of depressed mood and anhedonia over the past 2 weeks using a 4-point Likert-type scale (0 = not at all, 1 = several days, 2 = more than half the days, and 3 = nearly every day). The scores for the two items are summed to determine a total score, with a score of 3 or greater suggesting that the individual should be assessed further to determine whether depressive disorder criteria is met.

COVID-19-Related Worry

Respondents reported on their extent of worry about becoming infected with the COVID-19 virus, seriously ill due to the virus, unable to access important necessities such as a food and medication, unemployed (i.e., losing their jobs), and less financially stable. For each item, the participants reported their level of worry via a 4-point Likert-type scale (0 = not worried, 1 = a little worried, 2 = somewhat worried, and 3 = very worried).

Data Analysis

Analysis was conducted in R 3.6.2 (57). Continuous variables were examined for group differences using Welch's unequal variances *t*-test, a more robust alternative to Student's *t*-test for groups that may have unequal variances or sample sizes (58); categorical variables were examined with $\chi 2$ tests; and ordinal variables with Mann-Whitney-Wilcoxon tests. Cohen's d was used to determine standardized mean difference, a measure of effect size of differences between groups.

Formal mediation analysis was conducted using path analysis and structural equation modeling using the Lavaan package (59). Mediation models are statistical tests that assess whether the association between an independent and dependent variable can be attributed to the effect of a third variable (60–62). In mediation analysis, the strength of mediation is represented via the indirect effect (the product of the coefficient of the independent variable on the mediator and the mediator on the outcome variable). The direct effect is the association of the independent variable on the dependent variable, adjusting for the effect of the hypothesized mediator. The total effect is the sum of the direct and indirect effects.

Models were estimated using diagonally-weighted least squares. The full weight matrix was used to compute robust standard errors, and the test statistic was mean- and variance-adjusted. Indirect and total effect confidence intervals were calculated using bias-corrected adjusted bootstrap percentiles with 5,000 draws. Compared to other mediation estimation methods, this method has been found to have superior power for detecting true effects with accurate Type I error rates (63). Mediation was supported if the bootstrapped 95% confidence interval around the indirect effect did not include 0. Total effects were examined for evidence of divergence of direction between direct and indirect effects, which may weaken, nullify, or reverse the indirect effect. Binary endogenous variables were modeled using probit link functions. Age and gender were included as exogenous variables to adjust model estimates.

Model fit was evaluated using the root mean squared error of approximation [RMSEA; (64)], the Tucker-Lewis Index [TLI; (65)]; and the Comparative Fit Index [CFI; (66)]. Based on recommendations from Hu and Bentler (67), good model fit was evidenced by RMSEA values near or below 0.06 as well as CFI and TLI values near or above 0.95. When model fit was poor, modification indices were cautiously examined to determine whether freeing certain parameters would improve model fit. Modification indices provide data-driven information on the amount that model fit would improve if a single parameter restriction were lifted from the model. Given that modification indices are susceptible to capitalizing on chance characteristics of the data (68), decisions based on modification indices were used sparingly and applied only when the resulting model change could be supported by theory.

RESULTS

The final sample size, excluding incomplete responses (n = 995), poor-quality data (n = 303 from the paid panel recruitment, n = 2 from the social media recruitment), and demographic criteria (e.g., non-US citizen; n = 851) was 1,666 (See **Supplementary Materials** for a detailed consort diagram). Demographic variable descriptive statistics are reported in **Table 1**. Survey respondents ranged from 18 to 88 years of age (M = 45.87; SD = 16.17) and were slightly oversampled with regard to females, high yearly household income (>50% reporting $60 k or more), and higher levels of education (44.5% holding a graduate degree).

TABLE 1 | Sample descriptive statistics.

Variable	Descriptive statistics
n	1,666
Age (M ± SD)	45.87 ± 16.17
Age range (years)	18–88
Gender	
Female	994 (59.7%)
Male	647 (38.8%)
Non-binary	13 (0.8%)
Transgender	1 (<0.1%)
Unspecified	11 (0.7%)
Race and/or Ethnicity	
White or Caucasian	1,175 (70.5%)
Black or African American	163 (9.8%)
Hispanic/Latino(a)	106 (6.4%)
Asian/Pacific Islander	94 (5.6%)
American Indian or Alaska Native	12 (0.7%)
Native Hawaiian or Other Pacific Islander	3 (0.2%)
Additional Races and/or Ethnicities (self–described)	6 (0.4%)
Multiracial	88 (5.3%)
Unspecified	19 (1.1%)
Income (USD)	
< $20,000	233 (14.1%)
$20,001–$60,000	562 (33.7%)
$60,001–$100,000	410 (24.6%)
> $100,001	449 (27.2%)
Unspecified	12 (0.7%)
Education level	
Graduate degree	741 (44.5%)
College or University	620 (37.3%)
Secondary school/High school	282 (16.9%)
Primary school	16 (1.0%)
Vocational school	5 (0.3%)
Unspecified	2 (0.1%)

Autonomic reactivity T scores had similar distributional features to those reported in previous studies (M = 48.07, SD = 10.15, Range: 33.23–83.45) (49, 50). The mean number of prior adverse events was 5.93 (SD = 4.86; range: 0–19). Respondents reported high levels of worry about the negative effects of COVID-19, with the highest levels of worry relating to infection, serious illness caused by the virus, and loss of financial stability (**Table 2**). Of the respondents, 93.7% reported at least a little worry about 1 or more threats associated with the virus,

TABLE 2 | COVID-19-related worry response distributions.

COVID-19 worry variable	Not worried (%)	A little worried (%)	Somewhat worried (%)	Very worried (%)
Becoming infected with COVID-19 virus	17.54	35.80	29.55	17.12
Becoming seriously ill because of coronavirus	22.56	34.72	25.87	16.85
Being unable to get important necessities	36.93	26.75	21.87	14.46
Being unable to get necessary medications	44.80	24.26	18.20	12.73
Losing job	49.12	18.47	14.48	17.92
Becoming less financially stable	23.00	26.49	23.42	27.09

27.8% met symptom criteria for post-traumatic stress disorder, and 28.7% met symptom criteria for depression.

Pearson and point-biserial correlations for continuous and binary variables are presented in **Table 3**. Age had a very small negative association with number of prior adversities ($r = -0.07$). In addition, age had a negative relation with self-reported autonomic reactivity ($r = -0.23$) and more advanced age was associated with a lower probability of depression and PTSD symptoms ($r = -0.26$ and -0.27, respectively). Higher numbers of previous adverse events were associated with higher values of autonomic reactivity ($r = 0.60$, $p < 0.0001$). Respondents with depression symptoms had more prior adverse experiences (No symptoms M = 5.07, SD = 4.10; Symptoms M = 8.10, SD = 5.84; $t_{(664.49)} = 10.317$, $p < 0.0001$, Cohen's d = 0.65). Those who had PTSD symptoms likewise had more prior adverse experiences (No symptoms M = 4.72, SD = 3.67; Symptoms M = 9.07, SD = 6.17; $t_{(590.11)} = 14.465$, $p < 0.0001$, Cohen's d = 0.98). Respondents who met depression criteria reported more destabilized autonomic reactivity [No symptoms M = 45.18, SD = 8.99; Symptoms M = 55.28, SD = 12.37, $t_{(686.98)} = 16.201$, $p < 0.0001$, Cohen's d = 1.00]. Likewise, destabilized autonomic reactivity was also greater in those who met PTSD criteria (No symptoms M = 44.56, SD = 8.05; Symptoms M = 57.13, SD = 12.45, $t_{(616.82)} = 20.17$, $p < 0.0001$, Cohen's d = 1.33). Household income was not associated with number of adverse experiences (rho = 0.01, $p = 0.77$) or autonomic reactivity (rho = −0.05, $p = 0.05$). There were significant but small negative associations of household income and education with depression (rho = −0.10, $p < 0.001$; rho = −0.05, $p = 0.03$, respectively) and PTSD symptoms (rho = −0.10, $p < 0.001$; rho = −0.07, $p = 0.01$, respectively).

Younger respondents expressed more worry about loss of access to necessities, loss of access to medication, loss of job, and loss of financial stability due to the coronavirus (age and worry item rho = −0.21, −0.18, −0.30, −0.24, respectively; all $p < 0.001$) but there were no associations of age with worry about contracting the virus or becoming seriously ill because of it (rho = −0.02, $p = 0.39$; rho = 0.03, $p = 0.29$; respectively).

TABLE 3 | Means, standard deviations, ranges, and correlations with confidence intervals.

Variable	1	2	3	4
1. Age				
2. Prior adversities	−0.07** [−0.12, −0.02]			
3. Autonomic reactivity	−0.23** [−0.27, −0.18]	0.60** [0.57, 0.63]		
4. Depression symptoms (Binary)	−0.26** [−0.31, −0.22]	0.28** [0.24,0.33]	0.41** [0.37, 0.45]	
5. PTSD symptoms (Binary)	−0.27** [−0.31, −0.22]	0.40** [0.36, 0.44]	0.51** [0.47, 0.55]	0.54** [0.50, 0.57]

*Values in square brackets indicate the 95% confidence interval for each correlation coefficient. *p < 0.05. **p < 0.01.*
Correlations between continuous variables are calculated using Pearson's correlation coefficient and those including binary variables are point-biserial correlations.

COVID-Related Worry Measurement Model

Modeling began with establishing a COVID-19 worry using a reflective measurement model. In this model, each worry indicator has a unique influence independent of others and is also influenced by a general worry latent factor (69). Modification indices supported the need for free co-variances between (a) worry about infection and worry about becoming seriously ill and (b) worry about losing one's job and becoming less financially stable (i.e., these paths were not constrained to 0). These appeared to reflect the added correlation of infection-related and income-related worries and could thus be justified as modifications to the model. When these covariances were included, the measurement model fit the data well ($\chi 2 = 12.264$, df = 7, CFI = 1.000, TLI = 1.000; **Figure 1A**).

Model Building

Modeling proceeded by conducting individual tests of mediation for each outcome variable–PTSD symptoms, depression symptoms, and COVID-19-related worry.

First, joint variable distributions of adversity history, self-reported autonomic reactivity, and PTSD symptoms were examined. Formal testing supported the mediation of autonomic reactivity between adversity history and PTSD symptoms (standardized indirect effect = 0.340 [95% CI: 0.291, 0.390], standardized total effect = 0.532 [95% CI: 0.462, 0.602]; **Figure 1B**). Second, key variable relations with depression symptoms were examined. Formal testing supported the mediation of autonomic reactivity between adversity history and depression symptoms (standardized indirect effect = 0.293

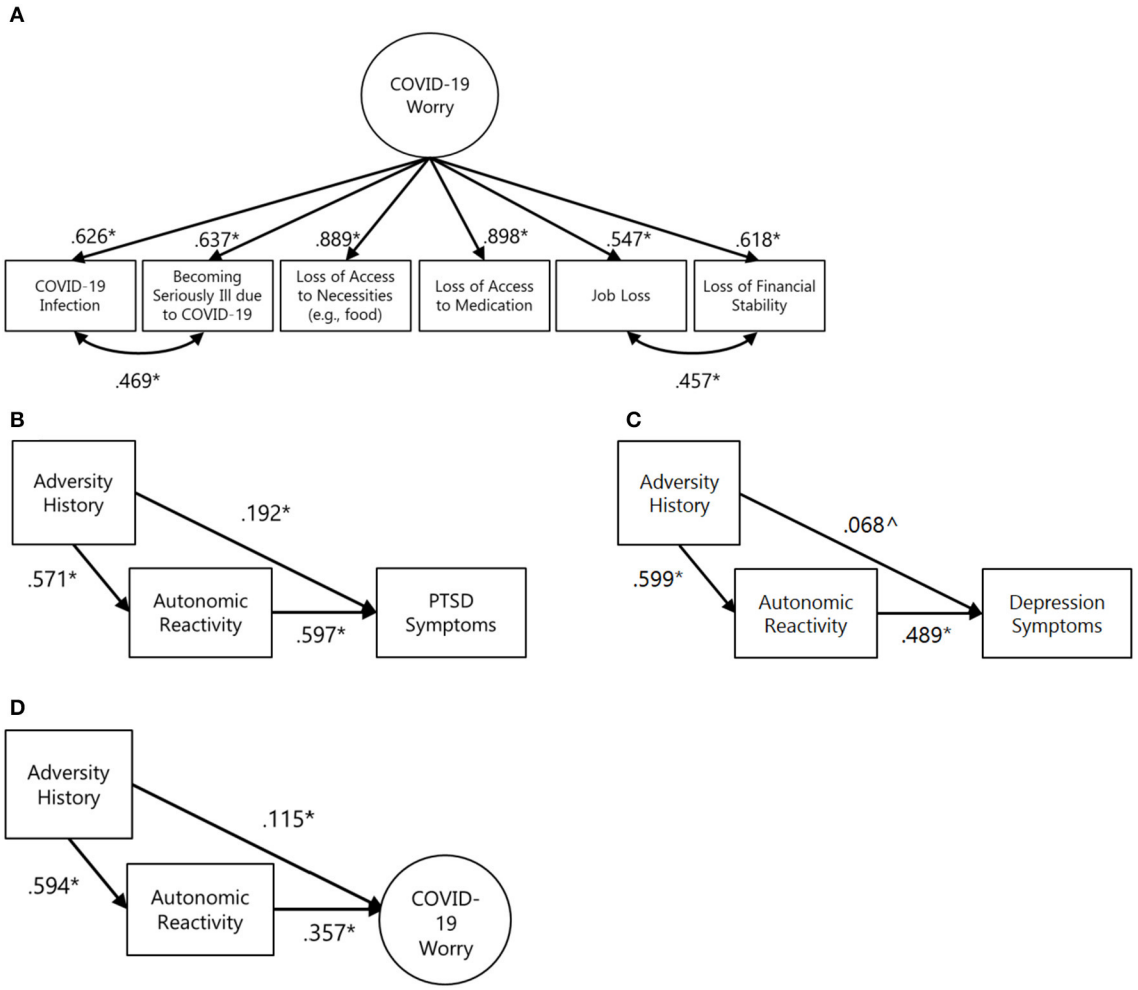

FIGURE 1 | COVID-19 worry measurement model and preliminary, unadjusted mediation models for individual predictors. In all figures: $^*p < 0.05$, $^p < 0.10$. **(A)** COVID-19 worry measurement model. Model fit indices: $\chi 2 = 12.264$, df = 7, RMSEA = 0.021 [90% CI: 0.000, 0.041] CFI = 1.000 TLI = 1.000 **(B)** Unadjusted mediation test for PTSD symptom outcome with standardized coefficients. Model fit indices not available due to model saturation. Standardized indirect effect = 0.340 [95% CI: 0.291, 0.390], standardized total effect = 0.532 [95% CI: 0.462, 0.602]. **(C)** Unadjusted mediation test for depression symptom outcome with standardized coefficients. Model fit indices not available due to model saturation. Standardized indirect effect = 0.293 [95% CI: 0.244, 0.342], standardized total effect = 0.361 [95% CI: 0.296, 0.429]. **(D)** Unadjusted mediation test for COVID-related worry outcomes with standardized coefficients. $\chi 2 = 27.045$, df = 17, RMSEA = 0.019 [90% CI: 0.000, 0.032] CFI = 1.000 TLI = 1.000. Standardized indirect effect = 0.212 [95% CI: 0.160, 0.266], standardized total effect = 0.327 [95% CI: 0.264, 0.385].

[95% CI: 0.244, 0.342], standardized total effect = 0.361 [95% CI: 0.296, 0.429]; **Figure 1C**). Third, key variable relations with COVID-related worry was examined. The extent of worry was positively associated with autonomic reactivity ($r = 0.357$). As above, formal testing supported the mediation of autonomic reactivity between adversity history and COVID-related worry (standardized indirect effect = 0.212 [95% CI: 0.160, 0.266], standardized total effect = 0.327 [95% CI: 0.264, 0.385]; **Figure 1D**).

The three mediation models were combined to test the independence of effects, with gender and age included as exogenous predictors of adversity history, autonomic reactivity, and all outcome variables. Due to small numbers of respondents who identified as non-binary or transgender ($n = 14$), only male and female effects could be included in the model. Model results are presented in **Figure 2**. All outcome variables were positively correlated, with the strongest association being between PTSD and depression symptoms ($r = 0.537$). Adjusting for age, gender, and the mutual associations between outcome variables, formal testing supported the mediation of autonomic reactivity in the link between adversity history and PTSD symptoms, depression symptoms, and COVID-19-related worry (**Figure 3**). Inclusion of household income in sensitivity analyses did not substantively affect the pattern of results.

DISCUSSION

This cross-sectional survey study focused on a large general sample of US residents and the factors that may influence patterns of mental health in response to the coronavirus pandemic. It examined the potential impact of adversity (i.e., childhood adversity/maltreatment, intimate partner

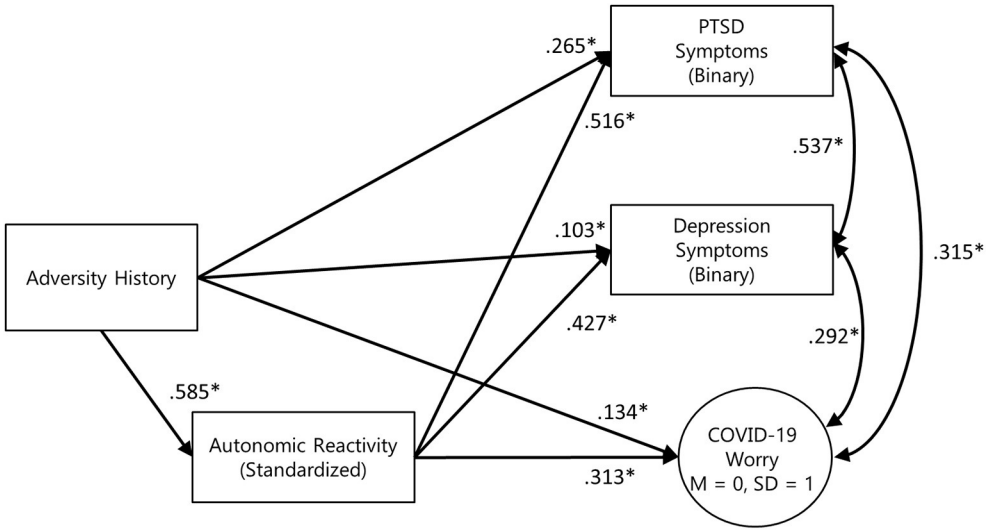

FIGURE 2 | Simplified final model diagram of the 3-outcome mediation model, adjusted for age and sex. Model fit indices: $\chi 2 = 216.853$, df = 37, RMSEA = 0.056 [90% CI: 0.049, 0.063] CFI = 0.994 TLI = 0.994. PTSD symptom standardized indirect effect = 0.301 [95% CI: 0.251, 0.354], standardized total effect = 0.558 [95% CI: 0.476, 0.631]. Depression symptom standardized indirect effect = 0.250 [95% CI: 0.202, 0.303], standardized total effect = 0.353 [95% CI: 0.283, 0.423]. COVID-19 worry standardized indirect effect = 0.183 [95% CI: 0.130, 0.237], standardized total effect = 0.318 [95% CI: 0.255, 0.383].

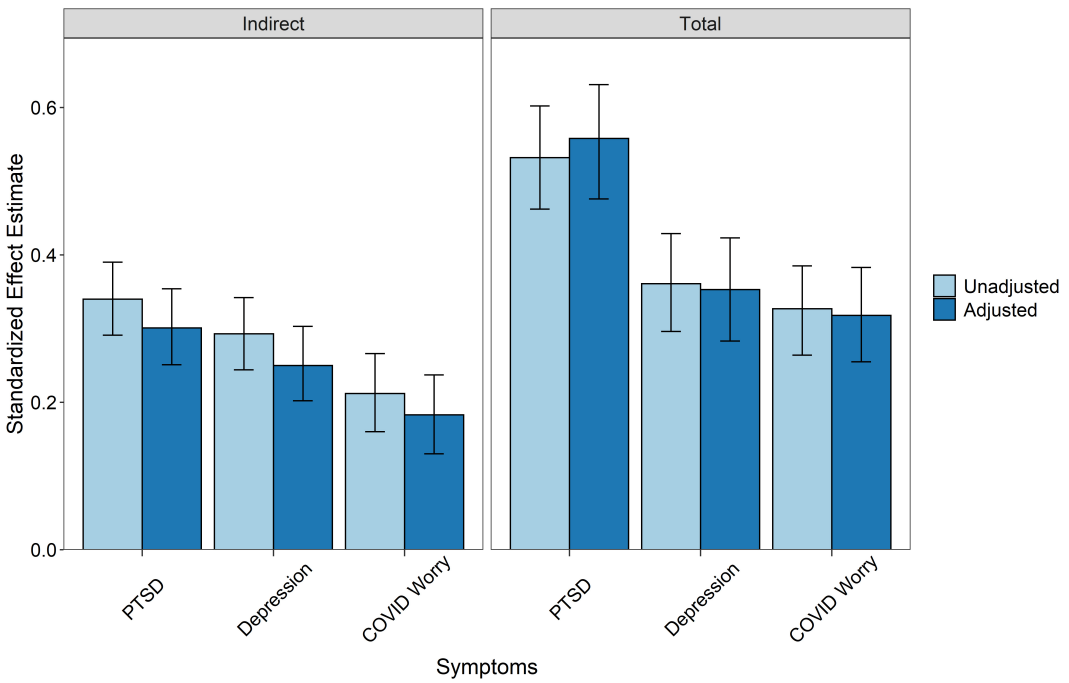

FIGURE 3 | Indirect and total effects from mediation models with 95% confidence intervals. Indirect effects represent the mediation strength of the adversity -> self-reported autonomic reactivity -> outcome pathway. The total effects are the sum of direct and indirect effects in the models. Unadjusted models are calculated using the paths between the three key variables only. Unadjusted estimates for the PTSD model: Standardized indirect effect = 0.340 [95% CI: 0.291, 0.390], standardized total effect = 0.532 [95% CI: 0.462, 0.602]. Unadjusted estimates for the depression model: Standardized indirect effect = 0.293 [95% CI: 0.244, 0.342], standardized total effect = 0.361 [95% CI: 0.296, 0.429]. Unadjusted estimates for the COVID-19 worry model: Standardized indirect effect = 0.212 [95% CI: 0.160, 0.266], standardized total effect = 0.327 [95% CI: 0.264, 0.385]. Adjusted models include all outcome variables with gender and age covariates. PTSD symptom standardized indirect effect = 0.301 [95% CI: 0.251, 0.354], standardized total effect = 0.558 [95% CI: 0.476, 0.631]. Depression symptom standardized indirect effect = 0.250 [95% CI: 0.202, 0.303], standardized total effect = 0.353 [95% CI: 0.283, 0.423]. COVID-19 worry standardized indirect effect = 0.183 [95% CI: 0.130, 0.237], standardized total effect = 0.318 [95% CI: 0.255, 0.383].

maltreatment, life-threatening events, and sudden losses) and self-reported autonomic reactivity. The results support the hypothesis that self-reported autonomic reactivity was related to previous adversity and current mental health. Destabilized autonomic reactivity scores were higher in respondents that reported experiencing more prior adverse events, and those who met the symptom criteria for depression and/or PTSD.

This study suggests that prior adversity history is a risk factor for mental health and worry during the COVID-19 pandemic, and that these effects are mediated by autonomic dysregulation. To our knowledge, this is the first study to examine the link between adversity history, autonomic reactivity, and a large-scale external stressor such as a pandemic. Adjusting for age, gender, and the mutual associations between outcome variables, formal testing supported the mediation of autonomic reactivity in the link between prior adversity and PTSD symptoms, depression symptoms, and COVID-19-related worry. These findings are consistent with Polyvagal Theory and previous research suggesting that individuals who experience adversity are at increased risk of developing chronic and sensitized threat responses to new challenges (27, 32). They are also consistent with research suggesting that autonomic dysregulation is a linking component that is found in a range of clinical conditions including anxiety (70), disorders of impulse control (71), borderline personality disorder (72), and PTSD (73). The mechanism in this study may also be related to neuroticism, a relatively stable tendency to respond to events with negative emotions and lability, which appears to increase risk of mental health disorders (74). Sensitized or chronic autonomic threat reactions may influence long term patterns of emotional responses toward negativity. There is some evidence of dampened parasympathetic regulation and sensitized physiological reactivity in those who fit a neurotic profile (75, 76) though this connection has been understudied in the context of adversity history and responses to prolonged external danger.

Although the current study does not focus on a clinical sample, the result suggesting that autonomic reactivity may be a mechanism linking adversity and psychological function may have implications for mental health intervention and prevention strategies. These results point to the brain-body threat-response circuits that impact physical, emotional, and cognitive function, suggesting that improving their regulation during a crisis may be a promising target for improving mental health and worry. Thus, it may be beneficial for research to examine how therapeutic strategies for dampening chronic threat responses and improving safety-related regulation as part of trauma interventions can help individuals whose nervous systems are biased toward mobilization and/or shut down. These safety-focused strategies could help with the stabilization that is needed prior to attempting other approaches, especially those involving exposure therapy.

Our results are consistent with clinical insights that individuals experiencing mental health symptoms may benefit from interventions with bottom-up approaches focused on the affect and feelings within the body [i.e., body-based or sensorimotor; (77)]. These approaches (e.g., sensorimotor psychotherapy and relaxation training) use interoception techniques (i.e., the noting of sensations, discomforts, pain, tension, pleasurers, and cues) to increase positive feelings toward physical sensations and help with integrating sensations and body regulation (78). Interventions including yoga (79), mindfulness-based stress reduction (80), and biofeedback (81) have been shown to reduce threat-responsive autonomic reactivity and have benefits for mental health. Additional research should explore their use as a therapeutic method or as part of a multi-method intervention to assist with coping during large scale crises such as the COVID-19 pandemic.

In addition, laboratory studies have shown that social connections can inhibit threat responses and promote affiliative safety states (82, 83). The social distancing and isolation strategies put in place by government mandates and individual decisions to reduce the spread for the COVID-19 virus may be detrimental if they decrease opportunities for co-regulation with others to reduce the impacts of threat response reactivity. This suggests that research into the promotion of opportunities for socioemotional connections during times of physical distancing is an important target to improve understanding of how clinicians can support coping mechanisms and help clients regulate threat responses.

Limitations

This study is not without limitations, including the use of social media for online data collection. To reduce the data bias, procedures were followed to evaluate data quality using a combination of attention checks and statistically or logically implausible response patterns. Given the social media sampling strategy, this study was not designed to assess nationally representative prevalence rates, though the relations between variables are consistent with prior literature based on objective measures, experimental methods, and prospective designs. The strength of the cross-sectional design selected for this study is the ability to rapidly collect data using validated measures to provide a picture of responses during the first months of the pandemic.

Another limitation relates to the use of self-report measures. Retrospective reporting of prior adverse events may induce bias both toward over- or under-reporting, which can contribute to decreasing reliability and validity of measurement (84) and bias the associations of self-reports compared to objective reports (85). However, the strengths of adversity self-reports include sensitivity for events that may not have been captured by prospective measures, such as the low documentation of sexual abuse in official records (85). In addition, the psychometric properties of the COVID-19 worry measure have not yet been examined in other datasets. The measure was created by a team of researchers and clinicians to address pressing needs at a time when no validated measure was available. The measurement model described in this study provides a starting point for additional psychometric study in the future. Follow up studies will need to examine test-retest reliability, validity, and whether the factor structure of worry is consistent across samples.

Further, due to single time point design it is unknown if the participants were already experiencing symptoms of PTSD, depression, and economic worry prior to the pandemic. Objective autonomic monitoring and prospective longitudinal designs are

needed to support the findings reported here, and to better establish temporal precedence. However, the results presented here are consistent with longitudinal data that show adverse experiences reported prior to the onset of the pandemic are a predictor of emotional distress (39). Thus, there is a need for prospective longitudinal research that allows for a better understanding about how changes in mental health relate to autonomic reactivity and regulation. Future research should also address the contributions of cognitive processes, such as posttraumatic growth and worldview, which are affected by adversity.

CONCLUSION

The autonomic nervous system (ANS) integrates brain-body threat responses. Prior adversity may sensitize individuals toward autonomic threat responses that increase risk of mental health and worry during crises such as the COVID-19 pandemic. In light of prior literature that shows the ANS to be sensitive to context and a useful therapeutic target, the results support the need for research on whether reduction of bio-behavioral threat responses and improvement of safety-related autonomic function could be effective treatment strategies, particularly during chronic, uncontrollable stressors.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Indiana University Institutional Review Board. The ethics committee waived the requirement of written informed consent for participation.

AUTHOR CONTRIBUTIONS

JK conceptualized the study, conducted analysis and interpretation of data, and wrote the first draft of the manuscript. LD conceptualized the study, interpreted data, and contributed to writing. EN and OR conducted analysis, contributed to interpretation of data, and contributed to writing. GL and SP conceptualized study, conducted data interpretation, and contributed to writing. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2020.577728/full#supplementary-material

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Rapid Review and Meta-Meta-Analysis of Self-Guided Interventions to Address Anxiety, Depression, and Stress During COVID-19 Social Distancing

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We conducted a rapid review and quantitative summary of meta-analyses that have examined interventions which can be used by individuals during quarantine and social distancing to manage anxiety, depression, stress, and subjective well-being. A literature search yielded 34 meta-analyses (total number of studies k = 1,390, n = 145,744) that were summarized. Overall, self-guided interventions showed small to medium effects in comparison to control groups. In particular, self-guided therapeutic approaches (including cognitive-behavioral, mindfulness, and acceptance-based interventions), selected positive psychology interventions, and multi-component and activity-based interventions (music, physical exercise) showed promising evidence for effectiveness. Overall, self-guided interventions on average did not show the same degree of effectiveness as traditional guided individual or group therapies. There was no consistent evidence of dose effects, baseline differences, and differential effectiveness of eHealth interventions. More research on the effectiveness of interventions in diverse cultural settings is needed.

Keywords: COVID-19, meta-analysis, self-guided interventions, depression, anxiety, culture, stress, subjective well-being

IMPACT STATEMENT

Social distancing measures are effective in reducing viral spread in the current COVID-19 pandemic but have been shown to increase mental health burdens. These collateral effects are affecting large numbers of individuals globally, requiring urgent attention because of the strains on mental health providers struggling to provide adequate support for people in need. Although there are many self-help guidelines available online and via social media, it is unclear how effective these are. We provide a quantitative review of evidence-based practices that can be used by individuals at home or in confined physical environments during social distancing and quarantine to manage anxiety, depression, and stress. Given the likely continuation of social

distancing measures in various parts of the world and shortages in mental health systems globally, our systematic review provides evidence on effective self-guided interventions, either as an initial stand-alone self-help intervention or while waiting for treatment.

INTRODUCTION

What strategies can an individual adopt to maintain good mental health and reduce anxiety and stress during quarantines and physical distancing? Quarantines are psychologically taxing (Brooks et al., 2020), yet quarantines and physical distancing are core behavioral strategies for containing the spread of communicable diseases such as COVID-19. Levels of depression, anxiety, and psychological stress tend to be significantly elevated and can reach clinical levels in both disease survivors as well as the general population during pandemics. For example, Reynolds et al. (2008) reported that over 40% of quarantined Canadians in their sample reported high levels of worry. In the context of the COVID-19 pandemic, Wang et al. (2020) found that 28% of Chinese respondents reported clinically relevant levels of anxiety. Across both studies, over 50% of the sample indicated moderate to high levels of stress. The long-term psychological consequences of quarantine can last for months or possibly years (Brooks et al., 2020; Ho et al., 2020). The current COVID-19 (SARS-CoV-2) pandemic is affecting individuals globally at an unprecedented scale. Although widespread physical distancing measures appears effective in mitigating the spread of COVID-19 (Milne and Xie, 2020), the psychological ramifications of social distancing may result in increased levels of mental health problems in the near-term future.

Public mental health resources are finite, and the mental health services currently available are unlikely to cope with the emerging demands (Dong and Bouey, 2020; Duan and Zhu, 2020; Xiang et al., 2020). Addressing mental health needs within a physical distancing context is critical, given the possibility of continued movement restrictions in the near future to combat repeated outbreaks of SARS-CoV-2 (Kissler et al., 2020). To bolster available mental health services, while also reducing the likelihood of virus transmission, there has been a recent drive to convert usual face-to-face mental health treatments into an online or tele-health format.

However, while such modifications are no doubt vital, they represent only one building block of an organized mental health response, particularly when dealing with a pandemic such as COVID-19. Furthermore, even with increased use of tele-health measures by mental health providers, the shortage of trained professionals coupled with the increased demand on public health services highlights the need for effective and evidence-based self-guided therapeutic interventions (Duan and Zhu, 2020). The "*World Health Organization Service Organization Pyramid for an Optimal Mix of Services for Mental Health*" highlights self-care approaches (actions taken by individuals to improve their well-being) as an essential component of optimal mental health care (World Health Organization, 2003). In order to promote resilience and to appropriately manage the emerging mental health impacts of the ongoing COVID-19 pandemic, it is necessary to identify effective self-guided approaches to manage the psychological demands experienced during such outbreaks. Self-guided interventions can provide a first point of intervention for concerned individuals to alleviate anxieties, stress and worries, decrease negative mood and depressive symptoms, and increase positive psychological functioning and subjective well-being, either as a stand-alone intervention or while waiting for treatment. Although there are many self-help guidelines available online and via social media, it is unclear how effective these are and how well they are grounded in scientific evidence.

The goal of our rapid review is to provide a broad summary of the current evidence drawn from published meta-analyses in order to evaluate the effectiveness of self-guided therapeutic practices which can be implemented by individuals on their own, including during physical distancing and quarantine measures. We focused on published meta-analyses of randomized controlled trials (RCT) or experimental studies that evaluate the effectiveness of psychological interventions and strategies for a range of psychological outcomes. In particular, we focus on increasing subjective well-being (including life satisfaction, quality of life, happiness), and decreasing anxiety, depression, or stress as key outcomes. Critically, we screened all meta-analyses identified by our search parameters, but only summarize evidence from those meta-analyses which included self-guided conditions which can be performed by individuals alone without the guidance of trained health professionals. Our meta-analysis is more inclusive in scope because previous meta-analyses have: (a) typically focused on either a specific type of intervention or compared a small number of interventions without considering the wider range of possible interventions that might be beneficial; or (b) did not specifically consider the relevance and evidence of self-guided practices that could be performed by individuals alone. Thus, our primary aim is to provide a comparative summary of the available evidence of diverse psychological strategies that can inform recommendations by public health workers and psychologists, as well as be made available to the larger public. The COVID-19 pandemic affects populations of all nations, but interventions are often conducted with Western, industrialized and individualistic samples (Henrich et al., 2010), requiring more attention to cultural differences in effectiveness. We therefore evaluated whether the meta-analyses included in this review reported differences in treatment effectiveness for individuals from different cultural backgrounds. We focus on interventions that might be applicable in the current pandemic (and beyond), but explicitly stress that our data is not based on interventions conducted during the current COVID-19 pandemic. In order to provide actionable advice, we provide an electronic supplement containing selected self-guided exercises based on evidence gathered in this review. These exercises and tasks were selected with attention to possible applications across different cultural and economic contexts.

METHOD

We performed a PsycInfo and MedLine search on March 22, 2020 to identify meta-analyses that have summarized RCTs or experimental studies that report the effectiveness of interventions on anxiety, depression, stress, or subjective well-being in human

populations. The exact search terms and their combination are listed in **Appendix A**. The inclusion criteria for our review were: (a) quantitative meta-analysis of RCTs or experimental studies; (b) conducted with general populations, clinical or non-clinical samples, or samples selected for anxiety or depression symptoms; (c) the sample was on average 18 years or older; (d) measures of anxiety, depression, stress, or subjective well-being were included; (e) the meta-analysis included interventions that are self-guided or could be used by individuals without supervision or guidance by a trainer, therapist, or mental health professional; and (f) reported sufficient information on effect sizes. Where available, relevant moderator conditions were also extracted for further analysis. We decided to include anxiety and depression clinical samples due to the reported increase of anxiety and depression during quarantines (Brooks et al., 2020). The exclusion criteria for our review were: (a) clinical or patient populations other than individuals or groups with clinical anxiety and depression symptoms; (b) meta-analyses of group-based interventions; (c) meta-analyses of individual therapies or interventions led by or supervised/assisted by another person; (d) meta-analyses that did not clearly report on conditions in criteria a-c; (e) meta-analyses focusing exclusively on children or adolescents; (f) systematic reviews; (g) meta-analyses of cross-sectional or correlational studies; and (h) not published in a peer-reviewed English language journal. Regarding group and clinician-led interventions, we included meta-analyses if the authors tested delivery and application effects and found no significant differences between self-guided and other applications. If a meta-analysis examined those differences and reported differential effects for self-guided interventions, we only included those effect sizes relevant for self-guided interventions.

We identified a substantial number of meta-analyses which examined the effectiveness of specific interventions, particularly for contemporary therapeutic approaches such as mindfulness and acceptance and commitment therapy (e.g., Hayes et al., 2012). Using all eligible meta-analyses may mean that identical primary studies might be included in a series of meta-analyses, leading to potential double-counting and duplication of effect sizes that would bias the overall patterns. To overcome this problem, we adopted the following strategies. First, we screened meta-analyses in a reverse temporal order, starting with the most recent meta-analyses per category. We then identified overlap in included primary studies between subsequent meta-analyses per outcome variable. If there was a 50% overlap or larger between two meta-analyses for a specific outcome variable, we included only the meta-analysis with the larger sample size. We still examined smaller meta-analyses to check if they reported moderator analyses of interest for our purposes, particularly the effectiveness of self-guided vs. other-guided or group interventions and differences in effectiveness between different cultural samples. As not all meta-analyses provided estimates for each of the outcomes of interest in this review, we repeated this process for each outcome variable. See **Figure 1** for a PRISMA diagram of the selection process.

META-META-ANALYSIS APPROACH

We present the average effect size and 95% confidence interval as reported in the original meta-analyses in the form of a forest plot. The most common effect sizes are variations of the standardized mean difference (typically d or g), therefore, we use these metrics for plotting the effects. If no confidence interval was reported, only the mean effect size is displayed.

However, this visual display does not easily allow a statistical summary of the overall effect sizes. Therefore, we converted standardized mean differences into r and then z-transformed r (Rosenthal, 1991). As expected, the transformed effect size and the original effect size correlated $r = 1.0$. Inverse variance weights were calculated from sample sizes. If only the overall sample size was available, we used the average sample size per study to estimate sample sizes for subgroups. The average effect sizes per intervention category were computed using rma with REML estimation in the metafor package in R (Viechtbauer, 2010). We report the unstandardized regression weights.

RESULTS

Participant Characteristics

Our sample of meta-analyses included 34 meta-analyses (total number of studies $k = 1{,}390$, $n = 145{,}744$). The majority of meta-analyses included general population samples, including working adults (meta-analysis $k = 16$). The second largest sample group were mixed general population and clinical samples (meta-analysis $k = 11$). Purely clinical samples were included in 4 meta-analyses and students were the primary population in 3 meta-analyses. All but one meta-analysis (Dickens, 2017) exclusively focused on adult populations. Only 5 meta-analyses explicitly reported and tested cross-cultural differences.

Qualitative Review of Published Meta-Analyses

We used two approaches to evaluate the relative effectiveness of self-guided interventions. First, we used Cohen (1988) effect size benchmarks to specify small ($d = 0.2$), medium ($d = 0.5$), and large ($d = 0.8$) effect sizes of standardized mean differences. This first allows us to assess the overall effectiveness of self-guided interventions compared to control interventions (typically, waitlist, or active control groups). Second, we compared the overall effect sizes of self-guided interventions against effectiveness benchmarks of traditional clinician-guided psychotherapy for reducing depression symptoms (Cuijpers et al., 2020). The overall effect size of traditional clinician-guided psychotherapy on depression was $g = 0.72$ ($k = 385$), with Cognitive-Behavioral Therapy (CBT) showing an effectiveness of $g = 0.73$ ($k = 205$); Behavioral Activation Theory $g = 1.05$ ($k = 21$), and third-wave therapies (including Acceptance and Commitment Therapy [ACT] and Mindfulness-Based Interventions [MBI]) an effectiveness of $g = 0.85$ ($k = 19$).

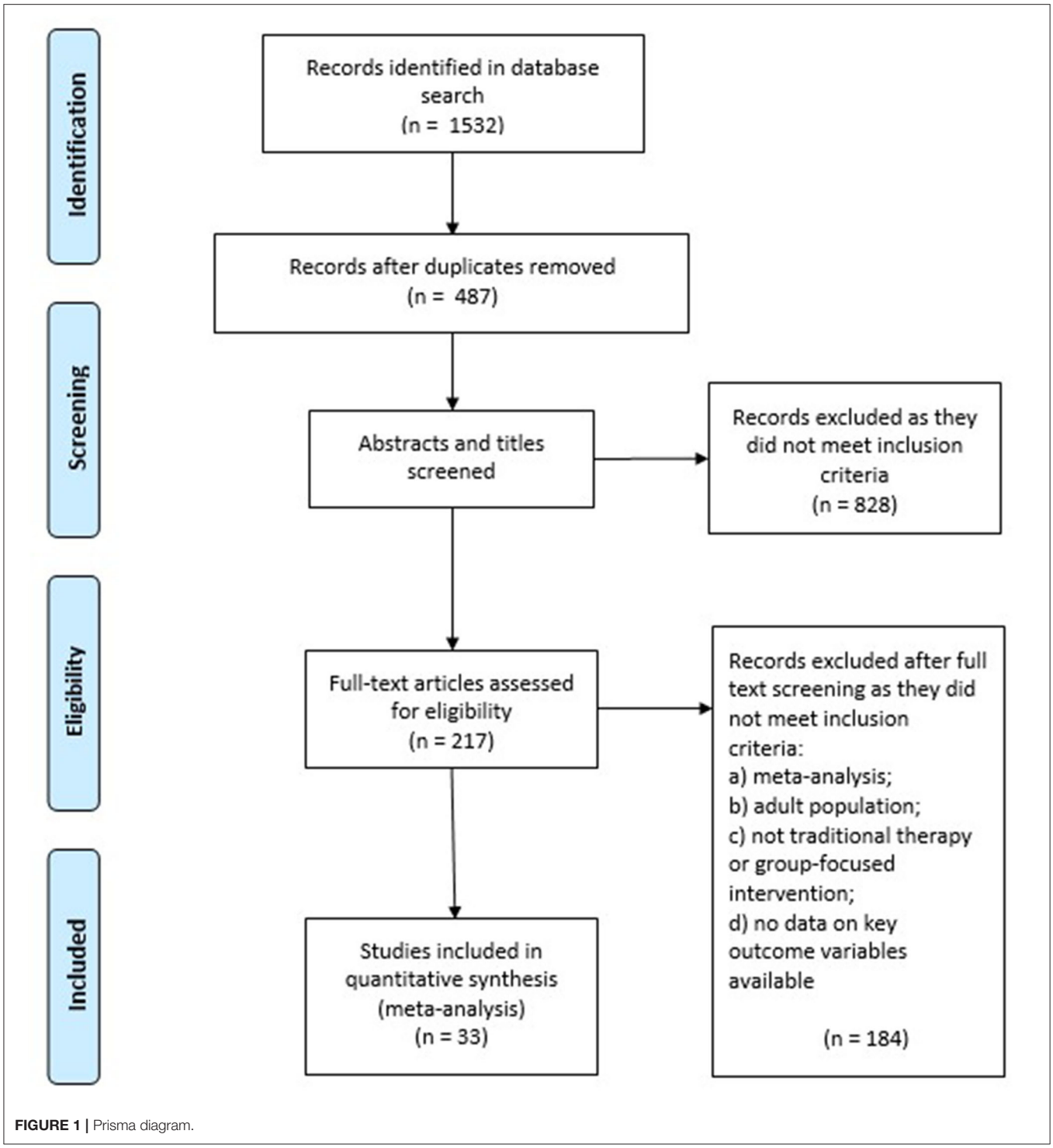

FIGURE 1 | Prisma diagram.

Effectiveness Across Types of Self-Guided Interventions

Table 1 shows an overview of the meta-analyses included in this review. The large majority of psychological intervention meta-analyses that were eligible to be included in our review consisted of meta-analyses of clinical psychology therapy-derived interventions ($k = 17$), which encompass self-guided CBT, ACT, and MBI, as well as diverse Positive Psychology-based interventions ($k = 8$).

TABLE 1 | Overview of meta-analytical findings.

Article	Population	Type of interventions	Control groups	Data quality	Data base *n* (*k*)	Evidence of effectiveness of self-guided interventions	Effect sizes	Dose effects	Base line effects	Cultural differences
Blanck et al. (2018)	Primarily student	Mindfulness (guided; audio-tapes)	CT and RCT with active and inactive controls	Tulder Quality Assessment scale mean = 5.59 (SD = 1.56); 10 studies had high quality, 5 studies judged low quality (out of 18); Evidence of publication bias (funnel plot, Egger regression)	$n = 1,150$ ($k = 18$)	No significant difference between guided and self-administered interventions	Anxiety: $g = 0.39$ [0.22, 0.56] (Overall compared to inactive), $g = 0.27$ [0.03, 0.50] (Overall compared to active); Depression: $g = 0.41$[0.19, 0.64] (Overall compared to inactive), $g = 0.27$[−0.04, 0.58] (Overall compared to active)	Practice time and duration of individual sessions did not show significant effects	NA	NA
Cavanagh et al. (2014)	General population	Self-help mindfulness and acceptance-based interventions	RCT with active and inactive control	Jadad score: on average medium quality; publication bias for anxiety, but not depression (funnel plot)	$n = 2,286$, ($k = 15$)	Guided interventions show larger effect (*post-hoc* analysis)	Anxiety: $g = 0.34$ [0.10, 0.57], Depression: $g = 0.37$ [0.19, 0.56]	Self-help interventions: The mindfulness and/or acceptance components resulted in a significantly higher level of mindfulness/acceptance skills and significantly lower levels of anxiety and depressive symptoms than control conditions, with small to medium effect sizes	NA	NA
Chu and Mak (2020)	Clinical and general population	Mindfulness (including meditation, Loving-kindness)	RCT with active and inactive control	RCTs showed medium quality on average. Higher-quality studies showed significantly smaller ES's. Evidence of publication bias (Egger regression)	$n = 912$ ($k = 11$, RCT's only)	Online studies showed higher ES than group (but small number of valid comparisons)	SWB (Satisfaction with life): $g = 0.53$ [0.26, 0.80] (RTCs)	NA	No difference between clinical and general populations	No significant difference between regions (North America; Europe/Australia; Asia; other)
Conn (2010)	General population	Physical activity	Experimental studies (including quasi-experiments and pre-post comparisons)	Random assignment shows significantly smaller effects	Control group designs: $n = 1,081$ ($k = 22$); Pre-post design: $n = 3,420$ ($k = 45$)	Individual vs. group training not significantly different	Depression: $d = 0.52$ [0.28; 0.77] for control group designs; $d = 0.47$ [0.38; 0.56] for pre-post designs	home exercise less effective than fitness center; more training per week less effective; shorter trainings more effective	NA	NA
Cregg and Cheavens (2020)	Clinical and general population	Gratitude	RCT with active and inactive control	Cochrane: majority of studies was classified as medium to high risk of bias; bias rating did not significant moderate ES overall (studies where participants were aware of condition had larger pooled ES compared to blinded/insufficient information studies); all outcomes are adjusted for unreliability. Possibility of publication bias (larger ES with smaller *n*)	$n = 3,675$ ($k = 27$)	No difference between online vs. offline activities	Anxiety: $g = -0.16$ [−0.38, 0.05]; Depression: $g = -0.17$ [−0.24, −0.10] (outliers excluded)	Duration (days, weeks) and compliance do no moderate ES	Level of depression does not moderate ES	NA

(Continued)

TABLE 1 | Continued

Article	Population	Type of interventions	Control groups	Data quality	Data base *n* (*k*)	Evidence of effectiveness of self-guided interventions	Effect sizes	Dose effects	Base line effects	Cultural differences
Cuijpers et al. (2011)	Clinical samples	Self-guided interventions (mainly CBT)	RCT with active and inactive control	Cochrane: acceptable level of bias (but no blinding); no evidence of publication bias (Egger regression)	n =1,362 (k = 7)	Self-guided interventions are effective compared to control; personal contact vs. complete self-help did not moderate effect size	Depression: d = 0.28 [0.14; 0.42]	NA	NA	
Curry et al. (2018)	General population	Kindness (other focused; excluding loving-kindness)	Experimental studies	No quality rating; no evidence of publication bias (funnel plot)	n = 4,045 (k = 27)	NA	SWB: d = 0.28 [0.16, 0.41]	NA	No differences between socially anxious and other populations	NA
Davies et al. (2014)	Clinical and non-clinical samples	Multicomponent online interventions	RCT with active and inactive control	Cochrane: Moderate quality on average	n = 1,480 (k = 17)	NA	Inactive control: Anxiety: g = −0.56 [−0.77; −0.35]; Depression: g = −0.43 [−0.63; −0.22]; Stress: g = −0.73 [−1.27; −0.19] Active control: Anxiety: g = −0.18 [−0.98; 0.62]; Depression: g = −0.28 [−0.75; −0.20]; Comparison intervention: Anxiety: g = −0.10 [−0.39; −0.18]; Depression: g = 0.33 [−0.43; 1.09]	NA	NA	NA
de Witte et al. (2019)	General population	Music activities and music therapy	RCT with active and inactive control	Quality rated and no evidence of publication bias (funnel plot)	n = 6,800 (k = 79)	No significant difference between music therapy and self-guided music activities	Anxiety: g = 0.55; Stress: g = 0.51	No effect of frequency or duration	No differences between surgery, non-medical, or polyclinical procedures	No difference between Western or Non-Western samples
Deady et al. (2017)	General population	eHealth (8 CBT; 1 ACT, 1 self-help emails)	RCT with active and inactive control	Downs and Black checklist: Fair to good quality; no evidence of publication bias (Egger regression)	n = 4,522 (k = 10)	NA	Anxiety: d = 0.31 [0.10; 0.52]; Depression: d = 0.25 [0.09; 0.41]	NA	No difference between general and indicated/selected populations	NA
Dickens (2017)	General population (including children)	Gratitude	Experimental (including quasi-experimental), comparing gratitude to neutral, negative, and positive intervention	NA. Evidence that negative interventions (focusing on hassles etc.) produce significantly larger ES	n = 3,351 (k = 38)	NA	Gratitude vs. Neutral: Depression: d = 0.13; SWB (life satisfaction): d = 0.17; Stress: d = 0.04; Gratitude vs. Positive: Depression: d = 0.02; SWB (life satisfaction): d = 0.03; Stress: d = −0.03	NA	NA	NA
Firth et al. (2017)	Clinical and non-clinical samples	eHealth	RCT with active and inactive control	Cochrane: most show lack of blinding; No evidence of publication bias (funnel plot)	n = 3,414 (k = 18)	eHealth interventions with "in-person" (i.e., human) compared to without feedback had small, non-significant effects on depressive symptoms; in-app feedback applications showed slightly greater ES compared to no in-app feedback; self-contained smartphone apps showed slightly larger ES compared to non-self-contained interventions (p = 0.07)	Inactive control: Depression: g = 0.56 [0.38; 0.74]; Active control: g = 0.22 [0.10; 0.33]	Length (in weeks) showed a trend to reduce effectiveness	Mild-to-moderate depressive groups showed larger improvement; no significant ES for samples with major depressive disorder, bipolar disorder, and anxiety disorders (but possible lack of power)	NA

(Continued)

TABLE 1 | Continued

Article	Population	Type of interventions	Control groups	Data quality	Data base *n* (*k*)	Evidence of effectiveness of self-guided interventions	Effect sizes	Dose effects	Base line effects	Cultural differences
Frattaroli (2006)	Clinical and general population	Expressive writing	RCT with neutral or waitlist control	Mean quality rating = 2.94 (scale 0–4); higher quality studies show smaller psychological health effect (strongest impact for participant expectation of study benefit); larger *n* was associated with weaker effects (possible publication bias)	$n = 8,533$ ($k = 112$)	Larger ES when expressive writing was conducted at home and in private settings	Anxiety: $r = 0.03$ [−0.09; 0.19]; Depression: $r = 0.04$ [−0.11; 0.16]; SWB: (Satisfaction with life) $r = 0.03$ [0.01; 0.08]; Stress $r = 0.02$ [−0.02; 0.08]	Trend for larger ES with more than 3 sessions; no effect of length of disclosure or spacing of sessions	Studies with participants with a history of trauma or stressors did not moderate ES; writing about more recent trauma showed stronger effect	No effects for proportion of ethnic minorities
Heekerens and Eid (2020)	General population	Positive psychology intervention (best-possible-self intervention)	RCT with active control group	Cochrane:	$n = 4,462$ ($k = 34$)	NA	Depression: $g = -0.09$ [−0.23; 0.06]; SWB (Life satisfaction): $g < 0.01$ [−0.09; 0.09]	NA	NA	NA
Hendriks et al. (2018)	Clinical and non-clinical samples	Positive psychology interventions	RCT with active and inactive control	Cochrane: mean quality score 1.79 on 0–6 scale	n= 3,009 ($k = 28$)	Self-guided interventions showed no effect (compared with group studies, but difference not significant)	Anxiety: $g = 0.95$ [0.28; 1.61]; Depression: $g = 0.62$ [0.19; 1.05]; SWB: $g = 0.48$ [0.24; 0.72]	Longer interventions showed larger ES	No significant difference	Non-western samples only
Hendriks et al. (2020)	Clinical and non-clinical samples	Positive psychology interventions	RCT with active and inactive control	Cochrane: 26% (13 studies) had high quality, average study $M = 3.2$ on 0–6 scale; Low quality studies show higher effect than moderate quality studies; funnel plot and Egger regression show some inconsistent evidence of publication bias	$n = 6,141$ ($k = 50$)	No statistically significant difference between individual, self-help, and group studies	Anxiety: $g = 0.35$ [0.23; 0.48]; Depression $g = 0.32$ [0.13; 0.51]; SWB: $g = 0.34$ [0.18; 0.50]; Stress: $g = 0.35$ [0.03; 0.66]	Inconsistent duration and session effects	No difference between clinical and general populations	Non-Western samples show significantly larger ES compared to Western samples
Huang et al. (2018)	Students	Diverse interventions	RCT with active and inactive control	CONSORT rating: moderate compliance	$n = 3,602$ ($k = 51$)	Easy to disseminate interventions (less guidance, etc.) showed smaller effects	Anxiety overall: $g = 0.48$ [−0.62; −0.34]; For mixed/other interventions: $g = -0.84$ [−1.19, −0.49]; CBT $g = -0.39$ [−0.55; −0.22]; Mindfulness–based: $g = -0.49$ [−0.84, −0.15]; Depression overall effects: $g = -0.60$ [−0.74, −0.46]; For mixed/other interventions: $g = -0.76$ [−1.19, −0.32], CBT: $g = -0.59$ [−0.72, −0.45]; Mindfulness-based: $g = -0.52$ [−0.88, −0.16]; Attention/perception modification: $g = -0.46$ [−1.06, 0.13]	Longer interventions showed larger ES	NA	Effects for depression vary by region (in order of effectiveness): Asia > Australia > North America > Europe; no effects for anxiety
Karyotaki et al. (2017)	Clinical samples	self-guided internet-based CBT	RCT with active and inactive control	Cochrane: overall low risk of bias (but no blinding); evidence of publication bias (Egger regression)	$n = 3,876$ ($k = 16$)	Self-guided interventions are effective compared to control; adherence increases effectiveness	Depression: $g = 0.27$ [0.17, 0.37]	No significant effect for treatment duration	No baseline effects	NA

(Continued)

TABLE 1 | Continued

Article	Population	Type of interventions	Control groups	Data quality	Data base *n* (*k*)	Evidence of effectiveness of self-guided interventions	Effect sizes	Dose effects	Base line effects	Cultural differences
Kirby et al. (2017)	General adult population	Compassion-based interventions (incl. loving kindness)	RCT with active and inactive control	Cochrane: most studies show low quality (blinding, reporting, attrition); funnel plot suggested weak evidence of publication bias	$n = 1,285$ ($k = 20$)	NA	Anxiety: $d = 0.49$ [0.30–0.68]; Depression: $d = 0.64$ [0.45–0.82]; SWB: $d = 0.51$ [0.30–0.63] (relative to waitlist); Anxiety: $d = 0.42$ [0.19; 0.64]; Depression: $d = 0.62$ [0.44-0.80]; SWB: $d = 0.48$ [0.28–0.67] (active control).	NA	NA	NA
Koydemir et al. (2020)	General population	Positive psychology interventions	RCT with active and inactive controls	No quality rating; Funnel plot suggests some publication bias	$n = 16,085$ ($k = 68$)	No statistically significant difference between self vs. trainer guided interventions; technologically assisted interventions significantly less effective than traditional interventions	SWB: $d = 0.22$	Duration effects significant (longer duration more effective)	NA	NA
Ma et al. (2019)	University Students	Mindfulness training and ACT	RCT with active and inactive control	Cochrane: 20% of studies showed high risk of bias (but study quality was not a significant moderator); evidence of publication bias (smaller n shows stronger effect)	$n = 2,472$ ($k = 22$)	Method of delivery had no significant effect	Depression: $g = 0.52$ [0.39, 0.65]	Weekly delivery more effective than more frequent training, inconsistent effects of duration (in weeks)	Indicated MBIs showed stronger effects than universal MBIs, but no difference with selective MBIs	NA
Malouff and Schutte (2017)	Clinical and general population	Optimism training (mostly best possible self and self-compassion)	RCT with active and inactive control	Funnel plot suggests some positive bias	$n = 3,319$ ($k = 29$)	Online studies showed weaker effect than in-person interventions	SWB (Optimism): $g = 0.51$ [0.36, 0.66] (waitlist control) SWB (Optimism): $g = 0.23$ [0.09, 0.37] (active control)	In-person intervention hours showed negative effect on ES (longer sessions less effective)	No difference for healthy vs. identified problem sample	NA
Massoudi et al. (2019)	Clinical population (anxiety, depression)	eHealth	RCT with active control group	Cochrane: Low risk of bias for 46.7% of trials, with high risk for 29.5%. No evidence of publication bias (symmetric funnel plot)	$n = 4,183$ ($k = 14$)	NA	Depression: $g = -0.19$ [−0.31, −0.06]	NA	NA	NA
O'Connor et al. (2018)	Clinical and non-clinical samples	eHealth third wave treatments (9 ACT, remainder mixture of CBT, mindfulness and others)	RCT with active and inactive control	Cochrane: moderate level of bias; bias is associated with larger ES; weak evidence of publication bias overall (funnel plot)	$n = 3,176$ ($k = 21$)	Therapist guidance did not significantly moderate ES	Inactive control: Anxiety: $g = 0.32$ [0.09, 0.56]; Depression: $g = 0.52$ [0.26, 0.77] Active control: Anxiety: $g = 0.31$ [0.07, 0.54]; Depression: $g = 0.29$ [0.14, 0.44] Comparison intervention: Anxiety: $g < 0.01$ [−0.16, 0.17]; Depression: $g = -0.02$ [−0.18, 0.15]	Number of intervention sessions did not moderate ES	No statistical difference between clinical vs. non-clinical populations	NA

(Continued)

TABLE 1 | Continued

Article	Population	Type of interventions	Control groups	Data quality	Data base *n* (*k*)	Evidence of effectiveness of self-guided interventions	Effect sizes	Dose effects	Base line effects	Cultural differences
Panteleeva et al. (2017)	General population	Music listening	RCT with active and inactive control	CONSORT rating: Low quality on average	$n = 792$ ($k = 21$)	NA	Anxiety: $d = -0.30$ [−0.55, −0.04]	NA	NA	NA
Pavlacic et al. (2019)	Clinical and general population	Expressive writing	Experimental (including pre–post studies)	No evidence of publication bias, but low power in *post-hoc* power analyses	$n = 1,581$ ($k = 53$)	NA	SWB (Quality of Life): $d = -0.01$ [−0.16, 0.13]	*Post-hoc* analyses suggest that short term intervals show positive ES, longer time intervals show negative ES (but low power)	NA	NA
Reinhold et al. (2018)	General population (no PTSD diagnosis)	Expressive writing (emotional, personal topic)	RCT with active and inactive control	Cochrane analysis: quality not correlated with ES; removed one study with incorrect reporting	$n = 4,009$ ($k = 39$)	NA	Depression: $g = -0.09$ [−0.15, −0.02]	Higher number of writing sessions and specific writing topic (vs. general) showed higher ES	No effect of clinical vs. non-clinical samples, depression score at pre-test	NA
Slemp et al. (2019)	Working adults	Mindfulness-based work interventions (ACT included; yoga excluded)	Intervention based (including quasi-experimental)	Down and Black: overall poor quality. No effect of data quality on ES; evidence of publication bias (Egger regression)	$n = 6,044$ ($k = 119$)	Self-guided interventions where as effective as other guided interventions ($p = 0.077$)	Anxiety: $d = 0.58$ [0.37, 0.79]; Depression: $d = 0.42$ [0.24, 0.59]; Stress: $d = 0.47$ [0.35, 0.58]	No dose effects for duration (weeks) or number of sessions	NA	NA
Spijkerman et al. (2016)	General population	Online administered MBIs	RCT	Jadad scale and Cochrane: most studies (k =10) medium quality; Evidence of publication bias (funnel plot)	$n = 2,360$ ($k = 15$)	For stress: interventions supported by therapists produced larger effects than online only interventions; no differences found for anxiety, depression and well-being.	Anxiety: $g = 0.19$ [−0.06, 0.43] (Self–help only); $g = 0.22$ [0.05, 0.39] (Overall) Depression: $g = 0.29$ [0.03, 0.55] (Self-help only); $g = 0.29$ [0.13, 0.46] (Overall); Stress: $g = 0.19$ [−0.01, 0.38] (Only self-help); $g = 0.51$[0.26, 0.75] (Overall); Well-being: $g = 0.31$ [0.11, 0.52] (Self-help only); $g = 0.23$[0.09, 0.38] (Overall)	For stress: more sessions had stronger effect (when excluding outliers, this effect disappears)	No differences between general and groups with psychological problems	NA
Stratton et al. (2017)	Working adults	eHealth interventions (CBT, mindfulness, stress management)	RCT with waitlist control	Down and black ratings; evidence of publication bias (funnel plot, Egger regression)	$n = 2,922$ ($k = 23$)	Guided eHealth interventions show higher ES than unguided ones	Overall effects – Anxiety: $g = 0.21$; Depression: $g = 0.25$; Stress: $g = 0.30$	NA	Targeted populations (compared to untargeted) showed stronger ES overall (mainly driven by target effects for Stress Management on stress outcomes; no effect for CBT interventions)	NA
Strohmaier (2020)	Clinical and general population	MBCT/MBSR and other Mindfulness-based practices	RCT with active or inactive controls	Cochrane: Only five studies showed low risk of bias	$n = 15,971$ ($k = 203$)	No significant effects of the number of face-to-face sessions or contact hours	Compared to inactive controls: Anxiety: $d = -0.49$ [−0.59, −0.38]; Depression: $d = -0.60$ [−0.70, −0.50]; Stress: $d = -0.73$[−1.00, − 0.46] (Post–program). Compared to active controls: Anxiety: $d = -0.16$ [−0.26, −0.05]; Depression: $d = -0.20$ [−0.30, −0.11]; Stress: $d = -0.32$ [−0.61,−0.04]	Immediately post-program no dose response differences, but at 1–4 months follow-up shows inconsistent dose effects (e.g., home practice, intensity, facilitator contact)	No effect of baseline differences	NA

(Continued)

TABLE 1 | Continued

Article	Population	Type of interventions	Control groups	Data quality	Data base *n* (*k*)	Evidence of effectiveness of self-guided interventions	Effect sizes	Dose effects	Base line effects	Cultural differences
Vonderlin et al. (2020)	Working adults	Mindfulness work interventions (at least 2 h; at least 50% mindfulness practice; ACT and yoga included)	RCT with active and inactive control	Cochrane: low risk of bias; some evidence of publication bias for stress (funnel plot)	n = 5,161 (k = 56)	No effect of method of delivery (self-guided/online vs. in-person delivery)	SWB (Life satisfaction): g = 0.68 [0.24, 1.12]; Stress: g = −0.66 [−0.88, −0.44]	Program attendance hours increased SWB (but not duration in weeks)	NA	NA
Weisel et al. (2019)	General population	Multicomponent mobile health apps	RCT with active and inactive control	Cochrane: 53% (10/19) exhibit bias in at least three domains	n = 3,681 (k = 19)	Standalone smartphone apps	Anxiety: g = 0.43 [0.19; 0.66]; Depression: g = 0.34 [0.18, 0.49] (overall) Anxiety: g = 0.49 [0.27, 0.71]; Depression: g = 0.41 [0.24-0.59] (waitlist control)	Follow-up assessments were not examined	NA	NA
Yang (2018)	Clinical groups	Computer-Mediated Support Groups	RCTs and one-group pre-test post-test design	Possibility of publication bias (funnel plot, Egger regression)	n = 7,582 (k = 43)	Presence vs. absence of facilitator did not moderate ES	Depression: d = 0.32 [0.22; 0.43]	Group size was significant: larger online groups less effective	NA	NA

If no 95% confidence intervals are included, they were not reported in the original meta-analysis.

Self-guided therapy-derived interventions

A large number of studies used therapy-derived interventions including CBT, MBI, and ACT, and showed small to medium effect sizes for reducing anxiety, depression, and stress. Effects for subjective well-being in some analyses showed moderate to large effect sizes (Chu and Mak, 2020; Vonderlin et al., 2020). When compared to active control groups instead of non-active controls or waitlist groups, effect sizes typically diminished but remained statistically significant (e.g., Deady et al., 2017; O'Connor et al., 2018). Overall, the self-guided effect sizes tended to be lower than the effectiveness of traditional clinician-guided therapies, but clearly showed an effectiveness over and above active control groups (e.g., Spijkerman et al., 2016; Stratton et al., 2017). Other meta-analyses found no difference for self-guided compared to clinician-guided interventions (e.g., in general: Spijkerman et al., 2016; O'Connor et al., 2018 found no difference for anxiety and depression). Based on these meta-analyses, self-guided therapy-derived interventions are recommended to improve well-being during isolation.

Positive psychology-based interventions

Positive psychology-based interventions are typically focused on positive functioning, including interventions focusing on optimism, gratitude, or kindness. There is a somewhat older literature on expressive writing (Pennebaker, 1997) which we included here for convenience purposes. Overall, the effect sizes of positive psychology-based interventions were typically small and appear even more strongly affected by the type of control group than therapy-derived interventions (for a particularly striking example, see Dickens, 2017). Some of the positive psychology gratitude interventions differ by the focus of the intervention: either self- or interpersonally-oriented gratitude. These differences appear to be similarly effective (e.g., Cregg and Cheavens, 2020). Cregg and Cheavens (2020) found online compared to off-line applications equally effective, whereas Koydemir et al. (2020) reported greater effectiveness of non-technologically mediated interventions. Hendriks et al. (2020) reported that web-based interventions were as effective as online positive psychology apps. Expressive writing interventions showed the smallest effect sizes overall in this group, whereas compassion and kindness-based interventions showed moderate effect sizes in some meta-analyses (Kirby et al., 2017). Based on these meta-analyses, expressive writing interventions are the least effective, whereas gratitude, especially compassion-based interventions, could be recommended to improve well-being during quarantine and isolation.

Other activity-based interventions

Other activity-based interventions comprised a broad category including various physical exercise, arts, and music-based activities. Physical exercise showed weak effects overall in improving subjective well-being, with slightly larger effects for reducing depression (Conn, 2010). Music-based interventions also showed weak to moderate effects in reduced anxiety and stress levels (Panteleeva et al., 2017; de Witte et al., 2019). Therefore, activity-based interventions, including music and

physical exercise, show small to moderate effects and could be recommended to improve mental health during isolation.

Multicomponent online and app-interventions

Multicomponent online and app-based interventions showed small to moderate effects, with diminished effects when compared to standard therapeutic interventions (see for example, O'Connor et al., 2018). Overall, their effectiveness was considerably smaller than similar non-online interventions (e.g., Malouff and Schutte, 2017) or standard in-person therapies. The relative effectiveness of online only compared to smartphone-based apps remains unclear (Firth et al., 2017; Weisel et al., 2019), and thus no clear guidance is available.

Dose Effects

Dose effects, or the extent to which people are practicing or using a specific activity, are important to consider when recommending self-guided practice. These might include total practice time, or duration of individual interventions. Several meta-analyses examined the effectiveness of interventions at different dose levels. For therapy- derived interventions, Blanck et al. (2018) and O'Connor et al. (2018) found no dose effects for self-guided CBT-based interventions. In contrast, Firth et al. (2017) reported a reduction (although not statistically significant) in the effectiveness of longer-term smartphone-based interventions, whereas Huang et al. (2018) reported greater effectiveness of longer ACT and CBT-based interventions on depression. Strohmaier (2020), Spijkerman et al. (2016, after removing outliers), and Slemp et al. (2019) found no difference in dose effects for MBI-based interventions. Focusing on life satisfaction, Vonderlin et al. (2020) reported greater life satisfaction was correlated with higher number of mindfulness-based practice hours, whereas Ma et al. (2019) reported inconsistent dose effects for mindfulness-based interventions in students, with a slight increase in effectiveness for weekly practices compared to more frequent sessions.

Positive psychology interventions also showed inconsistent dose effects. Hendriks et al. (2020) reported inconsistent patterns for interventions of more or less than 8 weeks for different outcome variables. Similarly, for expressive writing exercises, the dose effects are inconsistent across the studies that reported them (Frattaroli, 2006; Malouff and Schutte, 2017; Reinhold et al., 2018). For physical exercise, a meta-analysis by Conn (2010) found that home-based unsupervised exercise was less effective than unsupervised exercise in fitness centers. The same meta-analysis also suggested that shorter training overall might be more effective in improving depressive symptoms. de Witte et al. (2019) reported no significant dose effects for music interventions. Examining the overall pattern, dose effects appear inconsistent and no clear guidance is available about optimal levels of practice.

Baseline Effects and Applicability for Clinical Populations

One important concern in recommending self-guided interventions is whether these interventions are applicable for populations experiencing clinically relevant symptoms. In particular, a specific intervention may show no effect or an adverse effect in clinical populations, making the intervention unsafe for such populations. Hence, we investigated whether meta-analyses examined baseline effects of anxiety, depression, or stress on effectiveness, or directly compared the effectiveness between clinical and non-clinical populations.

Among therapy-derived interventions, several meta-analyses found no significant baseline effects or difference between clinical and non-clinical samples (Spijkerman et al., 2016; Deady et al., 2017; O'Connor et al., 2018; Strohmaier, 2020). For positive psychology interventions, several meta-analyses also found no difference between clinical and non-clinical samples (Frattaroli, 2006; Reinhold et al., 2018; Cregg and Cheavens, 2020; Hendriks et al., 2020). Only Pavlacic et al. (2019) reported larger effect sizes for groups with a Post-Traumatic Stress Disorder (PTSD) diagnosis compared to non-PTSD groups. No difference between clinical (labeled socially anxious) and non-clinical populations was found for kindness-based interventions (Curry et al., 2018). Taken together, this suggests that therapy- derived and positive psychology interventions in general could be recommended to populations irrespective of their depression or anxiety levels or clinical diagnosis status. For music interventions, de Witte et al. (2019) reported no differences between different populations in terms of effectiveness. For generic smart-phone applications (including a large number of clinical therapeutic approaches), Firth et al. (2017) reported that effectiveness of these apps was better for individuals diagnosed with mild-to-moderate levels of depression, but groups diagnosed with major depressive disorder, bipolar disorder, and anxiety disorder showed no significant improvement when using these applications. However, these sample sizes were typically small and might have been too small to show the effectiveness of these eHealth apps. Overall, clinical status or level of anxiety or depression do not exert a strong influence on the effectiveness of these self-guided interventions. This is encouraging news to support the widespread recommendation of these self-guided interventions in general, in the absence of immediate clinical guidance or supervision.

Cross-Cultural Applicability

The current COVID-19 pandemic is affecting all countries. For this reason, we also examined the extent to which the interventions might be applicable and effective in different cultural regions. Unfortunately, only a small number of meta-analyses ($k = 5$) attended to possible cultural differences in the effectiveness. Chu and Mak (2020) found no significant differences in mindfulness-based interventions between world regions and de Witte et al. (2019) comparing the effectiveness of music interventions reported no differences between Western and non-Western samples. In contrast, Hendriks et al. (2020) compared positive psychology interventions and reported larger effect sizes in non-Western compared to Western samples. However, it is unclear whether these comparisons might be confounded by other study characteristics. An earlier meta-analysis by Hendriks et al. (2018) only focused on non-Western interventions and reported low quality studies. Overall, it is noteworthy that there are relatively few high-quality studies

available that have examined the effectiveness of self-guided psychological interventions in samples beyond Western Europe, North America, and Australia.

Contextualizing the Evidence-Base Against Excluded Intervention Types

We were unable to include any studies that exclusively looked at yoga or meditation because meta-analyses of these studies always included group settings or guidance by a trainer or clinician. Based on our inclusion criteria, we were unable to include them in our review. However, the evidence from recent meta-analyses suggests that these interventions are effective for anxiety, depression, and broader mental and physical health (see for example, Sedlmeier et al., 2018; Zoogman et al., 2019) and clinical network meta-analyses attest to their safety and effectiveness (Chen and Shan, 2019). A further advantage of these types of interventions is that they seem to show higher effectiveness in non-Western populations (e.g., Zoogman et al., 2019). Given the wide availability of online yoga and meditation sessions/apps and the overall effectiveness of guided yoga and meditation sessions *in situ*, we could cautiously recommend the practice of yoga and meditation for improving mental health during quarantine and social distancing conditions.

Meta-Meta-Analysis of the Effectiveness of Self-Guided Interventions

Figures 2–5 show the effect sizes and confidence intervals (if reported) from the meta-analyses (we converted r coefficients reported in Frattaroli, 2006 into d). We recoded effect sizes for anxiety, depression and stress so that positive numbers indicated a positive change (improvement) for the experimental group compared to the control group. As **Figures 2–5** demonstrate, most meta-analyses showed an advantage of the intervention compared to the control group, but the type of control group appeared to impact the observed effect size.

After converting standardized mean differences to z-transformed r, the average effect size r was comparable across the four outcome variables, for anxiety $r = 0.19$ (95% CI: 0.14, 0.24; $k = 31$); depression $r = 0.17$ (95% CI: 0.13, 0.20; $k = 45$); subjective well-being $r = 0.19$ (95% CI: 0.13, 0.25; $k = 25$), and stress $r = 0.19$ (95% CI: 0.11,0.26; $k = 17$). Effect sizes computed for comparisons with active control groups yielded smaller effects, but this difference was only significant for depression ($Q\,[1] = 5.70$, $p = 0.017$, $R^2 = 0.096$).

When examining differences between types of interventions, we used therapeutic approaches (CBT, ACT, and MBI) as the reference category. For positive psychology interventions, we separated gratitude and expressive writing interventions from other positive interventions. Due to the small number of effect size summaries available, we included activity-based interventions (exercise, music) with other/multicomponent interventions. For anxiety, we found a significantly larger effect for mixed, multicomponent and other interventions compared to CBT and ACT ($b = 0.19$ [95% CI: 0.05–0.55]; $p = 0.009$). For subjective well-being, we found a trend for mindfulness interventions to show larger effect sizes compared to CBT ($b = 0.16$ [95% CI: $= 0.02$ -0.34], $p = 0.086$). For depression, we first controlled for active control group comparisons (see the results reported above). Expressive writing exercises had a significantly smaller effect size on average compared to CBT/ACT based interventions ($r = -0.15$ [95% CI: -0.29 to -0.00], $p = 0.017$). We did not find statistically significant differences in the effectiveness of different interventions for stress.

DISCUSSION

Our rapid review of available meta-analyses demonstrated that there are a number of evidence-based self-guided interventions that can be used by individuals at home to manage depression, anxiety, stress, and well-being during stay-at-home orders, lockdown, and quarantine. Overall, self-guided interventions are better at improving psychological health compared to no intervention (e.g., waitlist controls) and, to some extent, active controls (e.g., comparable treatments). In particular, self-guided therapy-derived interventions (including CBT, ACT, and MBI), mindfulness-based practices, positive psychology interventions, and activity-based interventions (e.g., physical exercise, music listening) appear effective in reducing anxiety, depression, stress, and in increasing subjective well-being compared to both active and inactive control groups. However, dose effects were largely inconsistent. Therefore, we cannot recommend specific intervals or durations for any of the intervention categories. Baseline effects were largely absent, implying that even individuals with elevated stress or psychological problems can use these practices at home without supervision, however we strongly recommend contacting health professionals if an individual is experiencing distress.

The unique context created by social distancing and quarantine necessitates reflection on the way self-guided interventions might be used. Although expressive writing interventions showed effectiveness compared to control groups, effectiveness was consistently lower compared to CBT and ACT-based interventions. Expressive writing about concerns or worries (including detailed reflections of difficult or traumatic events) may not be appropriate without adequate clinical support or guidance (Reinhold et al., 2018), especially when acutely experiencing negative emotional symptoms. Hence, we do not recommend these exercises for individuals to perform unsupervised at this current time of elevated collective worry and distress (see Wang et al., 2020).

Overall, self-guided activities included in these meta-analyses appear effective, but not as effective as in-person or group-based interventions. Therefore, these activities can be useful as a first line of psychological support during stay-at-home and lockdown periods, but they could not and should not replace more guided clinical interventions (either via telehealth or once in-person sessions become available again). Given the current strain on the mental health system and the likelihood of further restrictions in the near future, it is important to provide widely available evidence-based practices to avoid negative collateral

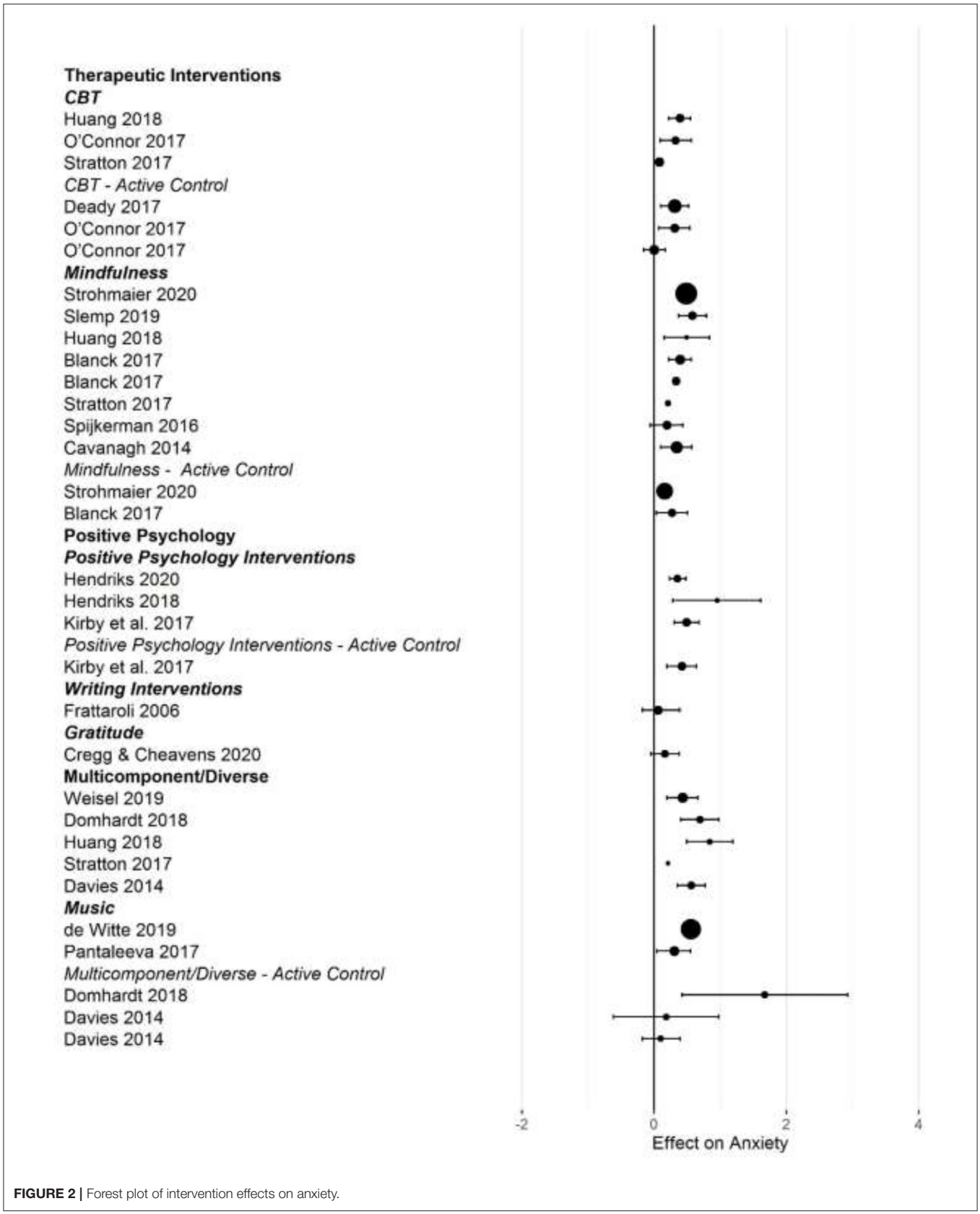

FIGURE 2 | Forest plot of intervention effects on anxiety.

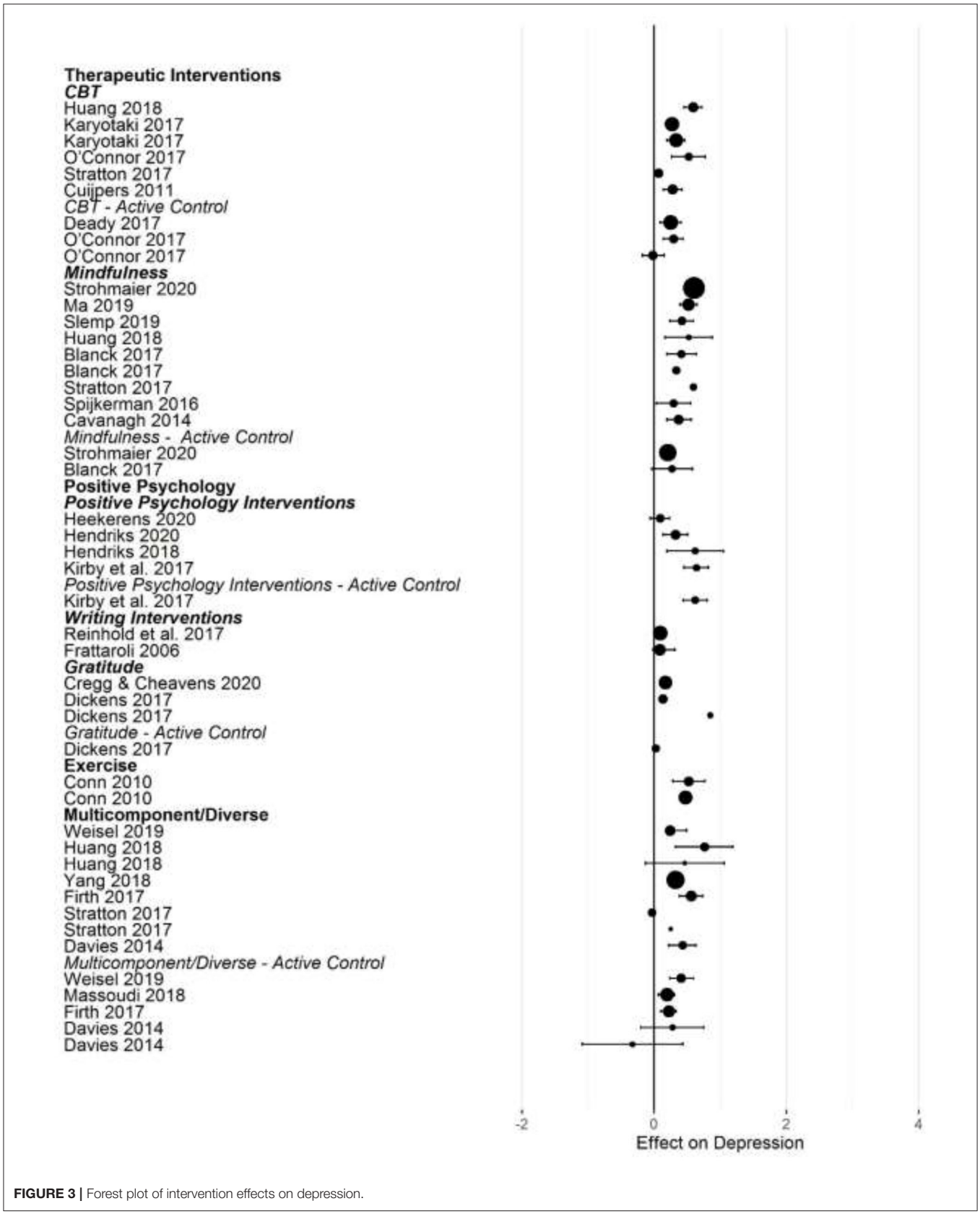

FIGURE 3 | Forest plot of intervention effects on depression.

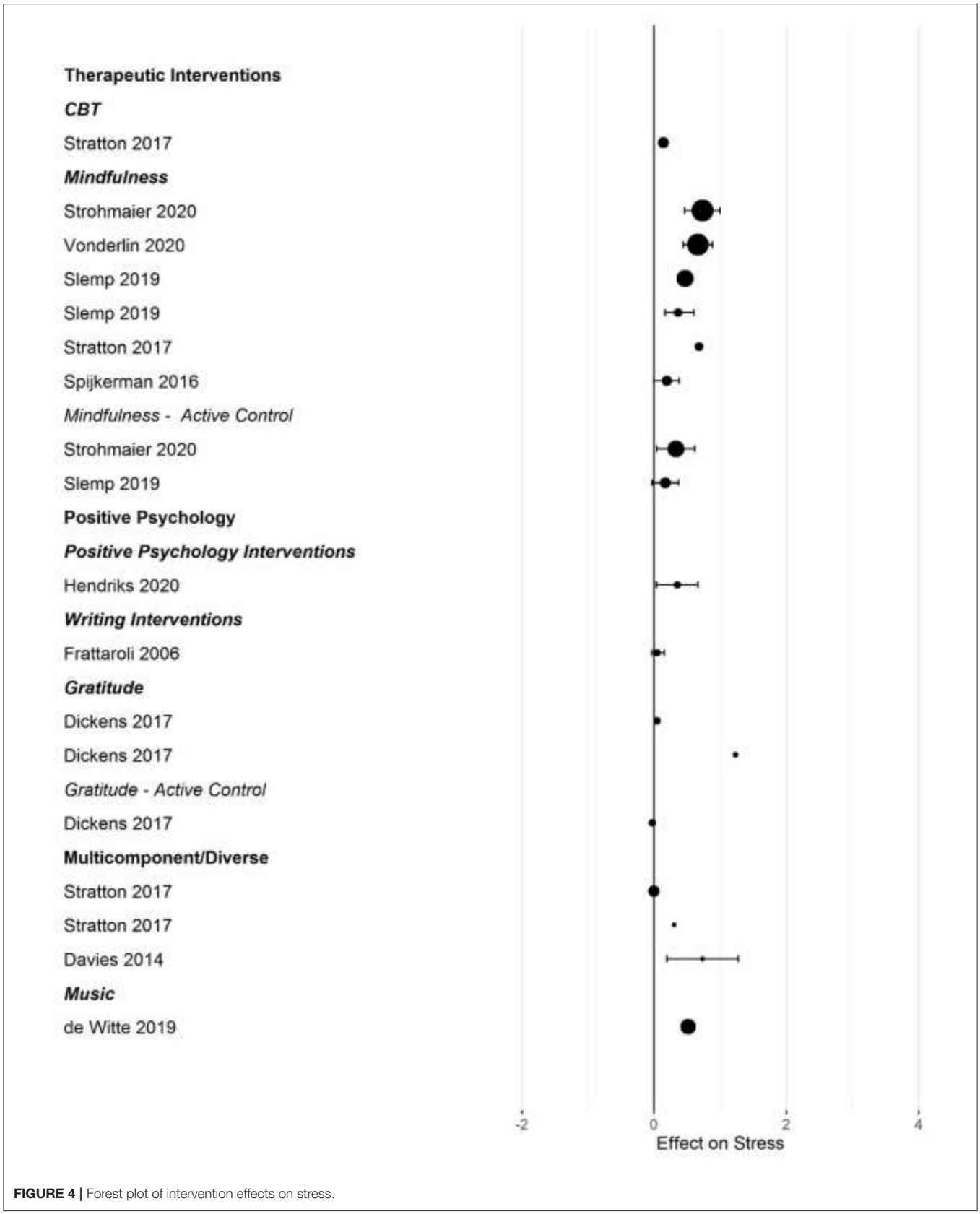

FIGURE 4 | Forest plot of intervention effects on stress.

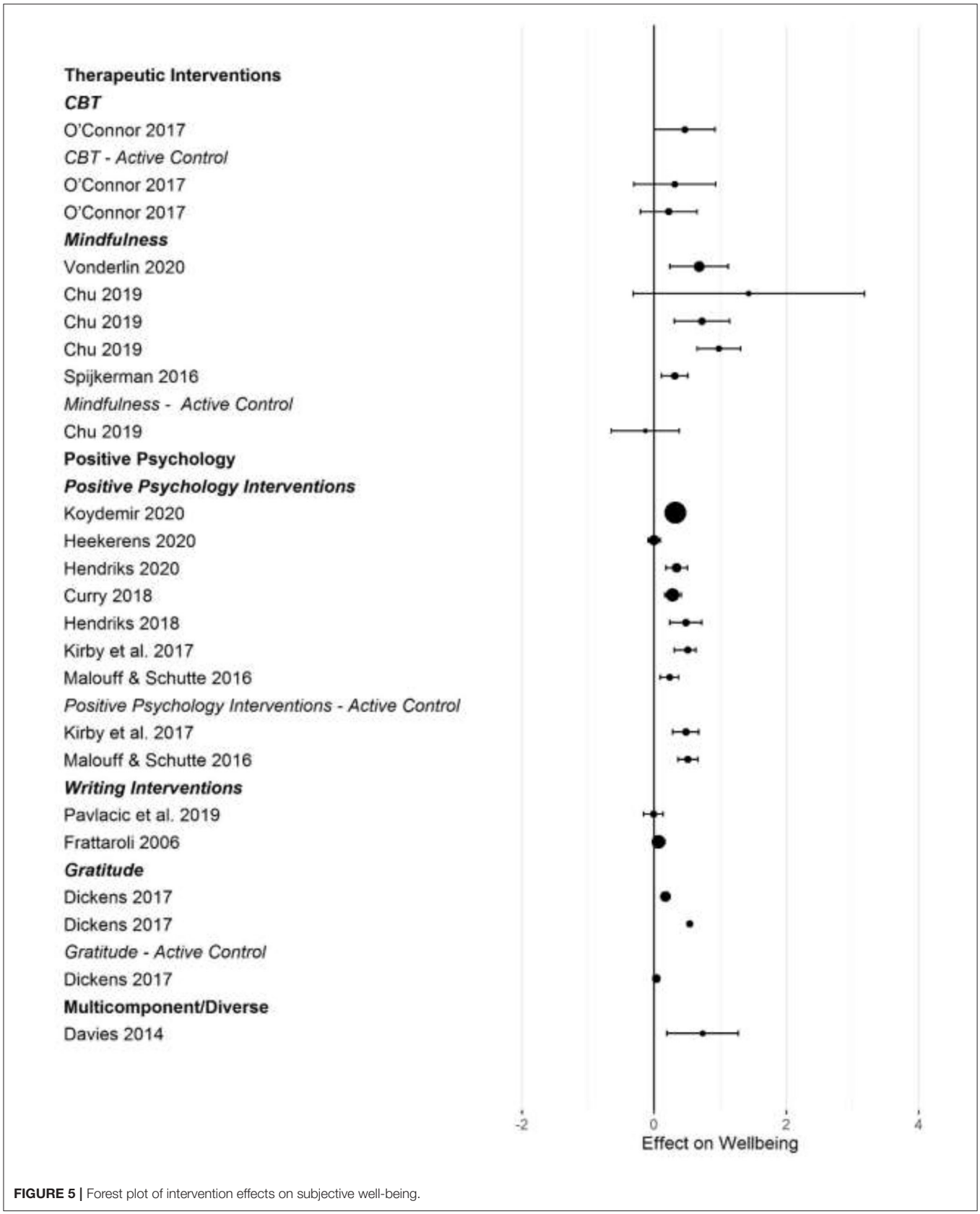

FIGURE 5 | Forest plot of intervention effects on subjective well-being.

effects on mental health at the population level (see Brooks et al., 2020; Duan and Zhu, 2020). This review provides an overview of best-practice self-guided interventions conducted prior to the pandemic that can be recommended and implemented at large scale to help and support populations at risk of mental health problems. However, self-guided interventions need to be complemented by further investment and strengthening of traditional mental health care support.

At the same time, the review clearly highlights blind spots in our understanding of evidence-based practices. More highly controlled research on self-guided and home-based interventions is needed to inform public health decision-making during pandemics that require quarantine and social distancing over potentially long periods of time. What are the ideal levels of compliance for self-guided mental health interventions beyond an initial lockdown period and how can mental health be maintained? When should self-guided interventions first be implemented or recommended to populations at risk and how long should these practices be maintained after the immediate lifting of more restrictive lockdowns? What are the effects of repeated lockdowns: should recommended self-guided interventions be switched or rotated? The meta-analyses summarize studies that were not specifically geared toward evaluating interventions that are focused on home practices during lockdown.

We isolate three main limitations of the current evidence-base to guide future research. A first gap, especially in the current context of global pandemic, is the lack of attention to culturally transferable interventions. Most studies have been conducted with samples from high-income, highly educated, and mainly Western nations. Given the greater population density and living arrangements in non-Western environments, these conditions may make effective mental health interventions even more urgent. We need further national and international multi-center research that includes diverse groups of participants to better understand whether interventions developed for autonomous individuals socialized into societies that emphasize individuality and self-reliance are as applicable and as effective in more community oriented contexts (Smith et al., 2013). A second major concern of current distancing measures which we were unable to address here is the potential for a negative impact on social relationships. The current lockdown measures require greater interpersonal skills, both in terms of living together with others in closed spaces for extended periods of time as well as maintaining contact with others outside the immediate social "bubble." The current evidence is clearly geared toward the individual as the focus of the intervention, with little emphasis on social relationships (although gratitude interventions might be the single major exception). Thus, we need more evidence of the effectiveness of social interaction interventions. A third limitation is that our evidence is based on interventions that were conducted prior to the current pandemic. It is unclear whether the effectiveness of self-guided interventions is equally effective under the specific conditions of a pandemic. The baseline effects that we report make us cautiously optimistic about the continuing effectiveness of these interventions, even in conditions of increased overall stress and anxiety. A meta-analysis of controlled studies during the current pandemic would be highly beneficial.

Finally, it is worth considering the broader role of psychologists in responding to the COVID-19 pandemic. A major concern for individuals, groups, organizations, and nations is the economic impact of the current pandemic. The mental health impact of quarantine is more dramatic for lower income groups (see Reynolds et al., 2008). The medium and long-term negative economic impact of COVID-19 on the larger population, and especially financially and economically more vulnerable populations also needs greater attention from psychologists. Psychologists need to collaborate with economists and others involved in economic decision-making to consider options to support people to upskill and create new employment opportunities which help to alleviate this financial worry.

In summary, the current evidence suggests that a number of self-guided interventions suitable for at-home practice during lockdown and physical distancing are effective to for improving mental health. Specifically, we recommend interventions based on cognitive behavioral therapy, mindfulness, and acceptance-based activities, selected positive psychology activities, physical exercise, and music as useful first-line mental health interventions. However, these activities are not as effective as in-person and group based therapeutic interventions, and so they should not replace clinician-guided interventions for individuals and groups in need. Many of these interventions are now available via smartphone and web-based applications. In order to provide broad access to such evidence-based interventions to mitigate the negative side-effects of social distancing measures, this article includes an online supplement with selected exercises and further information to help individuals cope with the mental health challenges of physical distancing and quarantine.

DATA AVAILABILITY STATEMENT

Publicly available datasets were analyzed in this study. This data can be found at: https://osf.io/fpx4s/.

AUTHOR CONTRIBUTIONS

RF conceptualized the study and wrote the first draft. RF, TB, JK, MZ, KR, AR, and LG conducted the literature search and data extraction. RF, JK, and TB conducted the analyses and created the visualizations. DW coordinated the activity material collation. DW, TN, BI, and MC collated and summarized the activity material. PM provided feedback and advice. All authors approved the final version.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.563876/full#supplementary-material

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*Indicated that study was included in the review.

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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APPENDIX A

Search Terms

("Mental health intervention" OR "self therap*" OR "mindful*" OR "meditation" OR "yoga" OR "positive psychology" OR "gratitude" OR "journaling" OR "expressive writing" OR "low intensity exercise" OR "applied relaxation" OR "self-guided" OR "affective touch" OR "physical exercise" OR "social-media" OR "mindful eating" OR "creative tasks" OR "occupational therap*" OR "social media intervention" OR "mental health app" OR "well-being app" OR "smartphone intervention" OR "art therap*" OR "music therap*") AND "meta-analy*"

A second search used these more specific search terms:

("quarantine" OR "isolation" OR "social isolation" OR "confinement")

AND "meta-analy*"

AND "pandemic."

frontiers in Psychology

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Fostering the Reconstruction of Meaning Among the General Population During the COVID-19 Pandemic

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The COVID-19 outbreak has seen people in many countries asked to radically modify their way of life in compliance with sweeping safety measures. During the current crisis, technology is turning out to be key, in that it allows practitioners to deliver psychological services to people who would otherwise be unreachable. However, professionals cannot solely rely on their traditional modes of practice, in that different methods are required to bring to light the needs of those affected by the emergency. People are being overwhelmed by a cascade of unusual and unexpected events that are putting a strain on their everyday routines and usual meaning-making systems; ongoing challenges to their employment and financial status will likely divert personal resources away from psychological well-being. We therefore argue that psychologists should also consider the needs of the general population. Among those who may require help–aside from the main targets of psychological intervention, such as healthcare personnel and COVID-19 patients and their relatives–specific attention should be paid to those who are not at the center of the crisis. We suggest that this large segment of potential users may benefit from a non-medical approach focused on the promotion of meaning-making processes. Indeed, the disruptive nature of the current situation hinders sense-making and threatens to undermine psychological balance and well-being, at an individual as well as at a societal level. The present article proposes a methodological perspective based on the reconstruction of meaning-making processes (sense of coherence, predictability, metaphors, narratives). Specifically, psychological interventions should promote personal and collective resources with a view to: "normalizing" current distressful experiences (i.e., acknowledging that such reactions are normal in light of the present situation); widening the observational field, taking relational contexts into account, and promoting an understanding of distressful experiences as coping strategies; fostering meaning-making/reconstruction processes through the use of appropriate metaphors and narratives; promoting a sense of coherence. We present two clinical vignettes to illustrate how these principles might be applied in practice. In conclusion, the exceptional psychological challenges posed by the COVID-19 pandemic require practitioners to adopt a broad and flexible perspective on clinical intervention.

Keywords: COVID-19, psychological distress, meaning construction process, sense of coherence (SOC), limits of the biomedical model, general population, clinical psychology, resilience

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INTRODUCTION

The recent coronavirus disease (COVID-19) outbreak has seen people in many countries asked to radically modify their everyday behaviors in compliance with sweeping safety measures introduced by European, Asian, and American governments. It is well documented that having to cope with infectious outbreaks places a considerable strain on people's lives[1] (see Brooks et al., 2020; Pfefferbaum and North, 2020). During the COVID-19 crisis, entire populations have suddenly found themselves struggling with an invisible enemy that can potentially strike anyone and may only be confronted by forgoing–although temporarily–the company of significant others and enduring severe reductions in living space and personal freedoms.

In view of the above, it is our opinion that scholars should extend their research focus beyond those "in the frontline," such as healthcare personnel, COVID-19 patients, and their relatives, to investigate the impact of the emergency on the public at large, given that "emotional distress is ubiquitous in [populations affected by public health emergencies]–a finding certain to be echoed in populations affected by the COVID-19 pandemic" (Pfefferbaum and North, 2020, p. 1). Indeed, recent works have pointed up the need to study the "psychological effects of the COVID-19 pandemic across the whole population and in specific vulnerable groups" (Holmes et al., 2020, p. 10) in light of the clearly adverse effects of quarantining on psychological well-being (Brooks et al., 2020) and long-lasting stressors related to the outbreak (Sood, 2020).

The negative effects of forced and prolonged mass quarantining include boredom, loneliness, social disconnectedness, a sense of lack of meaning, relationship breakdowns, anger, avoidance behaviors, unhealthy behaviors, and abnormal emotional reactions (Brooks et al., 2020; Holmes et al., 2020; Pfefferbaum and North, 2020). The unavailability of routine assistance due to the closure of businesses and institutions can further amplify the impact of the crisis, potentially affecting large sectors of the population: consider, for example, families with schoolchildren, persons living alone, elderly persons and their caregivers, unemployed persons, those on a low income, people in unstable social conditions, homeless persons, and other vulnerable categories (see World Health Organization, 2020). It is also likely that the pandemic will have enduring psychological consequences on an unprecedentedly global scale in the later stages of mass home confinement (when freedom of movement has been at least partially restored) and over the long-term aftermath of the lockdown. A recent survey by the American Psychological Association (2020) revealed that the pandemic has altered all aspects of personal and family life, from health and work to education and exercise. Parents of children under 18 are among the categories most affected by pandemic-related stress. The emergency has upset daily routines (during both the initial lockdown and the ongoing phase of gradual resumption of normal activity),[2] severely impinging upon personal as well as family and interpersonal projects and drastically modifying habitual modes of interaction at both the familial and social levels.

The nature of the disease itself prompts significant uncertainty about the future. People's concerns can be many and varied, spanning fears for their occupational and financial status during the recovery phase; anxiety surrounding new behaviors that the epidemiological situation may require them to adopt in the interests of their personal safety (such as novel modes of interacting with strangers, alternative workplace procedures or leisure-time activities, etc.); worry that a new wave of disease may hit the world, or that we may have to live with the virus for a long time to come. It is likely that such sources of distress will wield a profound effect on community mental health, although not necessarily in terms of diagnosable disorders.

Policy makers and psychological scientists thus need to be keenly aware of the wide-ranging psychological impact of the pandemic if they are to design targeted psychological surveillance and intervention strategies for helping people to cope with it (see Higgins, 2020).

Accordingly, this paper presents a possible perspective on addressing COVID-induced forms of distress–which are often subtle and elusive, but, nevertheless, worthy of attention–in people who are not at the center of the crisis, that is to say, those impacted by safety measures but not necessarily directly affected by COVID-19. First, in the "Critical Issues for the Delivery of Psychological Assistance During the COVID-19 Outbreak" section, we acknowledge the key role of technology in providing access to, or ensuring the continuity of, psychological services to this population. We also flag conceptual issues with interventions–whether technologically mediated or face-to-face–that are strongly rooted in the biomedical model and draw on a symptom-centered approach. While recognizing the importance of taking symptoms into account in all clinical intervention contexts, we argue that symptom-centered approaches may be of limited benefit when applied to forms of distress whose diagnostic status is unclear (or inexistent).

We therefore suggest that a broader perspective on psychological intervention is needed. In the "Making Sense of COVID-19: Routine, Predictability, Narrative, Sense of Coherence, and Resilience" section, we explore the link between COVID-19-related distress and the disruption of meaning, going on to outline key theoretical aspects of the meaning-making process, such as routine, predictability, narratives, sense of coherence, and resilience. Then, in the "Enhancing Processes of Meaning Making About COVID-19 in the General Population" section, we describe a multipronged perspective on psychological intervention, whose main features are coherent communication strategies, the de-pathologization of distressful reactions to the pandemic, a widening of the field of observation from individuals to their relational contexts, and the negotiation of suitable personalized metaphors for enhancing psychological well-being. In the "Clinical Vignettes" section, we present two

[1]There is evidence that pandemics may also have positive effects, such as strengthening individual resilience, increasing levels of social cohesion, and fostering positive concern about mental health (Perrin et al., 2009; Pfefferbaum and North, 2020).

[2]The disruption of previous routines and the need to adjust to new ones represent a major source of stress for 74% of American parents.

clinical vignettes to practically illustrate how our proposed perspective might be applied in practice. Finally, in the "Concluding Remarks" section, we conclude by summarizing the broad criteria that we believe should inform intervention targeting COVID-19-induced psychological issues.

CRITICAL ISSUES FOR THE DELIVERY OF PSYCHOLOGICAL ASSISTANCE DURING THE COVID-19 OUTBREAK

The situation in countries that have implemented mass home confinement in response to the COVID-19 outbreak raises serious mental health concerns. However, policy makers dealing with large-scale public health challenges typically overlook recommendations to supplement physical health interventions with mental health programs (Perrin et al., 2009). Due to the perception that physical assistance is more crucial or urgent, and the awareness that enormous financial, political, and even communication resources are required to address the epidemiological aspects of pandemics, the psychological impact of the emergency may only receive attention at a later stage. Clearly, this has major implications for people's mental health and the availability of psychological assistance, compounding the critical factors that already routinely hinder access to mental health services.

Under normal conditions, a high proportion of people suffering from mental health problems do not receive care. It is well documented that the barriers to seeking treatment are attitudinal rather than structural. In other words, people are more frequently hindered from looking for help by their own thoughts and beliefs than by practical obstacles to accessing psychological services (such as a lack of financial resources, transportation, or availability). In a World Health Organization (WHO) study conducted by Andrade et al. (2014) in 24 countries, people with mental health issues reported not seeking treatment for two main reasons: 1. They wished to handle the problem independently. 2. Their self-perceived need for treatment was low, associated with the expectation that the problem would get better on its own. Now, in a pandemic scenario where the greatest emphasis is understandably laid on physical protection and the implementation of effective safety measures, it is likely that such attitudinal barriers may impact even further on people's willingness to ask for psychological assistance, at least in the initial stages of the emergency. We further hypothesize that a crisis like the COVID-19 pandemic will lead individuals to increasingly focus on ongoing challenges to their employment and financial status, and that this can easily lead them to divert personal resources away from caring for their mental health. Such a dynamic may be exacerbated by two concurrent factors. First, media and government communications about the risks associated with the pandemic and the safety measures to be adopted are frequently perceived as inadequate, alarming, and even contradictory (see Brooks et al., 2020), while the style, approach, and content of media and government communications can accentuate perceptions that some issues are more urgent than others, thus influencing the focus of people's attention. Second, growing recourse to drugs for stress-related symptoms may favor the adoption of shallow solutions to complex problems (Ao, 2020; Pesce, 2020). Furthermore, while the sample in the above-cited study by Andrade and colleagues was assessed using a DSM-IV-based diagnostic approach, in the current pandemic, people may suffer from forms of distress that are not strictly ascribable to traditional psychopathology or that fall below the diagnostic threshold and are therefore less immediately recognizable. Hence, during a pandemic, a lack of psychological surveillance is likely to become a major problem due to the combined effects of all these factors. There is a severe risk that people's psychological needs will remain unexpressed and untreated.

In a scenario like the present emergency, the use of technology to provide psychological assistance is turning out to be key, as the only viable way to overcome the necessary barrier of obligatory physical distancing. This last-mentioned concept has very recently replaced that of social distancing (Gunnell et al., 2020), in acknowledgment of the distinction between social connections and physical connections, and reflecting the fact that the former may be ensured by technological devices, while the latter are generally precluded during large-scale sheltering in place.

Although it is beyond the scope of this article to analyze in depth the use of technological devices for psychological purposes, we should note the undoubted advantages of deploying technology during an infectious outbreak. First, research has documented the efficacy of mental health services mediated by technological devices[3] in targeting psychiatric disorders across a range of populations and settings (Bashshur et al., 2016; Hubley et al., 2016; Ebert et al., 2018; Shore et al., 2020). Second, the deployment of technology is generally accepted and positively evaluated by clients (Bashshur et al., 2016; Hubley et al., 2016). Third, through the use of technological devices, psychological assistance can be made virtually available to all those who need it, including persons living in isolated regions or those whose liberty of movement is most severely restricted. Fourth, technology-based intervention is financially advantageous for clients, practitioners, and healthcare institutions alike (see Bashshur et al., 2016). Finally, technological mediation may mitigate the shame and stigma associated with attending psychological services, thus facilitating access to mental health assistance (Ebert et al., 2018). In sum, the psychological community has a duty to avail of technology to efficaciously deliver psychological interventions to the population at large. However, despite the huge potential offered by the online medium, certain limitations of most of the technologically mediated psychological services currently on offer should be noted. As Bashshur et al. (2016), as well as Ebert et al. (2018), have pointed out, mediated services are generally designed and delivered in keeping with standard cognitive behavior therapy (CBT) principles. In other words, due to the features of technological devices and the type of interaction that they

[3]A variety of labels are used in the literature to indicate these practices: telemedicine applied to mental health, telepsychology, mediated services, Internet- and mobile-based intervention.

typically support, these services most frequently target changes in specific behaviors and thoughts and are therefore particularly suited to treating specific psychopathological conditions such as, for example, panic disorders, and PTSD (Bashshur et al., 2016; Hubley et al., 2016). However, telepsychology is a multifaceted and evolving area comprising multiple kinds of services with diverse features. To simplify somewhat, one main type of intervention is closely modeled on face-to-face interaction: the practitioner/client relationship (whether in the area of counseling, education, psychotherapy, supportive intervention, etc.) is merely transferred to a different (technological) medium. Another group comprises more focused interventions, including interactive self-help lessons, virtual or augmented reality exposure-based techniques, serious games, avatar-led sessions, and others.

Both types of intervention–whether or not directly based on CBT principles–tend to be symptom centered, that is to say, they target discrete, well-defined symptoms,[4] using current diagnostic systems such as the DMS-5 (American Psychiatric Association, 2013) and the ICD-11 (World Health Organization, 2018).[5] There is ample evidence that this approach is rooted in a biomedical model of clinical intervention that has influenced clinical psychology more profoundly than is commonly believed (Henriques, 2002; Deacon, 2013; Frances, 2013; Castiglioni and Laudisa, 2015). Analogously to its treatment of bodily ailments, the biomedical model conceptualizes forms of mental distress as diseases, that is to say, as clusters of interconnected and concurrent symptoms (with diagnostic status) that form a single framework of disease (Hucklenbroich, 2017). It consequently emphasizes the development and delivery of disorder-specific treatments (Deacon, 2013), such as manualized interventions, behavior protocols, and skills training.

Now, what aspects of the biomedical model might turn out to be problematic when addressing the distress caused by the COVID-19 pandemic and its direct and indirect consequences? In answer, let us focus on two conceptual features of this model.

First, as stated above, it presupposes a sort of isomorphism between bodily problems and mental problems. Mental health issues are understood as forms of dysfunction, that is to say, as problematic (i.e., prejudicial) deviations from normal, physiological functioning. Thus, mental symptoms are viewed as signals that something is going wrong inside the individual: sources of distress are viewed as endogenous, while external factors only influence the expression of inner causes (see Slife et al., 2017). This perspective strongly favors biological explanations for mental health issues (Henriques, 2002; Deacon, 2013; Johnstone and Boyle, 2018).

Second, the biomedical model frames mental problems as relatively context independent, where context is understood as the social, situational, relational, and local conditions or circumstances in which a particular phenomenon occurs (see VandenBos, 2015). In principle, from a biomedical perspective, the diagnostic process may be conceptualized in two ways: as a part-whole explanation, whereby all symptoms are manifestations or components of the disease, or as a causal explanation, whereby all symptoms of a disease are connected by a causal chain (Hucklenbroich, 2017). In both cases, the conceptual resolution, although different in degree, is narrower in focus, centering on a sort of *micro-context* whose elements are internal to the individual (such as personality traits, reinforcement histories, cognitions, etc.) and proximal to the cluster of symptoms (hence generally biological in nature) (see Slife et al., 2017). This is because if symptoms are envisaged as impersonal displays of a discrete disease (see Hucklenbroich, 2017), understanding and diagnosing mental health issues will be seen as relatively independent of other specific situations or circumstances pertaining to the broader context where these issues have arisen (see Bradford, 2010; Jacobs and Cohen, 2010). This *meso*/*macro-context*, whose elements are distal to the cluster of symptoms and interpersonal in nature, thus becomes marginal to understanding an individual's distress. In sum, such an approach "assigns a secondary role to the social world as a source of 'triggers' or 'stressors' and offers a particular construction of the person, often as biologically different and vulnerable (. . .)" (Johnstone and Boyle, 2018, p. 90).

Hence, symptom-centered approaches grounded in the biomedical model bear methodological as well as practical implications when addressing mental health issues arising due to infectious outbreaks. On the one hand, they fail to acknowledge that forms of distress they label as mental problems might be better understood as coping strategies–although painful and onerous in terms of emotional resources–deployed to face extraordinary environmental circumstances (Bentall, 2009; Herman, 2015). They therefore risk overlooking or underestimating the active stance that an individual must adopt in order to cope responsibly with pandemic-related issues. On the other hand, symptom-centered approaches focus heavily on the disability associated with the problem under scrutiny, that is, the impairment interfering with the individual's ability to function in one or more key life domains (VandenBos, 2015). This emphasis may hinder the development and leverage of personal, familial, and social resources for dealing with distressing experiences; on the contrary, it may amplify the shame, guilt, and stigma often experienced in relation to mental health problems (Bentall, 2009; Deacon, 2013).

[4]In the interests of epistemological clarity, let us here summarize our perspective on "symptoms" throughout this paper: Far from viewing them as mere "facts," we conceptualize symptoms (and their diagnosis) as–at least in part–theoretical constructs. Indeed, "one of the major conclusions from the philosophical analysis of science after the demise of logical empiricism in the second half of the 20th century has been that there is no such thing as notions of 'experience', 'fact', 'evidence', and the like (including 'symptom'), which are *not* theoretically informed. In the wake of the tradition begun by philosophers and historians of science such as Hanson and Kuhn, a common place of contemporary philosophy of science is that any piece of scientifically relevant 'evidence' is, in fact, *theory laden* (Hanson, 1958), that is to say, it is meaningful only when viewed as part of a theoretical framework" (Castiglioni and Laudisa, 2015, p. 4). Nevertheless, in light of the specific aims of this paper, we do not set out here to make a systematic critique of the traditional diagnostic approach.

[5]We acknowledge that the weaknesses attributed to the biomedical model certainly extend beyond the boundaries of CBT and indeed concern many models of psychological intervention. However, we also note that most of the interventions offered during the pandemic–whether face-to-face or technologically mediated–have been based on CBT principles, given the core features of this approach (i.e., symptom centeredness, focus on rapid interventions, replicability of interventions, quantifiability of results, etc.). These features make the CBT model particularly apt to be chosen for intervention in emergency situations such as the COVID-19 pandemic.

This said, a caveat is in order here. We are not suggesting that symptom-centered approaches are to be rejected. We acknowledge that the treatment of symptoms is a key component of all clinical interventions targeting specific manifestations of distress. Furthermore, symptoms may be conceptualized as the "tip of the iceberg," so to speak, in that they often offer access to a client's needs and system of meanings. Indeed, symptoms are frequently the reason individuals decide to request a clinical consultation in the first place, as well as the conduit linking the client's needs with the clinician's competence. Hence, a careful clinical assessment of symptoms is a key component of any psychological intervention, regardless of the practitioner's clinical orientation.

Rather, we contend that: 1. Symptom-centered techniques (whether technologically mediated or not) may prove inadequate when used as stand-alone interventions, encouraging a mechanistic reading of complaints and treatment that is exclusively aimed at bringing about the remission of symptoms. 2. They may be unhelpful in cases of milder and/or blurred symptomatology, or manifestations of distress that do not fully meet any given set of diagnostic criteria (see Deacon, 2013). These considerations are relevant to the COVID-19 emergency insofar as we may reasonably assume that the most common sources of distress during infectious outbreaks do not necessarily give rise to classical mental health conditions, in terms of either intensity of distress (i.e., milder and/or subtle forms of distress may be the norm) or quality of subjective experience (i.e., they will likely generate new ways of coping with novel stressors).

We therefore argue that the marked influence of the biomedical model on most psychological practices–including those that are technologically mediated–risks undermining psychological responses to the challenges posed by the COVID-19 outbreak to the population at large.

MAKING SENSE OF COVID-19: ROUTINE, PREDICTABILITY, NARRATIVE, SENSE OF COHERENCE, AND RESILIENCE

As described above, the COVID-19 pandemic is generating a set of long-lasting triggers that are highly disruptive of the processes by which people usually make sense of their lives. It poses serious challenges, at a variety of levels, to the systems we all use (both individually and socially) to construct a meaningful sense of the world we live in and even of ourselves. Within the constructivist paradigm[6] (Neimeyer and Mahoney, 1995; Raskin and Bridges, 2002; Neimeyer, 2009), meaning construction is seen as the most central factor in human psychological life, a key to understanding both typical and atypical mental functioning.

Meaning making is a complex and multilayered process that includes cultural, linguistic, social, familial, and psychological (cognitive and emotional) components, among others. Together, these elements give rise to a *lived*, *dynamic sense of intentionality* and *selfhood*. Given the nature and variety of its constituents, meaning is never entirely individually constructed: it is something that we both "make and find" (Shotter, 1993, p. 77). In the specific domain of mental suffering, Guidano (1991, pp. 56–60) defined psychopathology as a "science of meaning," proposing that "personal meaning organization" shapes the meaning-making process that undergirds the development of self, lending coherence and stability to personal identity (citation omitted for anonymous peer review, Castiglioni et al., 2014). Hence, most forms of mental distress derive from a disruption (or interruption) to meaning making.[7] For example, in depression (one of the consequences of the COVID-19 pandemic viewed as most likely and harmful by WHO), "depressed persons often report that *they feel disconnected from the world*, that it appears as an *empty place deprived of all meaning*" (Jacobs, 2013, p. 2, italics added).

As long documented in the literature (Kelly, 1955; Bruner, 1990, 1991), there is a close (psycho)logical link between routine, predictability, and meaning. The disruption of everyday routines renders the world unpredictable, thus interfering with sense making, a process that according to Kelly (1955) relies on the ability to "predict and control events." In circumstances such as these, *time*–one of the core dimensions of human life–is deeply impacted: the *present* is "suspended" (a phenomenon that applies particularly to the confinement phase of managing the pandemic); the *past* no longer provides the wherewithal to interpret the current situation; the *future* becomes unpredictable, and all capacity for forward planning is arrested, given that most aspects of everyday reality have become fuzzy and unrecognizable, causing disorientation and the inability to act (a phenomenon that is typical of the current recovery phase).

The multifaceted process of meaning making described above organizes and expresses itself through metaphors and narratives. *Metaphors* serve to provide us with an idea of something that is hitherto unknown to us by associating it with an object we already

[6]By "constructivist paradigm" we mean a sort of broad theoretical "umbrella" encompassing a range of theories, which in, some cases, are different, and "rival" to each other (Kuhn, 1962-1970). Attempting to analyze the differences between the positions of individual scholars would mean initiating a huge and potentially never-ending epistemological debate. Such an analysis would fall far outside the scope of this paper. The present article, whose specific focus is the impact of the COVID-19 pandemic, is generally informed by the constructivist perspective. For each of the main points in our argument, we cite the authors whose work we consider most salient. All the scholars whose work we draw on may be viewed as belonging to the "extended family" of constructivism, in all its different varieties and with all its different nuances. This should be sufficient–for the specific purposes of the present work–to ensure the overall epistemological coherence of our proposed perspective, leaving the analysis of the different constructivist positions to other works (see for example, to limit the field to clinical psychology: quotations omitted for anonymous peer review; Neimeyer and Mahoney, 1995; Castiglioni and Faccio, 2010; Castiglioni, 2011). Importantly, the key constructs on which we have based our perspective display a degree of commonality. Specifically, they share the following common points, which may be viewed as alternative to the premises of the biomedical model: (a) a focus on the importance of meaning-making processes; (b) an emphasis on the "embeddedness" of such processes in social/relational contexts.

[7]From a "general" constructivist standpoint, we might say that mental distress arises when one feels that one's usual system of meanings has become useless, unavailable, or unsound for the purposes of making sense of one's current situation. Hence, the existing meaning-making system is "interrupted" or "suspended" before it has been possible to elaborate a sufficiently satisfactory "alternative type of construction" (whether by extending/further modifying the old one or by replacing it with a new one): no viable sense making (whether personal or "social") appears to be currently possible (Kelly, 1955; Feixas et al., 2009).

know (Battistelli, 2020), a function that bears similarities to the process of "anchoring" described by Moscovici et al. (2001) in his theory of social representations.[8]

Narratives are stories, based on metaphors, that convey the meaning of events in our lives over time (Polkinghorne, 2004; Squire et al., 2014); they thus offer a useful guide to interpreting and dealing with unfamiliar phenomena. "Narrative is a form of discourse that links events together across time, and thus, it can display the temporal dimension of human existence. Narrative form captures the notion that human lives are 'becomings' or journeys in which actions and happenings occur before, after, and at the same time as other actions and happenings" (Polkinghorne, 2004, p. 58).

Due to their discursive nature, narratives are constructed in and through social interaction. Neimeyer and Sands (2011) described how people organize the "seamless flow of life events," including negative happenings, into meaningful episodes that reflect personally significant themes, and then seek validation for this framework of meaning in the course of relating to others. From a narrative point of view, individuals construct a life story that is uniquely their own, yet unavoidably shaped by the social discourse of their specific cultural context.

The ability to construct meaningful and consistent narratives that illuminate and explain what is happening, at the individual, familial, and societal levels, appears to be a fundamental (pre)requisite for coping with any situation we may be presented with. Narratives, metaphors, and the set of meanings they convey, all contribute to establishing our *sense of coherence*.

The construct of sense of coherence (SOC), first proposed by Antonovsky (1993, 1987, 1979), offers a helpful framework for integrating personal and contextual factors. SOC is a stable universal construct that applies to all genders, social classes, and cultures (Sagy and Antonovsky, 2000; Eriksson and Lindström, 2005). It may be defined as a global predisposition reflecting the degree to which an individual feels pervasively, lastingly, and dynamically confident that internal and environmental stimuli are structured, predictable, and explainable (*comprehensibility*); that resources are available to meet the demands posed by these stimuli (*manageability*); and that such demands are challenges meriting investment and engagement (*meaningfulness*). Accordingly, sense of coherence would appear to be a key factor in our ability to deal with traumatic events such as the COVID-19 emergency and its direct and indirect aftereffects (Kimhi et al., 2010; Veronese et al., 2013; citation omitted for anonymous peer review).

There is no doubt that the COVID-19 pandemic, which is unprecedented in recent Western history, is a quintessential instance of the "unknown": one that defies all our usual sense-making systems, challenging our "sense of coherence." It thus requires the construction of new meanings, as well as of new routines, metaphors, and narratives, or–at the very least–a major revisiting or re-adaptation of existing ones.

As expressed by Prime et al. (2020, p. 9) in a "hot-off-the-press" paper on family well-being during COVID-19, "in recent weeks, families have encountered social disruption; family illness; and, for many, death and grief. They will experience the highest levels of adaptation when they are able to 'make sense' of the disaster by incorporating the events into their existing worldview, or by modifying their views, in a way that promotes health, togetherness, and a sense of coherence."

Significantly, Prime and colleagues view the *family* as playing a key role in the process of meaning (re)construction, given its status as the crucial point of intersection between the individual and social dimensions. They propose a conceptual framework based on systemic and ecological models of human development and family functioning, in which they link the social disruption (public health emergency, financial turmoil, job losses) caused by COVID-19 to family–and particularly child–adjustment, through a cascading process involving family caregivers, family (sub)systems, and family processes (Prime et al., 2020). A key construct in their work is "family resilience," a construct first developed by Walsh (1998, 2015), who–in a critique of the individualistic "deficit model"–reinterpreted the concept of resilience (traditionally viewed as an exclusively individual trait) according to insights drawn from systemic family therapy. "Walsh (1998, 2015) seminal work on family belief systems in fostering resilience highlights three critical areas in which family beliefs will be implicated in the response to COVID-19: (a) meaning making of adversity, (b) fostering a positive outlook, and (c) transcendence and spirituality" (Prime et al., 2020, p. 9).

Despite its novel status, COVID-19 presents some similarities to other traumatic events such as natural disasters, catastrophes, terrorist attacks, wars, and traumatic loss (Prime et al., 2020), all situations that elicit major distress (Veronese et al., 2010) found that, in a context of ongoing warfare and protracted political violence, the capacity to attribute sense and coherence to uncertainty promoted a sense of efficacy and power. Hence, the ability to construct meaning in uncertain and traumatic conditions may be expected to enhance psychological well-being and quality of life, mitigating the direct and indirect effects of trauma caused by adverse conditions. Furthermore, clinical theory on traumatic loss (Hooghe et al., 2012; Neimeyer et al., 2014; Procaccia et al., 2018 citation omitted for anonymous peer review) suggests that family systems and their crucial role in meaning-making processes contribute to a more advanced ability to make sense of adverse events.

The study of narratives can further our understanding of the processes through which family members maintain or construct a sense of resilience following a shared loss or, as in the case of the current pandemic, a prolonged adverse situation. This is borne out by the finding that mourners who succeeded in gradually integrating their bereavement into their meaning systems report fewer symptoms of complicated grief over the longer term (citation omitted for anonymous peer review; Holland et al., 2010; Procaccia et al., 2018).

Naturally, all of the factors in meaning making just outlined can be influenced, and potentially significantly reinforced, by the use of technological media. As observed in the "Critical Issues for the Delivery of Psychological Assistance During the COVID-19 Outbreak" section, new digital technologies can facilitate the

[8]Within this theoretical framework, Moscovici examined the process whereby scientific theories are translated into, and permeate, "common-sense" knowledge.

work done in clinical settings; more generally, they can enhance people's everyday interaction with others. For example, they can enable routines to be maintained that might otherwise be interrupted due to physical distancing requirements, or they can serve to convey and amplify narratives and metaphors, bringing them to the attention of wide audiences, and they can even offer a "laboratory" for the creation of new meanings.

In light of this background, how may the key coping factors we have just described be enhanced to equip the broader population for dealing with COVID-19?

ENHANCING PROCESSES OF MEANING MAKING ABOUT COVID-19 IN THE GENERAL POPULATION

One of the first areas requiring intervention is *communication strategy*. As argued by many (Brooks et al., 2020; Holmes et al., 2020), in a situation like the COVID-19 pandemic, all official and media communications should be clear, consistent, and brief, especially those concerning the practical rules to be followed in the interest of avoiding infection and accelerating recovery from the public health and economic crises. In practice, conflicting messages delivered by media and government agencies in many countries have posed an additional challenge to the sense of coherence of the general population, especially in terms of the perceived *comprehensibility* and *manageability* of the pandemic (Antonovsky, 1996; citation omitted for anonymous peer review, Veronese et al., 2013). With regard to comprehensibility, inconsistent information about the nature of COVID-19 undermines the perception that the phenomenon is predictable and explainable. With regard to manageability, confusing communications have prompted serious doubts about the technical and practical resources available to address the pandemic and its consequences.

Second, clinical intervention should foster the *normalization* of psychological reactions to the pandemic. It seems reasonable that–up to a certain degree–fear, anxiety, depressive mood, sorrow, preoccupation, disappointment, insomnia, lessened or increased appetite, inability to concentrate, and many other distressful reactions should be viewed as natural responses to the exceptional triggers generated by the COVID-19 emergency. As argued by Horwitz and Wakefield (2007, p. 9) in relation to depressive symptoms arising in response to adverse events, "such reactions, even when quite intense due to the severity of the experience, are surely part of normal human nature." It is therefore difficult to justify the current overreadiness to pathologize many "negative" reactions to detrimental stimuli (see Schimmenti et al., 2020; Venuleo et al., 2020). Of course, individuals can react very differently, in terms of both intensity and type of response, depending on a multitude of factors, including previous mental disorders, disadvantaged circumstances, economic difficulties, membership of discriminated-against minority groups, and so on (Johnstone and Boyle, 2018; Prime et al., 2020), and some reactions may be perceived as more "appropriate" than others with respect to society's standards of "normal." In any case, we, here wish to flag the risk of what Frances (2013) has termed diagnostic hyperinflation, a phenomenon that entails the medicalization of *ordinary* life. In the context of the current situation, an increase in distress and requests for psychological support should be generally viewed as an appropriate and proportional response to *extraordinary* circumstances that have altered virtually all aspects of everyday life. Thus, an uptick in demand for psychological services might even be seen as desirable, to the extent that it likely reflects self-awareness on the part of those undergoing distress. At the same time, initial psychological assistance should be characterized by *active listening*, with a view to allowing the client's needs to emerge and be expressed. As argued elsewhere (citation omitted for anonymous peer review, Castiglioni and Laudisa, 2015) in relation to depressive symptoms, throughout the diagnostic process, practitioners should take careful account of the traditional distinction between "endogenous" syndromes, arising in the absence of any apparent external reason, and "reactive" ones, triggered by negative external circumstances.

A third aspect, which is closely interconnected with the second, concerns the crucial importance of *widening the observational field* from individuals to their familial and social–relational contexts (Watzlawick et al., 1967; Bateson, 1972) if we are to fully understand the origins and nature of clients' suffering and contribute to the effective resolution of their difficulties. As argued above, the biomedical model tends to be a-contextual, limiting its observational (and diagnostic) focus to the individual. This is due to its implicit correlation with the so-called "deficit model." The latter posits that "psychopathology is the result of dysfunction and distress, which are attributed to some deficiency within the individual. Thus, the onus is on the individual to enact certain changes to reduce distress and dysfunction and consequently improve mental health" (Anglin and Polanco-Roman, 2017, p. 998). In contrast with this predominantly "illness-oriented" biomedical-deficit perspective, more health-oriented paradigms (Antonovsky, 1996; Seligman et al., 2005) emphasize the importance of promoting well-being by focusing both on individuals' personal strengths and on the resources available to them in their contextual environments, such as the earlier-cited factor of family resilience. The outcomes of previous research on war settings by one of the present authors (citations omitted for anonymous peer review, Veronese et al., 2010, 2012, 2013) suggest that clinical intervention should be designed to reinforce components of positive functioning rather than to "rectify" behaviors, patterns of thinking, or emotions perceived as maladaptive. In keeping with the methodological principle of widening the field of observation, clinical efforts should be directed at increasing clients' "social capital," in terms of maximizing and leveraging cohesion at the levels of family, networks of friends, and community. Used to this end, participatory frameworks and action research models can facilitate and enhance therapeutic interventions focused on symptoms (Razer et al., 2009; Smith and Romero, 2010). Overall, the emphasis should be on fostering well-being and strengthening positive coping factors, with a view to obtaining stronger outcomes in uncertain situations without short-term solutions (Nguyen-Gillham et al., 2008; Hunt, 2010).

Group intervention offers a valuable means of targeting this goal. We suggest that the formation of *ad hoc* peer groups–whose meetings could be physical and/or technologically mediated and would be led by a specialized psychologist, at least in the earlier stages–may be key in this regard. Such groups–by sharing their emotional experiences surrounding the pandemic and activating the members' personal resources–would counteract the sense of meaninglessness and disconnectedness induced by the decrease in the quality and quantity of interpersonal interactions imposed by the COVID-19 emergency. Indeed, the very fact of taking part in a group promotes a sense of being connected to others, which is crucial in the current scenario where individual behaviors are interdependent (in terms of the mutual observance of safety measures), yet people have far fewer opportunities to interact with one another (due to lockdown arrangements and physical distancing rules). Among their intrinsic therapeutic factors, groups can inspire hope, given that they "invariably contain individuals who are at different points along a coping-collapse continuum" (Yalom and Leszcz, 2005, p. 5): hence, mutual interaction among group members may itself instill the hope of future improvements. Furthermore, groups may foster a normalizing outlook on the personal issues and distressful experiences generated by the pandemic: the discovery that many issues and experiences are shared with others could prompt the members of the group to broaden their definition of "normal" (for examples of group interventions fostering meaning-making processes, see Breitbart et al., 2010; Lund et al., 2017). A particularly interesting format recently developed in the context of the COVID-19 pandemic is W I I Thrive,[9] a group-centered approach aimed at enhancing human dignity and well-being with integrity. Within this framework, individuals are encouraged to form peer groups with a view to connecting with and supporting each other and discussing the challenges of adaptive living, on the basis of a shared set of ideas, values, and practices (G. R. Henriques, personal communication, 28 May 2020).

Finally, spirituality, in terms of either religious beliefs and rituals or a sense of "connectedness" to nature, art, beauty, etc., has been identified as an additional key resource for coping, healing, and fostering personal, familial, and group resilience (Delgado, 2007; Walsh, 2010; Prime et al., 2020). In brief, active social and personal engagement with spiritual and/or religious experiences may contribute to maintaining an adequate sense of coherence, and thus to coping better with psychological distress caused by the COVID-19 pandemic and the resulting socioeconomic crisis (Drageset et al., 2008).

Fourth, interventions aimed at restoring and fostering well-being should focus on processes of *meaning construction*, drawing on *metaphors*, and *narratives* that orient clients in coping with the pandemic and its long-term consequences. Let us consider the "metaphor of war" as an example of this kind of meaning-making process, bearing in mind that the performative power of communication and language enables us to "do things with words" (Austin, 1962).

Throughout this paper, we have more than once drawn a parallel between how people may be affected by the COVID-19 pandemic and the impact on individuals and communities of ongoing armed conflict. It is not by chance that one of the figures most widely used in the media (as well as in everyday conversations among people) to describe the current health emergency has been the war metaphor: we are engaged in a war against an "invisible enemy" (the virus), a war that has its own soldiers, prisoners, heroes, martyrs, traitors, victims, and fallen. Vedovelli (in Milesi, 2020) has critiqued the pervasive use of this metaphorical device, arguing that it risks generating a climate of suspicion, closures, barriers, and clashes. On the contrary, Battistelli (2020), while recognizing the potential insidiousness of the "pandemic as a war" metaphor, has pointed to its effectiveness in conveying a notion of serious threat to people's safety, health, and lives, thus spurring us to join forces in combatting the disease. In Vedovelli's view, social communications should be aimed, on the one hand, at making the "inexpressible" (the invisible enemy) understandable through the *logos* of scientific discourse and, on the other, at generating and supporting social relations. The debate between these two scholars illustrates how different metaphors give rise to different narratives and sets of meanings, potentially orienting the way in which we experience, interpret, and deal with the pandemic.

Of course, in our opinion, other metaphors could be viable, too. For example, the metaphor of the journey (Polkinghorne, 2004), which portrays us as currently traveling over very rough terrain with no reliable map, or the bereavement metaphor (Neimeyer et al., 2011), whereby, as a community, we have joined together to mourn our previous way of life, hoping that a new alternative will soon emerge, or the "man-as-scientist" metaphor (Kelly, 1955), according to which we all strive to predict and gain control of events, for example, by researching the causes of this unprecedented phenomenon and studying new solutions for overcoming or managing it. However, the range of metaphors available in a certain cultural context are not infinite. Given that meaning-making processes are embedded in their social–cultural and historical contexts, to some extent, "the affective interpretation of the insurgence of the pandemic scenario, rather than depending on the inherent characteristics of COVID-19, reflects the patterns of affective meanings grounding the cultural milieu at the moment in which the interpretation was enacted" (Venuleo et al., 2020, p. 124).

All these metaphors produce different narratives and interpretations, which in turn may prompt different attitudes and behaviors. In the context of clinical intervention, the practitioner can negotiate suitable personalized metaphors with the client.

CLINICAL VIGNETTES

We now present two clinical vignettes with a view to practically illustrating–although in brief–some aspects of the clinical perspective outlined in the last section.

[9]W I I stands for "We" (referring to one's relationships with others), "I" (individuality and subjectivity), "It" (referring both to the natural world and human technological and scientific understanding of it). Thriving refers to a state of flourishing, optimal functioning, and fulfillment across all levels of analysis and time frames (see https://www.wiithrive.com/home).

The first vignette thematizes the normalization of distressful experiences generated by the COVID-19 pandemic and the value of widening the field of observation to include the client's present and past contextual environment.

> C., an only child, is a 49-year-old married woman with two children, one of whom displays difficult personality traits. She lives with her family in the suburbs of Milan. At the age of nine, she lost her father, a farmer, and spent her youth with her mother, a woman – then in her late forties – without a formal education. At the age of 20, she met her husband, whom she describes as "a strong man you can rely on." However, she has somehow always felt inferior to him: she still believes that she was lucky he "chose her, a simple country girl." She is now employed by a state-owned enterprise.
>
> During the COVID-19 home confinement, she discovered that she had been in contact with an elderly woman who later passed away due to coronavirus. As required by governmental regulations, C. reached out to the local health authority to report what had happened. She was very worried about her own health status and tried to gather information about the possible consequences of infection. She relayed that the health professionals she spoke with – first by phone and later in person – had displayed a highly detached attitude. In their interactions with her, they focused solely on what had happened during the brief contacts C. had had with the deceased woman and on the measures to be taken as a result. C. was clearly distressed by the situation but had the impression that her concerns were largely being ignored. When healthcare personnel finally called her home, she described their attitude as cold and "medical." The team's protective attire and scant verbal interactions with C. – while consulting frequently among themselves – all contributed to making her feel even more "psychologically distant" from the very people she was relying on to take care of her. C. began to believe that her worries were excessive and stopped "trying to make an emotional connection" with the health professionals, from whom she had initially expected a word of comfort. In the weeks following the in-home meeting, one of the team phoned her regularly once a week, but kept the conversation firmly focused on her observation of the confinement rules and on recording "objective parameters" (temperature, presence of breathing difficulties, etc.). C. shut down during these calls and only spoke to answer the questions put to her by the health worker. She began to think that her worries were "wrong" and unworthy of attention.
>
> Although she was developing an increasingly judgmental attitude toward herself, she also progressively felt the need to share what had happened with someone who would really listen to her. Her husband was not a candidate given that he tended to minimize and trivialize her emotional concerns.
>
> When she first met one of the authors for a consultation, her sense of being emotionally incompetent was evident. She stated that "normal people react differently," while she herself "couldn't stop crying during the lockdown, like a kid." At first, she was unable to connect the extraordinary nature of the disruption to her everyday routines with the emotional reactions that had followed. The habitual meanings underpinning her self-assessments ("You're just a country girl," "You don't know how the world works," "You must be wrong to feel or think this," and "Stop crying and complaining") continued to prevail over any objective evaluation of the situation. The aim of the initial sessions was to listen closely and nonjudgmentally to her account and help her to link her emotional reactions to what had actually happened: drawing out this connection was intended to normalize her experiences, making them more understandable and acceptable to her (see the *normalization criterion*). This required the clinician to adopt a widened perspective that encompassed the personal, familial, cultural, and social contexts in which the sources of the client's distress had come into play. In light of these contextual features, the clinician guided the client toward developing a more comprehensive understanding of her life conditions. He did so by encouraging the client to view her thoughts and emotions as reactions to (internal and external) stimuli, rather than as manifestations of an inner and immutable deficit (see the *criterion of widening the observational field*). The practitioner also sought to enhance the client's awareness that these reactions had been strongly influenced by her personal history by fostering the construction of an alternative narrative framework, and specifically the view that the client had attempted to cope with an unprecedented series of unpredictable events based on the personal resources she felt she could count on. Such resources were deeply rooted in her own proximal and distal history and profoundly influenced the ways available to her for dealing with the events of the pandemic: the clinician noted that she could not have reacted any differently, given the exceptional nature of the events and the (personal, psychological, familial, social) resources at her disposal. To this end, he made connections between C.'s history and her present concerns. The clinician also made extensive use of a metaphorical analogy, drawing from the client's personal history. Because the client's mother had been bitterly critical toward her and excessively demanding considering her daughter's age ("an inflexible schoolmistress," in the shared language of the therapy), the client was continuously at risk of adopting the same attitude toward herself, and focusing exclusively on performance ("You should have done better!") rather than taking into account the unfavorable conditions she had been obliged to face ("I could not have behaved or thought differently, considering that. . ."). This negotiated and reiterated metaphor helped the client to develop a strong sense of kindness toward the much-criticized little girl that she had been and to transfer this to a considerable extent to her "adult-self." This, in turn, fostered the development of a nonjudgmental, positive attitude toward herself and her emotional life more generally, helping her

to make new sense of the difficulties she had encountered in the process of coping with the pandemic (see the *criterion of fostering meaning-making processes through the use of narratives and metaphors*).

The second vignette, while also confirming the importance of contextual factors, touches more specifically upon the role of community resilience and the mitigating effects of experiencing connectedness and transcendence.

F., an only child, is a 39-year-old single woman who has been living in Milan for the past 10 years. Her family is wealthy and highly cultured; she herself is very bright and has broad cultural interests. Her parents have been always emotionally unreliable: in her everyday interactions with them, they display an unpredictable mix of support, indifference, and offensiveness. She attended university in another town, where she felt unable to live up to her parents' expectation that she should be independent. During this troubled university period, she began taking drugs and abusing alcohol. A few years later, after hitting a particularly low point, she decided to give up drugs, and did so successfully and on her own. After completing her studies, she planned to pursue her longstanding dream of working abroad. However, the sudden news that her mother was seriously ill interrupted this project, and she decided not to leave so she could care for her mother. In recent years, she has worked on and off and decided to enroll at university again, although she feels like "a fish out of water." Nevertheless, she has recently experienced a "pleasant sense of continuity" from devoting herself to work and recreational activities that "at last have meaning."

The COVID-19 home confinement hit F. hard. On the one hand, she became increasingly concerned about the social and personal effects of the pandemic, worries that were exacerbated by news stories in the media, which she followed incessantly during the lockdown period. On the other hand, her sense of disconnect – which habitually took the form of feeling "unusual" or "odd" (on account of still attending university in her late thirties, being able to afford not to have a proper job, having unusual and varied cultural interests, etc.) – was progressively exacerbated by a lack of interaction with others due to the home confinement measures. Her sense of personal identity gradually became more fragile, in the absence of habitual reference points such as interpersonal interactions, daily routines, work, and recreational activities. She felt that the continuity in her life – which she had finally achieved after "meaningless years without building anything significant" – was in danger: the temporary disruption of her routines had triggered a sense of meaninglessness, associated with low mood, hypersomnia/insomnia, hypervigilance, and occasional convulsive crying.

F. found unexpected relief when – by chance – she tuned into an independent radio station, whose contents she perceived as surprisingly in harmony with her own worldview and interests. Day after day, F. felt increasingly more connected, reporting the clear perception that "there are people out there that I feel connected with: I'm not alone anymore!" She perceived this connection to be profound, rooted in the arts, human values, and cultural interests. Her contact and interactions with the radio presenters and their guests – although mediated by technology – had the effect of "turning something around." First, the distress F. reported having experienced gradually remitted; second, she became determined to stop delaying completion of her university course and decided to seriously devote herself to her studies. In view of the above, F. requested a psychological consultation.

During the first session with the clinician, F. displayed a generally disparaging attitude toward herself, behaving as though she expected the clinician to judge her for being "odd" and "unusual." The clinician challenged this "given" definition of herself, asking the client to explain what she meant by "odd" or "unusual." Their ongoing exchanges on this topic progressively led the client to acknowledge that her "isolation made her feel like she was 'unique,' in the negative sense of the word". She also recognized that she might have been feeling like this because she had hardly ever had the opportunity to meet people with similar interests and cultural awareness before tuning into the radio station (see the *criterion of normalization*). This discussion with the practitioner encouraged the client to do a "reality check" (as she evocatively said) and to "come out of my own narrow subjective perspective" (cit.) to consider the possibility that her personal experience – although private – could, nonetheless, be shared with many other individuals, at least on the basis of "our common human nature" (see the *criterion of widening the observational field*). This gradually led F. to develop a more appreciative attitude toward herself, as well as toward her own areas of knowledge, interests, and personal resources, in general. The practitioner pointed out to her that these resources can be useful for coping with reality, even in the face of an unprecedented event such as the pandemic: he connected the challenges of the present time with her skills and capacities. These comments were received with a mixture of suspicion and curiosity, and progressively fostered the construction of new meanings related to the events surrounding the pandemic. F. began to perceive herself differently, as "more resilient," and found the courage to leave her home to safely meet other people. Borrowed from a popular saying, a metaphor emerged in the course of therapy, thus formulated by F.: "we are all experiencing the same storm. We are not in the same boat though: some people are sailing in fancy yachts with all the comforts, others in flimsy cheap rowing boats. Everyone is reacting in their own way to this pandemic, and there's nothing wrong with that. I know I have to take care of my boat, the same as everyone else. Still, F., don't forget there's a storm out there!" (see the *criterion of fostering meaning-making processes through the use of narratives and metaphors*). This metaphor expressed F.'s gradually developing awareness of being personally responsible for her life decisions.

CONCLUDING REMARKS

Undoubtedly, the dramatic impact of the COVID-19 pandemic on the mental health of the general population gives much cause for concern. Individuals, families, and communities have been cast back on their own resources on an unprecedented scale. In light of this scenario, we have attempted to sketch out a perspective on psychological intervention that we believe to be appropriate for addressing the crisis and its aftermath.

In summary, clinical interventions aimed at relieving the distressful consequences of the pandemic should fulfill a set of general, but crucial, criteria:

1. *Flexibility*. There should be scope for interventions to address forms of distress whose manifestations are blurred and/or milder than expected, and do not necessarily fully conform to any specific diagnosis.
2. *Personalization*. Interventions should be informed by an assessment of symptoms that takes the client's underlying meaning systems into account, given that similar adverse stimuli may hold very different meanings for different individuals and in different contexts. Attending to the dimension of meaning should not exclude the use of symptom-centered techniques where required.
3. *Extended focus*. Interventions should conceptually link the development of mental problems to external triggers and stressors ascribable to the interpersonal domain (vs. solely internal triggers ascribable to the internal and/or biological domain). This is what we have defined as widening the field of observation to situate events (such as the client's complaints or symptoms) within their interpersonal contexts and promote an understanding of distressful experiences as strategies for coping with objective external challenges.
4. *Emphasis on positive resources*. Intervention should foster awareness of personal, familial, and social resources and their deployment to develop personalized coping strategies, in a shift away from exclusively deficit- and disorder-centered outlooks.

We believe that all practitioners, independently of their clinical orientations, may benefit from adopting these overarching criteria. Our recommendations are not in conflict with the theoretical and methodological specifics of the various clinical approaches. Rather, we advocate for a broader psychological perspective on forms of distress associated with the negative cascade of events that has ensued upon the COVID-19 outbreak, suggesting that they call for a departure from more classically disorder-oriented and deficit-centered outlooks. In short, our ultimate purpose is to contribute to the debate on how traditional forms of clinical intervention may best be adapted to the novel contextual factors being shaped by the pandemic.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

The authors equally contributed to the writing of the article. Both authors contributed to the article and approved the submitted version.

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The Public Health Impact of Coronavirus Disease on Human Trafficking

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The global pandemic of severe acute respiratory syndrome coronavirus 2 exacerbates major risk factors for global human trafficking. Social isolation of families and severe economic distress amplify the risk of interpersonal violence, unemployment and homelessness, as well as increased internet use by under-supervised children. Aggravating the situation are overwhelmed health systems, severe limitations in activities of social service organizations, and decreased contact of healthcare professionals with children. Healthcare professionals have a duty to be alert to possible indicators of trafficking, and aware of available victim resources which can be offered to at-risk patients. Healthcare facilities should take steps to increase public awareness of trafficking and community resources.

Keywords: coronavirus disease, COVID-19, human trafficking, health impact, prevention, public health, sex trafficking, labor trafficking

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INTRODUCTION

Human trafficking is a major global public health problem (1, 2). In all likelihood, the prevalence of exploitation will increase as a result of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic (3–6). Trafficking involves the exploitation of others using force, fraud, coercion, or abuse of power, principally in the contexts of commercial sex and forced labor (7). The impact of human trafficking ranges from individual health consequences (e.g., traumatic injury, infections, unwanted pregnancy, malnutrition, exposure to toxins, post-traumatic stress disorder, and depression) to family strife and division, community discrimination, business expectations for docile and unpaid labor, and societal norms of cheap consumer goods.

The recent global outbreak of SARS-CoV-2 has led to major social changes severely limiting social interaction and restricting movement of individuals and populations. While research on the specific impacts of COVID-19 has yet to emerge, the current state of knowledge provides some insight into the ways such a global crisis will likely exacerbate vulnerabilities to trafficking (5, 6). Social distancing and closures of schools and businesses have decreased in-person contact and expanded online communication. Dramatic changes in the economy have also significantly increased unemployment, poverty, and homelessness (8). The changes have the potential to markedly increase the risk of human trafficking both during and after the pandemic. Notably, baseline risk for trafficking is not equally distributed in society. People of color, gender minorities, migrants, those with a history of abuse, and the working poor are more likely to experience trafficking (9–14). The pandemic's impacts will likely magnify these risks among

already marginalized populations. COVID-related trafficking risks may be grouped into three interrelated categories: family life, economic distress, and limits in external professional assistance. Intensification of family strains due to quarantine may be exacerbated by both economic strain and limited access to services, all combining to produced new and heightened vulnerabilities, especially for those marginalized populations who are unequally affected by both COVID-19 and human trafficking. It is incumbent upon HCPs to be aware of these heightened risk factors during pandemics.

FAMILY LIFE

1. **Rise in intimate partner violence (IPV) and child maltreatment**. Family violence, including IPV and child abuse are risk factors for human trafficking (15, 16). Given the mandated restrictions in movement seen in many countries as part of the coronavirus disease (COVID-19) mitigation effort, as well as closures of alternative safe housing, and increased financial pressures, families struggling with violence and interpersonal dysfunction are forced to spend increasing amounts of time together, which may exacerbate tensions, Reports related to IPV and child sexual exploitation increased in multiple countries during the early period of the Covid pandemic (17, 18). Increased financial strains may result in family members exploiting each other into forced labor. Overcrowding within a residence, and/or the presence of a sexual offender may render children in the home vulnerable to sexual abuse or exploitation. Maltreated children are less likely to come to the attention of mandated reporters now that schools are closed (19). This allows abuse to go unchecked and potentially drives a child to run away from home, rendering them at an even higher risk of exploitation.
2. **Increased use of internet by children.** With school closures many children turn to social media and other online activities to fill their time. For those who engage in risky online behaviors such as acting aggressively toward others, or sharing personal information with people met online (20), and who have risk factors associated with offline sexual abuse may experience increased risk of online sexual exploitation, especially if the added time on the internet occurs in the context of limited supervision (21). The allure of fraudulent online job ads can also increase risk of labor trafficking for children, youth, and adults who lack safe job searching skills.

ECONOMIC DISTRESS

1. **Labor exploitation/trafficking**. Globally, economic stress could increase cross-border migration in search of work, which can put people at risk of exploitation (9, 22). Simultaneously, border closure to prevent the spread of infection could limit workers' options to migrate for safer work conditions outside their home countries or increase the cost associated with migration (23). In these situations as well as others involving increased economic crisis due to COVID-19, desperate adults and youth may be forced to accept exploitative, coercive, unpaid, or inescapable work conditions (5, 6). Caregivers may allow children to engage in hazardous child labor such as work with dangerous machinery, or work in an unhealthy environment. Children and youth may be induced to engage in illicit activities to earn money, such as selling or transporting drugs.
2. **Sexual exploitation/trafficking**. Caregivers in financially fragile positions at baseline may resort to sexual exploitation of children to pay for food or other necessities (24). Adolescents may decide to assist the family in obtaining money by selling sex. Adults involved in consensual commercial sex may find it more difficult with COVID-19 restrictions to solicit clients, forcing them to engage in riskier behaviors and to accept clients who might present greater danger of abuse, rape, or trafficking (25).
3. **Traffickers.** In addition to the increased vulnerability described above, economic strain could encourage people to engage in illicit activity, including compelling or coercing others into unpaid labor or forced sex work (6, 24, 26). Addressing economic strain is as relevant to preventing victimization as it is to preventing perpetration.

LIMITS IN ASSISTANCE FROM PROFESSIONALS

1. **Overwhelmed health systems**. The surge in hospital and emergency department admissions related to COVID-19 has overwhelmed health systems in many countries. Major concerns about infection exposure, PPE and ventilator shortages, and treatment of severely ill patients take priority in the attention of healthcare professionals (HCP) and administrators. Understandably, other urgent situations including human trafficking may be overlooked and the opportunity for offering resources to exploited persons missed. HCPs may assume there is no time to screen for trafficking and exploitation or to spend time counseling about worker rights, community referrals, and resources.
2. **Overwhelmed social service agencies**. As social service agencies struggle with cuts to funding and keeping clients and staff safe, typical face-to-face contact and service provision for high risk families may be limited (4). Organizations providing services to trafficked persons, immigrants/refugees, and homeless/runaway youth and adults will need to shift outreach techniques to identify and serve those in need.
3. **Under-staffed law enforcement agencies**. Economic desperation, homelessness hunger, and anti-immigrant bigotry may lead to marked increases in crime and general social unrest. Over-stretched law enforcement staff may shift their focus away from trafficking investigations.

DISCUSSION: WHAT CAN HCPs DO?

Trafficking is a public health issue that affects people of all ages, races, genders, nationalities, and sexualities. While trafficking and other forms of violence occur regardless of pandemics or natural disasters, it is critical in moments of heightened risk that

HCPs equip themselves to be particularly vigilant and prepared to assist survivors. The following are recommendations that HCPs can implement to address the overlapping heightened trafficking risk factors related to familial life, economic distress, and HCP capacity. These actions are designed to increase the likelihood of identifying individuals at risk of trafficking and providing them appropriate care, regardless of the underlying exacerbating circumstances, which will often be obscured to the practitioner.

1. While HCPs may have very little time to spend with patients in person, especially those without concerns of SARS-CoV-2 infection, even emergency department staff can offer at-risk patients written resources related to worker rights, IPV, national human trafficking hotlines, and/or immigrant/refugee services (27). If delivering healthcare via telemedicine the provider can type in the links in the "chat" box. Such resources can be downloaded from HEAL Trafficking (https://healtrafficking.org/patient-resources/, and https://healtrafficking.org/covid-19-resources-2/).
2. When conducting telemedicine evaluations, HCPs should be observant of conditions in the patient's environment. If such a visit occurs in the home of a trafficked/exploited person, possible indicators of exploitation may be evident, such as apparent bullying or violence occurring in the home environment, other suspicious activity in the background, or the presence of a domineering companion who wants to speak for the patient.
3. Healthcare facilities should display posters on human trafficking, IPV and other forms of violence, including contact information for resources and other assistance for both patients and providers. These posters should avoid using sensational images that reinforce stereotypical images of white cis-gendered female sex trafficking victims, and rather capture a diversity of lived experience, in order to improve outreach to the most affected communities.
4. HCPs may collaborate with community providers serving vulnerable populations and, with the patient's permission, refer patients for virtual or in-person services. Lists of national online resources are also a potential source of assistance to vulnerable patient populations.
5. Encourage HCPs to identify community and government agencies providing emergency support (e.g., food and basic supplies) and make a list of such service providers easily accessible to patients who travel to health facilities or engage in telehealth sessions.
6. Encourage health professional organizations to advocate for labor rights and enforcement of labor laws, especially those related to minimum wage, work hour limits, safety requirements, and healthcare benefits for workers.
7. Since there is significant overlap in risk factors for online and offline sexual abuse/exploitation, as well as for online and offline labor exploitation, research suggests that HCPs use established strategies for offline abuse prevention to help reduce the risk of online exploitation. For example, they may counsel pediatric patients and caregivers about healthy and unhealthy relationships, the importance of consent, respect for others, safety planning, and safe job search strategies (28).
8. Talk to caregivers about joining online support groups or having their children join safe, supportive, well-monitored peer groups.
9. If an HCP suspects exploitation/trafficking, they should report concerns to authorities ***IF*** (1) the patient appears to be in imminent danger (call emergency services), (2) the HCP has a mandatory reporting obligation, or (3) the report is not mandatory but the patient requests law enforcement involvement. All HCPs should be aware that reporting can lead to negative consequences including (but not limited to) criminalization of victims, immigration proceedings, and violent repercussions, so it is imperative that patient requests regarding law enforcement engagement be respected when possible, given mandatory reporting laws. In addition, if the decision is made to involve law enforcement, every effort should be made to engage the members of law enforcement most informed about the complexities of trafficking.

For information on how HCPs can assess for trafficking and connect trafficked patients to resources, see **HEAL Trafficking (resources for health professionals): www.HEALtrafficking.org.** Health professionals may connect trafficked persons with the **National Human Trafficking Resource Center hotline: 1-888-373-7888 (SMS "BEFREE") 24/7.**

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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Implementation of a Mindfulness-Based Crisis Intervention for Frontline Healthcare Workers During the COVID-19 Outbreak in a Public General Hospital in Madrid, Spain

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Introduction: The COVID-19 outbreak is having an impact on the well-being of healthcare workers. Mindfulness-based interventions have shown effectiveness in reducing stress and fostering resilience and recovery in healthcare workers. There are no studies examining the feasibility of brief mindfulness-based interventions during the COVID-19 outbreak.

Materials and Methods: This is an exploratory study with a post intervention assessment. We describe an on-site brief mindfulness intervention and evaluate its helpfulness, safety, and feasibility.

Results: One thousand out of 7,000 (14%) healthcare workers from La Paz University Hospital in Madrid (Spain) participated in at least one session. One hundred and fifty out of 1,000 (15%) participants filled out a self-report questionnaire evaluating the helpfulness of the intervention for on-site stress reduction. Ninety two subjects (61%) participated in more than one session. Most of the participants were women (80%) with a mean age of 38.6 years. Almost half of the sample were nurses (46%). Sessions were perceived as being helpful with a mean rating of 8.4 on a scale from 0 to 10. Only 3 people (2%) reported a minor adverse effect (increased anxiety or dizziness).

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Discussion: Our data supports the utility, safety and feasibility of an on-site, brief mindfulness-based intervention designed to reduce stress for frontline health workers during a crisis. There is a need to continue testing this type of interventions, and to integrate emotion regulation strategies as an essential part of health workers' general training.

Clinical Trial Registration number: NCT04555005.

Keywords: mindfulness, brief mindfulness-based intervention, compassion, stress, COVID-19, healthcare workers, implementation, general hospital

INTRODUCTION

The pandemic caused by the SARS-CoV-2 poses a major challenge for national health systems around the globe. Along with Italy, Spain was one of the European epicenters of the pandemic, with more than 220,000 people infected and over 25,000 dead by May 15th 2020, the core period of the pandemic in Madrid (Spain) until date (1). Currently (by August 10th) 322,980 people have been infected and 28,576 have died (2). Almost one third of the people infected were diagnosed in the region of Madrid, where more than 8,000 people died from February 25th to May 15th (8,464 to August 10th). Hospitals had to change their structure almost entirely in order to effectively respond to the emergency.

La Paz University Hospital is a public, general hospital in Madrid that provides healthcare to a catchment area of over 500,000 people. Around 3,000 patients infected with SARS-CoV-2 have been treated in this Hospital by May 15th (3). Since the beginning of March 2020, most of its units were converted to COVID-19 wards, non-emergency surgeries were canceled, and beds in intensive care units (ICUs) were quadrupled. Additionally, many professionals from different specialties were deployed to the frontline. This entailed working with unknown colleagues in novel settings where safety and trust are critical.

Healthcare workers have been a vulnerable population exposed to close contact with infected patients, to an excessive workload and to experiences of physical exhaustion, fear, emotional disturbance, and dysregulation of sleep patterns during the COVID-19 pandemic (4–8). Many studies have been conducted in China during the outbreak, and the results reveal high rates of anxiety and depressive symptoms, sleep problems and psychological distress in more than 70% of the surveyed samples (4, 9). In addition, follow-up studies show that psychological effects may persist long after the outbreak. Wong et al. found that 3 years after the 2003 SARS outbreak, 23% of healthcare workers reported moderate to greater depressive symptoms (10). This outbreak is also putting healthcare workers into ethical and moral dilemmas. They have to make decisions that may include how to allocate scant resources to equally needful patients, how to balance their own physical and mental health needs with those of the patients and how to align their commitment to help patients with their willingness to be with family and friends (11). In light of this situation, the Word Health Organization has made recommendations for identification and management of physical, mental health and psychosocial well-being in healthcare workers (12, 13).

Previous studies outline the importance of safeguarding the morale and mental health of healthcare professionals as this can influence the success of healthcare delivery (14, 15). Stigma and abandonment have been reported across various outbreaks despite differences in culture, education levels and available healthcare services (16, 17). Besides physical recommendations that may help reduce psychiatric symptoms, studies emphasize as coping strategies the support from colleagues and sustained engagement with updated, reliable information about the outbreak (18).

Our Mental Health Team participated in the Ebola Health Emergency in Madrid (Spain) in 2014. A total of 100 people, most of them healthcare workers, were attended (19). One emphasized conclusion was that the mental health team should be involved during the emergency from initial stages providing training in emotion regulation techniques for the rest of professionals.

Mindfulness is the ability to pay attention to the present moment in an intentional, non-judgmental way (20). Mindfulness-based programs have shown efficacy in reducing stress (21) and increasing quality of life and self-compassion in healthcare professionals (22). Gilmartin et al. conclude in a systematic literature review that brief mindfulness interventions (lasting 5–20 min once a day) may be effective in improving healthcare provider's well-being and decreasing levels of anxiety and stress (23). Furthermore, mindfulness training is associated with emotion regulation, fostering well-being and resilience and promoting switching from a state of automatic pilot to one of cognitive awareness, enabling a more thoughtful approach to clinical decision-making (24–26). Other studies outline the importance of self-compassion because of its positive association with happiness and recommend to include specific self-compassion components in future programs aimed at enhancing well-being in healthcare workers (27, 28).

Mindfulness can certainly be a "pathway to resilience and recovery" during the COVID-19 pandemic (29). One of the actions taken by La Paz University Hospital's Mental Health Team was developing a brief Mindfulness-based intervention for frontline healthcare workers to train emotion regulation. Following the recommendations given by some authors with experience in mindfulness training (24, 30), the intervention was

conceived as a brief experience (between 5 and 10 min), delivered on-site (at COVID-19 wards) and repeatedly (twice a day, 7 days a week), during 7 weeks.

The aim of the present study is to describe an on-site, brief mindfulness-based crisis intervention and explore its feasibility, helpfulness and safety for frontline healthcare workers in the midst of the COVID-19 storm.

MATERIALS AND METHODS

This study was developed as an exploratory research design with a post-intervention assessment.

From the beginning of the emergency, at least two members of the Mental Health Team went to the places where frontline health professionals were working (emergency department, ICUs, COVID-19 wards) and offered the intervention on-site.

The Ethics Review Board approved the study and concluded that due to the emergency situation and the fact that such type of intervention was delivered as routine care at our hospital, participants' consent was not required. Trial registration number: NCT04555005.

Measures

An anonymous, short self-report questionnaire was designed *ad hoc* to collect the following variables: age, gender, profession, workplace, session attendance, and perceived helpfulness in reducing current stress (ranked on a 0–10 point visual analog scale). Subjects filled out the questionnaire right after the session.

We collected the following data as indicators of the utility, safety and feasibility of the implementation of this intervention:
Utility:

- Mean "perceived helpfulness in reducing current stress."

Safety:

- Number and % of participants who reported any kind of adverse event.

Feasibility:

- Number and % of professionals who attended at least one session, out of the total number of health care workers of the hospital.
- Number of sessions that were held in COVID-19 wards between March 10th and April 26th.
- Number and % of participants who filled out the survey out of the total number of professionals who attended at least one session.
- Number and % of professionals who attended more than one session.

Intervention

The intervention consisted of 5–10 min of mindfulness practices delivered twice daily by experienced psychiatrists, psychologists, and mental health nurses. They were supervised by certified mindfulness trainers. The intervention was presented to each new team with an introduction as a justification of the action based on: (1) The importance of self-care, as professionals are the most valuable means the system has to deal with the crisis. There is no care for others if there is no care for oneself; (2) Placing mind training and emotion regulation at the same level of importance as the dressing and undressing of the personal protective equipment; and (3) The need to build an inner space of calm in the midst of the storm, from which successful actions can be taken. This explanatory introduction seems a key element to improve the acceptability and the adherence to the intervention. Three elements were trained in each session: (1) Focused attention through the invitation to kindly rest attention on a specific anchor, such as breathing, parts of the body like hands or feet, or the surrounding sounds; (2) Conscious movements through soft hatta yoga stretching exercises which were done standing or sitting, adapted to any physical condition; and (3) Compassion, through kind and inviting language and attitude, *via* specific sentences and gestures which invite to care for oneself (i.e., placing one or both hands on the chest). Participants were invited to recognize and accept without judgment any emotion, thought and body sensation that arose during the practice.

Sessions were characterized by being proactive, on-site, flexible, repetitive, generating an internal pause and place of empowerment. Flexibility was manifested in the order in which each element was presented and the duration, which could be changed depending on the context and the level of energy or concern of each team at each moment. For example, if we felt that the team was highly aroused, we started with a set of conscious movements. The aim was to recognize the tension and restlessness present at that particular moment and to invite, through the practice, to focus the attention to the present moment in a kind and compassionate way.

RESULTS

More than 3,000 sessions were held in COVID-19 wards between March 10th and April 26th, the core period of the pandemic in Madrid (Spain) until date. Any worker of La Paz University Hospital could participate. One thousand out of 7,000 healthcare professionals (e.g., physicians, nurses, social workers, physical therapists, technicians, cleaning staff) attended at least one of the sessions. Therefore, the initial enrollment rate was of 14%. **Table 1** shows, utility, safety and feasibility outcomes.

The rate of survey completion collected for 3 days (from April 13th to April 15th) was 15% (150/1,000). Demographic characteristics of the participants are shown in **Table 2**, while **Table 3** shows data of the intervention. Most interventions were carried out in Intensive Care Units (23%), COVID-19 Medical Units (38%), and the Emergency Department (22%). Ninety two participants out of 150 (61%) attended more than one session.

Participants perceived the intervention as being helpful for reducing stress with a mean rating of 8.4 on a scale from 0 to 10. There was no significant statistical difference ($t = -0.599$, $\alpha > 0.05$) on the perceived helpfulness between those participants who attended just one session (mean = 8.4; SD = 1.7) and those who attended more than one session (mean = 8.6; SD = 1.3).

Mild adverse effects were found in 3 participants (2%) who reported dizziness and increased anxiety after the session.

TABLE 1 | Utility, safety and feasibility outcomes.

Utility, Mean (SD)	
Indicator 1[a]	8.4 (1.55)
Safety, *n* (%)	
Indicator 2[b]	3/150 (2%)
Feasibility	
Indicator 3, *n* (%)[c]	1000/7000 (14%)
Indicator 4, (number of sessions)[d]	>3000
Indicator 5, *n* (%)[f]	150/1000 (15%)
Indicator 6, *n* (%)[e]	92/150 (61%)

Note.
[a]*Indicator 1: Mean "perceived helpfulness in reducing current stress."*
[b]*Indicator 2: Number and % of participants who reported any kind of adverse event, out of the total number of participants who filled out the survey.*
[c]*Indicator 3: Number and % of professionals who attended at least one session, out of the total number of healthcare workers at the hospital.*
[d]*Indicator 4: Number of sessions that were held in COVID-19 wards between March 10th and April 26th.*
[e]*Indicator 5: Number and % of participants who filled out the survey out of the total number of professionals who attended at least one session.*
[f]*Indicator 6: Number and % of professionals who attended more than one session.*

TABLE 2 | Characteristics of the participants.

Age (years), Mean (SD)	38.6 (12.3)
Sex, *n* (%)[a]	
Women	119 (79.9)
Men	30 (20.1)
Profession, *n* (%)	
Nurse	52 (46)
Nursing assistant	35 (31)
Orderly	11 (9.7)
Nursing Resident	1 (0.9)
Medical Resident	2 (1.8)
Physician	8 (7.1)
Cleaning Staff	2 (1.8)
Technician	2 (1.8)

[a]*No missing values.*

TABLE 3 | Characteristics of the intervention.

Participants per session, M (SD)	7.43 (2.57)
Location, *n* (%)[a]	
ICUs	32 (22.7)
Emergency Department	31 (22)
Medical Unit	54 (38.3)
Physiotherapy Unit	10 (7.1)
Radio-Oncology Unit	10 (7.1)
Radiology Unit	2 (1.4)
Central Services	2 (1.4)
Times of participation in a session during the crisis[b]	
1	33 (26.4)
2–5	67 (53.6)
>5	25 (20)

[a]*Data of valid percentage has been used in all cases.*

DISCUSSION

This study explores whether an on-site mindfulness-based crisis intervention designed for stress reduction for frontline healthcare professionals could be implemented on acute health wards of a public, general hospital during the outbreak of the COVID-19 pandemic in Madrid and shows data of feasibility, utility and safety of the intervention.

One core issue in this research is that the team developed and implemented the intervention in a short period of time and under extremely adverse circumstances (scarcity of protection materials and equipment, professional fatigue due to long shifts, hospital wards closed due to the infection, etc.). In this context, the initial enrollment was of one in every seven workers (14% participation rate). La Paz University Hospital has more than 7,000 workers but we could not access all of them probably due to factors such as fatigue, shifts, sick leaves, lack of time (the intervention was offered during working hours), among others. Moreover, not all of the 7,000 professionals were frontline health workers.

We collected questionnaires for 3 days only. Results of the 150 people (15% of the global participation) show that participants perceived the intervention as being helpful for reducing stress with a mean rating of 8.4 on a scale from 0 to 10, with a continuous participation rate over 61%, and few mild adverse effects (2%). We are aware of the fact that there may be some bias among people who completed the survey -e.g., those who found it particularly helpful may have been more likely to respond-. In addition, the rate of participation (14%) might reflect the bandwidth of the research team to only be able to reach a portion of providers. Although certainly the benchmark for determining feasibility may be lower during a pandemic, there is no established cut-off for what that benchmark would be. Taking these limitations into account our data suggest feasibility and good utility and safety outcomes during a pandemic.

Randomized controlled trials are the best study design to test the comparative effect of an intervention. This was far from the objective of the current research. We cannot answer the questions "was this intervention effective?" or "was there any change after the intervention?" The intervention was rated by health workers as very helpful with no differences in the ratings between those who attended one session and those who attended more sessions. This finding is similar to Gilmartin's conclusion (24). To our knowledge, there are no studies that evaluate the implementation of a brief mindfulness-based intervention during a crisis.

The acceptability of the intervention may be related to the fact that it was facilitated on-site, and it was an invitation to stop on a voluntary stance. The aim was to practice and train self-care strategies without adding excessive time-consuming practices and strain. In addition, the sessions were open to all members of the team working at that moment, so people were not marked or stigmatized as someone who specifically needed mental health support.

We asked for adverse effects and three participants reported increased anxiety and dizziness. A recent review about the

possibility of harm in mindfulness-based programs concluded that adverse events are no more common in these programs than comparison conditions (exercise or psychotherapy) and may not be attributable to the intervention or are not clinically significant (31).

We provide some hypotheses that we are currently exploring with a qualitative research method in a representative sample. The intervention may be considered as a peer support strategy. Members of the Mental Health Team were in the acute wards with healthcare employees sharing the same reality and all emotions that could arise. This may have helped participants generate a sense of closeness and connectedness which is associated with calmness and helps counteract experiences of stigma and shame (32). In a context where collaborative networks are as critical as they are fragile (because of professionals' deployment or fatigue), this is of great importance. Moreover, the invitation to participate in the sessions could reduce stigma and empower the person who actually connected with their own resources. Delivering the intervention in a group format might also alleviate the sense of loneliness and foster a feeling of "being part of" which has been found to be beneficial (33). Finally, having these mindfulness slots was useful for detecting professionals in situations of special vulnerability. In these cases, we invited them to take care of themselves and contact other members of the Mental Health Team for individual support.

Interventions like the one we describe in this article might constitute a beneficial response to some of the challenges faced when supporting frontline healthcare providers (34, 35). Some of these challenges are: the consideration on the part of managers and the own health professionals that self-care is a luxury and not a need; struggles of healthcare professionals with being in touch with their own feelings, and the recognition of emotions such as fear or anxiety that may produce shame or guilt; asking for help and support can be associated with stigmatization (36); frontline health workers tend to be in "doing mode" during the emergency, having difficulty to take or make little breaks during work time (24).

We cannot generalize the acceptability to all professions. The intervention was well-accepted specifically by nurses and nursing assistants. Doctors had more difficulty to make a pause and some of them reported "not having time," or "not being interested in this approach." The question why doctors are not interested or not convinced to participate needs further investigation. In addition, the majority of the participants were women, who have shown to be more empathetic and compassionate than men (37) and maybe more willing to participate in the sessions and contribute filling out the questionnaire. However, up to 70% of people who work in health professions are women according to global data of the 2019 Labor Force Survey in Spain (38), which might explain the high percentage of female participants in our sample. Moreover, we cannot state that this type of intervention could be implemented in settings with no mindfulness experienced professionals. In this study, psychiatrists and clinical psychologists specifically trained in standardized mindfulness programs delivered sessions and supervised the intervention done by professionals with less experience in mindfulness.

The findings of this study are promising and show the feasibility and safety of a brief mindfulness-based intervention to promote healthcare workers' well-being in highly demanding places like ICUs and emergency units. More studies are needed in cross-cultural contexts. The World Health Organization popularized the slogan "no health without mental health" to underscore how important mental health is. We agree with this claim. Furthermore, we assert "no healthcare without self-care."

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by La Paz University Hospital Research Ethics Committee. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

BR-V, ÁP, AM-S, and CB wrote the first draft of the manuscript and reviewed the successive versions of the manuscript. RM, MT, and M-PV-V made relevant contributions to the manuscript. All authors contributed to the implementation of the intervention in an acute setting and approved the final version of the manuscript.

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Relations of COVID-19-Related Stressors and Social Support With Chinese College Students' Psychological Response During the COVID-19 Pandemic

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This study examines the main and interactive relations of stressors and social support with Chinese college students' psychological symptoms (e.g., anxiety, depression) during the COVID-19 pandemic. All the constructs are assessed by self-report in an anonymous survey during the pandemic outbreak. The results show that the number of stressors has a positive relation with psychological symptoms, and social support has a negative relation with psychological symptoms. In addition, social support serves as a buffer against the negative impact of stressors. These findings hold implications for university counseling services during times of acute, large-scale stressors. Specifically, effective screening procedures should be developed to identify students who experience large number of stressors and provide suitable psychological intervention for them.

Keywords: PTSD, depression, anxiety, social support, COVID-19-related stressors

INTRODUCTION

It is well-established that stressful events (e.g., earthquakes and fatal diseases) have a significant impact on individual physical and mental health (1). However, the impact of large-scale stressors (e.g., infectious disease) on psychological adjustment in the general population is understudied, and we know little about how to improve psychological adjustment in the general Chinese population during the COVID-19 pandemic outbreak. The present study aims to examine the main and interactive relations of stressors and social support to individual psychological responses during the COVID-19 pandemic outbreak and holds the promise of information for counselors to prevent the negative psychological effects of the pandemic on the general college student population.

Relation of Stress to Psychological Response

Lazarus and Folkman (2) define stress as "a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" (p.19). To maintain biological homoeostasis during environmental or physiological challenges, our physiological coping mechanisms involving the hypothalamic-pituitary-adrenal axis, the autonomic nervous system, and the cardiovascular, metabolic, and immune systems protect the body from internal or external stress (3).

A mild, brief, and controllable state of challenged homeostasis could actually be perceived as pleasant or exciting and could be a positive stimulus for emotional and intellectual growth and development (4). However, if the normal stress response occurs frequently, it is not self-limited, and if the individual does not adapt to a repeated stressor of the same type, adverse metabolic consequences occur. A large body of research literature has shown links between chronic and acute stress and short- or long-term psychological and physical disorders, such as anxiety, depression, and PTSD (5–7). Specifically, people who experience a large number of stressors related to infectious diseases tend to show more psychological symptoms (e.g., PTSD, depression) than those who experience fewer stressors (6, 8). The COVID-19-related stressors are those stressful events related with COVID-19 disease that might endanger their well-being, such as an important person being infected with COVID-19 or having to cancel a vacation due to the pandemic. Facing the COVID-19 pandemic, an individual might experience different COVID-19-related stressors for many other reasons. Thus, the first hypothesis is proposed as follows:

Hypothesis 1: Individuals who experience more COVID-19-related stressors might have more psychological symptoms than those who experience less.

Relation of Social Support to Psychological Adjustment

The conservation theory of resources posits that both resource loss and resource gain are key predictors of psychological response, such as depression (9). Infectious diseases, such as with the COVID-19 pandemic, are often large scale and beyond individual control, and they lead to major resource loss. Social support is often regarded as an important compensation mechanism in buffering individual psychological responses when facing challenging environments (10). On the one hand, social support could be beneficial to individual mental health by providing the needed material and mental resources for dealing with life challenges. On the other hand, social support could improve individual psychological adjustment by enhancing the individual sense of control in dealing with stressful events. A vast body of research has demonstrated that the adequacy of social support is negatively related to the severity of psychological symptoms, such as depression (5, 11–13), and is positively related with well-being (14). A meta-analysis shows that social support is the strongest predictor of PTSD severity (15).

Social support is also regarded as a moderator in the relation between stressors and psychological outcomes (10). The moderating role of social support can be explained in the following ways. First, previous work suggests that perceived social support fosters feelings of belonging and security and a sense of control over the environment, which may enhance self-esteem, thus reducing the negative effects of stress on psychological adjustment (16–18). Second, research shows that social support could decrease the likelihood of maladaptive inferences about actual stressful life events by forming new schemas or revised schemas, which may attenuate the negative psychological outcomes of stressful events (19–21). Many studies show that people who perceive adequate social support find negative events to have fewer adverse consequences (e.g., anxiety, depression) than those who perceive little or no support (22–24). Thus, social support might moderate the stress-psychological symptom relation during the COVID-19 pandemic. The second hypothesis is proposed as follows:

Hypothesis 2: Social support (a) is a protective factor in predicting individual psychological symptoms and (b) could be regarded as a buffer in the relation between COVID-19-related stressors and psychological symptoms.

The COVID-19 Outbreak as a Unique Context for Studying Stressors, Social Support, and Psychological Symptoms

As an unusual and contagious pneumonia, the COVID-19 pandemic is caused by a novel and highly transmissible coronavirus. It caused international concern for its speed of transmission and varying degrees of illness and is designated by WHO as a public health emergency of international concern (25). As of March 15, 2020, a total of 150,000 laboratory-confirmed cases and 5,720 deaths have been documented in 141 countries or areas (26), and mainland China is one of the most highly infected areas. Under this circumstance, the Chinese government officially stepped up pandemic prevention and control with stricter measures to prevent the virus from spreading (25). These measures include tracing contacts, strengthening traffic control in each city, forbidding mass gatherings, closing nonessential public places, deferring the opening time of schools, and replacing in-person teaching with online teaching. Despite the benefits, these strict measures may also create heavy psychological and emotional burdens on the general population. For example, an individual may be quarantined because of a suspected or confirmed infection or an individual might cancel a vacation trip because of the COVID-19 pandemic. In particular, the student population (e.g., college students) became susceptible to the pandemic due to its large population density and their immaturity. Research shows that individuals across samples (from the general public to healthcare workers) report significant psychological responses during the outbreak (27–29). Psychological responses include perceiving COVID-19-related fear, threat, and worry and experiencing symptoms of psychological disorder. Moreover, these studies report significant individual differences in psychological response to COVID-19-related stressors and in susceptibility to mental health problems during the pandemic. However, these studies mainly focus on general local residents who live in infected areas and front-line health care workers rather than the general population. Although these studies investigate the impact of COVID-19 disease on individual psychological responses (e.g., perceived stress to COVID-19 disease) and psychological disorders (e.g., depression) during pandemic outbreaks, the relationship between COVID-19-related stressors and psychological adjustment during pandemics and their underlying mechanisms have not been thoroughly investigated. Therefore, studying the impact of the COVID-19 pandemic holds the promise of information for counselors to prevent the

negative psychological effects of pandemics on the general college student population.

METHOD

Participants

Data were collected between March 2 and March 15, 2020, using an anonymous, self-reported questionnaire. A total of 450 college students with different majors who participated in the curriculum of "Happy psychology" and "Mental health and education for primary and secondary school students" were invited to take part in our survey. The research material was sent to each student by email. The students were asked to return the completed survey as well as signed informed consent by the deadline. This study was conducted under the approval of the Moral and Ethics Committee of the School of Psychology, Jiangxi Normal University (Nanchang, China). Questionnaires with more than 15% of the items unanswered were excluded from the late analysis. A total of 431 survey responses were used in the following analysis. Of the respondents, 267 (61.9%) are female, and participant ages range from 18 to 22 ($M = 19.1$, SD $= 0.92$). Regarding their grade, 140 (32.5%) are freshmen; 197 (45.7%) sophomore; 54 (12.5%) junior, and 40 (9.3%) senior students. There are 33 (7.7%) students who lived in Hubei Province (the hardest hit areas) during the pandemic outbreak.

Measurement

COVID-19-Related Stress

According to the stress definition of Lazarus and Folkman (2), stressors are events that might endanger one's well-being. Main et al. (6) found that the stressors related to infectious disease could be grouped into six categories during the SARS epidemic, including self-, family-, friend-, acquaintance-, information-, and other infectious disease–related events. Main's view on stressor categorization of infectious disease is supported in our interview survey during the COVID-19 pandemic. Therefore, we developed a checklist measure to assess participants' experience of COVID-19-related stressful events (stressors) based on Main's SARS-related stressor scale. These events are grouped into six categories: (a) self-related events (three items, e.g., "You have experience contacting someone with a confirmed COVID-19 case"), (b) family-related events (three items, e.g., "A member of your family is suspected of having COVID-19"), (c) friend-related events (three items, e.g., "A close friend of yours is diagnosed with COVID-19 and receives treatment"), (d) acquaintance-related events (three items, e.g., "Someone you know [not including your family or a close friend] has COVID-19-like symptoms [fever, coughing]"), (e) information-related events (two items, e.g., "You heard others talking about the severity and contagiousness of COVID-19"), and (f) other COVID-19-related events (two items, e.g., "You had to cancel your vacation because of the COVID-19 pandemic"). Participants indicated whether each event occurred since the COVID-19 pandemic outbreak. The total number of events endorsed across all categories was computed with a high score indicating that students experience more COVID-19-related stressors.

Anxiety

The Chinese version of the GAD-7 is a one-dimensional, self-reported scale that is used to assess the symptoms of anxiety in adults (30). The participants were asked to rate perceived symptom burden during the past 2 weeks between 0 (not at all) and 3 (nearly every day), resulting in a total score ranging from 0 to 21. Higher scores indicate that the students might have higher symptoms of anxiety during the pandemic. The Chinese version of the GAD-7 demonstrates good psychometric properties (31) with a Cronbach's α of 0.86 in the present study.

Depression

The PHQ-9 is widely used to measure depression severity in adults with one item for each of the nine depressive symptoms (32). The participants were asked to rate perceived symptom burden during the past 2 weeks between 0 (not at all) and 3 (nearly every day), resulting in a total score ranging from 0 to 27. Higher scores indicate that the students might have higher symptoms of depression during the pandemic. The PHQ-9 is translated into various languages (including Chinese) and yields robust reliability in adults (including Chinese samples) (31, 32). The Cronbach's α of the PHQ-9 is .85 in the present study.

PTSD

The Impact of Events Scale – Revised [IES-R; (33)] is used to measure PTSD symptoms. The IES-R consists of 22 items: eight for re-experiencing/intrusion symptoms, eight for avoidance symptoms, and six for hyper-arousal symptoms. Each item is rated on a 5-point Likert-type scale between 0 (not at all) and 4 (extremely), reflecting the extent to which the particular symptom is a problem for the respondent during the past 1 week. The IES-R is demonstrated to be a valid tool in diagnosing PTSD in a Chinese sample (33) with Cronbach's α of the three dimensions of the IES-R ranging from 0.85 to 0.91 in the present study.

Perceived Social Support

The perceived social support scale (34) is used to measure the individual's degree of satisfaction of the support received from family, close friends, and other-related persons (such as teachers and common students but excluding close friends and family members). The scale includes three items, and the participants were asked to rate each item scored on a four-point Likert scale ranging from "very satisfied" to "very dissatisfied." Higher scores indicate greater satisfaction with the support from family members and others. The Cronbach's α of the perceived social support scale is 0.85 in the present study.

Control Variables

Previous research shows that sex, family residence (or the degree of exposure to disease), and age (or grade) are important influencing factors in predicting individual psychological adjustment during infectious disease (6, 29). Therefore, the variables of sex, grade, and family residence (Hubei vs. non-Hubei) are used as control variables in the present study.

TABLE 1 | Zero-order correlation of study variables for the full sample ($N = 431$).

Variable	$M \pm SD$	1	2	3	4	5	6	7
1 Anxiety	3.85 ± 3.62	1						
2 Depression	5.73 ± 4.36	0.51**	1					
3 Avoidance	6.61 ± 5.77	0.48**	0.32**	1				
4 Intrusion	6.21 ± 5.12	0.60**	0.40**	0.75**	1			
5 Hyper-arousal	3.72 ± 3.84	0.65**	0.45**	0.73**	0.83**	1		
6 Social support	4.98 ± 1.26	−0.32**	−0.48**	−0.17**	−0.18**	−0.23**	1	
7 Stressors	2.63 ± 1.21	0.14**	0.19**	0.16**	0.18**	0.17**	0.05	0.1

*Stressors, COVID-19-related stressors. **$p < 0.01$ (two-tailed test).*

Data Analysis

Considering that the indicators of psychological symptoms might be correlated with each other, it is appropriate to test the relations between those outcome variables and their predictors simultaneously in one model (35). The multivariate general linear model is used to investigate the effect of predictors (e.g., COVID-19-related stressors, social support) on the following psychological symptoms (e.g., anxiety, depression, avoidance, intrusion, and hyper-arousal) while simultaneously controlling for the effect of sex, grade, and family residence. Before running the model, the parametric assumptions on data (linearity, multicollinearity, multivariate normality, and homogeneity of variances) and the potential presence of multivariate outliers were assessed by inspecting diagnostic plots and performing ad hoc statistical tests, such as the Shapiro–Wilk test for multivariate normality, the Box's M test for homogeneity of covariances, and the Mahalanobis distance test for multivariate outlier detection. With the exception of linearity and collinearity (pair-wise correlations among dependent variables ranged from 0.32 to 0.83, all $p < 0.01$), the results of which were acceptable, all other assumptions were more or less violated. However, the multivariate general linear analysis is robust enough to such violation when the sample size is large (36). After deleting the 22 multivariate outliers that were identified by the Mahalanobis distance method, all skewness values became low and acceptable (between 0 and 1). A separation score was finally calculated for each dependent variable (e.g., anxiety) as the ratio of its between-group variance and its within-group variance. The higher the score, the greater the separation between groups that a variable gives. Data exploration and statistical analyses were performed with SPSS 16.0.

RESULT

The means, standard deviations, and zero-order correlation for the full sample are presented in **Table 1**. The results show that the number of COVID-19-related stressors is positively related to psychological symptoms (e.g., anxiety, depression, intrusion, avoidance, and hyper-arousal) (all $P < 0.01$), and social support is negatively related to the psychological symptoms above (all $P < 0.01$).

One-way Multivariate Analysis

The effect of predictors and demographic variables on psychological symptoms was tested one by one. A multivariate general linear model was used for factors (e.g., sex, grade, family residence) and continuous variables (e.g., COVID-19-related stressors and social support scores). All indicators of psychological symptoms (including anxiety, depression, avoidance, intrusion, and hyper-arousal) were regarded as outcome variables and were entered into the multivariate general linear model simultaneously. Results show that all demographic variables and predictors are significantly related with psychological symptoms (all $P < 0.05$). Furthermore, the examination of η^2 (eta squared) reveals small to medium effect sizes (from 0.03 to 0.11) with COVID-19-related stressors ($\eta^2 = 0.06$) and social support ($\eta^2 = 0.11$) showing a one-way moderate effect according to Cohen's criteria (37). In contrast analysis, significant linear (all $P < 0.001$), and quadratic (all $P < 0.05$) trends across the variables of COVID-19-related stressors and social support were found. Specifically, students who perceived high levels of COVID-19-related stressors (or social support) reported more (or less) psychological symptoms than did peers who perceived less, and hypothesis one is supported. The significant linear trends across the demographic variables (all $P < 0.001$) are also found in contrast analysis. That is, female students report more psychological symptoms than male students. Junior or senior students report more psychological symptoms than freshmen or sophomores. Students whose family residence is in Hubei province report more psychological symptoms than peers whose family residence is not in Hubei Province.

Multiple Multivariate Analysis

To test the independent impact of COVID-19-related stressors and social support on psychological symptoms, all independent variables (COVID-19-related stressors, social support, sex, grade, and family residence) were entered into a multivariate general linear model together. As presented in **Table 2**, all variables are significantly associated with psychological symptoms (all $P \leq 0.05$) and $\eta^2 s$ were not much dissimilar from one-way multivariate analysis results. The effect size of COVID-19-related stressors and social support became a little bit smaller. Although the quadratic trend is not statistically significant, the linear trend continues to be statistical significant (for COVID-19-related stressor: Wilk's $\lambda = 0.87$, $F_{(25,1,491)} = 2.54$, $P < 0.001$, $\eta^2 = 0.05$; social support: Wilk's $\lambda = 0.76$, $F_{(85,1,943)} = 2.84$, $P < 0.001$, $\eta^2 = 0.1$).

In order to examine the interaction effect, a new multivariate general linear model was built, including COVID-19-related stressors, social support, sex, grade, and family residence as factors. In the new model, both COVID-19-related stressors and social support are classified as three groups: low (the scores below−1 SD from the mean), medium (the scores between −1 SD from the mean and +1 SD from the mean), and high (the scores above +1 SD from the mean). Two two-way interaction effects (e.g., family residence × COVID-19-related stress and social support × COVID-19-related stress) are significant. Hypothesis 2 is supported. Specifically, for social support, with the COVID-19-related stressors increased, the psychological

TABLE 2 | Multivariate general linear results with effect sizes ($N = 409$).

	Wilks	*F*	Hypothesis df	Error df	*P*	η^2
COVID-19-related stressors	0.92	3.59	10	782	<0.001	0.05
Social support	0.84	7.74	10	782	<0.001	0.08
Sex	0.97	2.72	5	391	<0.05	0.03
Grade	0.96	3.24	5	391	<0.01	0.04
Family residence	0.98	2.23	5	391	<0.05	0.03

Multivariate general linear was used to investigate our hypotheses, in which the indicators of anxiety, depression, avoidance, intrusion, and hyper-arousal are outcomes variables; both COVID-19-related stressors and social support are predictors; and sex, grade, and family residence are covariates.

symptoms (e.g., anxiety, depression, and avoidance) of students increased sharply at the lower level of the social support group; in contrast, the psychological symptoms of students increased relatively slowly at the high level of social support group (see **Figure 1**). For family residence, with the COVID-19-related stressors increased, the psychological symptoms of students increased sharply at non-Hubei province; in contrast, the psychological symptoms of students increase relatively slowly at Hubei province (see **Figure 2**).

Finally, separation scores show that COVID-19-related stressors are mostly associated with the symptoms of depression scale, followed by intrusion and anxiety symptoms; social support is mostly related with the symptoms of depression scale, followed by anxiety symptoms (see **Table 3**). In other words, the significant trend that is found in the multivariate general linear model, i.e., the differences of psychological symptoms in different levels of COVID-19-related stressors (or social support) groups, is mainly due to the large between-group differences in depression and anxiety mean scores. In addition, similar results are found for demographic variables. That is, the demographic variable (e.g., sex, grade, family residence) differences on individual psychological symptoms are mainly due to the large between-group differences in depression and anxiety mean scores, too (See **Table 3**).

DISCUSSION

As a global public emergency issue, the COVID-19 pandemic has caused great suffering for those people who live in infected areas. Although there has been some research focusing on the influence of the pandemic on the psychological adjustment of patients and front-line healthcare workers, we know little about the influence of the COVID-19 pandemic on general population (e.g., college students). Therefore, studying the relationship between COVID-19-related stressors and Chinese college students' psychological adjustment during pandemics and their underlying mechanism could enrich our understanding about the impact of the pandemic on the general population. Our findings also could hold the promise of information for counselors to prevent the negative psychological effects of pandemics on the general college student population.

Main Effects of COVID-19-related Stressors and Social Support on Psychological Symptoms

Correlation analysis shows that the number of COVID-19-related stressors has a positive relation with psychological symptoms (including anxiety, depression, and PTSD symptoms), which is consistent with previous findings on individual adjustment during other infectious disease pandemics (e.g., SARS) in the general public sample (6). That is, during an acute, large-scale pandemic, such as the COVID-19 pandemic, even among individuals who are not directly contaminated with the disease, the psychological impact of the pandemic on the general population is significant. In addition, the negative relation found between social support and psychological symptoms is consistent with previous studies in which social support could be a protective predictor in stressful events, such as SARS, swine flu, or Middle East respiratory syndrome (MERS) (7, 38, 39).

Interactions Between Stress and Social Support or Family Residence in Predicting Symptoms

COVID-19-related stressors and social support interact with one another in predicting anxiety, depression, and the avoidance of PTSD. That is, the negative effect of COVID-19-related stressors on individual psychological symptoms is larger at a low level of social support than those at a high level. The symptoms of depression, anxiety, and avoidance could explain most of the interaction effect. This suggests that social support serves as a buffer against the impact of COVID-19-related stressors on psychological symptoms during the COVID-19 pandemic. For PTSD, comparing with the subscales of intrusion and hyper-arousal, the symptom of avoidance is more likely explained by the interaction of COVID-19-related stressors and social support. A possible reason might be that social support could provide enough resources in dealing with stressors and decrease the usage of avoidance coping strategies during acute, uncontrollable circumstances. However, the symptoms of intrusion and hyper-arousal might be common psychological responses related to biological mechanisms during the pandemic, which could be less affected by environmental factors (e.g., social support). For family residence, comparing with the students whose family residences are in Hubei province (the most affected area), the psychological symptoms of those students whose family residences are not in Hubei province are more likely affected by COVID-19-related stressors. This could be explained by the "psychological typhoon eye" effect, in which the impact of stress on psychological symptoms could be reduced because of the low level of posttraumatic event concern in extremely devastated areas (40).

Sex and Demographic Differences

Consistent with previous research (38), women tend to report higher psychological symptoms (e.g., anxiety, depression, and hyper-arousal symptoms) than men during a large-scale and uncontrollable pandemic. The possible reason might be that women tend to be more sensitive to external threat due to

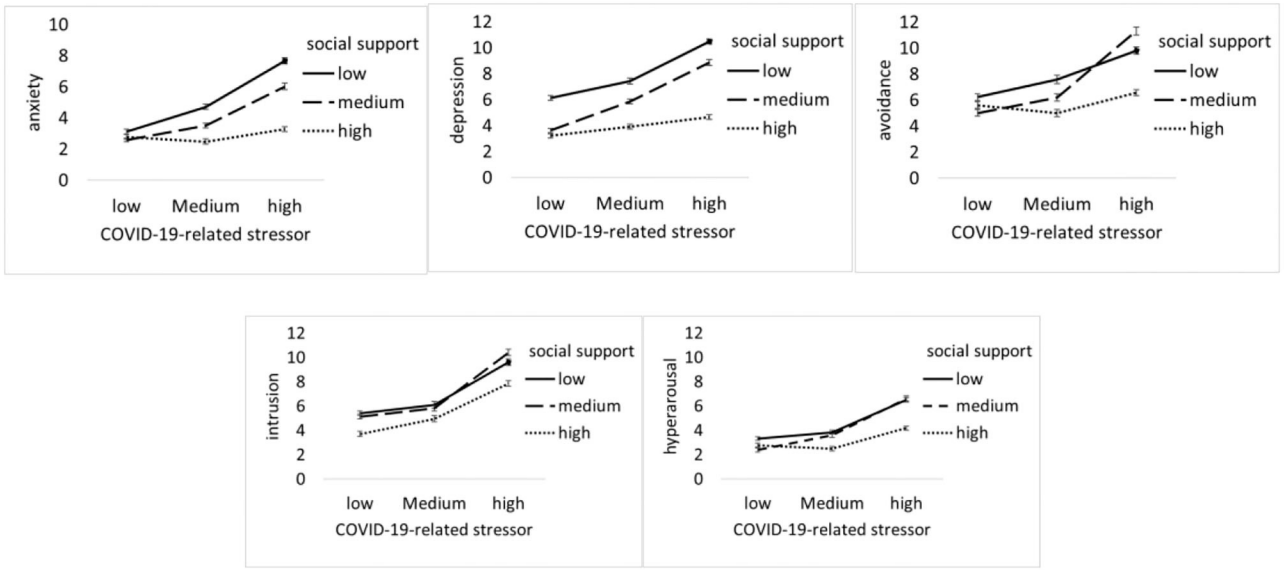

FIGURE 1 | COVID-19-related stressor by social support. Unadjusted psychological symptoms (including anxiety, depression, avoidance, intrusion, and hyper-arousal) data are plotted; means and standards errors are displayed.

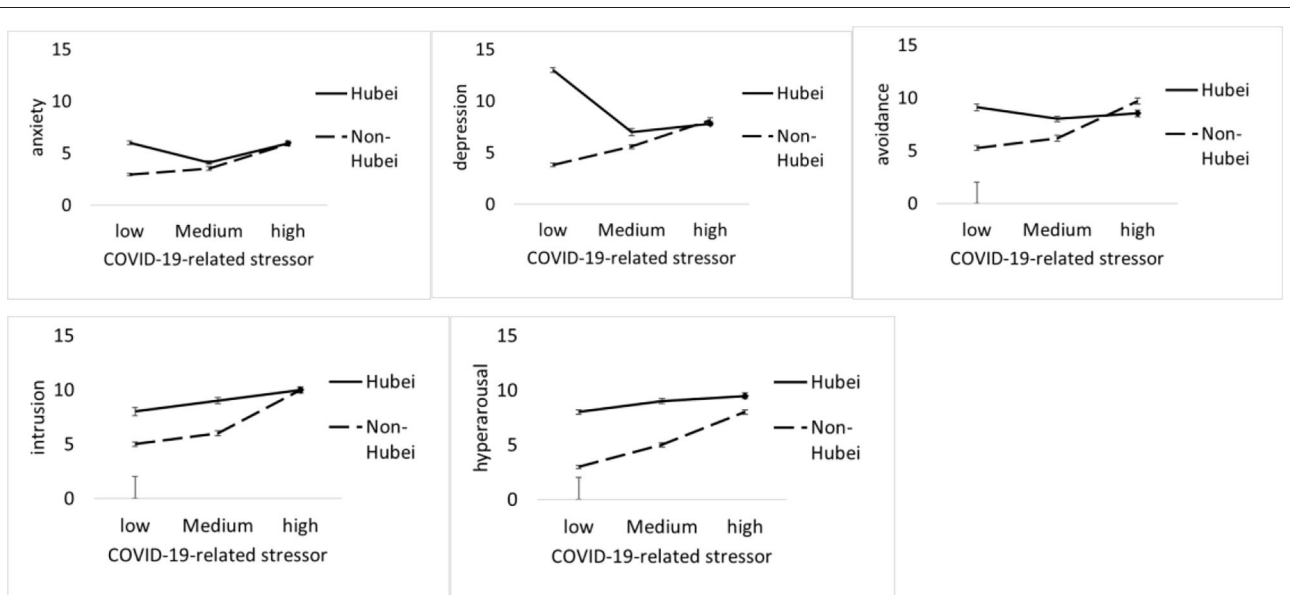

FIGURE 2 | COVID-19-related stressor by family residence. Unadjusted psychological symptoms (including anxiety, depression, avoidance, intrusion, and hyper-arousal) data are plotted; means and standards errors are displayed.

their biological factors (41, 42). For grade, students in a higher grade (e.g., junior or senior) reported increased symptoms of anxiety, depression, and PTSD than those students with lower grade (e.g., freshmen or sophomores). A possible reason might be that, compared with freshmen and sophomores, senior or junior students may experience more stress from graduation and looking for a job. With regard to other demographic variables, students whose family residence was in Hubei Province (the most infected area) reported higher anxiety and depression symptoms than did peers whose family residence was not in Hubei Province. The possible reason might be that, in an infected area, such as Hubei Province, students themselves and their family members or friends experience a greater threat from COVID-19. Therefore, in such cultures emphasizing family and relationships, students from the most infected areas tend to experience more psychological symptoms during a pandemic.

TABLE 3a | Separation values for each psychological symptom.

Variables	COVID-19-related stressors			Social support		
	Within-group variance	Between-group variance	Separations[a]	Within-group variance	Between-group variance	Separations[a]
Anxiety	11.2	97.38	8.69	11.2	141.45	12.63
Depression	14.5	147.38	10.17	14.5	521.47	35.96
Avoidance	30.83	190.23	6.17	30.8	140.51	4.56
Intrusion	23.79	215.88	9.07	23.8	106.98	4.5
Hyper-arousal	13.35	91.31	6.84	13.3	65.59	4.92

[a]*Calculated as the variable between-groups variance divided by its within-groups variance.*

TABLE 3b |

Variables	Sex			Grade			Family residence		
	Within-group variance	Between-group variance	Separations[a]	Within-group variance	Between-group variance	Separations[a]	Within-group variance	Between-group variance	Separations[a]
Anxiety	11.2	83.34	7.4	11.2	69.41	6.16	11.2	79.51	7.09
Depression	14.5	139.18	9.51	14.5	55.19	3.81	14.5	60.04	4.28
Avoidance	30.83	14.99	0.48	30.83	112.49	3.61	30.83	85.99	2.79
Intrusion	23.79	58.76	2.49	23.79	91.92	3.86	23.79	49.79	2.09
Hyper-arousal	13.35	81.52	6.04	13.35	49.79	3.71	13.35	5.86	0.44

[a]*Calculated as the variable between-groups variance divided by its within-groups variance.*

Implications of the Study for University Counseling Services

As one of the few studies on the relations of the stressors and social support with psychological symptoms among college students during the COVID-19 pandemic, this study has important implications for university counseling services during acute, large-scale stressors, such as an infectious disease outbreak or natural disaster. First, given the study findings, even students who are not directly affected by COVID-19 report significant numbers of COVID-19-related stressors and psychological symptoms during the pandemic. It is crucial that university campuses develop and implement effective screening procedures to closely monitor students' exposure to stressors and mental health adjustment. Second, the present study shows that social support is negatively related to anxiety, depression, and PTSD symptoms and served as a buffer against the negative effect of COVID-19-related stressors. In Asian culture, which is concentrated on family or kinship support (43), social support is a crucial resource for college students to deal with stressors during pandemic outbreaks. Third, the present study suggests that female students, students at higher grade levels, and those students whose family residences are located in pandemic-affected areas show vulnerability in the face of an infectious disease and experience more psychological symptoms. These students should receive more attention from university counseling services during pandemic outbreaks. In addition, the checklist measure for COVID-19-related stressful events developed in the present study can be modified to monitor students' exposure to disaster-related stressors, and students who are exposed to a large number of stressors should be identified to receive some preventive services.

Limitations

The study has several limitations. First, because all the constructs were assessed by self-report, the estimated relations among stressors, social support, and psychological symptoms might be biased by the reporter effect. Future research should consider a longitudinal design or use a multimethod to examine the role of stressors and social support in individuals' psychological symptoms during an acute, large-scale pandemic outbreak. Second, there has been some speculation that Asian cultures tend to emphasize family and relations more than Western cultures (43). It is possible that the interaction of these stressors and social support might not generalize to Western populations. Future research should test culture as a moderator of the relation between social support and adjustment using cross-cultural comparative samples (6). Third, although the sample used in the present study consists of students with different majors and is a representative sample of the college population to some degree, all of the participants were enrolled in two courses offered by the School of Psychology in one tertiary education institute, which might result in a bias in sampling. Future research could investigate the relations among the studied constructs with a large representative college student sample. In addition, research has shown that different types of stressors might have different degrees of influence on individual mental health (44). For example, some COVID-19-related stressors (e.g., "One of your family members has a confirmed COVID-19 case")

might have a larger impact on individual mental health than other stressors (e.g., "You have to cancel a vacation trip due to the pandemic"). The impact of the pandemic on psychological adjustment might be related to individual personality traits (e.g., coping) (20). For example, individuals who tend to use adaptive coping frequently might experience less psychological symptoms than those who use less adaptive coping during a pandemic outbreak. Therefore, future research could investigate the impact of stressors of different types or personality traits on individual psychological symptoms during pandemics.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Moral and Ethics Committee of the School of Psychology, Jiangxi Normal Univerity (Nanchang, China). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

XL carried out the concepts, design, data acquisition, analysis, and manuscript editing. MZ carried out the concepts, design, and manuscript editing. HW carried out the design, data acquisition. FM carried out the design and data acquisition. YW carried out the data aquisition. LL carried out the data aquisition. All authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Child Well-Being in Times of Confinement: The Impact of Dialogic Literary Gatherings Transferred to Homes

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The COVID-19 pandemic has created an unexpected situation that has forced people to find educational alternatives to support learning and ensure child well-being. The need for practices that "open doors" at home as a way to promote a quality education and to foster an environment of supportive relationships and a sense of community, has led to the in-depth analysis of successful educational actions, particularly the Dialogic Literary Gatherings (DLGs). The aim of this article is to show how the transference of DLGs to the home environment has had an impact on child subjective well-being in times of confinement, promoting a safe and supportive environment for learning, interacting, coexisting and on emotional development at different educational stages, especially for the most vulnerable children. Data collection consisted of a focus group of 10 teachers, 6 semi-structured interviews addressed to families and 6 life stories of students, from 4 primary education centers, 1 high school, and 1 Special Education School. Communicative methodology structured the two-level data analysis, for studying both the elements provided by online DLGs that favor and achieve child well-being, and the elements that may hinder those achievements. The results confirm that DLGs have had a notorious impact on children's and their families' well-being. Considering the findings in the development of educational public policies and the possibility of extending "open doors actions" as an option for future learning environments beyond the confinement situation is contemplated. Future research on how these spaces can have an impact on child well-being in upcoming contexts of the new normal in the education domain will be of interest.

Keywords: coronavirus, successful educational actions, childhood, well-being, quality relationships

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INTRODUCTION

The COVID-19 pandemic crisis has created an unexpected situation that has forced people to interrupt everyday activity to avoid the disease transmission, with schools closing as an emergency action (Enserink and Kupferschmidt, 2020; Wang et al., 2020). The way in which the outbreak is tackled may imply critical long-term effects (Gates, 2020), what is required is the implementation

of successful procedures to reduce to the extent of any possible undesirable effects, especially for the most vulnerable children (Brooks et al., 2020). In this context, the need to give continuity to teaching and learning, despite school suspension, through online education (Zhang et al., 2020), and to rapidly find educational alternatives for supporting this learning and ensuring child well-being has become an urgent necessity. Children are more vulnerable than adults in the face of traumatic situations and their impact on their daily routines (Bartlett et al., 2020). The quickly evolving new situation exposes children to conversations, constant media information, anxiety-inducing environments and changes and continuous adjustments to their routines as a result of the outbreak (Dalton et al., 2020). The global situation in general, and the prolonged home confinement, the social distancing and the school closures in particular, are having particular negative consequences on children's mental and physical health, interfering with their sense of security, structure or predictability (Bartlett et al., 2020; Wang et al., 2020), both in the short and long term, which cannot be neglected (Dalton et al., 2020). Regarding the mental effects, a psychological impact on anxiety, fear, boredom or frustration, *inter alia* (Brooks et al., 2020) has been reported, as well as trauma both for children and their families (Sprang and Silman, 2013). This situation can become a vicious circle, as the subsequent social-emotional and behavioral disorders may also contribute to more adverse results on health such as cardiovascular diseases, excessive weight gain, poor quality of life (Perrin et al., 2016), and a risk for future mental illnesses and cognitive development (Decosimo et al., 2019). These health consequences become more significant and persistent when we talk about vulnerable children with previous trauma or preceding physical, mental, or developmental disorders, as well as those with problems within the family (Bartlett et al., 2020). The lack of interactions with friends and outdoor activities (Wang et al., 2020), the absence of personal space at home, or the family's financial problems, are among other factors affecting child well-being in confinement, which have a challenging impact on youth and child well-being (Brooks et al., 2020). But despite the contingencies caused by this outbreak, especially on education around the world, this interruption is also providing new opportunities to find and discover transformative and stimulating practices, where the whole community—families and teachers—with the support of institutions and administrations, meet and reinvent education for the sake of the continuation of learning (Dryden-Peterson, 2020).

Organizations like the World Health Organization–UNICEF–Lancet Commission agree that children must be placed at the center of the Sustainable Development Goals (Clark et al., 2020), an idea that becomes imperative in the new situation. The Children's Bureau of the U.S. Department of Health and Human Services, through the Child Welfare Information Gateway, puts the focus on family support and engagement and community-based practices to ensure children's safety and well-being (Child Welfare Information Gateway, 2020). Those activities and the resources developed for promoting healthy behaviors in children should take under consideration some preconditions, such as protecting children in the face of online exposure, considering minimal equipment and small spaces, and guaranteeing opportunities for family-child interactions (Guan et al., 2020).

Child well-being is imperative in the current situation, in the wider present, and in the future as it will influence and predict forthcoming outcomes as adults (Lansford et al., 2019). The literature on child well-being is large and keeps on expanding, and therefore several and different definitions and indicators can be found, what makes the research review and the choice for a definition more complex (Pollard and Lee, 2003; Statham and Chase, 2010). From science, research projects, governments, institutions, organizations such as OECD or UNICEF and committees of the European Union or the United States, *inter alia*, there have been different attempts to create a system of indicators for measuring child well-being. Nevertheless, more work and attention on this is needed (Moore, 2020). In order to understand the concept, a multidimensional notion of child well-being definition seems the most suitable to approach a holistic reality incorporating physical, mental and social aspects of the person (Statham and Chase, 2010), influenced by the interactions with family, peers, the community, but also by policies and programs (Lansford et al., 2019). Different studies provide their classifications of child well-being domains, but many of them coincide to focus on cognitive, physical, psychological, educational, social or behavioral domains to define and measure the feeling of wellness in children (Pollard and Lee, 2003; Bradshaw and Richardson, 2009; Lansford et al., 2019). The latest tendencies in measuring child well-being have gradually evolved into engaging children in defining their perception and interpretation of well-being, what emphasizes the importance of subjective well-being in studies (Statham and Chase, 2010) and the consideration of a communicative perspective of research through the inclusion of the participants' voices (Flecha, 2000; Puigvert et al., 2012). This study will focus on the latter, paying special attention to the subjective well-being dimension as the sense of happiness or life satisfaction (Dinisman and Ben-Arieh, 2016), where the supportive interpersonal relationships constitute one of the main predictors (Diener et al., 2018). It will also measure it from a communicative perspective, considering the participants' view through the voices of families and teachers, but mainly focusing on students.

The role of schools in child well-being is decisive for its educational and psychological aid (Wang et al., 2020). Broader environments or connection to community settings have a major role in overcoming childhood adversities and in resilience (Bartlett et al., 2020). Health depends on the contexts that nurture both physical and mental wellbeing, and healthy environments go beyond the home, including the community or the school, implying stable relationships and interactions or the development of learnings and skills through education, among others (Center on the Developing Child, and Harvard University, 2014).

Thus, the need for actions that "open schools' doors" at home to promote a quality education and to foster an environment of supportive relationships and a sense of community, reinforcing child development and mental health (Roca, 2020) and improving the social, emotional and academic dimensions has led to the in depth analysis of the implementation of successful educational actions (Flecha, 2015) in confinement through virtual

means. Thus, some schools have started to implement *Open Doors Actions*: actions that emerge from new developments and from the transference of identified evidence-based strategies, aimed at educational communities, families, teachers and mainly students, that traditionally have created a safe and friendly environment for improving learning and coexistence in schools, and which are now brought through a virtual medium to home spaces. These actions for training, sharing and exchanging are forming a response to the challenge of maintaining caring, rich, and supportive interactions among peers and their educational communities. Evidence reported from eight schools has shown a positive impact on the emotional and cognitive development of children in confinement (Roca et al., 2020).

Among these evidence-based actions, one of the most extended practices are the Dialogic Literary Gatherings (DLGs), globally implemented in more than 3000 schools and centers around the world (Lopez de Aguileta, 2019). DLGs are dialogic spaces for educational purposes where participants—children and/or adults—involving egalitarian dialogs around classical readings of the universal literature, and where all of them have the same opportunities to speak without hierarchies, and creating in interaction new meanings about the text discussed (Flecha, 2000; García-Carrión et al., 2020). In them, participants delve into universal values, issues and feelings of concern that humankind has experienced since ancient times through the discussion of complex and rich works, finding meanings and reflecting on them upon the participants' own experiences and building new interpretations all together. The functioning is as follows: all students read alone, at home or at school, a previously decided piece of text from the book being read, which can be a faithful and high-quality adapted version of the original classic work. They choose a paragraph and note down the reasons that led them to select it. Along the DLG session, the students who wish to share their chosen paragraph as well as their reasons, and all the students start a debate or discussion on the raised idea, with the aim being to reflect on and to share and build meanings according to the participants' experiences (Flecha, 2009; Lopez de Aguileta, 2019). The egalitarian dialogue (Serrano et al., 2010); the diversity of voices to enrich interpretations and debate (Flecha, 2009); or the fact of grounding the contributions on arguments instead on of power claims (Oliver and Gatt, 2010) are crucial premises according to the dialogic learning principles (Aubert et al., 2008) executed when implementing DLGs.

Benefits of the DLGs have been shown in a wide range of contexts (Soler, 2015), and their impact can be found in different areas. In the academic field, the children involved have shown a boost in the school-relevant language, literacy skills (Lopez de Aguileta, 2019), reading skills, vocabulary acquisition, communicative skills (de Botton et al., 2014) and an increase of students talk ratio and quality participation through reasoning and argumentation (García-Carrión et al., 2020). Additionally, DLGs have nurtured transformations from a personal to a social and contextual level (Serrano et al., 2010), improving students' and their families' confidence and motivation for learning, as well as fostering community-school links, and transforming child-parents' interactions at home, with the discussion on classical works becoming part of their routine (de Botton et al., 2014). Evidence is provided about their effectiveness at all stages of life and in every context where they are implemented in all their diversity: from rural communities, to extremely disadvantaged backgrounds, high-complexity schools, special education centers, children's residential care institutions, adults educational centers or prisons (Pulido-Rodríguez et al., 2015; Alvarez et al., 2016; García-Yeste et al., 2017; Garcia et al., 2018; Rodrigues and Marini, 2018; Duque et al., 2020), to mention a few examples. The implementation of DLGs in said settings has been conducted on-site until confinement, but since the pandemic situation, the schools participating in the study are developing these meetings online, through a video conference platform, providing an opportunity for social contact during lockdown. The moderator continues to play a very important role both for maintaining a warm environment that encourages participation and for promoting dialogic principles. This study explores DLGs as an evidence-based action replicable in any educational on-site environments, which has been incorporated to European recommendations and public policies (Gómez et al., 2010; European Commission, 2011) and is now being transferred to online spaces. In this new situation, and considering all its benefits, this study seeks to explore two core issues: the extent to which the transference of DLGs to homes through online means can have a positive impact on child well-being in these times of confinement on the one hand, and how this learning action can promote a safe and supportive environment for learning, and how it can interact and coexist in different education stages, especially for the most vulnerable children. This is necessary not only to respond to the challenges of the current pandemic, but also for meeting future demands regarding the protection of child well-being and health (Shonkoff and Williams, 2020). In the framework of this study, the analysis has focused on the measurable areas of child well-being, focusing on prosocial behavior; positive relationships with family, peers and other adults as teachers; and academic performance, covering the behavioral, psychological, social and cognitive domains (Lansford et al., 2019).

MATERIALS AND METHODS

Little agreement is found in the literature when the best way to measure child well-being is discussed as diverse approaches are developed: from objective measures with assessments, records, tests, rates or statistics, to subjective measurements through interviews or scales, finding more subjective measures on literature than objective ones (Pollard and Lee, 2003). To this end, a communicative approach is used, through the joint construction of knowledge between researchers and research participants, what enables a better understanding of the improvements generated in the well-being of children due to the implementation of the DLGs in confinement times (Puigvert et al., 2012). The six DLGs, object of analysis, were already implemented in the participating schools before confinement and have been developed online through a video conference platform during confinement. Communicative methodology recovers the voices and views of the different educational

TABLE 1 | Participating schools' data.

School	Size (students)	Teaching staff (number)	+30% risk	Years DLG	Weeks ODA DLG	Times a week
PS1	260	24		7	9	1
PS2	410	35		5	8	1
PS3	462	33		7	7	1
PS4	540	40	X	8	5	1
SS1	800	80	X	3	11	1
ES1	197	54	X	5	5	1

agents- families, teachers and students themselves, for generating profound analysis with the aim of building useful knowledge for affording child well-being at present, as well as in future crises (Gómez et al., 2019).

Research Site

The schools participating in the study are part of a sub-net of SaLeaCom school (Rodrigues and Marini, 2018), in the neighboring territories of the Valencia and Murcia regions in Spain. These schools are part of the *Open Doors Schools* (Roca et al., 2020) project that started on March 18, 2020, to foster learning and supportive relationships, as well as a safe environment for childhood. This research has been conducted with schools that had already implemented traditional DLGs in person, although this is not a requirement for implementing online DLGs, and neither is the prerequisite of having had families participating before in the face-to-face format. Among all the schools, those that had already been implementing the online DLGs for at least 3 weeks were chosen. All the schools participating in this study ensured access to technology for all their students before starting the implementation of DLGs.

All the participating schools are public ones. The participating schools are diverse and heterogeneous: there are 4 primary education schools (PS), a special education center (ES) and a high school (SS). See **Table 1** for more detailed data on the characteristics of the participating schools.

Participants

With the aim of exploring the transference of DLGs to homes, the data reported in this study includes two communicative focus groups with teachers of the six schools, six semi-structured interviews with relatives and six communicative life stories with students, from the six schools, counting on: (a) one or two teachers per school in the focus group, a total of ten teachers; (b) one relative (mother or father) per school, a total of six, and (c) one child per school, a total of six, too. Three of the schools receive more than 30% of students in situation of vulnerability, including students with special needs and others at risk of social exclusion. **Table 2** shows the details regarding the participants' profiles and the data collection technique (fully explained in subsection "Data Collection and Techniques") employed to gather the information (see **Table 2**).

Ethics

All participants (teachers, families, and students) agreed to provide researchers with relevant data for the purpose of the study. Prior to data collection, they were informed of the nature of the investigation and informed written consent was obtained. In the case of minors, the informed consent of their parents or guardians was collected. All participants were informed that their participation was anonymous and voluntary, and that the data would be treated confidentially and used only for research purposes. The study respects the ethical guidelines of the European Commission (European Commission, 2013) and was approved by the Ethics Board of the Community of Researchers in Excellence for All (CREA)[1].

In order to ensure anonymity, a code was assigned to each participant and school. For participants, the first letter corresponds to their educational profile: T (teacher), P (school principal) and C (school counselor), and the second letter corresponds to the stage or kind of school where they are enrolled: P (Primary school), S (Secondary school), or E (Special Education center). Finally, a correlative number is indicated. For schools, the coding is similar: PS (Primary School), SS (Secondary School) and ES (Special Education School), adding a correlative number for schools with the same profile.

Data Collection and Techniques

Due to the confinement situation, the fieldwork was carried out in an online format between May 2 and May 24, 2020, after more than 3 weeks of implementing virtual DLGs usually for 1 h a week. The data collection was carried out through virtual means. A script was planned for the evidence collection, including questions about different blocks of contents: (a) exploration about the concerns and observations about the implementation of DLGs at schools and now at home, (b) the influence of the implementation of DLGs on well-being, and (c) new opportunities emanated from the transference of DLGs to

[1]The Ethics Board was composed by: Dr. Marta Soler (president), who has expertise in the evaluation of projects from the European Framework Programme of Research of the European Union, and of European projects in the area of ethics; Dr. Teresa Sordé, with expertise in the evaluation of projects from the European Framework Programme of Research and researcher in the area of Roma studies; Dr. Patricia Melgar, founding member of the Catalan Platform against gender violence, and researcher in the area of gender and gender violence; Dr. Sandra Racionero, former secretary and member of the Ethics Board at Loyola University Andalusia (2016–2018), and review panel member for COST action proposals in the area of health; Dr. Cristina Pulido, expert in data protection policies and child protection in research and communication and researcher in communication studies; Dr. Oriol Rios, founding member of the "Men in Dialogue" association, researcher in the area of masculinities, as well as editor of "Masculinities and Social Change," a journal indexed in WoS and Scopus; and Dr. Esther Oliver, who has expertise in the evaluation of projects from the European Framework Programme of Research and is researcher in the area of gender violence.

TABLE 2 | Participants' profiles in each data collection technique.

Profile	Age	School	School level	Time in the school (years)	Time participating in traditional DLGs in this school (years)	CFG	Int	LS
PP1	41–45	PS1	2° PS	11	8	X		
TP2	41–45	PS2	6° PS	5	5	X		
TP2'	31–35	PS2	2° PS	2	2	X		
TP3	41–45	PS3	5° PS	2	2	X		
TP3'	51–55	PS3	4° PS	1	1	X		
TP4	41–45	PS4	3° PS	2	2	X		
TS1	46–50	SS1	1° baccalaureate	9	3	X		
CS1	46–50	SS1	1° baccalaureate	11	3	X		
TE1	31–35	ES1	Primary	8	5	X		
TE1'	31–35	ES1	Primary	5	5	X		
FP1	46–50	PS1	2° PS	7	7		X	
FP2	51–55	PS2	6° PS	10	2		X	
FP3	41–45	PS3	5° PS	7	1		X	
FP3'	41–45	PS3	5° PS	7	1		X	
FP4	51–55	PS4	3° PS	15	6		X	
FS1	41–45	SS1	1° baccalaureate	5	1		X	
FE1	41–45	ES1	Primary	5	5		X	
SP1	6–10	PS1	2° PS	5	5			X
SP2	11–15	PS2	6° PS	4	2			X
SP3	6–10	PS3	5° PS	8	6			X
SP4	6–10	PS4	3° PS	6	3			X
SS1	16–18	SS1	1° baccalaureate	6	1			X

virtual spaces. The focus group, as well as the interviews and the life stories were audio-recorded and transcribed.

Communicative Focus Groups (CFGs)

Two CFG sessions were held. The objective of CFGs was to develop a shared analysis of the situation under study. The first CFG was carried out with one representative per school, in which the objectives of the study were validated, the dimensions of the impact on child well-being were discussed, and consensus was established around the collection of information to analyze the impact. The second CFG was carried out with 10 teachers from the 6 schools participating in the study. It analyzed how DLGs were being recreated in each of the schools and in the diversity of educational stages. Later, an in-depth analysis was done exploring the aspects of child well-being that were being more susceptible to improvement thanks to the DLGs. The CFG is a moment of analysis that enables the dialogic construction of scientific knowledge by creating bridges between scientific evidence, the object of research, and educational practices (Aubert et al., 2011). In these spaces, not only are the results are identified, but the participating people discover improvements to introduce in their DLGs through dialogue with other teachers.

Interviews With a Communicative Approach (Int)

Six semi-structured interviews with a communicative approach were carried out with six mothers, one from each participating school. The objective of the interviews was to analyze how families appreciated the performance of DLGs in confinement, their impact on the well-being of their daughters and sons, and the extent to which they were a space of prevention and care for boys and girls. Families were able to relate details about how their children prepared for the DLGs, how they saw them before and after participating in them and the extent to which DLGs became part of their children's lives, and also of other family members' lives.

Life History (LH)

Six short life stories were carried out with six students, one for each participating school, five for the primary education stage, one for special education and one for the secondary education stage. The objective of carrying out life histories over a short period of time is to dialogically reconstruct the reality lived by the student, giving voice to their thoughts, feelings and analysis. A cooperative process of understanding their experiences in DLGs was aimed at caring for and improving their well-being and that of their peers.

Data Analysis

The six DLGs under study were analyzed together to understand how they contributed to the improvement of children's subjective well-being in the diversity of educational stages, contexts and characteristics of the students. Taking into account the challenges that confinement has posed for children and their families and the possible consequences for their later development (Decosimo et al., 2019; Dryden-Peterson, 2020; Wang et al., 2020), this study addresses the impact of DLGs, taking as a reference, indicators related to child well-being from a subjective perspective, such as (1) the educational dimension (the developments and improvements achieved in instrumental learning and cognitive development), (2) the social dimension (considering the relationships and interactions of quality, and

the improvements achieved in social cohesion), and (3) the emotional dimension (feelings and affective development), as well as the (4) impact related to home and families, and (5) the barriers that have been identified to hinder those achievements and future perspectives.

RESULTS

The analysis shed light on indicators of child well-being where it is shown, from a subjective dimension counting on participants from the communities, how the DLGs online have impacted the children's feelings of wellness and even their feelings toward home and families in confinement times. This study also takes into account the barriers and challenges of the new implementation of this action, so besides proposing all the transformative dimensions, an account on the barriers is also reflected. Thus, the "Results" section is divided on the transformative conditions according to child well-being dimensions, (a) educational; (b) social; (c) emotional factors, or (d) the impact on families as well as (c) the challenges emerged in this novel situation and future prospects, according to participants' experience.

Learning, Cognition and Performance: The Educational Indicator

The schools participating in this study implement DLGs once a week for 1 or 2 h during the pandemic. More and more students have joined the DLGs since the online transference and, despite the short time of application, participants agree on the positive potential that it is having on different dimensions of child-wellbeing, but also in all the educational stages and with the diversity of children, mainly for the most vulnerable ones, those with special educational needs.

Improvements on the educational field are very noticeable according to the participants. For teachers, advances on different dimensions of learning are shown more sharply along confinement activity. Advances on reading skills, as this teacher comments "I have seen very clearly a progress in the children's reading performance. Since the confinement has started, they have improved a lot" (TP3); or in the linguistic production, very noticeable with the most vulnerable children, those from the Special education center, who were not able to build sentences further than a subject plus a verb, and now one of the school teachers praises "[In confinement] they have been incorporating the linguistic model into their language, creating longer structures."

Enhancements at a learning level have also been shown in relation to the instrumental knowledge. The emanated relations that students establish between the read texts and other school subjects suppose a creation of meaning within learning contents. Teachers, families and students agree on the fact that the readings and debates are very helpful for instrumental learning, mainly in the contextualization of learning, vocabulary acquisition, development of thought and oral expression, without being hindered by the online medium.

> Now, there is a creation of meaning, because you can send them [as task] the "length measurements" and they do it, but for example when in Tom Sawyer the yards come out, and they look for it [the meaning] and they know that they are 91 and a bit more centimeters. . . or the word "stunned," or "dread." It happens that the instrumental learning that you are providing them with online now [with the DLGs] acquires a meaning, that instrumental learning, with the DLGs, has more meaning (TP4).
>
> As we are little children, there are difficult words in the books and there we can learn as we comment on them (. . .). We cannot go to school, we cannot see as much things as when we attend school and the DLGs help us to know more things (SP1). Although we do the DLGs at home, we learn the same (SP4).
>
> The main thing is that it [DLGs] helps them with the vocabulary and to express what they think. Nowadays with so much technology this is has been a little forgotten, the oral aspect, the ideas. everything is writing in WhatsApp and I miss this (DLGs) in my older children. who have not had them (FP4).

Dialogic Literary Gatherings have also shown improvements regarding children's habits, both in maintaining daily routines and even in boosting the reading habit itself. One student expresses how helpful they have been for her, not only for learning, but also for continuing the learning and reading routine in confinement time:

> It is like in the school, to keep on the same habit, but through videocall (. . .) They [DLGs] helped me to read more (. . .) It is a funny way to express yourself while you learn new things, you read. . . It would be amazing that children who don't do DLGs started to! (SP3).

The educational performance has seen benefits through a notorious increase in the students' participation. All participating teachers agree on this improvement, reporting that changes in this direction are regarded as beneficial, especially for those who had more difficulties with engaging in debates:

> Changes have been noted especially at the level of participation, children who did not participate in person, are more participatory in the online [format]. . .. What seems nice is that it is counteracted in another way, the children who found more difficult for participate [in the on-site DLGs] are having a very important benefit now (TP2).

Interactions and Relations: The Social Dimension of Well-Being

According to the social dimension benefited by the DLGs, the fact of meeting online with the DLGs has helped students to better understand the new situation. One of the teachers who forms the special education center reports how for their students the new pandemic, and the subsequent confinement situation, was an odd and inexplicable situation, and how positive it has been to meet online to do the DLGs for their feelings of safety:

> Many did not understand what was happening, why they were inside the house. And then, this moment of meeting everyone (because they did not understand why they were at home), seeing themselves on the screens and explaining to them that we are here. . . they have understood the situation, because it was being experienced in this way (TE1).

Reflections and dialogues around other sociological issues that occurred in these spaces are also important and protective in these confinement times, "this is a place for dialogue, for talking about violence, attraction toward no violence and preventive socialization, that is very important now" (PP1).

Teachers underline the importance of counting on spaces for dialogue and interaction, especially for students who cannot rely on peers at home in the form of siblings or other relatives of their age. "Maintaining a space for dialogue is very important for the diversity of students, because there are children who are alone, do not have siblings, and they don't have the power to create dialogues, to interact" (TP4). All children need to share their concerns, their feelings, their routines with their friends and teachers, as is usually done in school, and according to families, the DLGs improve the communication with friends and teachers openly, and their relationships, as the school community is considered as a second family for many of them:

> The fact that he meets with his classmates, since they cannot meet, makes them very happy. It is their second family and they need that (. . .) they benefit from seeing their mates. (. . .) They feel empowered and they are happy because they are being listened to. It is important to continue promoting this bond with their teachers, their classmates. . . I think the DLGs provide these spaces so that they can communicate more with colleagues (. . .) She [daughter] needs that moment of recognition, and not only for her, to see her classmates, to see how they are. and to share those moments (FE1).
>
> For me, the DLGs [in this time of confinement] have provided me with a space of happiness. I have a great time in the DLGs, I think it gives me and my colleagues a lot of joy and happiness. Friendship with friends is very important, and [DLG] helps me in friendship with my friends and the teacher (SP4).
>
> And this [undergo DLGs online] is very important because families alone cannot, cannot be teachers, because we do not know and because we cannot. We try but we cannot, it is impossible to get there (FP4).

Quality social interactions, crucial for well-being, take place in confinement through online DLGs. According to teachers, it is clear that the DLGs make possible the creation of quality relationships which have impacted on their students' well-being now and for the future, and have opened options for new contexts of safe interactions:

> We ensure the super quality [in DLGs sessions and interaction] and I think that in this sense the DLGs are benefitting the students a lot at this moment [confinement] for their development and their well-being (PP1).
>
> The gatherings have been able to open other relationships and other opportunities to relate, that have created quality relationships and a safe context with an impact on their future (CS1).

Feelings and the Emotional Dimension

It has been generally acknowledged by all the participants that DLGs have a remarkable impact on the emotional well-being of students, which has been increased in confinement times. DLGs are considered a space for interconnection, mainly in the emotional dimension, and in that place the deepest feelings are shared. A teacher expresses that he has set other spaces with his students through virtual calls that have not been as successful and meaningful as the DLGs. Moreover, in a moment of outbreak and isolation, the opportunity to share feelings and to be in touch with "the second family" have been valued as a key condition for child well-being:

> The DLGs are an environment of interconnection but, above all, of emotional interconnection. It happens that all the stories in the end it happens that we address feelings, emotions and such. And oddly enough, although I have done other videocalls with the students so that they have other moments to talk as well and no [it doesn't work]! In other moments there is no excuse. If it is not in DLG, after 5 min, no one knows what to talk about anymore, it's like there is no reason to be there, together, there is no connection (.) I don't know what it is, what I know for sure is that, indeed, with DLGs something happens that would not happen in other circumstances. That, in confinement, must be maintained (PP1).
>
> [I want] To highlight all the emotional part of DLGs because children as my daughter, who have functional diversity, find difficulties to communicate, but above all to transmit and recognize feelings. So, what I would highlight the most is that these [online DLGs] are helping to understand and share feelings. It has been a great help for my daughter. (. . .) They have been all week without seeing each other, without seeing her other family (. . .) they are excited that they are going to see their classmates (FE1).

The DLGs nurture a space for sharing, apart from opinions, views, and knowledge, their emotions and feelings. Students have the opportunity to be in a context where to express freely and without judgment their positive, but also the negative emotions and concerns that maybe, in other spaces, they are not able to share. Thus, some teachers report that children often establish relationships between what is happening in the classical book and in their reality, telling their fears and worries through the characters of the book. But also, with teachers, some students have noticed that the line that separates the relationship of student-teacher with friendship is thinner now because during DLGs they have seen their teachers' emotions, feelings and opinions as "peers":

> Now, with Oliver Twist in all the DLGs, the relationship with the current situation emerges. I think it is a space that helps them a lot to talk about those fears, or those concerns that perhaps they do not even dare to speak [out of DLGs] but empathizing with the characters of the book, yes, these issues appear and appear (FP3).
>
> That moment, [the teacher] is like your friend, because you can tell him or her about your life. . . they are reading the same book as you and sharing ideas, their thoughts and so on. . . I like it because it's like we already passed that little line between teacher-student (. . .) I also like to have volunteers, they can become your friends and you can speak as normal as if you had known them your entire live (SP1).

Dialogic Literary Gatherings have traditionally open methods to encourage the emergence of feelings and the expression of them, something which has been particularly relevant in this pandemic situation. A parent thanks online DLGs as they have helped his daughter to bring out and express the feelings she has kept inside "they bring out feelings that otherwise it would be

difficult, and at that moment [during DLGs] they do it and tell you" (FP3). In this respect, a student recognizes how the book they have been reading has helped him to overcome the concern and to feel empathically through the links between the fiction story and the experienced situation:

> I am comparing it [the book] with this situation of confinement, as in the book they [the characters] had to be so controlled, they couldn't be mixed, no different thoughts were allowed. . . and that seemed to us quite similar to now. Now, we are supervised, we cannot go down into the street, we cannot touch each other, no hugs. . . and we started to compare and the truth is that you realize lots of things, and then you say 'it just seems that I am inside the book! How did I get inside the book, in what moment?' (. . .) Our teacher is who guides us and puts us on track and gives us examples for us to know, that it is not just fiction, that it is a reality and that these things can happen (SS1).

An increase of self-confidence has been highlighted by some teachers as one of the most noticeable changes in confinement times. The fact of being online may have provided them the opportunity to open up and to express their opinions without shyness. To provide some examples, a teacher talks about a girl with especial educational needs who did not used to participate in DLGs and who has started to be involved in and give her opinion much more frequently. The same observation is expressed by her mother, who points to the fact of doing online DLGs as the reason why children are gaining confidence to participating:

> A student with special educational needs who hardly ever participated in the DLGs, since we have been in the online DLGs it happens that we are more in touch with the family, we know that she is fine (. . .) and the fact that she does not have a camera [in the electronic device where she does the online connection] and she can feel more confident, also she can have an adult there, [it is shown that] she participates much more in the DLGs (TP3).
>
> I have realized that maybe as everyone is at home in front of their screen, they feel more confident and, children who did not used to participate so much in the face-to-face classes, they participate a lot now! (FP3).

Motivation has been another of the more commented aspects in the dialogues with participants, which has been very important to overcome confinement with a good state of mind in children. Students try to find the way to get connected to the DLG meetings and more and more students get involved in the sessions. A case was reported of a girl with an autistic disorder who found it difficult to be in all of the on-site DLG sessions, and now, in confinement this girl has started to be more motivated, sharing this moment with her classmates, connecting always to the DLG and staying there for the whole session:

> [The case of] a student whose devices didn't run the audios, also super-shy. So, this girl started to write in the chat because she, despite her shyness. she wanted to be there, because she wanted to be in the DLG. (. . .) Online DLGs started with 13 [students], then 16, then 23, that is, the number of people connecting has been increasing (TP4).
>
> An autistic girl that I have in the classroom, in on-site DLGs never made it through the whole DLG, she had difficulties. . ., but now, her mother told me that she is super motivated (. . .) Now she connects to everything. and she is in the DLG all the time, she does her things, but she doesn't leave the screen (TP4).

Friendship as one of the most important feelings is promoted in many ways through the DLG's online meetings. Students' stories, but also teachers' and families' interviews, have highlighted the condition of friendship as directly related to wellness and one of the first conditions they point out when they are asked about child-wellbeing, together with the emotional dimension:

> Friendship [has enhanced] too, because now [with DLGs] we can see each other, and that means a lot to me. At the beginning [of confinement] we could not meet, neither see nor talk to each other, we could only see the photos we have [of friends] or to think about how they would be doing. . . but now we can see them in reality, what they are doing! (. . .) To see your friends in a DLG, and to be able to speak [with them] can make you feel better (SP1).

Self-esteem can be boosted after the participation in DLGs meetings, as students participate, give their point of view, and their statements enrich and can trigger new interventions:

> After doing the DLG, she [daughter] feels very good, because she feels that her contribution has been appreciated by everyone and that sometimes it leads to more interventions. (. . .) She feels better and happier, her self-esteem grows (FP3).

The feeling of happiness has been shown through the stories and interviews. As a teacher states, families tell them that online DLGs is the happiest moment of the week: "And then the calls we have received from families in which they tell us that it [DLGs] are the happiest moment of the whole week for the kids. They are waiting for us to have the DLGs" (TS1). Families themselves express their children's happiness in the interviews: "It [online DLGs] makes her happy, because she loves to interact with her peers!" (FP3).

Impact at Home, and Homes That Make Impact Possible

One important factor has been identified in families that has enabled the improvements on the aforementioned dimensions. A mother expresses that when she herself gets involved in the online DLG, her daughter seems to have a better performance and seems happier: "I think that the days when I can participate in the DLG (. . .) she interacts more, and she feels happier" (FP4). Some teachers indicate some cases of children with educational needs or disorders that have improved a lot since confinement, due to having their relatives closer and helping them to formulate ideas or to feel confidence:

> I have noticed improvements regarding their interventions thanks to the help and support of the families. One case is that of a boy who has a language disorder, who hardly ever participated in class, and only since DLGs started to participate, and now much more, in less time. . . and I think it is because his mother is close to him and helps him, gives him more confidence. And then the case of a child who also started with many reading difficulties that I have also noticed a lot of improvement now. (. . .) I associate it to being directly related to the help they get from their families, (. . .) they

help them to link the ideas, or if they lose the thread, I hear how they get hooked on the idea again (TP2).

The fact of having more time for getting involved in their children's activities may have been the reason why children are enhancing their development, improving learning and behavior, as this teacher explains. Her student, whose parents normally work all day and had no time to share with their son, now state that they, with the confinement situation, spend more quality time with their child and as a result, the behavior disorders and his academic performance have improved significatively during this time:

The situation has changed a lot because they [parents] have gone from not to being able to participate [in school life] and having to find other means of taking part, to now [with more time to spend with their son]. And I do totally link the fact that the child is much better thanks to the fact that his [parents] participate. (. . .) They say a lot that they are trying to give their child quality time and I think this is directly linked to the improvement of the boy. . . which in this case was a boy with a lot of behavioral problems and a very low level of academic performance. . . and now he has undergone quite a significant change! (TE1).

At home, an impact has been reported too. The new situation has allowed more time to be spent with the family, but the way this time is shared can have different consequences. In the case of DLGs, the online implementation has helped to have a positive impact on homes. For instance, the case of a very shy student who has been helped by her sister, a former student of the school very accustomed to on-site DLGs, that has encouraged her to participate more, and it was acknowledged by the whole class (students and teacher), congratulating her:

Alliances also arise, as in the case of a very shy student (. . .). Through the alliance she has with her sister, who had been a former student of mine and who is used to DLGs, (. . .) and through the communication with their the mother who said "well, let her be with her sister, it might encourage her, and that fact generated that she, my current student, participated, and that is cool! (. . .) the fact that she has been able to participate because her sister was there with her. Then we publicly congratulated her sister (CS1).

Families report how the preparation for and the participation in DLGs have not only strengthened parent-child bonds, but also allowed children to access more topics, deep conversations and ways of expressing feelings at home. Children also express how they like to share this time with their parents and learn from them: "I like that he [father] tells me. . . because sometimes I learn things from what he says, I ask him the meaning of a word and I also learn things from what he explains to me" (SP4). According to families, they enjoy working together with their children and take advantage of the debates that have emerged through the preparation of DLGs:

It's funny about all the topics can emerge in a reading and that we can deal with at home, thus helping in their own learning and also in our family living. (. . .) At home, we try to work together in DLG, it is a time when we take the opportunity to talk a lot and express feelings (FP3).

From the first moment you have to sit down to read a story, starting with the bond you have to create as a mother-daughter to prepare it, because you know that there will be a session dedicated to that (. . .) Then you can integrate those explanations into your conversations with your children and that's good because it helps you to talk more with them (FS1).

Online DLGs for the Future. Overcoming Barriers for the Benefit of All

The challenge that some teachers and parents have reported is related to technology as a barrier. A teacher stated that there are students that feel less comfortable in front of a camera. One of the parents pointed to the fact that, in the first sessions, there was difficulty on respecting their turn to speak. One student said that she had the impression that the online version of DLG may be slightly slower. Nevertheless, all of them state that these challenges were present in the first sessions and that they have been getting used to the electronic devices and learning to cope with connection issues. In fact, according to some teachers, DLGs are online activities that work better and show results: "the proposal to have a DLG online in the confinement is the only thing that has worked for me, the only thing! Everything else, if I have explained, or made videos. I have no guarantees that it has worked, but the DLGs do."

Students, families and teachers claim that online DLGs should be extended beyond confinement. Some of them, mostly students, propose to meet with other schools that implement DLGs through virtual means, making it possible to know new opinions, new views, and new possible friendships: "I think it would be cool and it could be done, because you can meet many people also from other schools (. . .), you can know what they think, their feelings." (SP3, SP4, SS1). Other participants point out the possibility to extend DLGs in vacation times or beyond school hours. And some of them want its continuity in order to make it easier for families, even for volunteers, to participate, but also to make the most out of all the benefits that broader DLGs bring, as it has been demonstrated in this confinement time and reflected along this study:

For us [teachers], this confinement has been a gift, to be able to participate with all the families at the same time, having the opportunity to do DLGs with another school. . . I never imagined that we could do this from home, and with their families, that we could be interconnected. And now I think about it and I say why not? (. . .) It is so enriching, and I think that this does open up views of a good future. We love each other so much and we put up the barrier that we are far away. . . we have other tools, so for these tools that are the new technologies, we can "go" [virtually] to our school and forget about the pain of the distance, we can have virtual volunteers, virtual families. . . and to take the DLGs outside the school hours, and we will do them [DLGs] at a time that everyone can. . . and we will meet again (TP4).

DISCUSSION

This study has analyzed an evidence-based action, the DLGs, replicable in any educational context, which already had

evidence of its effectivity in the face-to-face format. It has been recommended into European public policy and other contexts and now it is transferred to home spaces through online connection. The results of the research have shown how the implementation of DLGs in online format, transferring them to homes, is having an impact on the improvement of children's well-being, from a subjective view. Precisely, the improvements have taken place in some of the well-being dimensions, such as the emotional, educational and social ones, reducing the risk of anxiety regarding the new situation of confinement and all the inputs children receive related to the COVID-19 outbreak. These virtual spaces have shown how they enable the involvement of families for which participating had never been possible before and have allowed many children to participate more and more thanks to the facilities provided by virtual communication. The study has gone further, exploring and revealing the benefits of this action for family life and in their homes, and how the reciprocal collaboration of the community agents has enabled such impact. It is concluded that online DLGs enable an effective management in the protection of children's well-being, which is also accessible, in terms of resources and natural environment.

The literature review has shown how the understanding of child well-being as a concept implies a multidimensional view (Statham and Chase, 2010) and that it cannot be separated from the influence of the community interactions with teachers, family, friends and classmates. In the same line, results of this study shed light on a way to maintain meaningful interactions, through an evidence-based action transferred to homes, which has an impact on different levels—particularly social, emotional and educational—keeping and even improving a feeling of well-being in such an extreme situation as this COVID-19 pandemic.

To obtain these results and following the international recommendations, the study has been approached from a communicative perspective of research (Puigvert et al., 2012). Subsequently, the focus of the inquiry has been the subjective dimension of well-being, accounting for the participants' views and thoughts, and adapting the research techniques to facilitate the most beneficial for both, researcher and participant. Subjective well-being, associated with a sense of happiness or life satisfaction (Dinisman and Ben-Arieh, 2016) has been widely reported by all the interviewees, as shown in the "Results" section, and the quality of interpersonal relationships (Diener et al., 2018) that take place in preparing for and participating in online DLGs is highlighted as the main factor facilitating said satisfaction.

The results of this study are supported by recommendations such as those from the Centre on the Developing Child and Harvard University (2020), where the idea of constructing community for improving well-being is emphasized. Protecting against the toxic stress through virtual contact with friends and supporting families during the outbreak and further are ideas stressed in the recommendations and reinforced by our study. Because the ultimate goal is to promote long-term well-being, both for children and their families, society and communities need to support responsive care in different settings, either school or home, but together, in community (Center on the Developing Child, and Harvard University, 2014).

Considering the feasibility of the implementation of online DLGs, and the fact that the impact of traditional DLGs has been collected in policies and recommendations, it is relevant to assess the opportunity to set it as a possible public policy in educational institutions during the time of the COVID-19 pandemic, in order to facilitate a wider impact on well-being for more children. The development of policies addressed to ensure a healthy child development has been studied as the foundation of a productive society intended to create a successful future. Public programs and policies directly affect the community capacities for strengthening that healthy development, underpinned by safe contexts and quality stable relationships (Center on the Developing Child, and Harvard University, 2014). According to Wang et al. (2020), it is the responsibility of not only families or schools, but also of governments, to immediately act to avoid, as far as possible, the impact of the COVID-19 pandemic on children's physical and mental health (Wang et al., 2020). Taking this into consideration and knowing the potentialities and viability of DLGs in homes, it seems possible and convenient to contemplate the proposal of developing public policies in this direction. Ensuring technological availability and internet access for conducting the DLGs needs to be considered in order to transfer this educational action.

This study has been limited to the analysis of subjective well-being, given the urgency of the crisis and the need to adjust the research to the available sample. The online DLGs were introduced less than a month before the study, not before ensuring technical support for every family without internet access or technological resources in order to ensure equal terms for all to share the educational experience. This time of deployment makes it difficult to measure the impact of DLGs transferred to the home on aspects related to the child's objective well-being. This study has shown that an impact on child well-being occurs and, therefore, further research on the elements and strategies of DLGs that facilitate and promote this impact is needed in order to facilitate the transference of this action to other educational spaces. Considering their further implementation beyond the confinement situation, it would also be relevant to delve into the long term impact of implementing this action, especially to explore its possible effects on improving academic performance, or preventing school failure. Further research on how the implementation of other Open Doors Actions (Roca et al., 2020), such as Dialogic workspaces with students, teachers and volunteers; Class assemblies, or other Dialogic Gatherings (musical, artistic, scientific, etc.), could have an impact on child well-being during the time of pandemic crisis and school closing would be relevant. A future line of research on the benefits of extending online DLGs after the confinement situation, in the upcoming contexts of the new normal in the education domain is also of interest.

The uncertainty which permeates the new global situation provides little insight about whether social distancing, teleworking and home schooling are new realities that will continue to become more and more common in our societies. What seems probable is that it will go along to become the

new normal. Results of the study indicate the desire—once the online connection obstacles are overcome, and the potentialities discovered—for continuing to implement DLGs online in the future. Considering the new setting and the voices of participants, who expressed their desire to continue with this action regardless of the pandemic situation, and given its complementarity with the face-to-face format, it seems plausible to think that this educational action will live on beyond the outbreak, as a useful and successful tool for boosting children's education and, above all, children's well-being as well as their families', encouraging the creation of a wider community and broader participation. Once the data collection period for this study was finished, researchers learnt that more and more between-schools alternatives had been emerging once the potentialities and opportunities offered by a virtual format of DLG were discovered. The different schools found in this online action an opportunity to connect different learning communities virtually, broadening educational horizons and extending their impact, through the joint implementation of this new Open Doors Action.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics Board of the Community of Researchers in Excellence for All (CREA), University of Barcelona. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

LR-E and ER-C conceived the original idea. SL-J conducted the literature review. ER-C coordinated the data collection and conducted the interviews. SL-J transcribed and analyzed the results with the support of ER-C and MR-S. SL-J wrote a draft of the manuscript. ER-C and MR-S revised it and included corrections. LR-E revised the final version of the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Cyberchondria During the Coronavirus Pandemic: The Effects of Neuroticism and Optimism

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Health anxiety during the current coronavirus pandemic can be a serious psychological issue, amplified by the medical uncertainty around this disease and social isolation. As older people are especially at risk of becoming severely ill, it is important to examine the personal factors that make members of this age group more prone to health anxiety. Previous studies indicated that cyberchondria, i.e., the repeated online search for medical information, exacerbates health anxiety. The present research investigated the effect of two opposing traits, optimism and neuroticism, on cyberchondria during the COVID-19 pandemic. The associations of cyberchondria with demographic factors (age, gender, and education) were also examined. A sample of 880 participants, aged 15–67, 65% of whom were female, participated in an online survey. Results show that neuroticism, age, and being female are positively associated with cyberchondria. Optimism was found to be related to cyberchondria, but this effect was qualified by a significant interaction with age. Further analysis revealed that the effect of optimism was significant only in the highest age group. Moreover, among these elderly participants, the psychologically protective influence of optimism against cyberchondria emerged as larger than the opposite effect of neuroticism. This demonstrates the mental benefits of encouraging a positive outlook on the current health crisis and on one's personal resilience in facing it, especially among the elderly. Conversely, among people who use the Internet as a major source of medical information, those high in neuroticism may be more prone to cyberchondria.

Keywords: cyberchondria, coronavirus, neuroticism, optimism, age

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INTRODUCTION

The coronavirus disease-2019 (COVID-19) emerged in December 2019, spread rapidly across the globe, and brought major changes to our lives, with countries all over the world imposing confinement measures (e.g., lockdowns and the closure of non-essential businesses) in order to avoid a rapid, uncontrolled spread of the virus and an overwhelming of medical systems. However, at the time of writing (August 2020), almost 24 million people have been infected across the globe, and more than 800,000 have already died. The COVID-19 outbreak brought an unprecedented disruption to people's personal and social lives, with complex psychological implications (i.e., distress, anxiety, depression, financial worry, loneliness, confusion, and anger) (Brooks et al., 2020; Lin et al., 2020; Tull et al., 2020; Zhang et al., 2020).

The information rate shared via the Internet increased significantly during the pandemic, as in similar previous health crises (Sharma et al., 2017). Using social media sites or news platforms, people accessed news and various articles about the pandemic and COVID-19 related information and shared their experiences and concerns. The medical uncertainty around COVID-19, as well as the social isolation measures, raised severe psychological concerns, and online searches for information related to specific health symptoms (e.g., loss of smell or chest pain) increased during the pandemic (Walker et al., 2020). For example, people's searches for information about COVID-19 increased in the US by 36% 1 day after the announcement of the first COVID-19 case (Bento et al., 2020). Khasawneh et al. (2020) revealed that over 80% of medical students used social media platforms and online search engines as their primary source of information on COVID-19. In Romania, searches about symptoms, health-related issues, and treatment for COVID-19 increased exponentially, with a maximum reached in March 2020[1] (Google Trends, accessed August 23, 2020). However, research also suggested that online information about COVID-19 also contains a large amount of misleading information (Li et al., 2020), and public health agencies should aim to control the spread of misinformation concerning the virus to be able to more efficiently manage the pandemic.

In most cases, COVID-19 (the disease caused by the novel coronavirus) causes mild symptoms (such as dry cough, fever, or tiredness), though some people do not develop any symptoms. However, according to World Health Organization [WHO] (2020), 1 in 6 people may become seriously ill. The differences concerning the incidence and the severity of COVID-19 are multifaced and based on several complex factors (e.g., sociobiological characteristics or socioeconomic factors) (e.g., Hatef et al., 2020; Kopel et al., 2020); the elderly—especially those with pre-existing medical conditions (such as diabetes, cancer, lung disease, or high blood pressure)—are generally more prone to develop more severe cases of COVID-19 infections, compared to other groups (Fischer et al., 2020; Nanda et al., 2020; Niu et al., 2020).

CYBERCHONDRIA AND ASSOCIATED FACTORS

Though accessing medical information using online sources is a common, useful, and accessible strategy for most people, in some cases, when online searching becomes excessive and repetitive, it can turn into a pathological behavior (i.e., cyberchondria). Vismara et al. (2020) provided a systematic review of cyberchondria (CYB), confirming its significant role in the increase of health anxiety, distress, and obsessive-compulsive related behaviors. Although there is still no consensus on the definition of CYB, most researchers agree that this type of behavior is often driven by distress or anxiety about one's health (Starcevic and Berle, 2013), which subsequently increases both distress and anxiety (e.g., Belling, 2006; Recupero, 2010). More importantly, this search for online medical and health-related information is compulsive and hard to resist (Vismara et al., 2020).

Various international surveys suggested that almost 80% of Internet users used the Internet for medical appointments (Aiken et al., 2012; Fox and Duggan, 2013), while a sample of > 12,000 individuals suggested that almost half of the participants used the Google search engine for self-diagnosis (Mcdaid and Park, 2011). The constant coverage on both online and offline media of the COVID-19 pandemic might have contributed to an increase in health anxiety, particularly for people with CYB. The constant reminders of guidelines for preventions (i.e., wearing protective masks and gloves, washing hands, and avoiding social contact), along with updates related to the novel treatments for COVID-19, and infection and death rates, fueled health anxiety and exacerbated behaviors associated with CYB (Farooq et al., 2020; Hongbo et al., 2020).

Data suggests that younger individuals (aged 30–44) are the most active users when seeking health-related information via the Internet (Andreassen et al., 2007). However, the associations between age, gender, and CYB are scarce and contradictory (Vismara et al., 2020). Some studies have found no direct relationship between age and CYB (Barke et al., 2016); meanwhile, Doherty-Torstrick et al. (2016) suggested that older participants were less likely to experience an increase in anxiety due to the search for medical information, compared to younger participants.

In terms of gender, education, and their relation to CYB, Doherty-Torstrick et al. (2016) reported no significant differences between males and females, similar to Bajcar et al. (2019) and Akhtar and Fatima (2020). Zarcadoolas et al. (2002) suggested that medical information is one of the main topics researched online by the less educated. Meanwhile, Atkinson et al. (2009) reported that higher educated women (those with a Bachelor's degree) look for more health information online, compared to men and to less educated people.

DISPOSITIONAL OPTIMISM, NEUROTICISM, AND HEALTH

Dispositional optimism refers to "the generalized, relatively stable tendency to expect good outcomes across important life domains" (Scheier and Carver, 2018, p. 1082) and is considered a stable trait over time. The effects of dispositional optimism on physical health were widely examined. For example, Carver and Scheier (1981, 1998) were among the first researchers to suggest that optimistic people engage more in efforts to fight difficulties when they experience adversity and are more likely to achieve better outcomes. Previous research suggested that individuals higher in dispositional optimism generally engage in more protective health-related behaviors than people low in this specific trait (Carvajal et al., 1998; Giltay et al., 2007; Krane et al., 2018). Scheier et al. (1989) explored the associations between dispositional optimism and an objective physical health outcome (i.e., a heart attack). They found that individuals higher

[1]https://trends.google.com/trends/explore?date=today%203-m&geo=RO&q=coronavirus%20simptome%20tratament

in optimism were significantly less likely to suffer a heart attack during a medical procedure (such as surgery).

Additionally, other researchers confirmed the links between optimism and the progression of certain diseases (e.g., atherosclerosis, Matthews et al., 2004; coronary heart disease, Tindle et al., 2009; stroke, Kim et al., 2011). People high in dispositional optimism also seem to have higher levels of cognitive functioning following traumatic brain injury (Lee et al., 2019). Dispositional optimism seems to be as important for one's mental health as it is for their physical health. For example, Liu et al. (2016) suggested that participants' higher levels of dispositional optimism were associated with lower levels of perceived stress and depression. Similar findings were reported by He et al. (2016), who highlighted the mediating role of optimism on the relationship between perceived social support and depression. Finally, optimism is generally negatively associated with maladaptive coping strategies (Segerstrom, 2006), and positively correlated to self-confidence, a general better adjustment in the face of adverse and traumatic life events, and healthier coping strategies compared to individuals low in dispositional optimism (Nes, 2016; Reed, 2016). During the COVID-19 pandemic, optimism was found to be significantly associated with a higher level of preventive behaviors (Jovančević and Milićević, 2020).

According to McCrae and Costa (1994), neuroticism is a temperamental, stable predisposition toward dysfunctions "that reflects the tendency to experience negative emotions, cognitions, and maladaptive behaviors" (Bajcar and Babiak, 2020, p. 1). Neuroticism was found to be a significant risk factor for CYB by Bajcar and Babiak (2020), in line with previous research that linked neuroticism and other personality traits (i.e., extraversion and conscientiousness) to health-related seeking behaviors (e.g., Lagoe and Atkin, 2015; Jacobs et al., 2017; Fergus and Spada, 2018), which are generally mediated by health anxiety (e.g., Lagoe and Atkin, 2015). Neuroticism might also harm a person's immune system through "a "predisposition model," wherein effects of stressors on the immune system are dependent on personality (Khosravi, 2020, p. 1.).

Concerning the COVID-19 pandemic, neuroticism was suggested as a marker of vulnerability to COVID-19 infection by Khosravi (2020), in line with Zajenkowski et al. (2020), and Abdelrahman (2020), who suggested that neuroticism may be positively associated with adopting social distancing to avoid potential COVID-19 infection. Additionally, higher neuroticism was related to more concerns and longer duration estimates related to the COVID-19 pandemic (Aschwanden et al., 2020), in line with similar findings (e.g., Weiss and Deary, 2020). Finally, Kroencke et al. (2020) suggested that individuals high in neuroticism might experience more negative effects during the COVID-19 pandemic.

THE PRESENT STUDY

Although various studies suggested the significant associations between optimism, neuroticism, and health-related behaviors, and a growing number of COVID-19 studies point to the importance of psychological traits for predicting pandemic-related behavior, there is still a scarcity of research concerning the relationship between dispositional optimism, neuroticism, and cyberchondria. Therefore, this study aimed to investigate the effects of optimism and neuroticism on CYB during the COVID-19 crisis. Additionally, we examined the associations between CYB and age, gender, and education. We also investigated whether the effects of the two psychological traits assessed on cyberchondria are moderated by age, given the increased COVID-19–related risk faced by the elderly.

METHODS

Procedure and Participants

We ran a web-based, cross-sectional survey at the beginning of April 2020, a few weeks after governments all over the world, including Romania, imposed numerous restrictions (i.e., social confinement) to prevent the spread of COVID-19. The study was approved by the Research Ethics Committee from the institution where the authors are affiliated. The survey was distributed to and by students enrolled at the university where the authors are affiliated, as a course credit requirement. The survey link was available for 10 days and posted in academic and social media groups, or by using other media channels (such as e-mails or other online communication groups). Participation was voluntary. Our final convenience sample consisted of 880 participants (57 were dropped from the study due to missing data). Their age varied from 15 to 67 ($M = 34.36$, $SD = 10.17$), most of them being females (64.8%), with a Bachelor's degree (48.6%). Participants answered anonymously after being presented with an informed consent form describing the aim of the study and ensuring the confidentiality of their answers.

Instruments

Participants answered the revised form of **The Life Orientation Test** (LOT; Scheier et al., 1994) which measures dispositional optimism on a 5-point Likert scale (1-strongly disagree, 5-strongly agree) using 10 items (out of which four were filler items). Cronbach's alpha indicated satisfying reliability (0.715) of the scale.

We used the **Cyberchondria Severity Scale** (CSS; McElroy and Shevlin, 2014) to assess people's excessive online searching for health-related issues, and the way this conduct affects their daily routine. Participants in our sample answered on a 5-point Likert scale (1-Never, 5-Always) to 33 items further divided into five different dimensions—*Compulsion*, *Distress, Excessiveness*, *Reassurance,* and *Mistrust of medical professionals*—assessing their related behavior within the past 2 weeks. High total scores indicated high levels of CYB. Cronbach's alpha indicated high reliability (0.947) of the scale.

The Neuroticism Scale from the international personality item pool—IPIP (1996)—was used to measure psychological distress. The 10-item instrument was translated and adapted for the Romanian population by Iliescu et al. (2015). Cronbach's alpha indicated good reliability (0.865) of the scale.

A demographic scale assessed participants' age, gender, and education (i.e., high school, Bachelor's degree, or postgraduate).

RESULTS

We computed the Spearman correlations between study variables, as the results of the Shapiro-Wilk tests of normality indicated that CYB, LOT, NS, and age are not normally distributed. These correlations and normality statistics are presented in **Table 1**, together with descriptive statistics on all variables. CYB was found to have significant but weak negative associations to optimism (i.e., LOT) and age, and to be positively related, albeit to the same weak order of magnitude, to neuroticism (i.e., NS) and gender, with female participants scoring higher than males.

Next, we investigated the effect of neuroticism, optimism, age, gender, and education on CYB through hierarchical multiple regression analysis. The three sociodemographic variables were entered in the first step, while neuroticism and optimism were entered in the second. In order to explore whether age moderates the effect of these two psychological dimensions on CYB, we introduced the interaction term (i.e., product) between neuroticism and age, as well as the interaction between optimism and age in the third step.

Results, summarized in **Table 2**, showed that in the third model age, gender, neuroticism, and optimism were significant predictors of CYB. However, while neuroticism was positive, as in the previous correlational analysis, the relationships of the other three variables to cyberchondria emerged as opposed to those indicated by simple correlations. Thus, when controlling the other dimensions, the standardized coefficients in the third step of the regression analysis indicate that male and older participants score higher on CYB than their female and younger counterparts. Moreover, optimism was indicated as having a positive association with CYB, but this main effect was qualified by a significant interaction between LOT and age, while the interaction term between neuroticism and age did not significantly account for cyberchondria. In order to explore the interaction between optimism and age, we analyzed the effect of optimism at each age level through multiple regression analyses. To this aim, we used the mean and standard deviation of the age distribution to split the sample into three groups.

TABLE 2 | Hierarchical regression model for cyberchondria (CYB).

	Step 1	Step 2	Step 3
	β	β	β
CSS			
Age	−0.08*	−0.02	0.72*
Gender	0.11**	0.07*	0.07*
Education	−0.07*	−0.06	−0.06
NS		0.28**	0.50**
LOT		−0.07	0.32*
NS x Age			−0.26
LOT x Age			−0.73**
ΔR^2	0.02**	0.10**	0.01*

*$p < 0.01$; **$p < 0.001$.
LOT, Life Orientation Test; NS, Neuroticism Scale.

TABLE 3 | Hierarchical regression model for cyberchondria (CYB) at each age level.

	Lowest age (under 24 years) $N = 166$	Medium age (25–44 years) $N = 572$	Highest age (over 45 years) $N = 142$
CSS			
Age	−0.12	−0.06	0.10
Gender	0.10	0.05	0.08
Education	−0.14	−0.01	−0.21**
NS	0.34**	0.29**	0.18*
LOT	0.10	−0.08	−0.22*
R^2	0.14**	0.13**	0.19**

*$p < 0.01$; **$p < 0.001$.
LOT, Life Orientation Test; NS, Neuroticism Scale.

The results of the analysis regression of CYB on the three sociodemographic variables, neuroticism, and optimism in each of the three groups defined by their age level are presented in **Table 3**. Results indicate that neuroticism is a significant positive factor of CYB at every age level. Optimism did not emerge as a significant predictor in the first two age groups, but it negatively and significantly predicted CYB in participants with the highest age. Moreover, at this age level, the effect of optimism on CYB, as indicated by standardized regression coefficients, emerged as stronger than that of neuroticism. The association of education to CYB scores was found to be similar to that of

TABLE 1 | Pearson correlations between study variables, means, and standard deviations ($N = 880$).

	1	2	3	4	5	6	*M*	*SD*	Shapiro-Wilk W statistic
1. CSS	1	−0.26**	0.33**	−0.08*	0.10*	−0.05	2.29	0.73	0.97**
2. LOT		1	−0.59**	0.17**	0.006	0.12**	3.61	0.73	0.98**
3. NS			1	−0.18**	0.13**	−0.03	2.30	0.76	0.98**
4. Age				1	0.06	0.21**	34.36	10.17	0.98**
5. Gender					1	0.17**	35.2% males, 64.8% females		
6. Education						1	23.2% highschool, 48.6% Bachelor's degree		

*$p < 0.05$; **$p < 0.01$.
CSS, Cyberchondria Severity Scale; LOT, Life Orientation Test; NS, Neuroticism Scale.

optimism across the three age groups, as education emerged as a significant negative factor of cyberchondria only in participants in the highest age group.

DISCUSSION

In a survey-based, cross-sectional study, we examined the effect of two opposite dispositional traits, i.e., optimism and neuroticism, and a series of demographic factors (gender, education, and age) on cyberchondria during the COVID-19 pandemic. We were also interested in the way age moderates the effects of the two psychological factors examined, given the fact that COVID-19 is especially dangerous for older people. Results suggested that optimism decreases the likelihood that people in the most vulnerable COVID-19 group (i.e., older individuals) will experience high levels of cyberchondria, emphasizing the importance of this psychological trait in overcoming the health-related anxiety that may be associated with CYB and amplified by the current crisis, in this specific age group. These findings extend the previously documented positive influence on optimism on protective health-related behaviors (e.g., Krane et al., 2018), suggesting that this active stance in the area of health management also protects highly optimistic individuals from excessive online searching for medical information during the current COVID-19 crisis, and from the psychological consequences of this behavior.

Given this benefit of optimism during the current pandemic, it is essential to consider ways in which it might be enhanced and/or pessimism reduced, especially among the elderly. For example, previous studies suggested that engaging in social activities, religious involvement, social support, physical activities, or practicing gratitude might enhance optimism and coping with adverse life situations (e.g., Greenglass et al., 2006; Giltay et al., 2007; Prati and Pietrantoni, 2009; Greene and McGovern, 2017; Progovac et al., 2017; Oberle et al., 2018; Wong et al., 2018). Health professionals and national authorities fighting the pandemic may benefit from the findings by focusing on the significant role of optimism for older people who use the Internet as a major source of medical information during the current health crisis.

The pattern of findings indicates that people high in neuroticism are especially prone to develop CYB manifestations irrespective of their age, in line with past studies on the relationship of this personality trait with CYB (Bajcar and Babiak, 2020), as well as with health anxiety and health-related behaviors (Lagoe and Atkin, 2015; Fergus and Spada, 2018). Results also suggest that when controlling for the effects of neuroticism, optimism, gender, and education, CYB is positively related to age, a result that contradicts previous findings (Doherty-Torstrick et al., 2016), while also highlighting the psychologically vulnerable status of the elderly during the COVID-19 crisis.

Besides other limits, such as its reliance on a convenience sample, which undermines the generalizability of the current findings, one of the limits of this study is that we did not measure health anxiety. This precludes us from concluding the degree to which the relationships that emerged in our results extend more generally in people's health anxiety. Further research should investigate the relationships between age, CYB, and health anxiety in the context of the COVID-19 pandemic and its psychological effects. For instance, McMullan et al. (2019) suggested that age might moderate the relationship between health anxiety and CYB. Future studies could examine whether this pattern of findings is altered by increased health risks faced by the older population during the current pandemic. Furthermore, to increase the generalizability of the current findings, future studies should rely on non-convenient, larger samples. Longitudinal approaches might also express in more detail whether and how the evolution of the current pandemic affects the nature and direction of relationships in the main variables explored in the current research.

To conclude, this study found that optimism is a psychologically protective factor against CYB during the current health crisis in the most vulnerable age group, i.e., the elderly. This effect runs against the general influence of neuroticism, which amplifies the risk of CYB. The practical implications of the current findings are various and mainly important for policy makers, clinicians, and healthcare systems in general. For example, public policies should find effective ways to promote rapid and strategic ways to increase optimism as a protective measure against CYB during and post the COVID-19 pandemic. Additionally, as Khosravi (2020) suggested, given the important association between neuroticism and CYB, self-report scales might be useful for the initial screening of individuals high in neuroticism, to launch personality-tailored prevention campaigns that might reduce CYB and its negative consequences during the pandemic. (such as disseminating information about ways to fight the current crisis, especially among individuals of high neuroticism, using optimism-enhancing strategies, and advertising the negative impact of excessive and repetitive online searching for COVID-19 related information).

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Institutional Review Board of Alexandru Ioan Cuza University in Iasi. Written informed consent to participate in this study was provided by the participants, and where necessary, the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

Both authors contributed equally to conceive and design the main goal of the study, analyze the data, and write the manuscript.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Psychological Impact During the First Outbreak of COVID-19 in Italy

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The first outbreak of COVID-19 in Italy was confirmed on February 21, 2020. Subsequently, COVID-19 turned into a global pandemic, causing a global health emergency, triggering an unprecedented event in the modern era. This study assessed the immediate psychological impact of the COVID-19 epidemic on emotional health and well-being.

An *ad hoc* questionnaire was designed for online completion to expedite data collection during the COVID-19 outbreak. People were invited to participate in the study via social media and email from 4 to 18 March 2020. The entire survey comprised of 21 questions, covering a wide range of factors, such as demographics, disease knowledge, psychological impact, daily life activities, and psychological precautionary measures. The main outcome measure was psychological impact. This was measured based on intensity and prevalence of self-reported feelings of anxiety, fear, sadness, anger, and concern during the epidemic.

In total, 10,025 respondents completed the online survey. Of these, about 73% were females, and 100% of the sample possessed good knowledge of the disease. The greatest prevalence of high psychological impact was reported in the <34 years' age group and in north Italy. Additionally, the psychological impact influenced important daily life activities, such as sexuality and nutrition.

Our study provides information about the immediate psychological (emotional feelings) responses of Italy's general population to the COVID-19 epidemic. The survey covers several factors that can influence mental health; our results help gauge the psychological burden on the community and offer ways to minimize the impact.

Keywords: anxiety, fear, sexuality, psychological distress, COVID-19

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INTRODUCTION

COVID-19 (coronavirus disease 2019; the pathogen called SARS-CoV-2; previously 2019-nCoV) is an acute and highly contagious viral disease which can cause rapidly spreading outbreaks of respiratory diseases (1). It was first diagnosed in Wuhan, China. Following this, it first spread to Italy, then to other European countries, and eventually, throughout the globe, affecting 184

countries from December 2019 to April 8, 2020. (2). Governments worldwide are under increased pressure to stop the outbreak from spiraling into a global health emergency.

Italy's first outbreak of COVID-19 was confirmed on February 21, 2020. In the beginning, it rapidly spread to north Italy and then affected all other regions. This soon became a global pandemic (WHO) (2), causing a global health emergency, triggering an unprecedented event in the modern era.

Disease control procedures focusing on restraining the virus were put in place across all regions, including quarantine, movement restrictions, military control, and bio-security measures.

Color-coded COVID-19 control zones were established within the first 2 weeks of the outbreak based on the level of risk of the virus spreading. These zones were re-assigned with the spread of the disease in the area, and each zone was subject to specific controls and restrictions. Currently, more than 139.422 people are infected, ∼80% in the north and at least 20% in south-central. Current data from disease surveillance and monitoring indicate the presence of active infection in Italy. When Italy will be declared COVID-19-free remains uncertain.

The impact on people was both economic, through financial and business losses and psychological, through the loss of freedom during quarantine and exposure to media images on television and in newspapers (3–5). Repeated media exposure can increase anxiety and heighten stress responses, this negatively affects health. Further, misplaced health-protective and help-seeking behavior can overburden health care facilities and available resources (4, 6). During Ebola and H1N1 outbreaks, media coverage of events had unintended consequences for those at a relatively lower risk of direct exposure, leading to severe public health repercussions. The need to combat false information and rumors is extremely crucial in the age of social media and information that can go viral (7).

Although several COVID-19-related research is emerging, few so far focused on the psychological impact on people directly exposed to such outbreaks (8–11).

The existing studies analyzed factors related to symptoms of anxiety and anger after quarantine. Brooks et al. reported that individuals with a greater knowledge about the disease during the initial stages of the MERS outbreak experienced increased anxiety and had greater trust in unofficial information (3). Wang et al. reported that during the initial phase of the COVID-19 outbreak in China, more than half the respondents rated the psychological impact as moderate-to-severe and about one-third reported to have experienced moderate-to-severe anxiety (10).

This study assessed the immediate psychological impact of the COVID-19 epidemic on emotional health and well-being.

METHODS

Survey Design and Sampling

An *ad hoc* questionnaire was designed for online completion to expedite data collection during the COVID-19 outbreak. People were invited to participate in the study via social media and email. The procedure involved filling an online consent form. All data were collected anonymously and stored in a password-protected electronic format.

More than 10,000 emails were sent to individuals as well as associations, clubs, and Facebook groups, with the assumption that the information would be forwarded within their own social circles, nationally. The initial invitation to participate was sent on March 4, 2020 (Week 2 of the outbreak). The survey remained open until March 18, 2020 (Week 4 of the outbreak), and date of completion was recorded with each respondent's data.

Survey Content and Outcome Measures

The questionnaire assessed the self-reported psychological impact. The content was reviewed by a small group of public mental health professionals (clinical psychologists). The entire survey comprised of 21 closed questions, covering a wide range of factors, such as demographics, disease knowledge, psychological impact, daily life activities, psychological precautionary measures, and frightening events (Refer to **Table 1**). The demographic information included: gender, age, highest level of educational qualification, and region of residence.

The main outcome measure reported in this study was psychological impact. This was measured based on intensity and prevalence of self-reported feelings of anxiety, fear, sadness, anger, and concern during the pandemic. This measure was assessed using questions that inquired about the intensity with which the respondents experienced certain feelings/emotions during the epidemic period. The responses were scored on a four-point scale, depending on the intensity of each emotion experienced (0 = "none" and 4 = "very high" intensity).

Psychological impact category included: self-reported feelings of anxiety, fear, sadness, anger, and concern for well-being (*What emotions do you experience after receiving information about COVID-19?*).

Daily life activities included: nutrition, sleep, sexuality, relationship with others, and sense of freedom (*How much does the current situation negatively affect the following?...*).

Psychological precautionary measures included: listening to less drastic media information, psychotherapy, use of disinfectants, use of medical device, and avoiding crowded places (*What would make you feel safer in this period?*).

Frightening events included: falling sick, economic crises, job loss, death, psychosis, and quarantine (*What scares you about COVID-19?*).

Statistical Methods

Descriptive statistics were used to calculate categorical variables. Percentage of responses was calculated according to the number of respondents per response with respect to the total number of responses to a question.

We performed logistic regression using the MATLAB command "mnrfit" to consider the relationship between factors of age, sex, and region and the four-point scale used to rate the endpoints (i.e., none, low, moderate, and high).

The association between ranked scores for questions were assessed using Kendall's Tau, a non-parametric correlation for

TABLE 1 | Demographic characteristics of the sample.

		N	%
Gender	Male	2,741	27.34
	Female	7,284	72.65
Age category	≤34	3,765	37.55
	35–64	5,816	58
	≥65	444	4.42
Education level	5–8 anni	163	1.62
	8–13 anni	735	7.33
	13–17	2,110	21.04
	>17	7,017	70
Regions of Italy	Abruzzo	58	0.58
	Aosta valley	6	0.06
	Apulia	295	2.94
	Basilicata	35	0.35
	Calabria	75	0.75
	Campania	148	1.48
	Emilia Romagna	476	4.75
	Friuli Venezia Giulia	88	0.88
	Lazio	1,046	10.43
	Liguria	248	2.47
	Lombardy	5,237	52.23
	Marche	93	0.93
	Molise	65	0.65
	Piedmont	694	6.92
	Sardinia	138	1.37
	Sicily	140	1.39
	Trentino South Tyrol	42	0.42
	Tuscany	552	5.50
	Umbria	57	0.57
	Veneto	430	4.29
	Not reported	29	0.29
	Nationals living abroad	73	0.73

discrete scores. Tau-b corrects for the presence of ties and also has a range between −1 and 1. Kendall's tau b of at least 0.7 represents a very strong relationship; 0.4–0.699, a strong relationship; 0.3–0.399, a moderate relationship, 0.2–0.299, a weak relationship; and 0–0.199 implies that the variables are likely to be unrelated, even if significant *p*-values are encountered. In contrast, a low negative Kendall's tau b value approaching its minimum of −1.0 indicates that high rating of one endpoint is associated with low rating on another.

Statistical significance was set at $p < 0.001$ to highlight the most important results.

RESULTS

Sample Details

Table 1 shows the details of the study sample. In total, 10,025 respondents completed the online survey. Of these, about 73% were females. A total of 70% of the respondents had completed tertiary level in terms of educational qualification. About 70% of the sample was from north Italy, 17% from central regions, 10% from the south, and only 72% were nationals living abroad. Further, 100% of the sample had good knowledge of the disease.

Psychological Impact

Multinomial logistic regression determined the relationship between demographic factors of region, age, and gender and scores (none, low, moderate, high) obtained from the psychological impact category (anxiety, fear, anger, sadness, concern) (**Figure 1** and **Table 2**).

A significant relationship ($p < 0.0001$) was found between *Region* and anxiety, fear, sadness, and concern, but not with anger, and between *Region* and all *Daily Life* aspects that were evaluated. Data from north Italy exhibited higher prevalence of high psychological impact (anxiety 28%, fear 18%, anger 21%, sadness 27%, concern 42%) than the center-south zones (anxiety 21%, fear 14%, anger 22%, sadness 23%, concern 34%).

A significant relationship was found between *Age* and anxiety, fear, and anger, but not with sadness and concern (**Figure 1**). The highest prevalence of high psychological impact was in the <34 years' age group (anxiety 29%, fear 18%, anger 24%, sadness 27%, concern 40%), and 35–64 years' age group. The lowest prevalence was in the >65 years' age group (anxiety 14%, fear 9%, anger 14%, sadness 21%, concern 32%).

Regarding *Gender*, we found a significant relationship with all the emotions. The highest prevalence of high psychological distress was among females (anxiety 30%, fear 19%, anger 22%, sadness 29%, concern 42%).

Logistic regression determined the relationship between demographic factors (*Region, Age, Gender*) and *Daily Life* aspects and *Frightening Events,* which showed that the epidemic negatively influenced all daily life activities (**Table 3**). People, especially females, were afraid of economic crises, falling sick, and dying (**Table 4**).

We investigated the correlation between perceived psychological impact and increase in the number of COVID-19 cases. We found that "concern" and "sadness" had the strongest correlation values (tau = 0.23 and 0.22, respectively) (**Figure 2**). For *Daily Life*, all correlations were positive. "Sexuality and nutrition" showed the highest values (tau = 0.30 and 0.29, respectively). Regarding *Frightening Events*, the highest correlation value was found for "*Falling Sick* (tau = 0.15)," indicating a general uncorrelated trend in this category.

We finally investigated how different levels of psychological impact were correlated using pairwise comparison (**Table 5**).

Most correlations relating to the endpoints' relevance to *Psychological impact*, *Daily Life*, and *Frightening Events* were statistically significant. **Tables 6** and **7** show low-to-moderate correlations (Kendall's tau statistic) except for *Falling Sick and Death*. These were issues most strongly associated with fear, anxiety, concerns, but not with anger or sadness.

For *Psychological precautionary measure*s, the highest correlation value was found only for *Use of Medical Device* (Fear tau = 0.24; Anxiety tau = 0.21; Concern tau = 0.2), indicating a general uncorrelated trend in this category (**Table 8**).

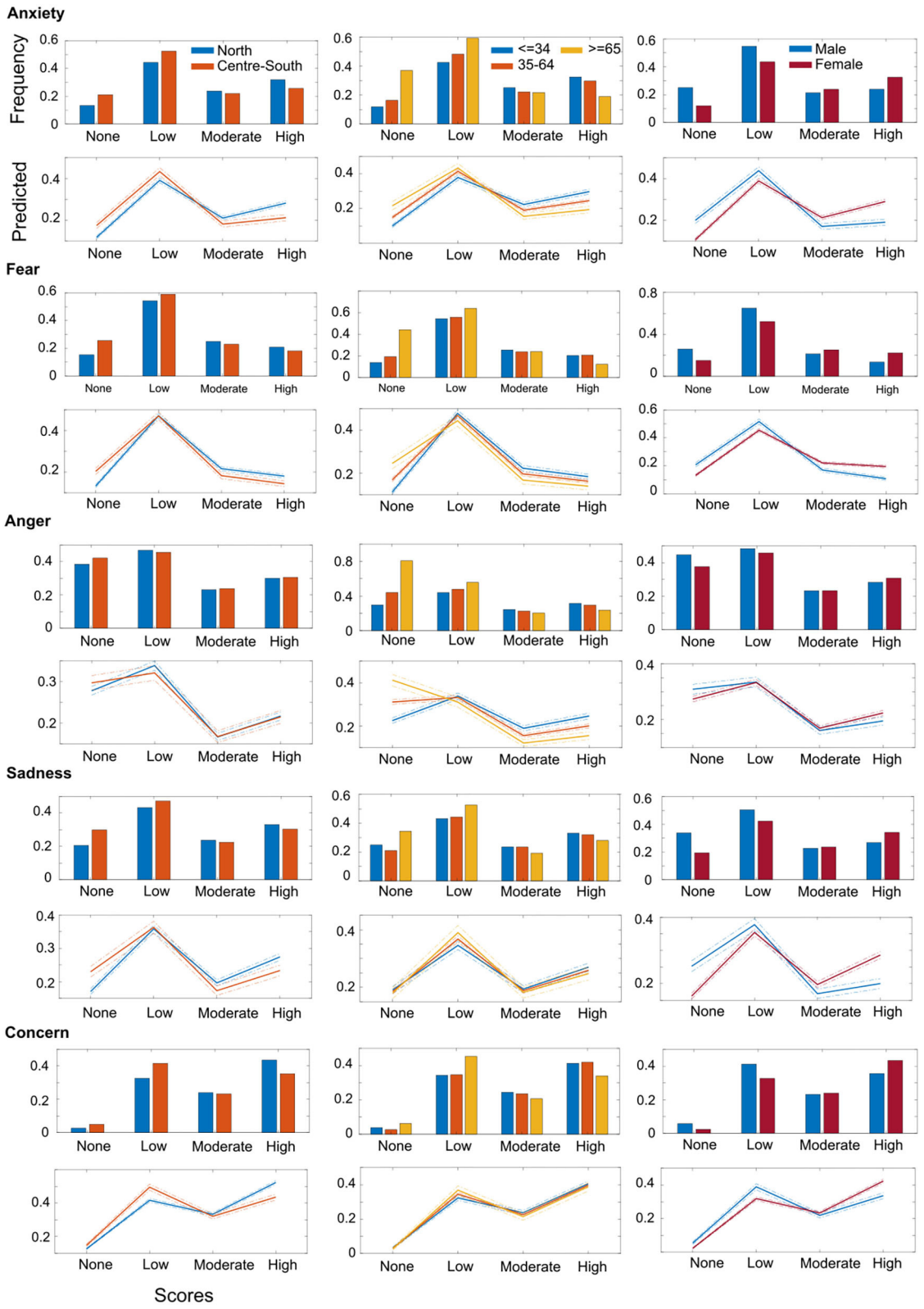

FIGURE 1 | Multinomial logistic regression data for psychological impact (anxiety, fear, anger, sadness, concern) score (none, low, moderate, high) and demographic factors (Region, Age, and Gender). Top Panel: bars represent the frequency count of scores normalized over the total number of each demographic factor. Bottom panel: predicted category counts (marked line) for the multinomial logistic regression model and 95% confidence bounds.

TABLE 2 | Multinomial logistic regression data for psychological impact category and demographic factors (region, age, and gender).

	Beta	StdErr	*t*-Stat	*P*-value
REGION				
Anxiety	0.32	0.03	9.42	**<0.0001**
Fear	0.27	0.03	7.84	**<0.0001**
Anger	0.02	0.03	0.73	0.4619
Sadness	0.21	0.03	6.19	**<0.0001**
Concern	0.33	0.03	9.36	**<0.0001**
AGE				
Anxiety	0.26	0.028	9.43	**<0.0001**
Fear	0.19	0.028	6.89	**<0.0001**
Anger	0.26	0.027	9.83	**<0.0001**
Sadness	0.03	0.027	1.26	0.2081
Concern	0.04	0.029	1.29	0.1979
GENDER				
Anxiety	−0.48	0.03	−13.96	**<0.0001**
Fear	−0.50	0.03	−14.22	**<0.0001**
Anger	−0.13	0.03	−3.97	**0.0001**
Sadness	−0.39	0.03	−11.61	**<0.0001**
Concern	−0.34	0.03	−9.68	**<0.0001**

Significant P values are highlighted in bold.

TABLE 3 | Multinomial logistic regression data for daily life activity category and demographic factors (region, age, and gender).

	Beta	StdErr	*t*-Stat	*P*-value
REGION				
Nutrition	0.42	0.04	10.32	**<0.0001**
Sense of freedom	0.48	0.04	13.19	**<0.0001**
Relationship with others	0.48	0.03	13.54	**<0.0001**
Sexuality	0.42	0.04	10.88	**<0.0001**
Sleep	0.37	0.04	9.38	**<0.0001**
AGE				
Nutrition	0.12	0.03	4.03	**0.0001**
Sense of freedom	0.23	0.03	7.92	**<0.0001**
Relationship with others	0.09	0.03	3.39	**0.0007**
Sexuality	0.24	0.03	8.04	**<0.0001**
Sleep	−0.03	0.03	−0.89	0.3722
GENDER				
Nutrition	−0.37	0.04	−9.39	**<0.0001**
Sense of freedom	−0.23	0.04	−6.27	**<0.0001**
Relationship with others	−0.16	0.03	−4.60	**<0.0001**
Sexuality	−0.01	0.04	−0.19	0.8469
Sleep	−0.41	0.04	−10.55	**<0.0001**

Significant P values are highlighted in bold.

TABLE 4 | Multinomial logistic regression data for frightening events category and demographic factors (region, age, and gender).

	Beta	StdErr	*t*-Stat	*P*-value
REGION				
Falling sick	0.13	0.04	3.23	**0.0012**
Economic crises	0.14	0.04	3.17	**0.0015**
Job loss	0.1	0.03	3.67	**0.0002**
Death	0.11	0.03	2.92	**0.0034**
Psychosis	0.31	0.03	10.25	**<0.0001**
Quarantine	0.19	0.03	4.99	**<0.0001**
None	0.01	0.05	0.16	0.8707
AGE				
Falling sick	−0.11	0.03	−3.70	**0.0002**
Economic crises	0.09	0.03	2.95	**0.0031**
Job loss	0.26	0.03	8.59	**<0.0001**
Death	−0.07	0.02	−2.51	**0.0119**
Psychosis	0.09	0.03	2.35	**0.0186**
Quarantine	0.22	0.02	7.59	**<0.0001**
None	−0.14	0.04	−3.08	**0.0020**
GENDER				
Falling sick	−0.34	0.03	−8.90	**<0.0001**
Economic crises	−0.13	0.04	−3.15	**0.0016**
Job loss	−0.16	0.03	−4.36	**<0.0001**
Death	−0.38	0.03	−10.30	**<0.0001**
Psychosis	−0.04	0.03	−1.07	0.2839
Quarantine	−0.19	0.03	−5.19	**<0.0001**

Significant P values are highlighted in bold.

DISCUSSION

The emergency caused by the COVID-19 pandemic puts a strain on psychological health. This is the first study conducted in Italy that collected psychological data before government restrictions were imposed and during the quarantine period.

This study shows that people feel psychologically vulnerable and are afraid of economic crises, falling sick, and dying. Additionally, the psychological impact of the disease influences important daily life activities, such as sexuality, nutrition, sleep, and sense of freedom.

Factors associated with high psychological impact included female gender and young age. Scientific evidence suggests that psychological distress is less during mid-life and greater among younger people (12). This may be because young adults frequently engage with social media and may be more exposed to misinformation online, which can trigger psychological distress (13, 14). These results confirmed that younger people and woman are particularly vulnerable and have lower coping ability to deal with the consequences of this pandemic (15).

During the epidemic period, both before and after the lockdown, negative feelings experienced by people contributed to decreased psychological well-being (e.g., decreased sexuality, sleep disturbances, and nutrition-related issues).

There is a longstanding acceptance that psychological distress in the form of anxiety, sadness, irritability, self-consciousness, and emotional vulnerability is strongly correlated to physical morbidity (16). However, few studies investigated whether these negative feelings affect sexuality during a pandemic. In line with our results, Panzeri et al. (17) showed that the negative aspects of lockdown can affect the quality of sexual life, while Luetke et al. (18)

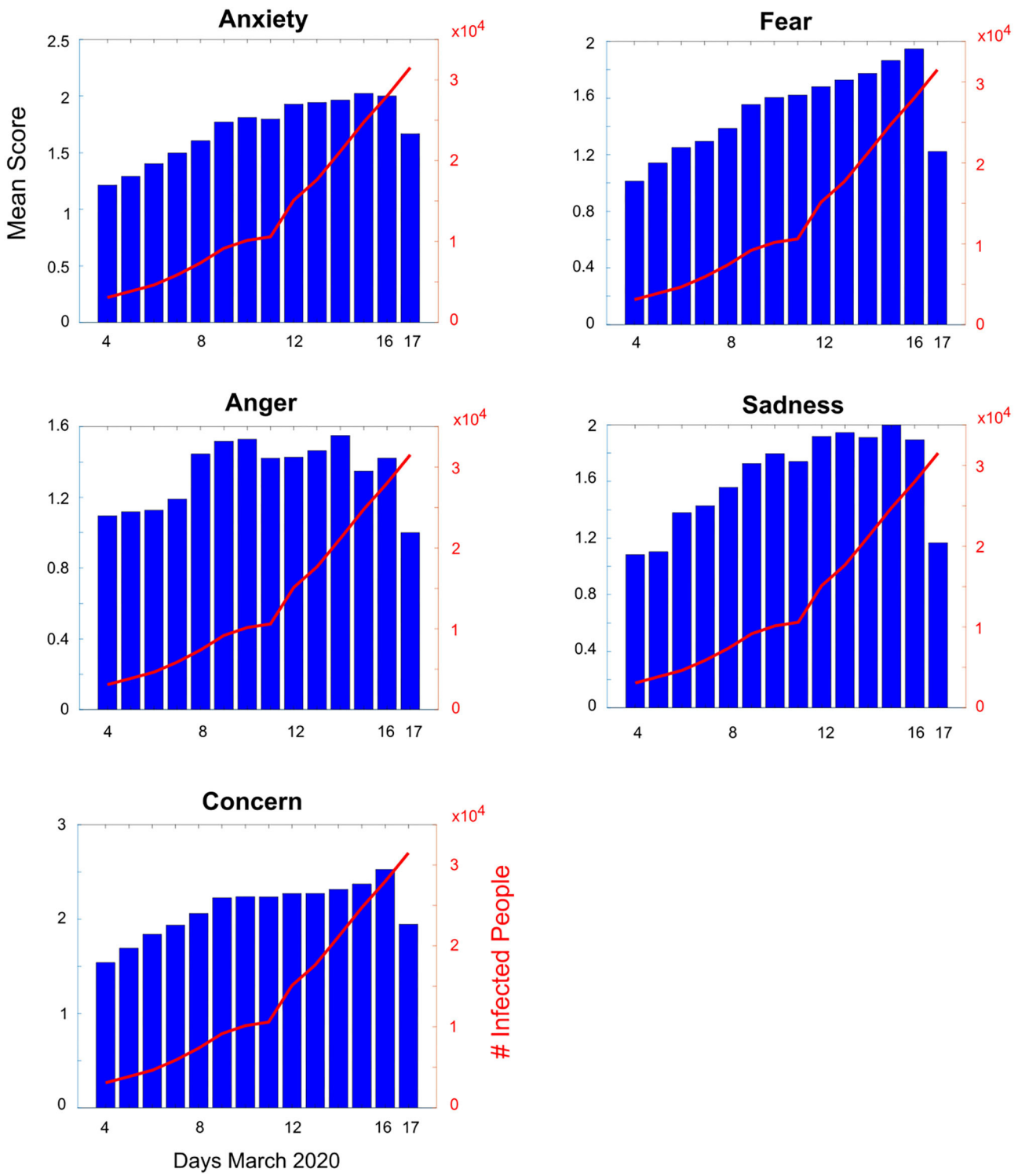

FIGURE 2 | Correlation between the perceived psychological impact and increase in the number of COVID-19 cases (from 4 to 18 March 2020). Blue bars represent the mean score for psychological impact (anxiety, fear, anger, sadness, concern) per day. Red axis shows the increasing number of infected people during the same days.

TABLE 5 | Correlation between increase in the number of COVID-19 cases and psychological impact, Daily Life Activity and Frightening Events categories.

	Psychological impact									
	Fear		**Anxiety**		**Anger**		**Concerns**		**Sadness**	
Increase in the number of COVID-19 cases	Kendall's Tau	*P*-value	Kendall's Tau	*P*-value	Kendall's Tau	*P*-value	Kendall's Tau	*P*-value	Kendall's Tau	*P*-value
	0.21	**<0.0001**	0.20	**<0.0001**	0.11	**<0.0001**	0.23	**<0.0001**	0.22	**<0.0001**
	Daily life activity									
	Sleep		**Nutrition**		**Sexuality**		**Relationship with others**		**Sense of freedom**	
	Kendall's Tau	*P*-value	Kendall's Tau	*P*-value	Kendall's Tau	*P*-value	Kendall's Tau	*P*-value	Kendall's Tau	*P*-value
	0.24	**<0.0001**	0.28	**<0.0001**	0.30	**<0.0001**	0.28	**<0.0001**	0.23	**<0.0001**

Frightening events										
Psychosis		**Economic crises**		**Falling sick**		**Death**		**Quarantine**		**Job loss**	
Kendall's Tau	*P*-value	Kendall's Tau	*P*-value	Kendall's Tau	*P*-value	Kendall's Tau	*P*-value	Kendall's Tau	*P*-value	Kendall's Tau	*P*-value
0.05	**<0.0001**	0.06	**<0.0001**	0.15	**<0.0001**	0.14	**<0.0001**	−0.003	0.072	0.03	0.00021

Significant P values are highlighted in bold.

TABLE 6 | Correlations values (Kendall's tau statistics) relating to "psychological impact and daily life activity" categories.

Daily life activity	**Psychological impact**									
	Fear		**Anxiety**		**Anger**		**Concerns**		**Sadness**	
	Kendall's Tau	***P*-value**	**Kendall's Tau**	***P*-value**	**Kendall's Tau**	***P*-value**	**Kendall's Tau**	***P*-value**	**Kendall's Tau**	***P*-value**
Sleep	0.37	**<0.0001**	0.39	**<0.0001**	0.19	**<0.0001**	0.32	**<0.0001**	0.29	**<0.0001**
Nutrition	0.33	**<0.0001**	0.35	**<0.0001**	0.19	**<0.0001**	0.30	**<0.0001**	0.28	**<0.0001**
Sexuality	0.29	**<0.0001**	0.30	**<0.0001**	0.17	**<0.0001**	0.27	**<0.0001**	0.25	**<0.0001**
Relationship with others	0.37	**<0.0001**	0.39	**<0.0001**	0.19	**<0.0001**	0.38	**<0.0001**	0.29	**<0.0001**
Sense of freedom	0.32	**<0.0001**	0.36	**<0.0001**	0.21	**<0.0001**	0.35	**<0.0001**	0.30	**<0.0001**

Significant P values are highlighted in bold.

TABLE 7 | Correlations values (Kendall's tau statistics) relating to "psychological impact and frightening events" categories.

Frightening events	**Psychological impact**									
	Fear		**Anxiety**		**Anger**		**Concerns**		**Sadness**	
	Kendall's Tau	***P*-value**	**Kendall's Tau**	***P*-value**	**Kendall's Tau**	***P*-value**	**Kendall's Tau**	***P*-value**	**Kendall's Tau**	***P*-value**
Psychosis	0.14	**<0.0001**	0.18	**<0.0001**	0.19	**<0.0001**	0.16	**<0.0001**	0.18	**<0.0001**
Economic crises	0.18	**<0.0001**	0.20	**<0.0001**	0.17	**<0.0001**	0.23	**<0.0001**	0.20	**<0.0001**
Falling sick	0.49	**<0.0001**	0.45	**<0.0001**	0.19	**<0.0001**	0.46	**<0.0001**	0.29	**<0.0001**
Death	0.49	**<0.0001**	0.42	**<0.0001**	0.19	**<0.0001**	0.39	**<0.0001**	0.28	**<0.0001**
Quarantine	0.24		0.25		0.16		0.20		0.20	
Job loss	0.17	**<0.0001**	0.18	**<0.0001**	0.16	**<0.0001**	0.18	**<0.0001**	0.17	**<0.0001**

Significant P values are highlighted in bold.

showed that Americans experienced more conflict in their romantic partnerships, owing to changes in their intimate and sexual lives.

Sexual health is an important parameter for well-being because it impacts our psychological and emotional state. Sexual activities and orgasms serve as anti-depressants because these release certain hormones like oxytocin (the hormone that controls attachment), endorphin (the hormone related to well-being which helps to manage pain), and serotonin (the happiness hormone that works against anxiety) (19, 20).

Live statistics and COVID-19-related news tracking the number of confirmed cases, recovered patients, and death toll heighten concerns and uncertainty among populations. Health officials in a growing number of countries are fighting to slow down the spread of the novel virus and are also working toward curbing a secondary issue that the World Health Organization (WHO) calls "infodemic" (4). The WHO defines infodemic as "an overabundance of information—some accurate and some not—that makes it hard for people to find trustworthy sources and reliable guidance when they need it." This problem is intensified by the ease and speed with which information can spread on social media. It generates fear and panic due to unverified rumors and exaggerated claims (6, 7, 15). It also promotes xenophobic and racist forms of digital vigilantism and scapegoating (16).

TABLE 8 | Correlations values (Kendall's tau statistics) relating to "psychological impact and psychological precautionary measure" categories.

Psychological precautionary measure	Psychological impact									
	Fear		Anxiety		Anger		Concerns		Sadness	
	Kendall's Tau	*P*-value	Kendal Tau	*P*-value	Kendall's Tau	*P*-value	Kendall's Tau	*P*-value	Kendall's Tau	*P*-value
Use of medical device	0.24	**<0.0001**	0.21	**<0.0001**	0.11	**<0.0001**	0.21	**<0.0001**	0.15	**<0.0001**
Use of disinfectants	0.17	**<0.0001**	0.14	**<0.0001**	0.06	**<0.0001**	0.16	**<0.0001**	0.09	**<0.0001**
Listening to less drastic media information	−0.14	**<0.0001**	−0.10	**<0.0001**	0.01	0.09	−0.15	**<0.0001**	−0.07	**<0.0001**
Avoiding crowded places	0.13	**<0.0001**	0.13	**<0.0001**	0.006	0.51	0.16	**<0.0001**	0.09	**<0.0001**
Psychotherapy	0.17	**<0.0001**	0.19	**<0.0001**	0.09	**<0.0001**	0.13	**<0.0001**	0.15	**<0.0001**

Significant P values are highlighted in bold.

Only with responsible information can the concerns and uncertainty experienced by the whole community be addressed, ensuring that people avoid indulging in uncontrolled and risky behavior during an epidemic (e.g., xenophobia) (21).

Since the disease originated in China, Asia-phobic reactions have been reported at the beginning of the epidemic, in various regions of the world (18). Our results revealed that Italian people tend to engage in avoidant behavior toward people with pneumonia-like symptoms rather than toward Asians. This maybe because with the virus' spread throughout Europe, Italians may also be at the risk of being discriminated against.

Given that xenophobia during outbreaks is not uncommon, facing prejudice, including discrimination related to COVID-19, may add to feelings of isolation (18) and adversely affect mental health.

LIMITATIONS

The strengths of this study lie in the large sample size, its extensive geographic coverage across Italy, and the early post-outbreak study period, but it has several limitations. Since we used an online survey, it is likely that the findings of the study under-represented the responses of those within certain demographics (e.g., those who are less educated, less affluent, and older respondents). Not everybody has access to the internet; online survey methodology is relatively uncontrolled, and the results are less generalisable.

We used a non-validated clinical questionnaire. The self-reported psychological impact may not adequately represent the mental health status assessed. Clinical prospective studies are necessary to provide more accurate data to support the need for focused public mental health strategies. This was a cross-sectional study, and associations between psychological impact and risk factors cannot be considered causal relationships.

The survey provides information on only the immediate psychological impact at a certain point of time. A longitudinal study is required to provide information on whether the observed impact would last for longer periods of time.

Additionally, those with a higher level of distress were probably more motivated to respond to the survey. Therefore, the extent of this response bias in the data cannot be accurately estimated.

The sample is far from being representative and consists mostly of individuals who accomplished higher levels of education, and it leans toward the female gender. Those who responded could be more inclined toward an interest in COVID-19-related information, and the sample could be biased due to the "infodemic."

CONCLUSION

This study determined the subjective psychological impact of Italy's first outbreak of COVID-19 on a substantial sample of the population. More than a quarter of the sample reported high levels of psychological impact that might require some form of external intervention. Certain groups, such as female and younger people are more vulnerable, and different aspects of well-being are impacted.

To support individuals in staying healthy during self-quarantine and isolation, we suggest a set of general tips (not based on the data). Using tele-health services is a valuable way of maintaining both physical and psychosocial health (22, 23). Staying virtually connected with friends and family and sharing emotions helps release any anxiety that one may have because it also helps improve communication among people (24). Staying updated with accurate health-related information and preventive measures could be associated with lower psychological impact (21). Feelings of stress and anxiety might only worsen if one closes oneself off from physically connecting with the significant other (19, 20).

Despite several limitations, our study provides information about the immediate psychological (emotional feelings) responses of Italy's general population to the COVID-19 pandemic. The survey covers several factors that can influence mental health. Our results help gauge the psychological burden on the community and suggest ways to minimize the impact.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent to

participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

RF and AP were involved in all aspects of the research project, design, conducting the research, data handling, exploratory analysis, and drafting and editing the paper. MR, DM, MD, FR, FM, SB, BP, and GP assisted with the design of the study and in data interpretation and editing of the paper. AA conducted the statistical analysis and contributed to the drafting and review of the paper. All authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Resilience Contributes to Low Emotional Impact of the COVID-19 Outbreak Among the General Population in Italy

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Background: The COVID-19 outbreak is severely affecting the overall mental health with unknown psychological consequences. Although a strong psychological impact is possible, scant evidence is available to date. Past studies have shown that resilience decreases the negative effects of stress. This study aimed to examine depression, anxiety, and stress among the Italian general population during the phase characterized by lockdown, and to investigate the role of resilience as a potential predictor.

Methods: A total sample of 6,314 Italian people participated in this study. Participants were recruited between March 29 and May 04 2020 through an online survey. The Depression Anxiety Stress Scales-21 (DASS-21) and the Resilience Scale (RS) were administered. Demographic data and lockdown related information were also collected. A correlational analysis was carried out to examine relationships between psychopathological domains and resilience. Three hierarchical regression analyses were conducted using the depression, anxiety, and stress as dependent variables and the resilience as independent variable controlling for age, gender, and education. COVID-19 specific variables were also included in the three regression analyses. A further exploratory analysis was carried out to examine which aspects of resilience predict depression, anxiety, and stress.

Results: The prevalence of moderate to extremely severe symptoms among participants was 32% for depression, 24.4% for anxiety, and 31.7% for stress. The

sample mean scores on depression, anxiety, and stress were higher than the normal scores reported in the literature. Results of correlational analysis showed that resilience factors, such as meaningfulness, self-reliance, existential aloneness, and equanimity, are inversely associated with depression, anxiety, and stress. Results of regression analyses indicated that resilience was statically significant in predicting depression, anxiety, and stress. Geographic area of residence and infected acquaintances were also significant predictors. Regarding the resilience factors, results revealed that meaningfulness, perseverance, and equanimity were statistically significant in predicting all the DASS-21 scales.

Conclusion: About a third of respondents reported moderate to extremely severe depression, anxiety, and stress. The present study suggests that psychological resilience may independently contribute to low emotional distress and psychological ill-being. These findings can help explain the variability of individual responses during the COVID-19 outbreak.

Keywords: COVID-19, clinical psychology, depression, anxiety, stress, DASS-21, resilience scale, resilience

INTRODUCTION

The coronavirus disease 2019 (COVID-19) outbreak impacted deeply on every aspect of daily life among several countries including Italy. Although the outbreak started from the Huanan Seafood Market in Wuhuan (Ahmed et al., 2020; Chen et al., 2020; Zhou et al., 2020), it has rapidly arisen with more than 5 million confirmed cases and three hundred and forty thousand deaths in the world (WHO report). Since the World Health Organization (World Health Organization, 2020) declared the COVID-19 outbreak a pandemic on March 11, many countries adopted restrictive measures never seen before. A massive lockdown was implemented by the Italian Government to decelerate the spread of the virus. This was an unprecedented decision concerning more than 60 million people in total with an unknown psychological impact. Most of the interventions implemented by health care authorities have focused on physical health including medical therapies and paid less attention to the psychological impact of the outbreak and the resulting lockdown. In the past, the containment measures following a severe outbreak were imposed in limited areas, such as for the 2003 outbreak of severe acute syndrome (SARS) even though with some similarities. A recent review including 24 studies found negative psychological effects among the population affected by the lockdown including post-traumatic symptoms, confusion, and anger (Brooks et al., 2020). However, the generalizability of these findings is still limited because of not specifically referring to the COVID-19 outbreak. Although evidence on the psychological impact of the COVID-19 remains unknown, early studies have provided some important results. A study among a large sample of Chinese people has found that about a third of the 52,730 participants reported psychological distress (Qiu et al., 2020). Also, in predicting psychological distress, the following risk factors have been identified: female gender, young or elderly age, and higher education. Another study involving a sample of 1210 participants from several Chinese cities reported a prevalence of severe depression, anxiety, and stress ranging from 8 to 29%, with most of the respondents considering the psychological impact of outbreak as moderate or severe (Wang et al., 2020a). Moreover, no significant decrease in negative psychological effects was detected among a 4-week period (Wang et al., 2020b). Similar results were found by an epidemiological study on a sample of 2,812 Italian participants with a prevalence of severe psychological symptoms of 32.8% for depression, 18.7% for anxiety, and 27.2% for stress (Mazza et al., 2020). Similar results were found by another study among Italian people during the initial phase of outbreak. Moccia et al. (2020) reported a prevalence of mild and moderate-to-severe psychological distress of almost 20 percent. A central tenet of this study was to examine the role of attachment in predicting psychological distress following the COVID-19 outbreak. In this perspective, findings pointed out that insecure attachment dimensions would be considered as risk factors for moderate-to-severe distress. Previous studies have demonstrated the relationships between psychological functioning and psychological distress among a wide array of populations (Bowlin and Baer, 2012; Lenzo et al., 2020a,b). From this perspective, there is growing evidence of resilience as a protective factor against negative psychological effects. In the last years, a growing number of researchers have confirmed the role that resilience has in the adjustment to adversity (deRoon-Cassini et al., 2010; Southwick et al., 2014; MacLeod et al., 2016; Schäfer et al., 2018; Van der Meer et al., 2018). From this perspective, resilience has been identified as a central target and it is worthwhile to enhance it among people during the COVID-19 outbreak (Khan et al., 2020). Although resilience is a multifaceted construct, a well-consolidated research framework explains resilience as a personality feature that mitigates the negative consequences of stress (Wagnild and Young, 1993). Meaningfulness, self-reliance, perseverance, existential aloneness, and equanimity are the five components underlying resilience (Wagnild and Young,

1990). Previous studies have found that resilience is inversely associated with poor mental health and depression and positively with meaning in life and self-efficacy (Girtler et al., 2010; Damásio et al., 2011; Surzykiewicz et al., 2019). To date, little is known about the relationships between psychological resilience and distress during the COVID-19 outbreak. This is surprising because a considerable amount of research has well demonstrated how resilience is inversely related to the impact of adversity, threats, or relevant sources of stress.

The first aim of this study was to examine the prevalence of depression, anxiety, and stress among a large sample of Italian people. We hypothesized about one-third of the prevalence rate for moderate to severe psychological distress and higher scores than the normal range. The second aim of this study was to explore the relationships between resilience and depression, anxiety, and stress. We hypothesized that we would find inverse relationships between resilience and depression, anxiety, and stress. Finally, the third aim of this study was to investigate the role of resilience in explaining depression, anxiety, and stress. We hypothesized that resilience would significantly relate to psychological symptoms.

MATERIALS AND METHODS

Participants and Procedure

A cross-sectional design to assess psychological response during the COVID-19 outbreak in Italy was adopted. Data presented in this study are part of a larger and multicentre research project named "Resilience and the COVID-19: how to react to perceived stress. Effects on sleep quality and diurnal behavior/thoughts." A total of 6,314 subjects participated in this study through an online survey system without any form of compensation. Thirty-seven cases were excluded for incomplete data and 622 were identified as outliers and removed from the sample. Consequently, the final sample consisted of 5,655 subjects, as shown in the **Table 1**. Participants ranged in age from 18 to 81 (M = 33.63, SD = 13.40) and 72.2% of the sample were female (n = 4082). Most of the participants were living in Northern Italy (68.5%). Less than half of the sample had a high school diploma (46.3%) and 93.6% (n = 5313) were employed or students. With regard to marital status, 39.3% were unmarried, divorced, or widowed. More than half of the sample worked during the lockdown (n = 3057, 54.1%), mostly as remote work (n = 1840, 60.2%). Eight percent (n = 470) of the respondents were in mandatory quarantine for COVID-19. A proportion of 14.9% (n = 840) declared that at least a loved one had been infected by COVID-19.

TABLE 1 | Demographic characteristics of the sample.

Variable	Mean	*SD*	*n*	Percentage
Age (in years)	33.63	13.40		
Gender				
Male			1573	27.8%
Female			4082	72.2%
Education				
Primary or middle school diploma			180	3.2%
High school diploma			2621	46.3%
Graduate			2378	42.0%
Postgraduate			476	8.4%
Partnership				
Unmarried, divorced or widowed			2222	39.3%
Married or in a steady partnership			3423	60.7%
Having children				
Yes			1625	28.7%
No			4030	71.3%
Area of residence				
Northern Italy			3871	68.5%
Central-southern Italy			1784	31.5%
Work status				
Employed or student			5313	93.95%
Unemployed or retired			342	6.05%
Work during the lockdown				
No			2598	45.9%
Yes			3057	54.1%
Work modality (n = 3057)				
Exclusively in-person work			623	20.4%
Exclusively remote work			1840	60.2%
Mixed (remote and in-person work)			224	7.3%
Mostly in-person work			103	3.4%
Mostly remote work			239	7.8%
No answer			28	0.9%
Number of household members				
≤2			3021	53.4%
3			1691	29.9%
4			715	12.6%
≥5			228	4.1%
Mandatory quarantine for COVID-19				
No			5166	91.4%
Yes			470	8.3%
No answer			19	0.3%
Infected acquaintances or loved ones				
No			4815	85.1%
Yes			840	14.9%
Death of loved ones for COVID-19				
No			5295	93.7%
Yes			358	6.3%

N = 5655

Ethical Statement

The current study was conducted in accordance with the 1964 Declaration of Helsinki and its later amendments. The study was approved by the Research Ethics Committee for Psychological Research of the University of Messina, Italy (n. 37442). The participants provided their written informed consent to participate in this study.

Measures

Socio-Demographics

Socio-demographic variables included age, gender, education, relationship status, employment status, and residential location during the COVID-19 outbreak. Also, additional information

related to COVID-19 was collected (i.e., if loved ones had been infected, family composition, etc.). **Table 1** reports the demographic characteristics of the sample.

Depression, Anxiety, and Stress

The Depression Anxiety Stress Scale – 21 (DASS-21) (Lovibond and Lovibond, 1995) was used to measure depression, anxiety, and stress. The DASS-21 is a 21-item self-report instrument using a four-point Likert scale ranging from "never" (0) to "always" (3). It consisted of the following three scales: depression (e.g., "I couldn't seem to experience any positive feeling at all"), assessing dysphoria, low self-esteem, anhedonia, lack of interest, and passivity; anxiety (e.g., "I was aware of dryness of my mouth"), comprising somatic and subjective symptoms of anxiety; stress (e.g., "I found it hard to wind down"), evaluating persistent arousal, irritability, psychological tension, and agitation. In the current study, the Italian version of DASS-21 showing excellent psychometric properties was adopted (Bottesi et al., 2015). Excellent levels of reliability were detected in this sample (Depression, $\alpha = 0.89$; Anxiety, $\alpha = 0.83$; Stress, $\alpha = 0.90$).

Resilience

The Wagnild and Young Resilience Scale (RS) (Wagnild and Young, 1993) was used to measure resilience which is defined as a personal and positive characteristic that enhances individual adaptation to adversity. The Italian version of RS is a 24-item self-report instrument (e.g., "When I make plans I follow through with them") using a 7-point Likert scale to "1" (*disagree*) to "7" (*agree*) (Girtler et al., 2010). The items are grouped into five scales as follows: Meaningfulness (e.g., "My life has meaning"), which measures the sense of having something for which live; Self-reliance (e.g., "When I am in a difficult situation, I can usually find my way out of it"), which measures the beliefs in oneself and one's abilities; Perseverance (e.g., "Sometimes I make myself do things whether I want to or not"), which measures perseverance despite adversity or discouragement; Existential aloneness (e.g., "I am able to depend on myself more than anyone else"), which measures feeling of freedom and sense of uniqueness; and Equanimity (e.g., "I do not dwell on things that I can't do anything about"), which measures a balanced perspective vision of one's life and experience. Also, it is possible to obtain a total score of the RS with higher scores indicating high resilience. Specifically, values of 126.6 and above indicate high resilience (Girtler et al., 2010). Previous studies have shown that the RS is a reliable and sample tool with good psychometric properties (Wagnild and Young, 1993; Aroian et al., 1997; Heilemann et al., 2003; Lundman et al., 2007; Girtler et al., 2010). In this study, the degree of reliability of the five scales was from acceptable to good, with a Cronbach's α of 0.65 for self-reliance, 0.71 for perseverance, 0.78 for equanimity, 0.80 for existential aloneness, 0.89 for meaningfulness, and 0.94 for the total score.

Statistical Analysis

Statistical analysis was performed using IBM SPSS Statistics version 22 (IBM Corporation, Armonk, NY, United States). Data obtained from this study were checked to detect and remove outliers and incomplete data (Tabachnick and Fidell, 2013). Subsequently, descriptive and inferential statistical analyses were conducted. Relationships between RS and DASS-21 were performed with Pearson product-moment correlation coefficients. To examine the relationship between depression, anxiety, and stress with resilience, three hierarchical regression analyses were conducted, each one including three steps. Depression, anxiety, and stress were set as dependent variables. Age, gender, and education were inserted as covariates in all the three steps. In the second step, we inserted COVID-19 specific variables as follows: geographic area of residence, mandatory quarantine, infected acquaintances or loved ones, and the death of loved ones due to COVID-19. Since the mandatory quarantine included the possibility that the respondents did not answer (i.e., "I prefer not to answer"), we excluded from the regression analyses all these cases. Lastly, we inserted the resilience total score in the regression analyses. Additionally, we carried out the three hierarchical regression analyses with the resilience factors (i.e., meaningfulness, self-reliance, perseverance, existential aloneness, and equanimity) in the third step to explore which aspects of resilience are related to the dependent variables.

RESULTS

Prevalence of Depression, Anxiety, and Stress and Relationships With the Response Time

Table 2 displays the percentage of participants falling into each of the five categories, such as normal, mild, moderate, severe, and extremely severe based on the Lovibond and Lovibond's percentile cut-offs (1995). The overall prevalence of moderate-to-extremely severe depression, anxiety, and stress among participants was 32, 24.4, and 31.7%, respectively. The last column of **Table 2** reports correlation coefficients between the DASS-21 scales and the response time from the lockdown start. Depression and stress scales showed a weak and positive correlation coefficient (respectively, $r = 0.03$, $p < 0.05$ and $r = 0.04$, $p < 0.01$) with time since the lockdown start. **Table 3**

TABLE 2 | Prevalence of depression, anxiety and stress.

	Percentage in each DASS category					Response time
	Normal (0–78)	Mild (78–87)	Moderate (87–95)	Severe (95–98)	Extremely severe (98–100)	*r*
Depression	51.5	16.6	19.2	8.1	4.7	0.03*
Anxiety	67.9	7.7	14.6	6.2	3.6	0.02
Stress	55.3	13.0	17.0	11.6	3.1	0.04**

N = 5655.
The percentiles in parentheses corresponding to Lovibond and Lovibond's cut-offs (1995).
**p < 0.05, **p < 0.01.*

TABLE 3 | Descriptive and correlational analyses.

	Min	Max	*M*	*SD*	Skew	Kurt	(1) RS meaningfulness	(2) RS self-reliance	(3) RS perseverance	(4) RS existential aloneness	(5) RS equanimity	(6) RS total score	(7) DASS-21 depression	(8) DASS-21 anxiety
(1) RS meaningfulness	13.00	49.00	37.67	6.93	−0.60	−0.04								
(2) RS self-reliance	12.00	45.00	33.06	5.83	−0.39	−0.29	0.69**							
(3) RS perseverance	3.00	21.00	15.53	3.15	−0.55	0.03	0.74**	0.66**						
(4) RS existential aloneness	5.00	21.00	17.50	2.78	−1.04	1.09	0.67**	0.56**	0.56**					
(5) RS equanimity	3.00	21.00	16.49	3.27	−0.78	0.29	0.68**	0.58**	0.63**	0.60**				
(6) RS total score	70.00	171.00	131.23	19.93	−0.59	0.01	0.92**	0.84**	0.83**	0.77**	0.80**			
(7) DASS-21 depression	0	34.00	10.33	8.21	0.80	−0.06	−0.36**	−0.27**	−0.39**	−0.26**	−0.34**	−0.38**		
(8) DASS-21 anxiety	0	22.00	5.75	5.73	1.05	0.25	−0.21**	−0.15**	−0.23**	−0.14**	−0.22**	−0.22**	0.55**	
(9) DAS-21 stress	0	42.00	14.81	9.04	0.36	−0.45	−0.27**	−0.20**	−0.30**	−0.14**	−0.25**	−0.27**	0.72**	0.63**

N = 5655.
Min, minimum value; Max, maximum value; M, mean; SD, standard deviation; Skew, skewness; Kurt, kurtosis.
***p < 0.01.*

presents the descriptive statistics for the three DASS-21 scales. The mean score for depression, anxiety, and stress was 10.33 (*SD* = 8.21), 5.75 (*SD* = 5.73), and 14.81 (*SD* = 9.04), respectively.

Correlational Analysis Between Resilience, Depression, Anxiety, and Stress

Table 3 shows descriptive statistics and correlation analyses. Results showed that all the RS scales were all positively and highly correlated with each other, and with the RS total core. Likewise, depression, anxiety, and stress scales were positively correlated with each other. Also, correlational analyses showed that meaningfulness, self-reliance, perseverance, existential aloneness, equanimity, as well as the RS total score were weakly and negatively correlated with depression, anxiety, and stress.

Regression Analyses for Depression, Anxiety, and Stress

Table 4 shows the regression results of the effects of resilience and COVID-19 specific variables controlling for age, gender, and level of education on depression, anxiety, and stress. In predicting depression, age (β = −0.19; $p < 0.001$), gender (β = −0.10; $p < 0.001$), and education (β = −0.02; $p < 0.001$) were all statistically significant in step 1. In step 2, the effect of age (β = −0.18; $p < 0.001$) and gender (β = −0.10; $p < 0.001$) persisted. In addition, area of residence (β = 0.03; $p = 0.039$) and infected acquaintances or loved ones (β = 0.05; $p < 0.001$) were statistically significant to explain depression levels. The results showed the same effects on depression in step 3, as illustrated in the **Table 4**. Furthermore, we observed a statistically significant effect of resilience on depression (β = −0.36; $p < 0.001$) with R^2 reaching 0.18. The second regression analyses tested the same model although considering anxiety as the dependent variable. In step 1, age (β = −0.11; $p < 0.001$), gender (β = −0.16; $p < 0.001$), and education (β = −0.04; $p < 0.001$) were all statistically significant. In step 2, after adding the COVID-19 variables, age (β = −0.10; $p < 0.001$), gender (β = −0.15; $p < 0.001$), and education (β = −0.05; $p < 0.001$) maintained a significant effect. In addition, area of residence (β = 0.06; $p < 0.001$) and infected acquaintances or loved ones (β = 0.05; $p < 0.001$) reached a statistical significance. We found the same effects of these factors in step 3. Moreover, the resilience score inserting in step 3 was statistically significant (β = −0.20; $p < 0.001$) with R^2 of the model reaching 0.09. Lastly, the third regression analyses examined stress as the dependent variable. In step 1, age (β = −0.23; $p < 0.001$), gender (β = −0.15; $p < 0.001$), and education (β = 0.04; $p = 0.003$) were statistically significant. In step 2, we observed the same effects for age (β = −0.23; $p < 0.001$), gender (β = −0.15; $p < 0.001$), and education (β = 0.04; $p = 0.004$). Furthermore, infected acquaintances or loved ones (β = 0.06; $p < 0.001$) was a statistically significant factor in predicting stress. In step 3, lastly, these effects persisted and we also observed a significant effect for area of residence (β = 0.03; $p = 0.042$), mandatory quarantine for COVID-19 (β = 0.03; $p = 0.036$), and resilience score (β = −0.25; $p < 0.001$).

TABLE 4 | The regression results of the effects of sociodemographic variables and resilience on depression, anxiety and stress.

	Partial regression coefficient				R^2	*F*	*p*
	β	*SE*	*T*	*p*			
Depression							
Step 1					0.05	97.96	< 0.001
Age	−0.19	0.01	−13.82	< 0.001			
Gender	−0.10	0.24	−7.79	< 0.001			
Level of education	−0.02	0.11	−1.58	< 0.001			
Step 2					0.05	44.55	< 0.001
Age	−0.18	0.01	−13.53	< 0.001			
Gender	−0.10	0.24	−7.63	< 0.001			
Education	−0.03	0.10	−1.88	0.061			
Area of residence	0.03	0.24	2.06	0.039			
Mandatory quarantine for COVID-19	0.01	0.39	0.32	0.746			
Infected acquaintances or loved ones	0.05	0.32	3.25	< 0.001			
Death of loved ones for COVID-19	0.02	0.45	3.25	0.232			
Step 3					0.18	153.99	< 0.001
Age	−0.14	0.01	−11.30	< 0.001			
Gender	−0.09	0.22	−7.30	< 0.001			
Level of education	−0.12	0.10	−1.00	0.319			
Area of residence	0.05	0.22	4.08	< 0.001			
Mandatory quarantine for COVID-19	0.01	0.36	0.53	0.593			
Infected acquaintances or loved ones	0.03	0.29	2.51	0.012			
Death of loved ones for COVID-19	0.02	0.42	1.32	0.187			
RS total score	−0.36	0.01	−29.53	< 0.001			
Anxiety							
Step 1					0.04	89.94	< 0.001
Age	−0.11	0.01	−8.22	< 0.001			
Gender	−0.16	0.17	−11.92	< 0.001			
Education	−0.04	0.07	−3.13	< 0.001			
Step 2					0.05	42.68	< 0.001
Age	−0.10	0.01	−7.66	< 0.001			
Gender	−0.15	0.17	−11.67	< 0.001			
Education	−0.05	0.07	−3.61	< 0.001			
Area of residence	0.06	0.16	4.18	< 0.001			
Mandatory quarantine for COVID-19	0.04	0.27	3.22	< 0.001			
Infected acquaintances or loved ones	0.05	0.22	3.72	< 0.001			
Death of loved ones for COVID-19	0.02	0.32	1.30	0.192			
Step 3					0.09	69.27	< 0.001
Age	−0.08	0.01	−6.11	< 0.001			
Gender	−0.15	0.16	−11.44	< 0.001			
Level of education	−0.04	0.07	−3.15	< 0.001			
Area of residence	0.07	0.16	5.25	< 0.001			
Mandatory quarantine for COVID-19	0.04	0.27	3.38	< 0.001			
Infected acquaintances or loved ones	0.04	0.22	3.28	< 0.001			
Death of loved ones for COVID-19	0.02	0.31	1.35	0.177			
RS total score	−0.20	0.01	−15.58	< 0.001			
Stress							
Step 1					0.08	160.92	< 0.001
Age	−0.23	0.01	−17.65	< 0.001			
Gender	−0.15	0.26	−11.40	< 0.001			
Education	0.04	0.11	3.01	0.003			
Step 2					0.08	73.27	< 0.001
Age	−0.23	0.01	−17.17	< 0.001			
Gender	−0.15	0.26	−11.32	< 0.001			

(Continued)

TABLE 4 | Continued

	Partial regression coefficient				R^2	*F*	*p*
	β	*SE*	*T*	*p*			
Education	0.04	0.11	2.86	0.004			
Area of residence	0.01	0.26	0.76	0.448			
Mandatory quarantine for COVID-19	0.03	0.42	1.91	0.056			
Infected acquaintances or loved ones	0.06	0.34	4.08	< 0.001			
Death of loved ones for COVID-19	0.02	0.49	1.22	0.224			
Step 3					0.14	116.96	< 0.001
Age	−0.20	0.01	−15.55	< 0.001			
Gender	−0.14	0.25	−11.10	< 0.001			
Level of education	0.05	0.11	3.64	< 0.001			
Area of residence	0.03	0.25	2.03	0.042			
Mandatory quarantine for COVID-19	0.03	0.41	2.10	0.036			
Infected acquaintances or loved ones	0.05	0.33	3.56	< 0.001			
Death of loved ones for COVID-19	0.02	0.48	1.28	0.200			
RS total score	−0.25	0.01	−19.69	< 0.001			

n = 5636.
RS, Resilience Scale.

Table 5 illustrates the regression results of the effects of demographic variables and resilience factors on depression, anxiety and stress. Regarding demographic variables, we found analogous results to the last ones considering the RS total score. On the other hand, resilience factors are specifically related to the DASS-21 scales. Meaningfulness (β = −0.09; $p < 0.001$), self-reliance (β = 0.04; $p = 0.038$), perseverance (β = −0.24; $p < 0.001$), and equanimity (β = −0.15; $p < 0.001$) factors were all statistically significant to explain depression. Meaningfulness (β = −0.06; $p = 0.010$), self-reliance (β = 0.04; $p = 0.027$), perseverance (β = −0.14; $p < 0.001$), and equanimity (β = −0.12; $p < 0.001$) factors were also significant in predicting anxiety. Lastly, meaningfulness (β = −0.12; $p < 0.001$), perseverance (β = −0.19; $p < 0.001$), existential aloneness (β = −0.11; $p < 0.001$), and equanimity (β = −0.12; $p < 0.001$) factors were statistically significant in predicting stress. Differently from depression and anxiety models, existential aloneness but not self-reliance was statistically significant.

DISCUSSION

Summary of the Main Findings

During the most critical weeks of the COVID-19 outbreak, Italy's government adopted a massive lockdown to prevent the spread of the virus. This study aimed to examine mental health in a large sample of Italian people and to investigate the role of resilience as a protective factor for negative psychopathological consequences. Evidence from restrictive measures and isolation relating to past outbreaks highlighted a high risk for developing mental health disorders with possible long-lasting effects (Brooks et al., 2020; Roychowdhury, 2020). However, the COVID-19 outbreak has for the first time concerned worldwide and severely involved Italy. Although health authorities launched a psychological online service, little is known about the psychological impact of the COVID-19. Our findings pointed out a high prevalence with about one-third of participants reported moderate to extremely severe symptoms of depression, anxiety, and stress. Results of descriptive statistics suggested a possible relevant psychological impact of the COVID-19 outbreak. Participants of this study had higher levels of depression, anxiety, and stress than the normal range reported by the Italian validation of the DASS-21 (Bottesi et al., 2015). Although some differences in the sample composition, it is reasonable to think that the values reported in this study are unusual and particularly higher than the normal range of prevalence. A recent study conducted during the Italian lockdown by Mazza et al. (2020) reported similar results even if with slightly lower scores. This result could be in part dependent on the period of the survey as Mazza et al. (2020) referred to immediate psychological responses since they collected the data from 18 to 22 March. Differently, our survey started later, towards the end of March, when Italy had been on lockdown for more weeks. In light of this perspective, it could be reasonable to hypothesize an incremental rate of psychopathological symptoms over time. Although we have taken into account this hypothesis, our results indicate only a small correlation of depression and stress with the time elapsed from the start of the lockdown. It is worthwhile to consider that no significant relationship was found between anxiety and response time. We state that these relationships could be mediated by several factors, such as individual characteristics, suggesting the lack of a direct effect of time response on depression, anxiety, and stress. Longitudinal data are needed to verify these hypotheses, even if preliminary data have confirmed that there were no changes in depression, anxiety, and stress levels in a 4-week period (Wang et al., 2020b). Studies involving Chinese people have found results in part different with the prevalence rate of psychological complaints ranging from 8 to 29% (Wang et al., 2020a,b).

TABLE 5 | The regression results of the effects of demographic variables and resilience factors on depression, anxiety and stress.

	Partial regression coefficient				R^2	*F*	*p*
	β	*SE*	*t*	*P*			
Depression*							
Step 3					0.20	120.41	< 0.001
Age	−0.14	−0.14	−11.13	< 0.001			
Gender	−0.09	−0.09	−7.07	< 0.001			
Level of education	−0.12	0.01	0.07	0.946			
Area of residence	0.05	0.22	3.80	< 0.001			
Mandatory quarantine for COVID-19	0.01	0.36	0.31	0.755			
Infected acquaintances or loved ones	0.03	0.29	2.34	0.019			
Death of loved ones for COVID-19	0.02	0.42	1.36	0.175			
RS meaningfulness	−0.09	0.03	−4.11	< 0.001			
RS self-reliance	0.04	0.03	2.08	0.038			
RS perseverance	−0.24	0.05	−12.64	< 0.001			
RS existential aloneness	0.01	0.05	0.48	0.635			
RS equanimity	−0.15	0.04	−8.27	< 0.001			
Anxiety*							
Step 3					0.10	54.55	< 0.001
Age	−0.08	0.01	−5.96	< 0.001			
Gender	−0.14	0.16	−11.21	< 0.001			
Level of education	−0.03	0.07	−2.43	< 0.001			
Area of residence	0.07	0.16	5.18	< 0.001			
Mandatory quarantine for COVID-19	0.04	0.27	3.30	< 0.001			
Infected acquaintances or loved ones	0.04	0.21	3.16	0.002			
Death of loved ones for COVID-19	0.02	0.31	1.36	0.174			
RS meaningfulness	−0.06	0.02	−2.58	0.010			
RS self-reliance	0.04	0.02	2.21	0.027			
RS perseverance	−0.14	0.04	−6.75	< 0.001			
RS existential aloneness	0.03	0.04	1.66	0.097			
RS equanimity	−0.12	0.03	−6.45	< 0.001			
Stress*							
Step 3					0.17	96.07	< 0.001
Age	−0.19	0.01	−15.08	< 0.001			
Gender	−0.13	0.25	−10.77	< 0.001			
Level of education	0.05	0.11	4.08	< 0.001			
Area of residence	0.03	0.24	2.15	0.031			
Mandatory quarantine for COVID-19	0.02	0.40	1.97	0.049			
Infected acquaintances or loved ones	0.04	0.33	3.46	< 0.001			
Death of loved ones for COVID-19	0.02	0.47	1.15	0.249			
RS meaningfulness	−0.12	0.03	−5.22	< 0.001			
RS self-reliance	0.03	0.03	1.39	0.164			
RS perseverance	−0.19	0.06	−9.80	< 0.001			
RS existential aloneness	−0.11	0.06	6.60	< 0.001			
RS equanimity	−0.12	0.05	−6.61	< 0.001			

n = 5636.
**We did not report the step 1 and 2 of the regression analyses.*
RS, Resilience Scale.

The second aim of this study was to examine the relationship between depression, anxiety, stress, and resilience. Previous studies demonstrated that psychological resilience promotes mental health and adaption in the face of traumatic experiences or adverse events (Southwick et al., 2014). According to Wagnild and Young (1993), resilience is a multicomponent construct comprising the sense of having something for which live, the beliefs in oneself, the perseverance degree in the face of adversity, personal feelings of freedom and distinctiveness, and a stable perspective of one's life. It is logical to assume that these aspects have been proven during the most critical weeks of the lockdown. For this reason, we hypothesized inverse relationships between psychological symptoms and resilience. In line with the hypothesis, the resilience dimension was negatively correlated with depression, anxiety, and stress. We obtained similar results when adopting the resilience factors, even though we considered

these results as exploratory. The results from the correlational analysis indeed confirmed the inverse relationships between the resilience factors and depression, anxiety, and stress. Past studies have well established these relationships (Girtler et al., 2010; Damásio et al., 2011; Surzykiewicz et al., 2019), even though our results specifically referred to people during the quarantine. While studies regarding the psychological impact of the COVID-19 have focused on the prevalence of psychological distress (Qiu et al., 2020; Wang et al., 2020a), none have explored relationships with resilience.

The third aim of this study was to examine the role of resilience dimensions in predicting depression, anxiety, and stress among a large sample of Italian people during the lockdown. Demographic data were included in the regression analysis given their contribution in predicting post-traumatic stress symptoms, depression, anxiety, and stress during the early stages of the COVID-19 outbreak (Qiu et al., 2020; Wang et al., 2020a,b). The results showed a significant effect of gender and age on depression. Also, gender, age, and education were statistically significant in predicting anxiety as well as stress. This is not surprising when we take into account findings from the literature on community samples. Previous studies have found that females had higher scores than males on depression, anxiety, and stress (Crawford and Henry, 2003; Norton, 2007), even though there was no consistency across the studies (Bottesi et al., 2015). However, it is worthwhile to highlight that a significant role of gender in predicting distress during the COVID-19 outbreak was found across countries, including Italy (Mazza et al., 2020; Wang et al., 2020a). Analogous issues have been described in the literature when considering age and education. Referring to past outbreaks, a worse psychological impact was associated with younger age and lower level of education (Brooks et al., 2020). Our findings seem to confirm the role of such demographic variables in explaining psychological impact during the lockdown following the COVID-19 outbreak. However, with regard to the COVID-19 outbreak, their results are only in part confirmed and more research is needed. For example, age was found to be related to higher stress but not to depression and anxiety (Mazza et al., 2020), even though referring to an early period of lockdown. It is reasonable to hypothesize that the lack of consistent results represents a preexisting critical issue (Bottesi et al., 2015) depending on several factors such as the sample composition. Regarding the role of information specific to COVID-19, we found more coherence when comparing with literature focusing on the COVID-19 outbreak in Italy. In this light, having an acquaintance or loved one infected with COVID-19 was associated with higher levels of depression, anxiety, and stress. Analogous results were detected by Mazza et al. (2020). Conversely, (Wang et al., 2020a) found no significant effect among their sample of participants in China. Surprisingly, we found that being in mandatory quarantine was related to anxiety and stress but not to depression. This could be in part depend by the overlap between anxiety and stress (Bottesi et al., 2015). The results also showed a significant effect for the area of residence, with participants who lived in Northern Italy scoring significantly higher than others on depression, anxiety, and stress. Findings from another recent study pointed out a higher prevalence of anxiety in the Lombardy region than the rest of Italy (Chirico et al., 2020). Nonetheless, these findings should be taken with caution since the possible and unavoidable imbalance of some COVID-19 information. Although the relevance of these findings focusing on demographic features predicting psychological distress, our main aim was to examine the specific contribution of psychological resilience. Understanding the psychological factors associated with distress among people during the COVID-19 outbreak is necessary to construct evidence-based interventions. Coherent with we expected, resilience was related to depression, anxiety, and stress. We also investigated which resilience factors are associated with psychological distress among the respondents. Although these findings can be considered only exploratory, we believe they can enhance our comprehension of the resilience role. Meaningfulness, self-reliance, perseverance, and equanimity were significant predictors of both depression and anxiety among Italian people during the COVID-19 outbreak. We found analogous results for stress except for self-reliance in the last regression analysis. On the other hand, existential aloneness was related to stress but not to depression and anxiety. Overall, these results suggest that the resilience components play a relevant role to explain distress. Nonetheless, the contribution of demographic data should be careful to take into account. The high prevalence rate of psychological symptoms founding among Chinese and Italian people involved in the lockdown has highlighted the need to consider mental health together with the fight of COVID-19 disease. Examining the role that psychological factors have for the development and maintenance of depression, anxiety, and stress is fundamental to detect people at risk of psychological disorders and to design evidence-based interventions (Castelnuovo et al., 2020). From this perspective, Moccia et al. (2020) have provided first evidence on the role of temperament and attachment style dimensions in predicting the psychological impact of the COVID-19 outbreak. More research is needed to confirm these findings and to verify the long-lasting effects of individual differences in the mental health of people who experienced the lockdown related to the COVID-19 outbreak.

Limitations

The current study has some limitations that should be addressed by future research and considered in understanding the results. First, this study adopted a cross-sectional design that did not allow establishing causal relationships between the observed variables. Longitudinal studies would better explain the long-lasting impact of resilience dimensions on depression, anxiety, and stress development among people who experienced the COVID-19 outbreak. This research is currently underway by the authors. Second, this study involved convenience sample recruitment that could have limited the generalizability of the results. The oversampling of some characteristics among the respondents (i.e., gender or work status) could influence the results obtained. Despite the possible selection bias related to our sample, our choice was the only solution to collect the data during the lockdown. The third limitation concerns the use of self-assessment instruments to measure depression, anxiety, and stress levels. Although the DASS-21 is a reliable and widely used tool, social desirability could affect results.

Conclusion

The negative psychological impact of restrictive measures following an outbreak is well documented. Nonetheless, there is still a paucity of studies focused on the COVID-19 outbreak. The results of our study pointed out that about a third of people reported moderate to extremely severe symptoms of depression, anxiety, and stress during the COVID-19 lockdown. Differences in the experienced severity of these symptoms seem to in part dependent on resilience dimensions. To our knowledge, this is the first attempt to examine the relationships between resilience and psychological symptoms among a large sample of Italian people. Starting from these results, psychological interventions focused on resilience could be useful to decrease the psychological impact of quarantine measures. Nonetheless, some limitations such as the cross-sectional design should be addressed by future research to clarify the role of resilience over time.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Research Ethics Committee for Psychological Research of the University of Messina, Italy. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

CF provided substantial contributions to the conception of the work, deep analysis of the literature, study design, development, and final approval of the manuscript. AM contributed in the design of the study and participated in the development and revision of the work and agreement for final approval of the manuscript. VL contributed to data analysis, to write the first draft and agreement for final approval of the manuscript. CZ, MF, DL, EV, LB, GP, GC, and RC contributed to the revision of the work and agreement for final approval of the manuscript. MQ and ES contributed to deep revision of the work, with literature analysis and agreement for final approval of the manuscript. All authors contributed to the article and approved the submitted version.

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Finding Meaning in Hell. The Role of Meaning, Religiosity and Spirituality in Posttraumatic Growth During the Coronavirus Crisis in Spain

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Coronavirus has blighted our world, hitting some countries harder than others. Morbidity and mortality rates make Madrid one of the worst affected places so far in the wake of the coronavirus. The aim of this study was to analyze the presence of post-traumatic growth during the coronavirus crisis and to understand the contribution of meaning, religiosity, and spirituality to such growth; 1,492 people completed the questionnaire; *N* = 1,091 residents in Madrid were selected for the study. We assessed the personal experience of COVID-19, the Spirituality, Religiosity, Meaning trough Purpose in Life-10 test, and Posttraumatic Growth (Community Post-Traumatic Growth Scale). Results showed significant differences for all measures of growth, with higher values in women. Sex and direct impact of COVID-19 accounted for 4.4% of the variance of growth. The different dimensions of meaning contribute differently to growth. Only religiosity was associated with total growth when meaning was included in the model. This same pattern of results is obtained in models predicting interpersonal and social growth. However, in predicting personal growth, it is spirituality that predicts this type of growth once meaning has been previously controlled for, while religiosity fails to reach a statistically significant level. Our results reflect the interest in maintaining the distinction between spirituality and religiosity, their different roles in traumatic growth and the different dimensions on which each has an effect. Finally, it confirms the importance of meaning in post-traumatic growth, especially the dimension of life goals and purposes.

Keywords: posttraumatic growth, meaning in life, spirituality, religiosity, coronavirus, COVID-19

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INTRODUCTION

Coronavirus has blighted our world, hitting some countries harder than others. At the time of writing (May 2020), Spain had 282,852 cases (6,050 cases per million inhabitants) and more than 28,750 deaths. Twenty-five percent of cases (67,932) and 31% of deaths (8,977) nationwide are concentrated in the capital, Madrid, with a population of 6,662,000 inhabitants (14% of national population). When lockdown was decreed on March 14, 180 people had been admitted to ICUs in Madrid for COVID-19; three weeks later, ICU admissions stood at 1,528, tripling the city's healthcare capacity. Morbidity and mortality rates make Madrid (along with Lombardy, Paris, or

New York) one of the worst affected places so far in the wake of the coronavirus, following statistical data[1]. The lockdown in Spain was one of the strictest and compliance levels were very high[2].

The overloaded healthcare system also affected family experiences of hospitalization and the death of loved ones. The sick were alone in hospital with no loved ones to accompany them and died with nobody they knew by their side. It is true that our healthcare personnel showed great professionalism and compassion in bringing tenderness and humanity at this time, but the distance, loneliness and lack of contact, burials with only two people per deceased allowed, and the lockdown of relatives made it much harder to mourn and access social support.

Different algorithms[3] have shown that on the one hand, the astonishing number of patients and deaths in Madrid can be explained by the delay in decreeing a state of emergency. However, while its preventive effect was minimal, it did serve to decrease the enormous pressure on healthcare services, which was very important in preventing an even greater number of deaths.

Thus, alongside the situation of threat, suffering, illness, and death that Madrid has gone through, and the tough conditions experienced by healthcare personnel and citizens alike, we have to add the difficulty of finding answers and the general perception among the population of "being late," of the uselessness of the measures taken, and of the idea that, although part of the suffering was inevitable, another part could have been avoided with earlier action.

However, even in these circumstances, psychology suggests that positive aspects can be found, for example personal change and growth, whether in social or spiritual terms. In 1999, Calhoun and Tedeschi defined post-traumatic growth as the subjective experience of positive psychological change reported by a person as a result of struggling with a traumatic event. As Páez et al. (2012) point out, traumatic events can have positive effects on a personal level (increasing wisdom and knowledge about oneself and others, appreciation of what one has and learning important priorities in life), in relationships with others (bringing the family together and keeping them closer, uniting the community, being more tolerant and compassionate with others, valuing the support they offer). Social growth can also be observed (reinforcing positive beliefs about the group, perceiving growth in the community), as can spiritual growth (having a better understanding of spiritual matters, having a stronger religious faith - Calhoun and Tedeschi, 1999).

Several factors contribute to facilitate growth. One of them is making sense of experience and existence itself. It is precisely by confronting this type of situation, showing the transitory nature of our existence and the inevitability of suffering (the "primordial facts," according to Frankl), that the opportunity for discovering meaning in life presents itself (Linley and Joseph, 2011). Triplett et al. (2012) suggest that repeated thinking or "rumination" leads to the assimilation of the situation to existing cognitive structures and the development of fundamental beliefs which make it possible to accommodate experience successfully. The presence of meaning is central to understanding positive change, which emerges after adversity through cognitive and emotional processing that reconstructs one's vision of self and the world (Schultz et al., 2010; Linley and Joseph, 2011).

Meaning can encompass different dimensions. García-Alandete et al. (2013) propose that these include the meaning given to experience or existence, that is, the understanding of experience within a broader context and personal satisfaction with life. Furthermore, meaning is also expressed in having a direction, aims, a vital purpose, a mission toward the achievement of which the individual directs his or her efforts. According to these authors, the first dimension has a more cognitive character, while the second is more motivational.

Other factors that facilitate growth are spirituality and religiosity. Many studies have found clear relationships between these variables and post-traumatic growth (see, for example, the meta-analysis by Shaw et al., 2005). However, some conceptual issues should be clarified regarding these variables in the context of post-traumatic growth. First of all, spiritual growth and the deepening of religious beliefs are conceived as a dimension of growth, as a result of growth; thus, studying their presence or their correlation with growth experiences can lead to a conceptual "overlap", since they are part of the concept to which they are linked (McGrath, 2011). It has therefore been recommended that spirituality or religiosity should not be included in measures of post-traumatic growth (Joseph, 2011). In addition, Shaw et al. (2005) point out that most studies have been correlational, and that it would be necessary to study in depth the extent to which these variables are antecedent or consequent. Third, spirituality and religiosity are not usually differentiated, but rather included in a single concept "spirituality/religiosity", or both terms are used interchangeably. Although related, they are not synonymous. According to Pargament (1997), spirituality refers to the fundamental function of religion as *the search for the sacred and the meaning of life*, and religiosity may be defined as the degree of commitment to the characteristic beliefs and practices of a particular religious tradition. For Hill et al. (2000), both constitute experiences of searching for the sacred. The differentiating characteristics are that religiosity: 1) can also include the search for non-sacred values, such as security, personal well-being, affiliation – values found in contexts normally focused on searching for the sacred; 2) legitimizes the search for the sacred by a group through their structures (practices, rituals). Spirituality, meanwhile, would be a more privatized and less normative experience.

Many people define their personal spirituality as something different from any religion, so four options could be established in relation to religion and spirituality (Zinnbauer et al., 1997): being both religious and spiritual, being religious but not spiritual, being spiritual but not religious or being neither religious nor spiritual. As Shaw et al. (2005) argue, it is important to direct efforts toward a clarification of the differences in their respective contribution to growth. Since the cognitive processes involved in

[1]https://coronavirus.jhu.edu/map.html

[2]http://www.interior.gob.es/prensa/noticias/-/asset_publisher/GHU8Ap6ztgsg/content/id/11918219

[3]https://proyectogaudete.com/covid19/

growth are centered on great existential questions about meaning, questions which are also central to spirituality (McGrath, 2011), a greater contribution of spirituality to growth would be expected (Shaw et al., 2005).

The aim of this study was to analyze the presence of post-traumatic growth during the coronavirus crisis and to understand the contribution of meaning, religiosity and spirituality to such growth. Specifically, we expect to find more growth linked to the dimension of meaning and sense in life (rather than the dimension of aims and purposes in life) and to greater spirituality.

MATERIALS AND METHODS

Participants and Procedure

A total of N = 1,091 residents in Madrid completed the questionnaire, 69.4% of whom were women (757). The sample was divided into age groups, with 34.4% aged 19–29 years, 8.1% aged 30–39 years, 22.0% aged 50–59 years, 18.1 aged 40–49 years, and 16.5% aged over 60 years. Sixty-seven percent of the sample were university graduates and 79.8% reported that their pre-crisis economic situation was good or very good.

Surveys were designed using Google Forms and distributed online, through LinkedIn, e-mail, and WhatsApp, to as wide a range of participants as possible through the researchers' social and work networks using a snowball sampling technique. The questionnaire was available in Spanish, and participants were anonymous, although they were offered the possibility of providing their email if they wished to be informed of the general results of the study. The only inclusion criteria were being of legal age (i.e., over 18 years old) and resident in Spain during lockdown. Data were collected during May 2020, the final month of lockdown.

Instruments

Sociodemographic Data. We assessed age range, according to age groupings used by the Ministry of Health, sex, highest educational level attained and perception of the economic situation before the crisis (with five categories: very bad, bad, fair, good or very good).

Perceived Spirituality and Perceived Religiosity. Perceived Spirituality was measured with the item *To what extent do you consider yourself a spiritual person*?, and Perceived Religiosity with the item *To what extent do you consider yourself a religious person*?. Following Krause et al. (2020), we decided against offering a definition of each term. Both questions had a 5-item response scale ranging from 1: not at all to 5: profoundly or extremely. Scores of 4 and 5 signaled High Perceived Religiosity (R+) and High Perceived Spirituality (S+), while scores of 1 and 2 signaled Low Perceived Religiosity (R−) and Low Perceived Spirituality (S−).

Experience of COVID-19. To ascertain the subject's direct contact with the disease, the following questions were asked: *Have you been diagnosed with coronavirus?* (Respondents were asked to differentiate between diagnosis by test, by a doctor or by self-diagnosis based on own symptoms). *Have you been hospitalized for coronavirus? Have you been admitted to the ICU for coronavirus? Have any of your loved ones been hospitalized for coronavirus? Have any of your loved ones been admitted to the ICU for coronavirus? Did you personally know anyone who has died of coronavirus? Have any of your loved ones died of coronavirus? Do you know anyone with a family member who died of coronavirus?* All items had a dichotomous response option, YES or NO.

Purpose In Life Test-10 (PIL-10, García-Alandete et al., 2013). *The Purpose In Life Test (PIL*, Crumbaugh and Maholick, 1969) is one of the most widely used instruments in meaning research, in particular part A, a scale of 20 Likert-type items, with 7 response categories. Although the authors of the instrument proposed it as a one-dimensional scale, different factors have been found in different studies. The present study follows the proposal of García-Alandete et al. (2013), who studied its psychometric properties in the Spanish population and proposed a reduction to a 10-item scale with a structure of two correlated factors: a cognitive-evaluative factor, related to the perception and general assessment of the meaning of life (Satisfaction and Sense of Life, SSL) and a motivational factor, related to the establishment of specific goals and vital purposes (Goals and Purposes in Life, GPL). Scores on the SSL scale range from 1 to 43, those on the GPL scale from 1 to 28, with a total score between 2 and 70, where higher scores indicate a higher level of meaning. In our sample, this questionnaire achieved internal consistency (Cronbach's alpha) of 0.899, with the GPL and SSL subscales showing Cronbach's alpha of 0.799 and 0.858, respectively.

Community Post-Traumatic Growth (CPTG) (Páez et al., 2012). The scale has 24 items with a range of responses from 1 (strongly agree) to 5 (strongly disagree). It investigates post-traumatic growth at four levels: personal (example item: *I have changed my priorities about what is important in life*), interpersonal (e.g., *I have discovered the support of people who were not close to me*), social (e.g., *I have discovered that my community, group, family is stronger than I thought*) and socio-political participation (e.g., *Political and ethical participation and commitments in the country have increased*). Our study assessed only the first three levels. Each subscale has a scoring range of 1 to 30 points, with a total scoring range, in our study, of between 3 and 90 points, a greater score pointing to higher levels of growth. In our sample, this questionnaire achieved internal consistency (Cronbach's alpha) of 0.928 (Total Growth), and Cronbach's alpha for the subscales of 0.861 for Personal Growth, 0.871 for Interpersonal Growth, and 0.830 for Social Growth.

Data Analysis

Given that the distribution of the variables lacked normality, confidence interval estimates were made using bootstraps, with 10,000 samples. Non-parametric tests were used to estimate differences between groups in terms of growth, meaning, Perceived Spirituality, and Perceived Religiosity, and the Bonferroni correction was used for *post hoc* planned comparisons. Likewise, bootstrapping was also used in the hierarchical regression models to estimate the confidence

TABLE 1 | Average scores in Sense, Growth, Perceived Spirituality, and Perceived Religiosity.

Variables	*N*	Min MAX	Mean	SD	LL 95% CI	UL 95% CI
Total growth	1075	1-5	3.18	0.81	3.13	3.23
Personal	1075	1-5	3.13	0.94	3.08	3.18
Interpersonal	1075	1-5	3.3	0.91	3.24	3.35
Social	1075	1-5	3.11	0.89	3.06	3.16
Total meaning	1075	1.7-7	5.29	0.94	5.23	5.35
SSL	1075	1.17-7	5.04	1.05	4.97	5.1
GPL	1075	2-7	5.67	0.95	5.61	5.73
Perceived Spirituality	1075	1-5	3.32	1.09	3.25	3.38
Perceived Religiosity	1075	1-5	2.75	1.35	2.67	2.83

16 participants had missing data. SSL, Satisfaction and Sense of Life; GPL, Goals and Purposes in Life; LL UL, Lower and Upper Limit, 95% confidence interval, bootstrap estimation.

intervals. Hierarchical regression analysis was used to explore the amount of variance of post-traumatic growth exclusively associated with perceived spirituality and religiosity. The statistical procedures were computed using the SPSS Package (v.24; SPSS Inc., Chicago, IL, United States).

RESULTS

One hundred and nine (10%) of the participants had been diagnosed with coronavirus, 6 of them had been hospitalized for coronavirus (one of them in the ICU), 254 participants (23.3%) had loved ones hospitalized for coronavirus (120 in ICU), more than half of the sample knew someone who had died of coronavirus personally (590 people, 54.1%), 143 people had lost a loved one to coronavirus (13.1%) and 80.1% (874 people) knew someone who had lost a family member to coronavirus.

Table 1 shows the mean scores for meaning, growth, Perceived Spirituality and Perceived Religiosity of the sample.

Table 2 presents the values for men and women in meaning and growth. Differences between men and women were not found in SSL (Mann-Whitney $U = 122956.5$, $p = 0.611$) but did exist in GPL, being higher in women ($U = 108272$, $p = 0.002$). There are no differences between men and women in total meaning ($U = 118013.5$, $p = 0.337$).

Regarding the relationship between Perceived Spirituality and Perceived Religiosity, while there are no differences in Perceived Religiosity ($U = 120081.5$, $p = 0.174$), women have higher scores in Perceived Spirituality ($U = 103124.5$, $p < 0.001$).

We then grouped the subjects into the four possible categories according to their Perceived Religiosity (R+ or R-) and Perceived Spirituality (S+ or S-) scores. Subjects with intermediate scores (3) were not included in the analyses. Subjects were grouped as follows: 346 subjects (31.7%) in the R+ S+ group, 8 (0.7%) in the R+ S− group, 116 (10.6%) in the R− S+ group, and 216 (19.8%) in the R–S group.

Since there were not enough people in the R+ S− group, the other three were compared (**Table 3**). We found differences between these groups in all growth variables (Kruskal–Wallis H for total, personal, interpersonal and social growth was $H = 74.43$, $H = 53.53$, $H = 49.31$, and $H = 68.97$, respectively, with $p < 0.001$ in all four cases). Planned comparisons with Bonferroni correction revealed greater total, personal, interpersonal and social growth in the R+ S+ group than in the R− S− group ($U = 21389.5$, $U = 23920.5$, $U = 24401.0$, and $U = 22518.5$, respectively; $p < 0.001$ in all cases). The R+ S+ group showed higher values than the R− S+ group in total ($U = 16516.5$, $p = 0.004$) and social growth ($U = 14324.5$, $p < 0.001$), but not in personal ($U = 19037.0$, $p > 0.013$) or interpersonal growth ($U = 17083.5$, $p > 0.013$). Finally, in measures of growth, the R− S+ group exceeded the R-S- group in total ($U = 9057.5$, $p < 0.001$), personal (U = 8741.0, $p < 0.001$) and interpersonal growth ($U = 9747.0$, $p < 0.001$), but not in social growth ($U = 10800$, $p > 0.013$).

Differences were also found in all the meaning variables (**Table 3**), with Kruskal–Wallis H for total meaning, SSL and

TABLE 2 | Values for meaning and growth in men and women.

Variables	Women					Men					Mann-Whitney U
				Bootstrap 95% CI					Bootstrap 95% CI		
	Average rank	Mean	SD	LL	UL	Average rank	Mean	SD	LL	UL	*p*
Total meaning	544.0	5.3	0.96	5.23	5.37	524.3	5.26	0.92	5.16	5.36	0.337
SSL	549.3	5.02	1.01	4.94	5.1	550.8	5.08	1.01	4.97	5.19	0.611
GPL	558.4	5.72	0.95	5.65	5.79	494.6	5.54	0.93	5.44	5.64	0.002
Total growth	573.6	3.25	0.79	3.19	3.3	483.5	3.03	0.82	2.94	3.12	< 0.001
Personal	584.8	3.24	0.93	3.17	3.3	458.0	2.89	0.90	2.79	2.99	< 0.001
Interpersonal	565.2	3.35	0.92	3.29	3.42	502.5	3.18	0.90	3.08	3.28	0.002
Social	559.4	3.15	0.88	3.09	3.22	515.7	3.02	0.93	2.92	3.12	0.034
Spirituality	576.8	3.42	1.07	3.35	3.5	476.3	3.07	1.11	2.96	3.19	< 0.001
Religiosity	554.4	2.78	1.35	2.69	2.88	527.0	2.67	1.35	2.53	2.82	0.174

Statistically significant differences were found for all measures of growth (total, personal, interpersonal, and social) (U = 105534.0, p < 0.001 for total; U = 97034.5, p < 0.001 for personal; U = 111896.5, p = 0.002 for interpersonal; and U = 116286.5, p = 0.035 for social) always with higher values in women. SSL, Satisfaction and Sense of Life; GPL, Goals and Purposes in Life.

TABLE 3 | Comparison between the three religious groups.

Variables	R– S–					R– S+					R+ S+				
	Average rank	Mean	SD	Bootstrap 95% CI		Average rank	Mean	SD	Bootstrap 95% CI		Average rank	Mean	SD	Bootstrap 95% CI	
				LL	UL				LL	UL				LL	UL
Total meaning	247.0	4.87	1.06	4.72	5.01	339.1	5.35	0.98	5.16	5.52	387.3	5.61	0.80	5.53	5.69
SSL	254.2	4.60	1.15	4.45	4.74	349.4	5.12	1.08	4.92	5.31	386.8	5.36	0.97	5.26	5.45
GPL	257.1	5.28	1.1	5.13	5.43	328.7	5.70	0.98	5.52	5.87	385.6	5.99	0.79	5.91	6.07
Total growth	249.5	2.83	0.80	2.72	2.93	338.8	3.15	0.78	3.01	3.29	396.0	3.40	0.78	3.32	3.48
Personal	259.7	2.73	0.89	2.61	2.85	363.3	3.18	0.99	3.01	3.36	381.4	2.73	0.89	2.61	2.85
Interpersonal	266.6	2.98	0.94	2.86	3.11	337.8	3.32	0.86	3.17	3.48	385.6	3.52	0.88	3.43	3.60
Social	262.8	2.77	0.93	2.65	2.90	304.9	2.95	0.89	2.79	3.14	399.0	3.38	0.86	3.29	3.47

SSL, Satisfaction and Sense of Life; GPL, Goals and Purposes in Life.

GPL of $H = 69.26$, $H = 61.97$, and $H = 58.46$, respectively, and $p < 0.001$ in all three cases. Planned-comparisons with Bonferroni correction yielded greater total meaning, SSL and GPL in the R+ S+ group than in the R− S− group ($U = 21089.5$, $U = 22623.5$, and $U = = 22296.0$ for total meaning, SSL and GPL; $p < 0.001$ in all three cases). The R+ S+ group showed higher values than the R− S+ group in total meaning ($U = 16653.5$, $p < 0.017$), in GPL ($U = 16371.0$, $p = 0.005$), but not in SSL ($U = 17524.0$, $p = 0.066$). Finally, the R− S+ group exceeded the R− S− group in all meaning measurements: total ($U = 8702.0$, $p < 0.001$), SSL ($U = 8851.5$, $p < 0.001$), and GPL ($U = 9624.0$, $p < 0.001$).

We computed hierarchical regression models to explore the prediction of growth from meaning, religiosity and spirituality, once sociodemographic and the impact of COVID is taken into account. **Table 4** shows the results with total growth as the dependent variable (analyses on subscales can be consulted as **Supplementary Tables 1–3**). Sex and age were initially entered as independent variables. In a second model, dichotomous variables which included the direct impact of COVID-19 were added. These two sets of variables accounted for 4.4% of the variance of growth. Once the effect of sex, age and the impact of COVID-19 were taken into account, the meaning variables were introduced; as we can see, only GPL, not SSL, manages to account for growth. In a final step, the variables of Perceived Religiosity and Perceived Spirituality were introduced. Only Perceived Religiosity predicts total growth in a statistically significant way if meaning has been previously taken into account. This same pattern of results is obtained in models predicting interpersonal and social growth. However,

TABLE 4 | Hierarchical regression models of total growth, on meaning and Perceived Religiosity and Perceived Spirituality (controlled by age, sex and impact of COVID-19).

Predictor	ΔR^2	Total growth		95% CI	
		β	SE	Lower limit	Upper limit
Step 1	0.022***				
Age		0.79**	2.22	0.20	1.36
Sex		4.68**	1.07	2.65	6.78
Step 2	0.022***				
Diagnosed with coronavirus		1.81**	0.65	0.53	3.06
With loved ones in hospital		1.13	1.43	−1.74	3.88
With loved ones in ICU		−2.24	1.99	−6.06	1.71
Knowing people who died		3.85***	1.01	1.85	5.77
With loved ones who died		0.075	1.65	−3.23	3.28
Step 3	0.077***				
SSL		−0.14	0.71	−1.51	1.26
GPL		4.61***	0.71	3.17	6.03
Step 4	0.026***				
Perceived Spirituality		0.92	0.58	−0.21	2.1
Perceived Religiosity		1.38**	0.43	0.52	2.24
Total R^2	0.147***				

*SSL, Satisfaction and Sense of Life; GPL, Goals and Purposes in Life. *p < 0.05; **p < 0.01; ***p < 0.001.*

in predicting personal growth, it is Perceived Spirituality that predicts this type of growth once meaning has been previously controlled for (B = 0.45, SE = 0.22, p = 0.044, 95% CI = [0.016 0.89]), while Perceived Religiosity fails to reach a statistically significant level (B = 0.34, SE = 0.17, p = 0.050, 95% CI = [−0.01 0.67]).

DISCUSSION

First, we can confirm that even in traumatic and life-threatening situations, such as that caused by the coronavirus in Madrid, it is possible to find indicators of positive growth at various levels of experience, which bears witness to the resilience of human beings and their enormous capacity to overcome problems. These results are congruent with those found by López et al. (2020) regarding well-being (growth and meaning) in old people in Spain during lockdown: even the most threatened age group managed to find personal resources for growth.

In all growth dimensions, higher values were found among women, results that coincide with the available evidence (see, for example, the meta-analysis by Vishnesky et al., 2010). Apart from differences, our study also shows that being a woman contributes significantly to post-traumatic growth, a finding which encourages us to continue exploring the underlying processes that explain this function; a possible hypothesis suggests that women's greater tendency to ruminative thinking or their style of coping, centered on emotion, facilitates the growth process (Vishnesky et al., 2010).

Direct contact with disease and death in this crisis is shown to be associated with the variables studied. Having known someone who died predicts greater personal, interpersonal and social growth, and greater Perceived Religiosity. Having been diagnosed with COVID-19 also predicts further growth, at all levels. It seems, then, that close contact with death or with the personal experience of the possibility of death, mobilizes resources which are necessary to focus attention on the positive aspects of the experience.

It is also interesting to see that the different dimensions of meaning contribute differently to growth. Having vital goals and purposes, being willing to reach goals and achievements, are associated with post-traumatic growth to a greater extent than experiencing that life is meaningful, valuable, or exciting.

Perhaps the most interesting results of our study are those showing the different contributions of Perceived Religiosity and Perceived Spirituality to post-traumatic growth.

First, it seems to be confirmed that, although related, they are not part of a single concept, and that lay people can distinguish perfectly well between the two and relate to the sacred in different ways, scoring higher in Perceived Spirituality than in Perceived Religiosity. Participants in our sample did not report being religious without being spiritual, and 20% said they were neither religious nor spiritual. The percentage of R-S- is lower in our study compared to other European countries such as Germany (Büssing et al., 2007 (for further analysis of the cultural differences in the meanings of these groupings consult Keller et al., 2013). The majority (31.7%) defined themselves as both religious and spiritual. Our subjects do not appear to see religiosity and spirituality as opposing or incompatible; spirituality is understood as an essential function of religion. R + S + subjects seem to have trust in a religious source as part of their spiritual quest, with this group being the one which had higher scores in growth and meaning. These results coincide with several studies which find psychological functioning is better in the R+ S+ group and worse in R− S+ (Schnell, 2012; Vittengl, 2018), which has been interpreted as "vulnerable people who are seeking existential meaning for their lives" (King et al., 2013, p. 161).

Second, the data show that each plays a different role in post-traumatic growth. Of particular interest is the fact that Perceived Spirituality broadly coincides with meaning in predicting growth, especially social and interpersonal, suggesting that it is through meaning that Perceived Spirituality influences these types of growth after traumatic situations. These data are compatible with those found by Büssing et al. (2007) in patients with chronic diseases: those with S+ reported greater search for meaningful support, as our study also appears to show. However, in the case of personal growth, it seems that Perceived Spirituality has a different function from that of Perceived Religiosity, and one that goes beyond meaning since it is only Perceived Spirituality that predicts such growth. Perhaps the resource of being able to take a positive view of situations, associated with S+ (Büssing et al., 2007), partly explains this result.

Perceived Religiosity, on the other hand, seems to contribute other significant values and models in addition to meaning, which facilitate social and interpersonal growth in the face of traumatic and life-threatening situations. According to Pargament (1997), religious coping contributes something special that is particularly interesting when responding to situations in which the subject comes face to face with their limits, and where their strength and control are confronted with their vulnerability and finitude, such as the situation caused by the coronavirus. Several authors have highlighted the social support function of religious participation (Shaw et al., 2005; López et al., 2015); indeed, López et al. showed that the greater the support of the religious community perceived by the participants, the greater the degree of post-traumatic growth. It would be interesting to explore the different functions that both variables, Perceived Religiosity and Perceived Spirituality, fulfill in traumatic situations.

This study has some limitations. First, social desirability was not controlled for, which could have affected the scores obtained for variables. Furthermore, although the sample is very large, it is not a representative sample. Although the distribution in age ranges is generally similar to that of the population of Madrid, some differences may have influenced results: our subjects perceived they are better off economically, and a higher percentage had university degrees than the general population. Perhaps, this results in a greater capacity for reflection and reasoning which, in turn, facilitates the experience of transcendence and meaning. Finally, our measure of religiosity and spirituality was global and self-rated, but religiosity has different meanings for different participants. This study did not explore its different dimensions (e.g., participation in religious

practices and intrinsic religiosity), which makes it difficult to interpret our results. Future qualitative studies are necessary to reveal how lay people understand these constructs. Finally, we did not include other possible variables which could also influence growth, so our conclusions should be treated with caution. For example, with regard to social isolation, we did not take into account that people living alone have experienced a situation of greater social isolation.

However, our results clearly reflect the interest in maintaining the distinction between the two concepts, their different roles in traumatic growth and the different dimensions that each has an effect on. Finally, it confirms the importance of meaning in post-traumatic growth, especially the dimension of life goals and purposes. Even in situations as difficult as the one experienced, with the immediate threat of death and disease, during a strict lockdown, surrounded by pain and fear, it is possible, and more necessary than ever, that people reflect on purposes and goals in life, the experience of transcendence and meaning, and social support. Ultimately, our study reminds us that human beings are greater and stronger than their fear and pain.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MP-U developed the study concept and study design. RJ substantially contributed to the study concept and performed the data analysis and interpretation. MP-U drafted the manuscript. Both authors approved the final version of the manuscript and also agreed to be accountable for all aspects of the work.

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"#I-Am-Engaged": Conceptualization and First Implementation of a Multi-Actor Participatory, Co-designed Social Media Campaign to Raise Italians Citizens' Engagement in Preventing the Spread of COVID-19 Virus

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The COVID-19 pandemic forced health authorities around the world to introduce public health measures to contain the risks of contagion. This greatly impacted on citizens' quality of life, often raising concerns and reactance. There is an ongoing urgent need to promote and sustain behavioral changes and adherence to preventive measures. Based on the theoretical framework of the Patient Health Engagement Model and a participatory co-design process, a social media campaign aimed at improving citizens' health engagement toward behavioral change for preventing the spread of COVID-19 was promoted in Italy in the early months of the pandemic. In this paper, we describe the methodological process adopted to develop the campaign, its characteristics, and the first results—in terms of audience reach and engagement in its early implementation. The discussion of this grounded-up and citizen-centered approach to social campaign development highlights key ways of promoting learning, engaging citizens, and supporting their participation in the co-production of educational interventions for behavioral change toward preventive actions.

Keywords: COVID-19, behavioral change, health engagement, communication campaign, prevention, Patient Health Engagement Model, health communication

INTRODUCTION

On January 30, 2020, the World Health Organization (WHO) declared the Coronavirus epidemic a public health emergency of international concern (Duff, 2020). In little more than a month, starting on March 9, 2020, the entire country of Italy was forced into lockdown. In order to contain the COVID-19 epidemic, government authorities took extreme measures, such as the closure of cities and regions, the closure of schools and offices, the reorganization of health services, the restriction

of transportation, and stopping people from leaving home except for urgent needs (Saglietto et al., 2020). This introduced new challenges that the country was poorly prepared to handle. As the numbers of cases rapidly increased, there was growing evidence that behavioral changes were required for citizens to reduce the risks of transmission. For this reason, large scale public health communication interventions were implemented to raise citizens' awareness, and responsibility, increasing their literacy about the restrictive measures (Bonell et al., 2020).[1] The decision took into account the lessons learned from the management of previous epidemic experiences such as HIV, SARS, Ebola (Vijaya et al., 2004; Smith, 2006; Figueroa et al., 2014; Friedman et al., 2016; Gillespie et al., 2016; Figueroa, 2017; Rose, 2017; Bedson et al., 2019). However, there are still problems of poor adherence to such measures (Briscese et al., 2020; McFadden et al., 2020; van Rooij et al., 2020). As in the management of previous epidemic experiences, the initial unavailability of an effective drug therapy/vaccination had forced the authorities to activate "non-pharmacological" interventions of a social nature, fostering behavioral change to mitigate the impact of the pandemic by leveraging the capability of citizens to adhere to the preventive public health measures (Ferguson et al., 2006; Godoy et al., 2012). Furthermore, people and community engagement during public health emergencies have been increasingly recognized as an important component to enable behavioral changes to reduce the spread of disease (Schoch-Spana et al., 2007; Bedson et al., 2019). The role of social media through an educational campaign was extensively examined using the scientific literature and was a key element in promoting behavioral change (Agha, 2003; French et al., 2010; Denecke and Atique, 2016; Fayoyin, 2016).

Empowering communities during the emergency phase and improving their psychological motivation to adhere to restrictive measures, norms and regulations was critical due to the feeling of uncertainty that can undermine the "psychological commitment" of people when adopting new life rules: not only in the acute phase of the emergency but also, and above all, in the medium-long term management of the epidemic (Sniehotta et al., 2005). As a long tradition of scientific studies in psychology has shown, enhancing preventive behavioral change is a long and challenging process (Forkan et al., 2015). Adherence to the new measures could be represented as a roller-coaster: a bumpy journey with moments in which citizens feel motivated to adhere and moments in which fatigue and frustration prevail causing them to renounce new habits (Rubin et al., 2009). It is challenging to monitor and sustain psychological engagement and the motivation to change behaviors, and it is even more crucial that people do so in the COVID-19 era (van Bavel et al., 2020).

In this paper, we describe the process of conceiving developing, and first launching of a public educational campaign (named "#I-am-engaged") aimed at sustaining Italian citizens' engagement and adherence to the COVID-19 preventive measures, with the ultimate aim to create changes that will psychologically endure people, enabling people to cope with the long term impact of the pandemic.

The Theoretical Framework: The Patient Health Engagement Model

Many models of behavioral change have been developed over the years, trying to identify the factors which may support or inhibit the adoption of preventive behaviors. For instance, the Health Belief Model (Maiman and Becker, 1977) and the Protection Motivation Theory (Rogers and Prentice-Dunn, 1997) have shown that risk avoidance depends on an individual's beliefs about their susceptibility to the risk and the perceived severity of the health threat. This is connected to the perceived effectiveness of actions that will avoid risk and the individual's self-confidence in their ability to perform them. The Theory of Planned Behaviors (Ajzen, 2011) and its further developed form (the Integrative Model of Behavioral Prediction) (Yzer, 2012) that aims to magnify the role of social norms in the process.

Although these models are effective in orienting educational campaigns for behavioral change, they lack a full considering of the role of emotional dynamics in that process. Recent studies have underlined the importance of considering the role of anticipated emotions and desires in predicting the intention to change in health behaviors by proposing the integration of the Theory of Planned Behaviors (Perugini and Bagozzi, 2001; Kim et al., 2013). Prochaska and DiClemente used a Transtheoretical model of change that further emphasized the role of process-like emotional dynamics by underlining the role of sub-conscious determinants of an individuals' motivation to change health behaviors (Prochaska and DiClemente, 2005). Building on these arguments, by integrating the lesson learned from the studies on the process of griefs and griefing and the conceptualization of the Five Stage of Loss model by Kubler-Ross (1969), we elaborated the Patient Health Engagement Model (PHE-Model) (Graffigna and Barello, 2018) with the ambition of describing the subjective emotional dynamics which undermine changes to health behaviors. Different from the previously mentioned models, the PHE-Model points to the crucial role of psychological willingness to engage in health risk prevention. The PHE-Model describes the process of the emotional and motivational reframing of an individuals' role in perception in the management of a health risk condition and its consequences, evolving from being a passive user of services to an active partner of the healthcare system and healthcare professionals (Barello et al., 2020). The model describes four psychological positions on a continuum from minimum to maximum engagement: "Blackout" (complete disengagement, psychologically freezing and behaviorally paralysis), "Arousal" (initial awareness of the risky situation but lack of skills to manage it effectively), "Adhesion" (effective emotional regulation and coping with the risk condition), "Eudaimonic Process" (ability to deal with the uncertainty of the moment and a strong motivation to become proactive and responsible for personal

[1] See for example the following institutional campaigns promoted by the National Health Authority of Italy in the first phase of the COVID19 pandemic in Italy https://www.who.int/campaigns/connecting-the-world-to-combat-coronavirus; https://www.health.gov.au/resources/collections/coronavirus-covid-19-campaign-resources; http://www.salute.gov.it/portale/nuovocoronavirus/dettaglioNotizieNuovoCoronavirus.jsp?lingua=italiano&menu=notizie&p=dalministero&id=4221.

health behaviors) (Graffigna et al., 2017). In particular, the highest position of the PHE-Model (namely, Eudaimonic Project) depicts a psychological condition of full consciousness about people one's role and responsibility in the management of their health, thanks to a positive approach to life and illness, to the ability to correctly navigate (i.e., find and use) health information, to an effective adjustment to hazard to health conditions, and to an ability to cope with the uncertainty of the situation and the related psychological distress (Barello and Graffigna, 2015; Graffigna and Barello, 2018). Therefore, the Eudaimonic Project status, which is the higher level of engagement described by the PHE model, requires people to reframe on both emotional and cognitive-behavioral levels (Menichetti et al., 2018).

Previous studies conducted on different patient populations have demonstrated that a high level of engagement, as measured with the PHE-Model, is predictive of a higher adherence to medical prescriptions and a better-informed search for online information (Graffigna et al., 2017). The assumption behind the application of the PHE-Model to a "non-patient" population relies on its psychological nature. The PHE-Model considers health engagement as the function of an emotional process of elaboration and adaptation to a critical health event. This critical health event in the case of chronic patients often coincides with clinical diagnosis, or with a new symptom, or with a new request for a life style change for medical reasons. In the case of the COVID19 emergency, the risk of contagion from Sars-Cov-2 is—at the psychological level—an analog critical health event that can trigger the psychological ability of individuals (patients and not) to cope with risk and to engage in changes to health behavior. To prove this concept in relation to the recent COVID-19 pandemic, a high level of PHE is predictive of a safer adaptation to the emergency, considering different targets of the general population, such as adults and students (Graffigna et al., 2020; Nania et al., 2020).

Based on these considerations, we adopted the PHE-Model as a theoretical framework for orienting the first conceptualization and development of the *#I-am-Engaged* campaign, starting from the hypothesis that public adherence to preventive measures during a pandemic emergency requires a deep consideration of the moods and emotions of citizens: monitoring and fostering individuals' positive emotional elaboration of a critical event—such as the COVID-19 pandemic—as a function of the psychological readiness to engaged in their health protection, a situation which is crucial to sustaining people's ability to preventively cope with COVID19.

Context of the Campaign

The concept and the design of the campaign *#I-am-Engaged* were based on three subsequent methodological steps:

1. A quantitative cross-sectional online survey on a representative sample of the Italian population aimed at investigating the psychological impact of the COVID-19 pandemic, the level of Italian citizens' engagement in the COVID-19 preventative measures, and their attitudes toward media and informative sources on the topic.
2. A participatory design approach to define contents, tone of voice, modes and the media mix of the educational campaign.
3. A preliminary analysis of the first output of the campaign launch in terms of audience reach.

More in detail, the three phases can be methodologically described as follows.

MATERIALS AND METHODS

The Cross-Sectional Online Survey

Before developing the campaign and its content, an online survey of a representative sample of Italian citizens was conducted between February 28 and March 4, 2020, to understand people's reactions to the COVID-19 pandemic's outbreak and collect insights about their unmet needs for behavioral change, which could be addressed by the social campaign.

The study took place between February 28 and March 4, 2020. A sample of 1,000 Italians, who were representative of the Italian population for gender, age, employment, geographical area, and from the urban centers of residence in all the different regions of Italy. Participants were over 18 years old and completed a self-administered online questionnaire. The sample was recruited through a random selection from the consumers' panel managed by Norstat srl. The eligibility criteria for being involved in the study were that all participants had to aged 18 years or older, being able to read and understand Italian, and live in Italy.

After recruitment and informed consent, responders were asked to complete an online survey involving questions about health engagement, affective response, and behavioral responses to the COVID-19 pandemic. The full methodological details and results of this survey are reported in an extensive paper currently being submitted (Graffigna et al., 2020).

The Participatory Design of the Campaign

The study involved a participatory process in which researchers, representatives of patients organizations as well as clinicians were facilitated and actively participated in designing the aims, contents, and format of the social campaign, based on their personal representations, meanings, priorities, and needs (Charania and Tsuji, 2012). The stakeholders involved in the participatory process were selected based on their previous experience in promoting the engagement of individuals toward the management of their health, as attested by previous publications on the topic, participation in educational initiatives, and/or active engagement in patient advocacy campaigns. In particular, we involved representatives of Patients' Organizations as they are the bearers of a chronic experience that challenges them daily with are engaged in adopting appropriate behaviors for effective health management. They are an example of psychological engagement with behavioral change and of persistence in the adherence to prescribed changes in lifestyle due to disease management (see **Table 1** for details).

TABLE 1 | Stakeholders of "I am engaged" campaign.

Expert's category	Number of experts involved in the campaign generation
Patient associations' representatives	16
Health care professionals	4
Researchers	6

The campaign's participatory design process followed these steps: first, the results of the survey were presented, discussed, and enriched by a wide community of communication experts, patient engagement advocates, and laypeople using a live Facebook webinar. The strategy, target, content, tone of voice of the campaign aimed at promoting citizens' engagement in behavioral change was co-designed with a group of stakeholders using an iterative email process of discussion and sharing starting from the first draft proposed by the research team. Improvement was suggested by the stakeholders in further steps of reconfiguration until the final version of the campaign structure and contents was achieved.

First Proof of Concept: Audience Reach and Engagement

Evaluating the impact of social communication campaigns is always hard due to the many intervening factors that can influence a real-world setting (Bloom, 1980; White, 2014; Veríssimo et al., 2018). Due to the explorative nature of the #I-am-engaged campaign, and the time constraints in developing it, due to the COVID19 emergency, we were not able to structure a systematic process of evaluation for its effectiveness. This limit is typical of social communication campaigns launched during a critical event (Firestone et al., 2017). However, in order to provide preliminary proof of concept for our campaign, we monitored the first quantitative data of audience-reach and engagement in the first period of launch (from March 10, to May 27, 2020). The following indicators (which are commonly considered for social media marketing campaigns, e.g., Barger and Labrecque, 2013; Hair et al., 2017) were considered: number of views (only for Facebook live videos), number of likes, number of comments, number of people reached and number of shares. These indicators were collected with the metrics released from Facebook and LinkedIn platforms.

RESULTS

Main Findings From the Online Survey

The survey study involved a total of 976 participants with a mean age of 44 years (SD = 14; range 18–70). Of the 1,000 citizens contacted, 24 reported missing data in the questionnaire and were excluded from the analysis. For a more detailed description of the study (see **Table 2**).

Regarding the engagement variable, only 16% of our sample resulted in a higher position (i.e., "Eudaimonic project," with no significant differences between genders, or among age ranges (see **Table 3**).

TABLE 2 | Demographic profiles of the sample involved in the online survey (N = 968).

	n	%		n	%
Gender			**Chronic patient**		
Male	473	48.9	Yes	174	18.0
Female	495	51.1	No	794	82.0
Age			**Geographical area**		
18–24	99	10.1	North-West	253	26.0
25–34	156	16.1	North-East	178	18.4
35–44	209	21.6	Center	194	20
45–54	215	22.2	South and Islands	343	35.4
55–59	106	11.0			
60–70	183	19.0			
Education			**Coming from "red zones"**		
Middle school or lower	142	14.6	Yes	294	30.3
High school	586	60.6	No	674	69.7
University degree	240	24.8			
Employment			**Inhabited center size**		
Laborer	203	20.9	Up to 5,000 inhabitants	163	16.8
Office worker	153	15.8	5/10,000 inhabitants	150	15.5
Unoccupied	147	15.2	10/30,000 inhabitants	241	24.9
Housewife/man	146	15.1	30/100,000 inhabitants	189	19.5
Freelance professional	119	12.3	100/500,000 inhabitants	102	10.6
Retired	76	7.9	More than 500,000 inhabitants	117	12.1
Student	53	5.5	Missing	6	0.6
Manager	36	3.7			
Teacher	18	1.8			
Other	17	1.8			

TABLE 3 | Percentage of engagement levels in the overall sample and across different demographic groups.

	PHE model positions			
	Blackout	**Alert**	**Adhesion**	**Eudaimonic project**
Overall sample (%)	1.1	21.4	61.5	16
Gender (%)	$\chi^2(df = 3, n = 968) = 9.122$; $p = 0.028$			
Male	1.3	18.2	61.7	18.9
Female	1.0	24.4	61.2	13.3
Age (%)	Fisher's exact p-value = 0.139, based on 10,000 Montecarlo's simulations			
18–24	0	16.5	64.9	18.6
25–34	0.6	25	63.5	10.9
35–44	2.4	25.2	57.1	15.2
45–54	1.4	23.7	59.5	15.3
55–59	0.9	18.7	65.4	15.0
60–70	0.5	15.2	62.5	21.7

Pearson's Chi-squared and Fisher's Exact test were used to compare distributions.

When asked to report on the attitudes toward preventive behaviors required to mitigate the contagion spread, a small portion of the sample was asked to adhere to measures such as "Bought a face protective mask" (13.2%), "Canceled travels abroad" (25.3%), Reduced daily movements whenever possible (39.8%) (see **Table 4**). Regarding people's use of information and literacy about COVID-19 preventive measures, our sample

TABLE 4 | Citizens' attitudes toward preventive behaviors to mitigate the COVID-19 spread.

Preventive behaviors	**% of compliant**
Canceled travel abroad	25.3
Increased hands washing	78.0
Reduced meals out	33.3
Bought a face protective mask	13.2
Avoid getting close to influenced people	71.4
Avoid crowded places	67.4
Reduced daily movements whenever possible	39.8
Preventive attitudes (1 = Disagree, 5 = agree)	**M (SD)**
I am the most responsible in preventing the contagion by COVID-19	3.74 (0.92)
Preventive behaviors for COVID-19 are an act of social responsibility	4.16 (0.86)
I dedicate much time in getting informed about health	3.45 (0.85)
I usually share with my General Practitioner concerns regarding my health status	3.31 (1.0)
I am used to telling my General Practitioner unusual symptoms regarding my health	3.47 (0.86)

TABLE 5 | Citizens' reported use of sources of information and literacy regarding COVID-19.

Frequency of use of source of information (1 = Never; 5 = more than once a day)	**M (SD)**
Newscast	3.82 (1.04)
Television programs	3.06 (1.18)
Radio	2.57 (1.23)
Websites	3.14 (1.24)
Social networks	2.77 (1.37)
Specialized magazines	1.87 (1.11)
Newspapers	2.37 (1.25)
Scientific journals	1.87 (1.12)
General practitioner	2.13 (1.16)
COVID-19 info phone number	1.42 (0.93)
Literacy on COVID-19	**% of correct responses**
Are there specific medicines for the treatment or prevention of COVID-19?	89.7
Does COVID-19 hit both young and old people?	93.2
Does the vaccine against pneumonia protect against COVID-19?	91.8
Do pets transmit COVID-19?	91.6
Is it safe to receive a mail or a package from an area with a high rate of infected people?	78.9
Spraying alcohol or chlorine on the body may kill the new coronavirus?	84.3
Are antibiotics useful in preventing the infection by the new coronavirus?	88.9

reported that they used more than one source of information and were, on average, highly literate about the required preventive behaviors (see **Table 5**).

"#I-Am-Engaged" Campaign: Conceptual Structure and First Implementation

We conducted round tables with researchers and relevant stakeholders about the survey results, which revealed the need and relevance of a public education campaign, targeting adult Italian citizens, to improve the engagement of the population in the management of COVID. In particular, the survey revealed the need to target the motivational levers at the base of people's engagement in behavioral change, as data showed that people were informed but poor at adapting and changing their habits. This supported the decision to launch the #I-am-engaged campaign project. To reach the final configuration of the campaign, we conducted 34 rounds of telematic interaction. Finally, the panel of experts agreed on the definition of the two main components of the campaign: (1) a Vademecum (see Appendix 1 and **Figure 1** for the cover of this document) inspired by the Patient Health Engagement Model and aimed at fostering psychological motivations to engage in more responsible health prevention for COVID19 epidemic, and (2) a Facebook campaign to support the dissemination of such principles effectively and simply.

The Vademecum

The Vademecum is a leaflet in which the main contents of the campaign are showcased. The contents included recommendations that were derived from the key theoretical concepts of the PHE-model, and in particular, protocols previously conceptualized, developed, and piloted by the research team (Menichetti and Graffigna, 2016; Guida et al., 2019).

In particular, 10 recommendations were selected and described, anchored to key words that were inspired by the (Italian) acronym of the word engagement: empathize, navigate the right information, manage stress, trust the healthcare system, enjoy the time, be enthusiastic, monitor, balance, new normality, and drag (see **Table 6** for a deeper description of its scientific rationale).

All the recommendations of the Vademecum were explained with plain and simple text and developed in an extended graphic document uploaded on the university website and broadly virtualized by the Facebook campaign described below. The creative development of the Educational Campaign has aimed at facilitating the transmission and the understanding of these messages, as well as sharing and ensuring adhesion to the new measures. Specifically, on a stylistic level, we considered: (1) tone of voice: adoption of a concise, concrete, simple and immediate language; (2) visual style: the COVID molecule was chosen as the campaign's identifying icon for all messages, and graphically reconfigured in a non-medical, pleasant and reassuring style (watercolor, soft shades); and (3) reputational reinforcement was supported by the fact that all the stakeholders put logos on the campaign materials.

The Campaign First Implementation

The Facebook Campaign included the following actions:

- Hashtag: we created the hashtag #I-am-engaged (in Italian: #Io-sono-engaged) as an anchor/reference for all the messages and interactions of the campaign.

FIGURE 1 | The cover and last pages of the Vademecum—(we have received the appropriate permissions from the copyright holder of this figure to publish it).

- Facebook posts: The Vademecum was shared step by step (one keyword with the associated recommendation at a time) through three posts per week on EMH social pages and broadly shared by all the stakeholders involved in the participatory co-design.
- Facebook live videos: The dissemination of the Vademecum was supported and made more dynamic by a few Facebook live videos aimed at deepening the contents of the Vademecum and increasing awareness of the campaign. From a stylistic point of view, we opted for short live videos (30 min), highly interactive (thanks to the real-time exchange of opinions through the comments on the Facebook platform) and aimed at building a "ritual/usual" appointment, reproducing the normality of everyday life and closeness among people (consistently the name of the live broadcasts was "A coffee with EngageMinds HUB"). At least 10 appointments have been planned but this planning depends on the evolution of the pandemic.
- Video testimonies: Furthermore, the development of the campaign included a re-launch of content by encouraging video testimonies from followers of the campaign. The theme of the testimonies was sharing personal experiences and concrete engagement actions to manage the health emergency effectively. The videos were made in the form of short messages (30 s) and featured the same graphic references to characterize the entire campaign. The collected testimonies were shared twice a week on EngageMinds HUB social pages.

Proof of Concept: Preliminary Results on Audience Reach and Engagement

The campaign was launched on March 10, 2020, and was still ongoing at the time of this article's publication. The Vademecum was released completely, the Facebook live videos are in progress, as is the collection and dissemination of video testimonies. The total release of these contents is scheduled for the coming months. However, it is anticipated that the campaign will be adapted in response to its progress, based on the evolution of the experience of longer-term 'cohabitation' with COVID19, which is difficult to predict at this time.

The results were updated on May 27, 2020, and are summarized in **Tables 7**, **8**. Overall, these preliminary data show that the campaign was able to reach more than 40.000 people (33.390 on Fb, 12.689 on Ln). Although it is not possible to exclude the duplicated reach of the two channels, these results appear relevant and promising if compared with the whole Italian population. Potentially, the campaign reached one-third of the Italian population. Out of this, only 10% of the audience showed an active engagement with the campaign, by expressing likes (697 on Fb, 311 on Ln), by writing comments (102 on Fb, 10 on Ln), or sharing its contents (253 on Fb, data not available for Ln). Furthermore, these data show how audience reach and engagement was higher on Facebook than LinkedIn, probably due to the different nature of these platforms and their different targeted audiences. Facebook generally appears a more suitable platform for engaging with the audience and as a means to convey public health information in a lively manner.

DISCUSSION

The COVID19 pandemic has demonstrated how the behaviors of individuals are crucial to prevent contagion risks both for individual citizens and the whole community. In the absence of vaccination, the availability of pharmaceutical treatment still uncertain, and behavioral rules such as physical distancing, wearing face masks, and other hygiene norms will be crucial in containing the spread of the virus (Hellewell et al., 2020). This requires a huge change in people's attitudes toward health

TABLE 6 | The campaign rationale.

Vademecum keyword	Rationale	Conceptual link to the PHE model dimensions	Theoretical roots
Empathize (in Italian: *Empatizza*)	The acceptance of daily life limitations (such as lockdown) required to mitigate the contagion spread requires the individual ability to move from an individualistic consideration of personal benefit to the consciousness of one's behaviors impact on societal health. This is also a function of an adequate ability to empathize with the other, their needs, and expectations.	Emotional dimension	Barello and Graffigna, 2020; Harper et al., 2020
Navigate the right information (in Italian: *Naviga le corrette informazioni*)	The ability to navigate the corrected information about the virus, to recognize reliable sources of information is a crucial component of health engagement and foremost important in such an emergency such as the one of COVID19	Cognitive-behavioral dimension	Koh et al., 2013; Smith et al., 2013; Palumbo et al., 2016
Deal with stressors (in Italian: *Gestisci lo stress*)	The outbreak of coronavirus disease 2019 (COVID-19) may be stressful for people. Fear and anxiety about the risk of contagion can be overwhelming and cause strong emotions that might reduce people's engagement in preventive behaviors. Thus, finding strategies to prevent fear and anxiety from turning into distress can help us regain control of our lives, increasing our capacity to respond positively and reducing the anxiety and distress caused by uncertainty in a rapidly evolving situation.	Emotional dimension	Moos, 1992; Daubenmier et al., 2007; Gruman et al., 2010
Trust the healthcare system (in Italian: *Affidati al sistema sanitario*)	Mastering the consciousness of one own role in the healthcare system is a prerequisite of health engagement. Citizens are claimed to perceive themselves not only mere end-users of the healthcare system but also active players for the effectiveness and sustainability of the system. This in particular in the case of a Public National System such as the Italian one	Cognitive-behavioral	Gilson, 2003; Richards et al., 2013; Gabay, 2015
Enjoy time (in Italian: *Gustati il tempo*)	If one disease can provide wisdom beyond our comprehension of how fragile, interconnected and precious life is, the novel coronavirus (COVID-19) pandemic offers citizens a plethora of lessons on the relevance to take time for themselves to engage in a psychological recovery during and after the pandemic. It's important that people take breaks, and set up an accountability system for their lifestyle. In this situation, people need to ration their time wisely so that they can still meet targets while having a healthy work-life balance.	Emotional	Hunt and Macleod, 1987; Boekaerts, 1992
Be enthusiastic (in Italian: *Entusiasmati*)	It's easy to let negative thoughts and feelings creep in during the COVID-19 pandemic. Despite all of this, keeping a positive mindset can go a long way in managing through a difficult time. Having an attitude that looks for the positive and tries to be optimistic can help people to filter out some of the constant barrage of bad or discouraging news that might impact on people's motivation to cope with the difficulties and engagement in healthy behaviors.	Emotional	Meyers and Meyers, 2003; Henley and Donovan, 2004
Monitor yourself (in Italian: *Monitorati*)	Making people able to engage in self-monitor signals and symptoms is critical to assess if they may be at risk for disease and whether they qualify for additional testing or treatment. Symptom progression can occur rapidly and ensuring these people know when and how to seek hospital care can potentially save lives. Engaging people in monitoring and updating their health, medication, or treatment plans have the potential to increase treatment concordance, as well as enabling health care providers to review and intervene if needed.	Cognitive-behavioral	Dolan Mullen et al., 1997; Burke et al., 2002
Keep balance (in Italian: *Equilibrio*)	Balance or balancing served many important purposes in the context of health and illness literature. Achieving balance as a state is recognized as a way to enable people to experience a sense of health and well-being. Research also associated balance with resilience, describing it as a means of coping, gaining inner strength, moderating vulnerability, and adjusting to difficult changes. Balance also helps people to deal with uncertainty, unfamiliarity, and unpredictability. Balance or balancing is also a source of consolation that could help people deal with adversity. Balancing seemed to improve people's emotional experiences and self-esteem because it provided the necessary stability to prioritize commitments, helped people to resolve ambivalence, provided people with confidence about decisions made, and reduced guilt about value conflicts.	Emotional	Mullen, 1992; Lipworth et al., 2011
Find a new normality (in Italian: *Nuova normalità*)	New understanding about people's role in their health management and getting engaged in preventive behaviors calls attention to recognizing new forms of adaptations and new habits that encourage people's own coping and creative processes to deal with their strain and, in some cases, reconstruct everyday lives.	Cognitive-behavioral	de Ridder et al., 2008; Darcy et al., 2014
Be a leader of change (in Italian: *Trascina*)	Making a difference through guiding others, building awareness, and sensitizing the enlarged community is recognized as a characteristic of people fully engaged in their health. Helping others to adopt recommended behaviors to enable a virtuous circle of "health engagement contagion."	Cognitive-behavioral	Stanhope and Henwood, 2014; Anderson and McCleary, 2015

TABLE 7 | The results of the campaign—Facebook metrics.

	N	People reached	Views (of Facebook lives)	Interactions	Like	Sharing	Comments
Post	57	33,390		2,652	697	253	102
Facebook live videos	6		3,346				
Video testimonies	16						

prevention and their understanding of the crucial role they play in sustaining the healthcare system's ability to face the emergency. The engagement of individuals in this process, in becoming more aware of their role in health prevention, is regarded as a key aim for public health authorities across the world. However, so far, the majority of public health campaigns, particularly in Italy, have mainly focused on transferring literacy about the virus and behaviors (Crosier et al., 2015). Sustaining people's awareness and education toward COVID-19 health prevention requires a more complex approach and several combined actions (van Bavel et al., 2020). In particular, emotional reactions to the fear of contagion are important drivers of people's behaviors during a pandemic (Kim and Niederdeppe, 2013). The levels of the perceived threat to one's health are often related to an increased avoidance of health risks, but only when subjects are also equipped with the right literacy and skills (Maiman and Becker, 1977). Furthermore, as time passes and people become used to the emergency, it is important to orient educational initiatives to profoundly change people's attitudes toward health prevention. In the long-term, the concept of health engagement becomes crucial to ensure people's ability not only to acquire knowledge about the virus but also to become conscious about their responsibility in preventing the contagion for themselves and their community (Sniehotta et al., 2005). However, fostering the psychological readiness of individuals and encouraging them to engage in health prevention requires the development of initiatives aimed at supporting them in their emotional regulation and positive adaptation to stress and uncertainty of the emergency (Cameron and Leventhal, 2012). People need to promote a critical attitude toward the correct navigation of health information and to acquire competences related to self-monitoring and the self-management of health behaviors (Hibbard and Greene, 2013).

Based on these considerations, this paper illustrates the conception, design, and launch of a social media educational campaign aimed at sustaining more responsible COVID-19 prevention in Italian citizens, entitled the *#I-am-engaged* campaign. The core method of communication adopted in the campaign was a Vademecum, encouraging engagement in healthy habits, based on the Patient Health Engagement Model (Graffigna and Barello, 2018). The engagement principles included in the Vademecum were disseminated digitally via a Facebook campaign including Facebook educational posts, Facebook live videos, video testimonies.

TABLE 8 | The results of the campaign—LinkedIn metrics.

	N	Views	Like	Comments
Post	47	12689	311	10
Video testimonies	16			

Taking into account recommendations coming from scientific literature, the *#I-am-engaged-campaign* is theoretically anchored to the PHE Model, which identifies engagement as the fundamental leverage for behavioral change, promoting a multi-dimensional activation at a cognitive, emotional, and behavioral level (Graffigna and Barello, 2018). The campaign is also constructed around a community-based perspective, with a participatory process that favors co-creation among peers. Furthermore, the campaign adopts a positive tone of voice focusing on the promotion of good practices. The campaign takes into account the lesson learned in previous communication interventions reported in the literature. The *#I-am-engaged* campaign addresses the following trigger points to enhance people's engagement in COVID-19 prevention.

(a) *Theory driven approach*: Previous literature has demonstrated that it is crucial to not only focus on the technical aspects of communication, but also have a theoretical frame for understanding health behaviors as drivers to change (Gynther et al., 2012). From this perspective, our campaign used a comparative analysis of behavioral change models applied to health prevention and considered the adoption of these as part of the rationale and psychological model of engagement. This was the basis for selecting the key elements and concepts of the Vademecum in supporting behavioral change.

(b) *Positive tone*: A broad spectrum of psychological evidence has demonstrated how a positive communicative approach is more effective than a "scary" one that emphasizes the negative consequences of risk behavior. A reassuring and empowering tone, focusing on solutions is preferable in the case of health emergencies such as the COVID-19 pandemic, since this can foster individual self-efficacy and a positive attitude toward health prevention. This principle was a key element of the communication strategy adopted by our campaign. Several of the key psychological concepts promoted in the Vademecum have been inspired by Positive Phycology, which is one of the theoretical underpinnings of the Patient Health Engagement Model (Graffigna and Barello, 2018). Furthermore, the overall tone of voice of the campaign is positive, as was also suggested by the stakeholders in the co-design process, and aimed at simplifying and making accessible to everyone the psychological principles of the Vademecum. Finally, the graphic choices of the campaign (a watercolor drawn virus with clear and warm colors) were coherent, aiming to pass a scientific concept in a simplified and positive manner.

(c) *People oriented messages*: Embedding public communication with a deep understanding of the population's values and attitudes toward health prevention and concerns

are fundamental to generating understandable messages to which people will listen (Setbon and Raude, 2009; Gray et al., 2012; Crosier et al., 2015; van Bavel et al., 2020). According to this principle, a crucial step for the development of our campaign was the survey of a representative sample of the Italian population during the first phase of the emergency, which aimed at exploring people's literacy, attitudes, and levels of engagement toward COVID-19 prevention. The survey, which is discussed in more detail in another paper (Graffigna et al., 2020), confirmed the opportunity to change of people's attitudes toward prevention, rather than only to increase their literacy. Furthermore, it demonstrated the role of engagement in improving people's attitudes toward preventive measures during the COVID-19 emergency. The survey also provided the basis for enhancing stakeholder's discussion about evidence and nurturing the participative co-design process of the campaign.

(d) *Participatory approach*: Another important element for successful health communication is the adoption of a participatory approach that enhances the activation of the target. A prescriptive "medical" and logical approach to preventive education can be ineffective in promoting behavioral change and a "top-down" passage of preventive information, from an expert to laypeople results in poor engagement (Warren, 2004; Crosier et al., 2015). It may also raise psychological resistance and reactance in the target population (Bigi, 2016). Being conscious of this communication risk, we configured the *#I-am-engaged-campaign* as an "engaging campaign" inspired by the concept of people's participation in health prevention and aiming to foster individual psychological engagement. The campaign adopted a participative co-design during its development, involving key experts and stakeholders in health engagement promotion to ensure that the communicative style and tone of voice aligned with the cultural and social context. This enabled the construction of a solid base of collaboration for the dissemination of the campaign. In particular, the different stakeholders were involved both in patronizing the initiatives and in spreading them to their networks, but also in contributing with video testimonials aimed at making daily prevention the health engagement principles more concrete and applicable. Finally, the Facebook campaign disseminated the Vademecum principles (still in progress) and also aimed to reach further stakeholders and the general public through the hashtag *#I-am-engaged*.

Although the campaign is still ongoing at the time of this submission and social media feedback about its launch is partial, there have been some interesting achievements in terms of audience reach. In addition to the high number of people reached and the levels of social media engagement we achieved on Facebook and LinkedIn, other indicators of success were: (a) the mention of the campaign in the newsletter of Regione Lombardia;[2] (b) the mention of the Engagement Vademecum and related campaigns among the inspiring principles of the "Seven Steps" guidelines, launched by the Higher Ministry Of Health in Italy;[3] and (c) the interest of an important media partner in Italy (Radio24, in its program "Obiettivo Salute")[4] who partnered with the research team to adapt the campaign and Vademecum principles for radio.

There were also several limitations to this study. First, no data on effectiveness are provided for the campaign. This, however, is a common limitation of social marketing campaigns, launched under the pressure of an emergency to sensitize and inform audiences. Evaluating the impact of social marketing aimed at sustaining changes in health behavior is methodologically challenging due to the many intervening factors that can influence outcomes in a real world environment (Firestone et al., 2017; Veríssimo et al., 2018). Further data regarding the impact of our campaign will be collected in the coming months, both in terms of audience reach and engagement, and in terms of qualitative feedback and levels of appreciation. Due to the current contingency measures related to the pandemic, a structured pre-post evaluation of the campaign's impact on the audience's behaviors was not possible. However, future data and feedback about likes from the audience will be important for optimization and personalization, targeting specific population groups (e.g., young people, senior citizens, and so forth). Another potential limitation of the campaign is that it delivers a generalized message aimed at a preliminary sensitization of the population about the importance of engagement. The campaign was based on the analysis of the Italian situation and it will also be necessary to evaluate the transferability of the campaign to other countries characterized by different socio-cultural settings and health policies in the management of COVID-19.

Apart from these limitations, the case of the *#I-am-engaged* campaign is valuable in its conceptual and participatory structure and might potentially contribute to promoting public sensitization and awareness about COVID-19 prevention. The campaign appears to be a particularly valuable way to use social media platforms to foster exchange and Facebook campaigns shared and created a dialogue between scientists and the lay public about topics relevant to the COVID-19 emergency. This developmental process and its key features are potentially innovative and helpful when facing viral emergencies such as COVID-19.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethical Commission – Department of

[2]https://www.promozionesalute.regione.lombardia.it/wps/portal/site/promozione-salute/dettaglioredazionale/temi/stili-di-vita/buone-pratiche-resto-acasa

[3]http://www.salute.gov.it/portale/nuovocoronavirus/dettaglioNotizieNuovoCoronavirus.jsp?lingua=italiano&menu=notizie&p=dalministero&id=4689

[4]https://www.radio24.ilsole24ore.com/programmi/obiettivo-salute

Psychology, Università Cattolica del Sacro Cuore Milano. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

GG conceived the manuscript structure, supervised the project and campaign development, and drafted the methodology. GG and CB drafted the background, the description of the campaign, and the discussion. SB drafted the survey results. MS and MB drafted the analysis of the first launch of the campaign and contributed to the campaign project as a whole. All authors revised the text and approved the final version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.567101/full#supplementary-material

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Is It Just About Physical Health? An Online Cross-Sectional Study Exploring the Psychological Distress Among University Students in Jordan in the Midst of COVID-19 Pandemic

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Background: Since the spread of COVID-19 on a global scale, most of efforts at national and international levels were directed to mitigate the spread of the disease and its physical harm, paying less attention to the psychological impacts of COVID-19 on global mental health especially at early stages of the pandemic.

Objectives: This study aimed to assess and explore (i) The levels of psychological distress and its correlates (ii) Motivation for distance learning (iii) Coping activities and pandemic related concerns, among university students in Jordan in the midst of COVID-19 pandemic.

Methods: A cross-sectional study was conducted using an online self-administered questionnaire. The measure of psychological distress was obtained using the 10-item Kessler Psychological Distress Scale,while other questions have explored our study's second and third aims.

Results: A total of 381 completed questionnaires were included in the analysis. Female participants slightly predominated the sample (n = 199, 52.2%). The respondents aged 18–38 years (mean 22.6 years, SD: 3.16). Concerning distress severity, most of respondents were regarded as having severe psychological distress (n = 265, 69.5%). 209 students (54.9%) reported that they had no motivation for distance learning. Ordinal logistic regression revealed a significant correlation between distress severity and many predictors. Among the predictors that were found to act as protective factors against higher levels of distress included older age (aOR = 0.64, P = 0.022; 95% CI: 0.44–0.94), and having a strong motivation for distance learning (aOR = 0.10, P = 0.048; 95% CI: 0.01–0.96).In contrary, being a current smoker (aOR = 1.99, P = 0.049; 95% CI: 1.10–3.39), and having no motivation for distance learning (aOR = 2.49, P = 0.007; 95% CI: 1.29–4.80) acted as risk factors for having higher levels of psychological distress among the students.The most common coping activity reported was spending more time on social media platforms (n = 269, 70.6%), and 209 students (54.9%) reported distance learning as their most distressing concern.

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Conclusion: The COVID-19 pandemic and related control measures could impact the mental health of individuals, including students. We recommend a nationwide psychological support program to be incorporated into Jordan's preparedness plan and response strategy in combating the COVID-19 pandemic.

Keywords: COVID-19 pandemic, Jordan, university students, psychological distress, kessler distress scale

INTRODUCTION

COVID-19 is a highly transmissible respiratory disease caused by a new type of human coronaviruses; SARS-CoV-2 (Al-Tammemi, 2020). Since its discovery in late December 2019, the disease has spread widely across many countries and territories on a global scale. As of September 20,2020 more than 30 million confirmed cases, and over nine hundred thousand confirmed deaths across 216 countries and territories were attributed to the COVID-19 (World Health Organization [WHO], 2020).

Epidemics and outbreaks can pose profound impacts on physical health, mental health as well as the global economy resulting in disruptions of humans' daily life (Chakraborty and Maity, 2020). The containment measures that were adopted by many countries worldwide in combating the COVID-19 such as quarantine, countries' lockdown, travel restrictions, physical distancing, social isolation as well as local restrictions on individuals' mobility, can lead to a significant burden on mental health causing emotional and behavioral changes (SAMHSA., 2014; Brooks et al., 2020; Cao et al., 2020; Center for the Study of Traumatic Stress, 2020; Holmes et al., 2020).

In addition, the psychological impacts of outbreaks are considered a threat not only on individuals with pre-existing psychiatric illness but also on those who are free of any psychiatric condition (Ho et al., 2020). The fear of an epidemic can afflict individuals irrespective of their gender, age, race, or socioeconomic status. Anxiety, insomnia, anger, loneliness, fear, shame, helplessness, blame, guilt, and stigma were all found to be present during infectious diseases' outbreaks (Ho et al., 2020; Ornell et al., 2020). Different psychiatric conditions, including depression, panic attacks, Post Traumatic Stress Disorder, and even suicidality, were also reported to be associated with outbreaks, especially in younger age groups (Ho et al., 2020).

In epidemics, certain groups in the society such as older people, children, health care workers, infected patients, patients with pre-existing psychiatric conditions and students are at a greater risk of suffering from a significant degree of psychological pressure and stress compared to other individuals (Ho et al., 2020). It is essential to gather information about the impacts of the COVID-19 pandemic on the mental health of the general population and specific vulnerable groups, and this will help in developing appropriate interventions that would mitigate such pandemic's adverse effects (Holmes et al., 2020). Since the beginning of the COVID-19 pandemic, most of the global efforts act on the biological and physical aspects of the pandemic in order to limit its spread within the communities. However, much less attention was paid to the mental health risks of the COVID-19 pandemic especially at early stages of the pandemic.

Jordan is amongst the countries that have been struck by the COVID-19 pandemic, and in response to that, many preventive and control strategies were enforced by the government to retard the viral spread in the country. One of Jordan's public health responses during early stages of the pandemic was declaring the closure of all schools and higher academic institutions with shifting to online remote learning since the middle of March 2020 (Al-Tammemi, 2020; Jordanian Ministry of Health., 2020; Prime Ministry of Jordan, 2020). The COVID-19 pandemic along with the disruptions that happened in various sectors including the academic sector has forced the students to live in a new experience at both academic and personal levels. Consequently and in light of limited literatures that assessed mental health status of university students in Jordan, our present study aimed at (i) Exploring the level of psychological distress and its correlates amongst university students during the COVID-19 pandemic (ii) Evaluating the students' motivation for distance learning and, (iii) Exploring coping activities and major pandemic related concerns from students' perspective.

MATERIALS AND METHODS

Study Design and Participants

A cross-sectional study was conducted in May 2020, using an online self-administered questionnaire of closed-ended questions. The participants in our study were recruited through social media platforms employing a convenience sampling strategy. The questionnaire was distributed across seven randomly selected Facebook groups of university students in Jordan and academic groups on WhatsApp messenger for a duration of one day. These social media groups were created by students as a tool for general and academic communication within the students' community and involved students who are currently enrolled in different study programs and levels at various academic institutions in Jordan. The students who were available and voluntarily willing to be involved in the study could open a link to get an information letter about the study, eligibility criteria, and informed consent as a prerequisite to proceed in participation. Considering the nature of the web-based Google form surveys, the students were instructed to fill out the questionnaire with probity after fullfilling the eligibility criteria, consenting on voluntary participation and filling it only once. We did not provide any form of compensation to the participants upon their involvement in our study.

We decided to carry out this study using an internet-based survey due to the current pandemic crisis and the national strict measures on the face to face communication coupled with the

closure of all academic institutions in Jordan at the time of data collection. In addition, using the internet and social media for the recruitment and sampling procedures in this study has shown to be an effective and time-efficient method to reach inaccessible potential participants from different Jordanian regions by eliminating any geographical boundaries. A recent systematic review of 109 published articles that aimed at evaluating the use of social media such as Facebook for recruitment of research participants in various psychological and medical studies came into evidence, which supported the effectiveness and efficiency of this strategy (Thornton et al., 2016).

For a student to be able to participate in this study, all the following eligibility criteria were implemented:

1. Age $\geq$ 18 years.
2. Residing in Jordan during the pandemic crisis.
3. Active enrollment in an undergraduate or postgraduate study at a Jordanian University.

Instruments and Measures

The online questionnaire was created using *Google Forms* provided by Google^{TM} and was constructed in modern standard Arabic. The questionnaire consisted of three sections, with a total of 24 questions. The first section comprised of seven questions about sociodemographic information including age, gender, region of residence, study level, type of academic institution, marital status, and smoking status along with two questions about any history of pre-existing psychiatric conditions and related medication use.

The second section included an Arabic version of the 10-item Kessler Psychological Distress Scale (K10). This Arabic version was translated from the original English version by a team of linguistic experts from multiple Arab countries (Egypt, Libya, Lebanon, and Tunisia) in addition to Arab experts in Psychology in the United States. The Arabic version is provided by Harvard Medical School on the webpage of the National Comorbidity Survey (2013).

The 10-item Kessler Psychological Distress Scale (K10) is an internationally validated tool for simple and rapid assessment/screening of non-specific psychological distress in which 10 questions with 5-point Likert scale responses are present (Andrews and Slade, 2001; Kessler et al., 2002; Fassaert et al., 2009; Easton et al., 2017). On a sample of Arabs, the Arabic version of the 10-item Kessler Psychological Distress Scale (K10) has shown satisfactory psychometric properties with high internal consistency and reliability (Cronbach's α = 0.88) (Easton et al., 2017).

The questions of the 10-item Kessler Psychological Distress Scale (K10) are:

Question 1 (Q1). "During the last 30 days, about how often did you feel tired out for no good reason?"
Question 2 (Q2). "During the last 30 days, about how often did you feel nervous?"
Question 3 (Q3). "During the last 30 days, about how often did you feel so nervous that nothing could calm you down?"
Question 4 (Q4). "During the last 30 days, about how often did you feel hopeless?"
Question 5 (Q5). "During the last 30 days, about how often did you feel restless or fidgety?"
Question 6 (Q6). "During the last 30 days, about how often did you feel so restless you could not sit still?"
Question 7 (Q7). "During the last 30 days, about how often did you feel depressed?"
Question 8 (Q8). "During the last 30 days, about how often did you feel that everything was an effort?"
Question 9 (Q9). "During the last 30 days, about how often did you feel so sad that nothing could cheer you up?"
Question 10 (Q10). "During the last 30 days, about how often did you feel worthless?"

The response choices with their correspondence score weights are *None of the time* (1 point), *A little of the time* (2 points), *Some of the time* (3 points), *Most of the time* (4 points), and *All the of time* (5 points). With having 10 questions and five weighted responses as previously described, the total minimum and maximum scores for the Kessler distress scale (K10) are 10 and 50, respectively. As per the scale's guide, **Q3** and **Q6** were not asked in our study and were automatically scored as one point if the preceding questions **Q2** and **Q5** were answered as *None of the time*.

The severity of psychological distress was then categorized into four groups as the following based on the total K10 distress score for each participant: 10–19 = no psychological distress, 20–24 = mild psychological distress, 25–29 = moderate psychological distress, and 30–50 = severe psychological distress (Andrews and Slade, 2001).

The third section of the questionnaire included five questions about the following topics: one question about *coping activities during COVID-19 pandemic and the nationwide curfew in Jordan*. This question included a list of 13 activities from which the students were able to choose all that applies to their situation and to add any activity that was not listed among the choices using the option *"others, please specify."* Most of the listed activities were suggested by the authors and few others were adapted from another resource (USCF, 2020).Amongst these activities were spending more time on social networking platforms, talking to friends, watching television, more engagement with family, listening to music, practicing sports at home, studying and preparing for exams, increase smoking, reading Books/novels, meditation, herbal drinks, practicing Yoga, talking to a psychological counselor and others. Two questions about *the use of medications to cope with COVID-19 related distress,* in which one of the questions was with yes/no response to know whether the student used a medicinal drug to cope with pandemic distress or not and if yes, to report the frequency of usage, while the other question included different classes of medications with examples on most common trade names in each class and the students could add any medication that was not listed using the option *"others, please specify."* Additionally, one question about *students' motivation for online distance learning*, using a single-answer item with responses as no motivation, low motivation, moderate motivation, and strong motivation, and lastly, a question about

major pandemic related concerns as perceived by the students. This question was a single-answer question with five response choices including being infected by COVID-19, online distance learning, the economic impacts of the COVID-19 pandemic, curfew and social isolation, and other concerns.

The questionnaire was piloted on 10 students who were approached by the first author to test the phrasing, suitability, and understandability of the questions. The responses from these 10 students, as well as incomplete questionnaires, were excluded from the analysis.

Data Management and Analysis

Completed questionnaires were extracted from Google Forms as an Excel sheet and were then incorporated into STATA IC 16.1 (StataCorp LLC., Texas, United States). Descriptive analysis and summary statistics were used in which numerical variables were described as mean and standard deviation, while categorical variables were described as frequency and percentage. In addition, non-parametric tests were used including Wilcoxon Rank-Sum test to compare the mean of total K10 distress scores between males and females while Spearman's rank correlation to test the relationship between age and total K10 distress scores. Besides, ordinal logistic regression was employed to assess the correlation between psychological distress severity (outcome variable with ordinal responses) and other independent sociodemographic predictors. The confidence level was set at 95% and a *P*-value less than 0.05 was considered statistically significant.

Ethical Considerations

The study was conducted according to the *Declaration of Helsinki*. Ethical approval was granted by the Institutional Review Board at Al-Zaytoonah University of Jordan. Besides, the questionnaire ensured the privacy and confidentiality of participants by not asking any questions about names, phone numbers, physical addresses, or emails; thus, all participants were anonymous. Also, an information letter was incorporated into the first page of the questionnaire and included explicit information about the researchers and their affiliations, the study description and objectives, eligibility criteria for participation, voluntary participation and withdrawal, benefits and risks, privacy and confidentiality aspects, data handling, as well as the contact details for any enquiry. Furthermore, at the end of the information letter, electronic informed consent was requested from participants as a prerequisite to join the survey voluntarily.

RESULTS

Respondents' Characteristics

A total of 397 questionnaires were received, and 16 were excluded due to incompleteness. So, the remaining 381 were included in our analysis. There was a slight predomination of female participants (n = 199, 52.2%) compared to male participants (n = 182, 47.8%). The mean age was 22.6 years (SD = 3.16) and ranged between 18–38 years. The vast majority of participants were single (n = 352, 92.4%), undergraduates (n = 323,84.8%), studying at governmental/public universities or colleges (n = 209, 54.9%), living in the central region of Jordan (n = 302, 79.3%), currently non-smokers (n = 267,70.1%) as well as with no history of pre-existing psychological or mental illness (n = 366, 96.1%). More details about the sociodemographic characteristics of the respondents are provided in **Table 1**.

TABLE 1 | Sociodemographic characteristics of the Respondents (n = 381).

Variables	Results
Sex	
Male	***n*=182 (47.8%)**
Female	***n*=199 (52.2%)**
Age (Mean, SD)	**22.6, 3.16**
18–22	***n*= 208 (54.6%)**
23–27	***n*=142 (37.3%)**
28–32	***n*=22 (5.8%)**
33–38	***n*=9 (2.3%)**
Marital Status	
Single	***n*=352 (92.4%)**
Married	***n*=29 (7.6%)**
Region of residence	
Northern governorates	***n*=60 (15.7%)**
Central governorates	***n*=302 (79.3%)**
Southern governorates	***n*=19 (5.0%)**
Smoking Status	
Current Smoker	***n*=117 (29.9%)**
Currently non-smoker	***n*=267 (70.1%)**
Academic Institution	
Public university/college	***n*=209 (54.9%)**
Private university/college	***n*= 172 (45.1%)**
Study Level	
Undergraduate	***n*=323 (84.8%)**
Postgraduate	***n*=58 (15.2%)**
History of pre-existing psychiatric conditions	
Yes	***n*=15 (3.9%)**
No	***n*=366 (96.1%)**
Current use of medications among the 15 students who reported a history of pre-existing psychiatric conditions	
Yes	***n*=8**
No	***n*=7**

Kessler Psychological Distress Scale (K10) Results

The total K10 distress scores had a mean of 34.2 (SD = 9.4). The mean K10 distress score was slightly higher among women (mean = 34.7, SD = 8.56) compared to men (mean = 33.7, SD = 10.3); however, Wilcoxon Rank-Sum test showed that this difference is statistically insignificant (P = 0.566). Concerning age, Spearman's rank correlation test revealed a statistically significant inverse relationship between age and total K10 distress score (Rho = -0.1645, P = 0.001), which indicates that younger age groups were more likely to have higher total K10 distress scores; thus, more distress (**Figure 1**).

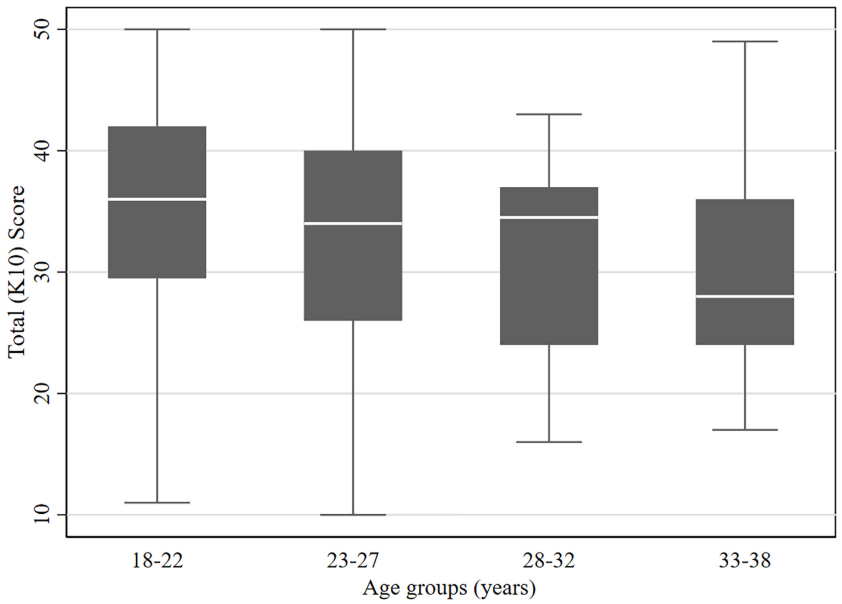

FIGURE 1 | The levels of total K10 distress scores among different age groups of the respondents.

TABLE 2 | The severity of Psychological distress among respondents based on K10 distress scale's categorization.

K10 Psychological Distress Category	Total K10 Score range	Frequency (*n*)	Percentage (%)
No Distress	**10–19**	27	7.1
Mild Distress	**20–24**	41	10.8
Moderate Distress	**25–29**	48	12.6
Severe Distress	**30–50**	265	69.5
Total		**381**	**100**

Regarding psychological distress severity categorization and based on K10 scale's categories described earlier in study instrument, most of respondents were regarded as having severe psychological distress (n = 265, 69.5%), followed by moderate psychological distress (n = 48, 12.6%), mild psychological distress (n = 41, 10.8%), and no psychological distress (n = 27, 7.1%). **Table 2** and **Figure 2** show more descriptive results of the K10 distress scale by severity level and gender.

Ordinal logistic regression was employed to assess the correlation between distress severity (ordinal outcome variable) and other sociodemographic predictors, however, considering our sample size (n = 381) and in order to achieve sufficient statistical power for the regression test, we have merged *no distress* and *mild distress* in one ordinal category as well as *moderate distress* and *severe distress* together in another ordinal category. Therefore, we had an ordinal outcome variable with two severity levels/categories. After that, we tested each independent variable against the outcome variable. All independent variables that had a P value less than 0.25 in univariable regression were included in the final ordinal logistic regression model. The regression model revealed a significant correlation between distress severity and some predictors. Among the predictors that were found to act as a protective factor against higher levels of distress were *older age* (aOR = 0.64, P = 0.022; 95% CI: 0.44–0.94), and having a *strong motivation for distance learning* (aOR = 0.10, P = 0.048; 95% CI: 0.01–0.96).In contrary, being *a current smoker* (aOR = 1.99, P = 0.049; 95% CI: 1.10–3.39), and having *no motivation for distance learning* (aOR = 2.49, P = 0.007; 95% CI: 1.29–4.80) acted as risk factors for having higher levels of psychological distress among the students. The detailed results of original logistic regression are presented in **Table 3**.

The Motivation for Distance Learning

Surprisingly, a significant proportion of the students have reported that they had *no motivation at all* toward the online distance learning (n = 209, 54.9%), and as described earlier, students with no motivation for distance learning were more likely to suffer from higher degrees of psychological distress (aOR = 2.49, P = 0.007; 95% CI: 1.29–4.80). **Table 4** and **Figure 3** demonstrate more descriptive details about the motivation for distance learning.

Coping Activities and Concerns During the COVID-19 Pandemic

The students have selected many coping activities that the they frequently practiced during the nationwide curfew in Jordan. Interestingly, the responses with highest frequencies were *spending more time on social networking platforms like Facebook and Instagram* (n = 269, 70.6%), *talking to friends on mobile phones and internet* (n = 217, 57%), *watching television and movies* (n = 210, 55.1%), *more engagement with family* (n = 202, 53%), and *listening to music* (n = 162, 42.5%). More details about these activities are provided in **Table 5**.

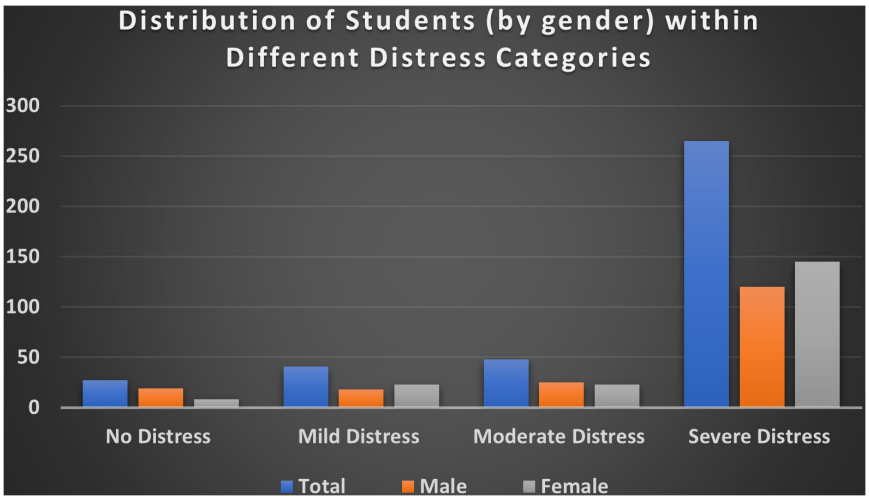

FIGURE 2 | Distribution of students (by gender) within different distress categories based on the overall K10 score for each student.

TABLE 3 | Results of Ordinal Logistic Regression for the correlation between psychological distress severity and independent predictors.

Predictors	Crude OR [95% CI]	*P*-value	Adjusted OR [95% CI]	*P*-value
Age	0.67 [0.50–0.90]	0.008	0.64 [0.44–0.94]	**0.022**
Gender				
Female	**Reference**		**Reference**	
Male	0.67 [0.40–1.1]	0.141	0.56 [0.30–1.03]	0.063
Smoking				
No	**Reference**		**Reference**	
Yes	1.48 [0.81–2.72]	0.206	1.99 [1.10–3.39]	**0.049**
Study Level				
Postgraduate	**Reference**		**Reference**	
Undergraduate	0.59 [0.26–1.36]	0.216	0.53 [0.17–1.64]	0.272
University/College				
Private	**Reference**		**Reference**	
Public	1.96 [1.15–3.34]	0.013	1.43 [0.74–2.77]	0.287
Motivation for distance learning				
Low	**Reference**		**Reference**	
No	2.62 [1.40–4.93]	0.003	2.49 [1.29–4.80]	**0.007**
Moderate	0.99 [0.49–2.02]	0.983	1.27 [0.59–2.73]	0.535
High/Strong	0.08 [0.01–0.76]	0.028	0.10 [0.01–0.98]	**0.048**

TABLE 4 | The degree of motivation for online distance learning among respondents.

Degree of motivation	Frequency (N)	Percentage (%)
No Motivation	209	54.9
Low Motivation	98	25.7
Moderate Motivation	69	18.1
Strong Motivation	5	1.3
Total	**381**	**100**

In addition, among the 381 respondents, 332 students (87.1%) reported no use of any medications during the last 30 days for coping with the distress accompanied the COVID-19 pandemic and the nationwide curfew, while 49 students (12.9%) reported the use of various types of medications at different frequencies with occasionally (1–2 times in a month) as the most common frequency. Sedative hypnotics (38%) reported being on the top of the used medications followed by others (28%), which included over-the-counter medications like Paracetamol and other simple analgesics. More details are demonstrated in **Figures 4**, **5**, and **Table 6**.

Moreover, 209 students (54.9%) reported that *online distance learning* was the highest and most serious issue of concern, followed by 75 students (19.7%) who reported *curfew and social isolation* as their highest issue of concern. Unexpectedly, only 53 students (13.9%) reported *being infected by COVID-19* as their most serious concern. **Figure 6** for more illustration.

DISCUSSION

In our study, the vast majority of the students (92.9%) suffered from different levels of psychological distress ranging from mild to severe degrees during the COVID-19 pandemic. The psychological wellbeing of university students in the midst of the current pandemic has been established and reported in recently published literatures as well. A recent study which was conducted by Cao et al. (2020) in China and aimed at exploring the psychological impact of COVID-19 on college students using

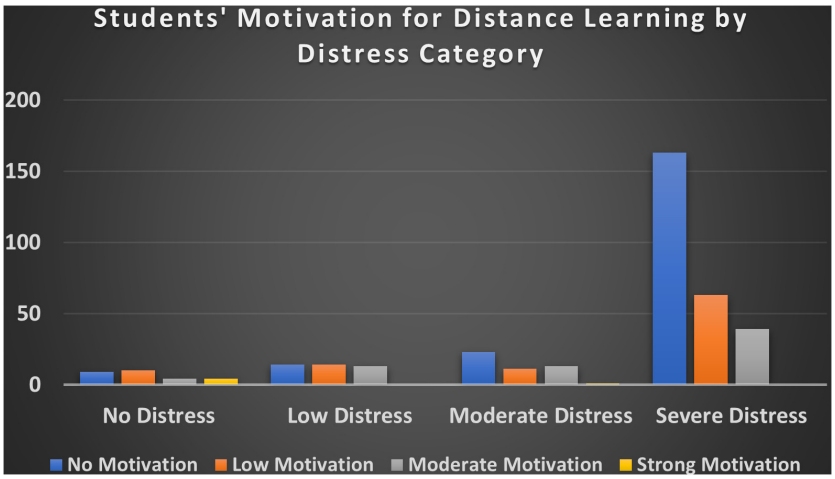

FIGURE 3 | Students' Motivation for Distance Learning per Distress Category.

TABLE 5 | Coping activities during the COVID-19 pandemic and the nationwide curfew in Jordan among the respondents.

Coping activity	Frequency (*n*)	Percentage (%)
Spending more time on social networking platforms like Facebook and Instagram	269	70.6
Talking to friends on mobile phones and internet	217	57
Watching television and movies	210	55.1
More engagement with the family	202	53
Listening to music	162	42.5
Practicing sports at home	113	29.7
Studying and preparing for exams	102	26.8
Increase smoking	69	18.1
Reading Books/Novels	68	17.8
Meditation	58	15.2
Herbal drinks	57	15
Practicing Yoga	6	1.6
Talking to a psychological counselor	6	1.6
Others	33	8.7

the 7-item Generalized Anxiety Disorder Scale (GAD-7) has revealed that 24.9% of students suffered from anxiety during this pandemic with a positive association of the level of anxiety with different economic and academic stressors (Cao et al., 2020). Similar to Cao et al. (2020) study, our study found that there was no significant difference in the total psychological distress scores between men and women. In addition, Cao et al. found that social support was negatively associated with anxiety status among students, and we have that as one of our most reported coping mechanisms, i.e., socialization through social networking sites. Nevertheless, in our study, age was statistically and significantly associated with distress severity; i.e., the younger the age, the more likely to suffer from higher levels of psychological distress. The difference in distress proportions between our study (92.9%) and Cao et al study (24.9%) could be attributed to the use of different scales, i.e., GAD-7 vs. K10 as well as the sample size. In addition, we carried out the survey in a period close to final examinations, which might have had an additional negative impact on the students' psychological status.

Additionally, a recent study by Olaimat et al. (2020) was conducted to assess attitudes, anxiety, as well as behavioral practices among university students in Jordan amidst the COVID-19 pandemic using an online survey developed by the authors to serve their study objectives. The study has found that 69.2% of participants reported being anxious as a result of fear of infection by COVID-19 and resultant disruptions in their lives. Among the predictive factors that affected the students' anxiety levels were age, gender and academic discipline of their study programs. Older students and female students were found to have more anxiety due to the fear of infection. However, in our present study the mean total K10 distress score was higher among women compared to men, but this difference in means was statistically not significant. In contrary, older age was amongst the protective factors against higher levels of psychological distress in our present study.

Moreover, a cross sectional study was conducted in Turkey which aimed at assessing anxiety status of university students using an online survey. The measure of anxiety levels were obtained using the Turkish version of abbreviated Beck Anxiety Inventory. The study has found that 44% of students reported a moderate level of worrisome and fear of catching COVID-19, while 80% of students reported a 'severe level' of scare and worries about their close relatives' health. The authors expected that the high levels of anxiety among the students in their study could be attributed to shifting to online learning along with other pandemic control measures such as social isolation and financial constraints (Akdeniz et al., 2020). Similarly, the aforementioned worries were also reported by the students in our study as part of their major concerns during the COVID-19 pandemic.

Furthermore, Stress and anxiety were assessed in France among university students during the current pandemic.

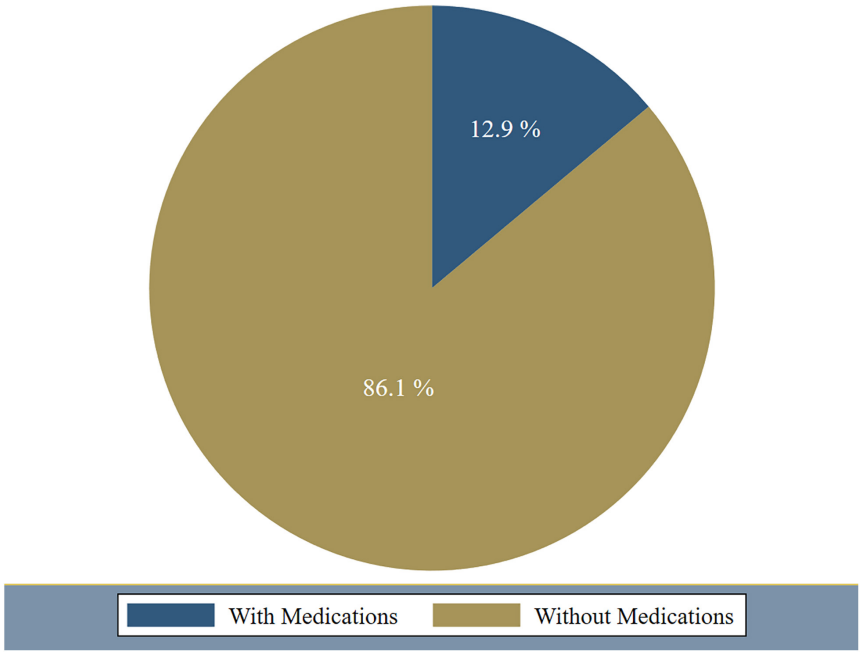

FIGURE 4 | Reported medication use for coping with the COVID-19 related psychological distress among respondents (percentage).

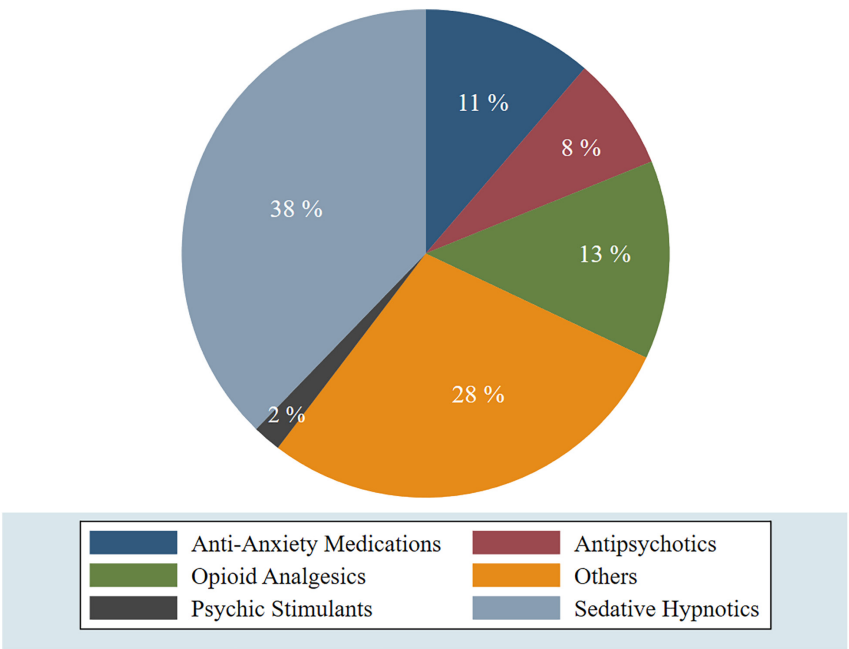

FIGURE 5 | Types of medications that were used by 49 students for coping with the COVID-19 induced psychological distress.

University students were asked to complete the World Mental Health International College Student survey which was distributed as an online survey. Among the 291 participants in the study, the majority of them experienced significant proportions of psychological distress of which 60.2% of students reported escalation of their anxiety to moderate-severe levels during the COVID-19 pandemic. However, 82.2% of the students in our study reported moderate to severe distress. This difference in distress proportion could be as a result of different scales used and cross-cultural factors. In the same study, the researchers found significant factors that affected the students' anxiety level including the economic situation of the students, and the

TABLE 6 | Medicinal drugs' usage frequency among the 49 students who reported the use of different medications in response to the COVID-19 induced distress.

Frequency of usage	Number of students	Percentage (%)
1–2 times in a month	17	34.7
1–2 times in a week	13	26.5
3–4 times in a week	10	20.4
Everyday	9	18.4
Total	**49**	**100**

disruptions in students' life (Husky et al., 2020). These factors were also reported in our study as pandemic induced concerns as perceived by the students. However, in our study, we have not collected data about the students' or their families financial status; thus we could not consider it in our regression analysis to examine its influence on the distress levels.

Jordanian universities have been taking humble attempts to implement distance learning into their educational system since 2015. Nevertheless, this strategy has been considered as a "challenging pedagogy" of the learning system in the country due to many obstacles (Al-Jaghoub et al., 2009; Atoum et al., 2017; Al Nawas, 2020). During the COVID-19 pandemic and after realizing the need to implement an emergency distance learning strategy, more serious steps were taken by decision makers at higher education sector and the Jordanian universities trying to guarantee a smooth shifting process coupled with ensuring a quality education as well. Besides, psychological distress was reported to be associated with distance learning and working from homes during the current pandemic. A recent qualitative study has addressed many of the distance learning's challenges including personal, technological, course-related as well as cultural challenges (Almaiah et al., 2020).These challenges might explain why most of the students (n = 209, 45.9%) in our study resported the lack of motivation for distance learning, especially within the Jordanian context where most of educational activities were used to be delivered by in-person attendance to universities/colleges with less attention to distance learning.

Besides, smoking exhibited a risk factor for suffering from higher levels of psychological distress among the students in our study, and this could be explained by the *bi-directional* relationship between smoking and mental wellbeing as addressed previously in a longitudinal study in Australia (Leung et al., 2012). Emotional and behavioral reactions toward the COVID-19 pandemic could vary. The type of coping strategy and the extent of adopting it also differs between individuals. In the present study, some students (12.9%) reported the use of various medicinal drugs as a result of pandemic induced distress. Although the figure is small but this raises a concern about the psychosocial response of some individuals in response to crisis which might lead to a risky behavior such as substance abuse. Therefore, more serious efforts should be done to spread awareness about healthy coping styles among different social components of the community (Pfefferbaum and North, 2020).

To the best of our knowledge, this is the first study in Jordan to assess the psychological distress among university students using the 10-item Kessler Psychological Distress Scale (K10) during the COVID-19 pandemic. In addition, this study is amongst the limited literatures to highlight the distressing concerns brought about by online distance learning on university

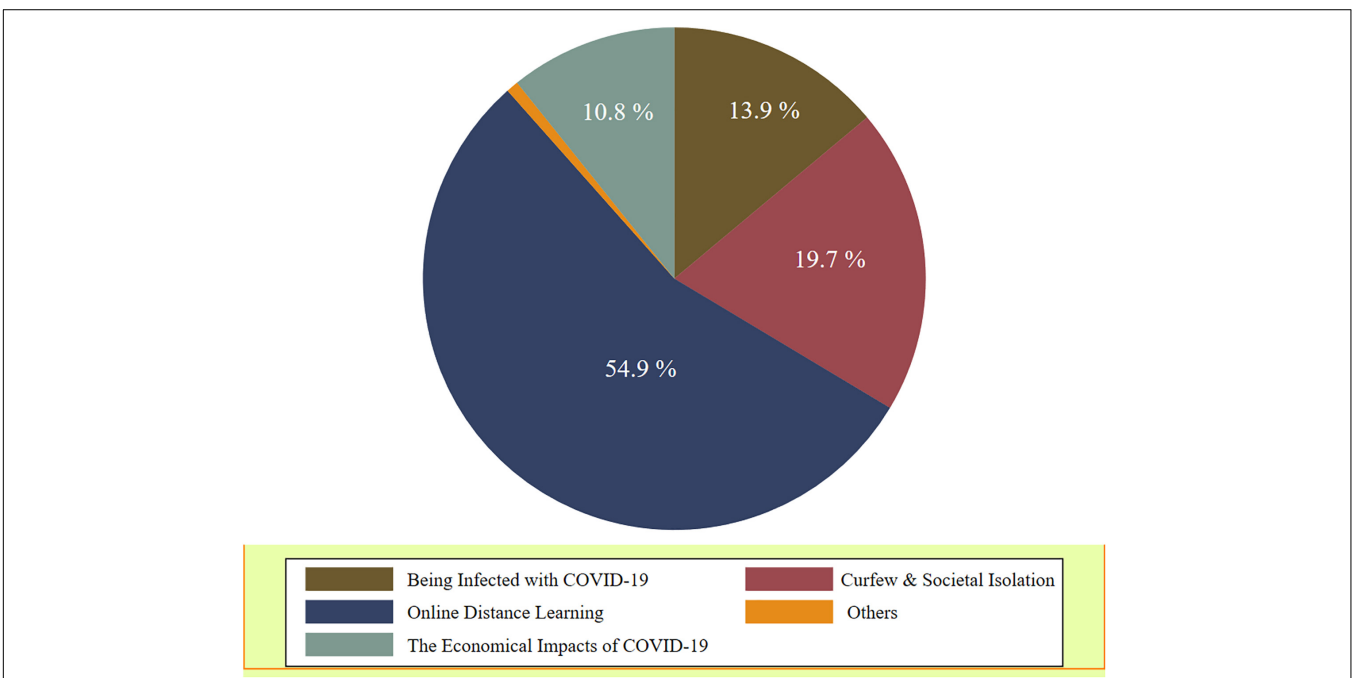

FIGURE 6 | The issue of the greatest concern as perceived by the 381 students (percentage).

students in Jordan. Still, there are limitations that should be carefully taken into consideration when interpreting the results including (i) using a non-probabilistic convenience sampling, which affects the representativeness of our sample and limits the generalizability of our results. However, this sampling strategy was believed to fit in lieu of the circumstances of the nationwide curfew, the closure of all universities and colleges in the country and shifting to online platforms at the time of our data collection (ii) the majority of respondents were undergraduates; we could have seen different results if our sample had more postgraduate students, (iii) We had a relatively small sample size which could be attributed to the limited period of data collection. There was a technical difficulty to follow up the survey and keep it visible to students within social media groups due to the large number of academic enquiries posted on these groups; thus, enforced our survey link to lose its visibility among the numerous recent posts. Also, the busy schedule of students (in the midst of a new distance learning strategy) might have affected their interests to participate in the survey (iv) The survey represented self reported states thus, over reporting or underreporting of psychological status could be expected, (v) The inherent limitation of cross-sectional studies which prevent assessing temporality of events i.e., psychological distress could be present prior to the pandemic and just escalated during it, and lastly, (vi) We missed the perspectives of non-Arabic speaking students in Jordan as the questionnaire was designed in Arabic only. Nevertheless, findings from our study shed the lights on various degrees of psychological distress that the university students have experienced during the current pandemic, and they could be considered as a vulnerable group. Also, the findings of our study encourage for further follow up research on this topic using a nationally representative sample of university students with more specific scales for psychological distress symptoms.

The results of this study provide new insights to direct policy makers and decision makers in the fields of higher education, as well as mental health. More attention and monitoring of college students' mental health should be sought. Since distance learning was the highest reported concern among students, faculty members should implement effective methods to make distance learning more interactive and students friendly. Psychological interventions should be implemented by psychologists and psychiatrists to provide guidance, psychoeducation, and mental health counseling to university students. There should be more active involvement with students' psychological health, coupled with educating them on how to deal with psychological distress during unprecedented situations like the current pandemic.

At the current circumstances of COVID-19 preventive measures in Jordan (distance learning strategy and physical distancing), psychological support could be provided to university students through publicly available online videos, television programs, and online/phone consultations. Also, mental health support could be provided through a hotline service to provide students with instructions about dealing with their academic stressors and other related mental health issues during this pandemic.

Moreover, efforts should be made to improve communications with college students' and guide them on how to access only evidence-based information from reliable resources about the pandemic. Besides, a comprehensive nationwide psychological support program should be developed and incorporated into Jordan's response strategy in combating the COVID-19. Future studies should assess the effect of implementing these suggested interventions on students' mental health. Furthermore, as the levels of psychological distress are expected to be dynamic over the upcoming period, it is wise to monitor and assess the impact of easing up the governmental restrictions, i.e., ending the curfew and returning to on-campus teaching, on the levels of psychological distress and anxiety among university students in Jordan.

CONCLUSION

The control and preventive measures that are implemented during the COVID-19 pandemic resulted in a severe disruption of various human life activities. The fear of the infection itself, along with the strict public health measures could impact the mental health of individuals. Our study highlighted a significant psychological distress among university students in Jordan during the COVID-19 pandemic and its related control measures. A significant proportion of the students were highly concerned about and distressed by the distance learning strategy; thus, prompt actions should be taken to improve the distance learning experience and solve any associated technostress. In addition, a nationwide psychological support program should be incorporated into Jordan's preparedness plan and response strategy in combating the COVID-19 pandemic and other crisis, considering students and other vulnerable groups in the community.

DATA AVAILABILITY STATEMENT

The dataset generated and analyzed for this study is available from the corresponding author on a reasonable request.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Institutional Review Board (IRB) at Al-Zaytoonah University of Jordan. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AA-T conceptualized the study, designed, prepared the questionnaire, and performed statistical analyses with inputs from AA and LA. AA-T and AA collected the data and wrote the discussion. LA wrote the introduction. AA-T wrote the methods, materials, and results. All authors have substantially and critically contributed to editing and revising the manuscript and providing critical feedback and approved the submission of this version of the manuscript.

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Perceived Social Support Protects Lonely People Against COVID-19 Anxiety: A Three-Wave Longitudinal Study in China

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The isolation necessary to prevent the spread of the coronavirus disease 2019 (COVID-19) can give rise to anxiety, especially for lonely people who often feel upset without others' company. Although isolated from others, people can still receive support from others, which might lower their COVID-19 anxiety. To examine the relationship between loneliness, perceived social support, and anxiety, we measured 222 Chinese participants' (54.50% female, M_{age} = 31.53, *SD* = 8.17) trait loneliness, chronic anxiety before the outbreak, COVID-19 anxiety at the peak and decline stages of COVID-19, and their perceived social support across the three time points. The results showed that people's perceived social support dramatically increased from the pre-pandemic to the peak COVID-19 stage, and remained stable during the decline of COVID-19 stage. In contrast, COVID-19 anxiety decreased from the peak to the decline stage. Further, perceived social support consistently moderated the relationship between loneliness with both chronic anxiety and COVID-19 anxiety. The current study provides initial evidence that perceived social support provides protection for lonely people in daily life as well as during unexpected disasters, which will contribute to finding ways to alleviate lonely people's anxiety during this global health crisis.

Keywords: social support, loneliness, COVID-19 pandemic, anxiety, longitudinal design

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INTRODUCTION

In January 2020, coronavirus disease-2019 (COVID-19) broke out and spread rapidly across the world within 2 months. On March 11th, the World Health Organization (WHO) declared COVID-19 as a pandemic (World Health Organization, 2020c). Up to the end of May 2020, there have been more than 5,560,000 confirmed cases and 351,000 deaths worldwide (World Health Organization, 2020b). As a global health crisis, the COVID-19 epidemic has threatened people's livelihoods and could give rise to greater anxiety (Bao et al., 2020; Galea et al., 2020).

Anxiety is an emotional state characterized by feelings of tension and apprehension, which reflect the complex emotional reaction under stressful situations (Spielberger et al., 1971). It is a common experience among both COVID-19 patients and the uninfected public (Holmes et al., 2020; Rogers et al., 2020). In China, a representative survey from 7,236 participants of various occupations reported that 35.1% of the sample had at least moderate

levels of anxiety symptoms during the outbreak period of COVID-19 (Huang and Zhao, 2020). Likewise, a representative community sample in the United Kingdom reported higher levels of anxiety and trauma symptoms during the COVID-19 period as compared to previous population studies (Shevlin et al., 2020). Similar results were also found in the US, India, and many other countries (Ford et al., 2020; Holmes et al., 2020; Othman, 2020; Roy et al., 2020).

To prevent the pandemic from spreading further, the World Health Organization (2020a) suggested that everyone maintain social distancing and avoid going to crowded places. In China, the government restricted all public transit from January 24th and shut down all non-essential companies and schools (Bureau of Disease Prevention and Control, 2020). In Italy, the government locked down the whole country and enforced a decree to prohibit people from public gathering (Pancani et al., 2020). Overall, billions of people sheltered in place to comply with home quarantine (Banerjee and Rai, 2020; Greenstone and Nigam, 2020). Being confined to the home can lead to deprivation of face-to-face communication, loss of social network size, and lower social contact frequency, which have been linked to increased anxiety (Bao et al., 2020; Brooks et al., 2020; Galea et al., 2020).

Isolation from others is particularly difficult for lonely people, who might often feel upset over the lack of others' company (Chen et al., 2012). People with high levels of loneliness have a subjective perception of the discrepancy between their desired and actual social relationships (Peplau and Perlman, 1982). According to the Loneliness Model (Hawkley and Cacioppo, 2010), lonely individuals suffer impairments in attention, cognition, behavior, and emotion systems, leading to poor mental health and disorders such as anxiety. Considering that lonely people might possess an excessive desire for social interaction, it is plausible that they might have more anxiety when being isolated from others during the COVID-19 pandemic (Spithoven et al., 2017; Armitage and Nellums, 2020; Holmes et al., 2020).

Though isolation may be challenging for lonely people in particular, they still have other opportunities, aside from face-to-face communication, to perceive other's support even while being isolated. In general, perceived social support might lower lonely people's anxiety as a positive psychological resource (Masten, 2001; Taylor and Broffman, 2011; Oh et al., 2014). According to the Salutogenic Model (Antonovsky, 1987), social support is one of the most important general resistance resources, which could prompt people to perceive their lives as predictable, controllable, and understandable, thus performing more adaptively in stressful situations. Similarly, the buffering hypothesis (Cohen and Pressman, 2004) suggests that social support might mitigate the negative effects of risk factors on adjustment. Indeed, recent evidence has shown that social support buffered the detrimental effects of acute stress reaction on COVID-19 anxiety among Chinese people (Guo et al., 2020). Hence, we predicted that social support might moderate the relationship between loneliness and COVID-19 anxiety, as well as chronic anxiety. Furthermore, we want to determine whether people's perceived social support would fluctuate with different development stages of the COVID-19 pandemic. If so, then we would examine whether the moderating effect of social support in the prediction of trait loneliness to COVID-19 anxiety remains robust across different stages of the COVID-19 pandemic.

The current study design involved the collection of three waves of data at the pre-pandemic, peak, and decline stages of COVID-19 in China to examine the relationship between loneliness, perceived social support, and anxiety. We aimed to examine: (1) whether perceived social support would moderate the relationship between trait loneliness and chronic anxiety in general; (2) whether perceived social support might fluctuate with the different stages of COVID-19 pandemic; and, if yes, and (3) whether perceived social support would moderate the relationship between trait loneliness and COVID-19 anxiety across peak and decline stages of the COVID-19 pandemic.

MATERIALS AND METHODS

Participants and Procedures

The present three-wave data belongs to a longitudinal project concerning the relationship between loneliness, perceived social support, and anxiety. After giving consent, participants filled out the questionnaire through a survey website[1], and were compensated with 12 yuan (approximately $2) each time. The procedures of the present study were approved by the institutional review board of Beijing Normal University.

We measured the participants' trait loneliness, perceived social support, and trait anxiety on January 3rd of 2020 when COVID-19 was not yet declared an emergent public health event. Then, we measured participants' perceived social support and COVID-19 anxiety in mid-February (February 13th–15th; Time 2, the peak stage of the pandemic in China) and mid-March (March 13th–15th, Time 3, the decline stage of the pandemic in China; see **Figure 1** for more details).

Two hundred and sixty-six Chinese adults took part in our survey, with 222 (83.46%) valid cases (filling all the questionnaires and passing test questions). Of the final participants, 54.50% (121 cases) were female, with ages ranging from 19 to 64 years (M_{age} at Time 1 = 31.53, SD = 8.17). Their monthly income ranged from "lower than 5,000 yuan" (49 cases, 22.07%) to "higher than 35,000 yuan" (5 cases, 2.25%). In addition, participants came from 26 provinces (11.71% from Western China, 9.91% from Northeastern China, 30.63% from East China, 22.07% from North China, 9.91% from Central China, and 15.77% from South China).

Of the 222 adults, 164 (73.87%) and 123 (54.41%) were followed at Time 2 and Time 3, respectively. Participants with complete vs. incomplete data significantly differed in their gender: $c^2(1) = 5.48$, $p = 0.019$, and age: $t(220) = 4.17$, $p < 0.001$.

Measures

Table 1 presents the descriptive statistics about the measures.

Trait Loneliness at Time 1 (Pre-pandemic Stage)

Trait loneliness was assessed using the 8-item loneliness subscale of the Solitude Behavior Scale (Chen et al., 2012), a valid scale

[1]www.wjx.cn

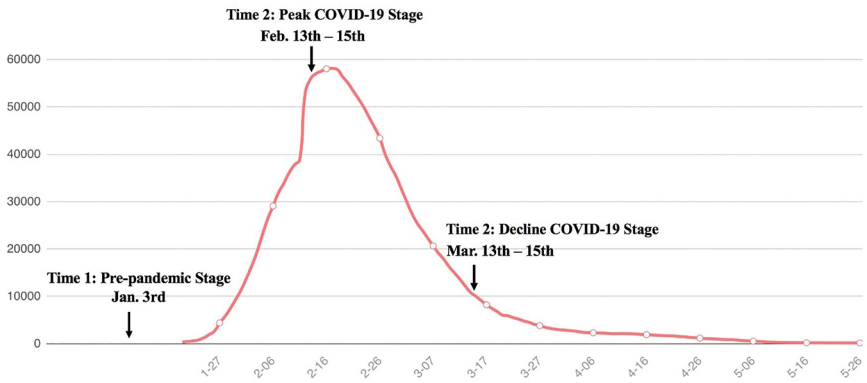

FIGURE 1 | The trajectory of current confirmed cases of COVID-19 in China.

for use in Chinese samples. Participants rated their levels of loneliness (e.g., "*I often feel lonely when I am alone.*") on a 5-point scale from 1 = "*strongly disagree*" to 5 = "*strongly agree.*" We summed all items, with higher scores indicating higher levels of trait loneliness. The Cronbach's alpha value was 0.85 in the present study.

Perceived Social Support at Time 1 (Pre-pandemic Stage) to 3 (Decline COVID-19 Stage)

Perceived social support was assessed using the 12-item Chinese version of the Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1988). The scale included three subscales: Family support (four items; "*I get the emotional help and support I need from my family.*"), Friends support (four items; "*I have friends with whom I can share my joys and sorrows.*"), and Significant Other support (four items; "*I have a special person who is a real source of comfort to me.*"). We summed items in each subscale, with higher scores indicating higher levels of perceived social support. This scale has shown good reliability and validity in Chinese adults (Wang et al., 2017). The Cronbach's alphas of each subscale were 0.81, 0.87, and 0.84 at Time 1, 0.84, 0.90, and 0.76 at Time 2, and 0.83, 0.81, and 0.81 at Time 3, respectively. The Cronbach's alphas of the overall scale were 0.90 at Time 1, 0.87 at Time 2, and.86 at Time 3.

Chronic Anxiety at Time 1 (Pre-pandemic Stage)

Chronic anxiety was assessed via the 20-item Trait Anxiety Subscale from the Chinese version of the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983; Li and Qian, 1995). Participants rated their levels of chronic anxiety (e.g., "*I feel nervous.*") on a 4-point scale from 1 = "*not at all*" to 4 = "*very much so.*" This scale has been well validated in Chinese adults (Chen et al., 2014). Total score was computed, with higher scores indicating higher levels of chronic anxiety. The Cronbach's alpha in this study was 0.89.

COVID-19 Anxiety at Time 2 (Peak COVID-19 Stage) and 3 (Decline COVID-19 Stage)

COVID-19 anxiety was assessed via the 10-item Self-check and Self-inspect Scale for COVID-19 Anxiety (Chinese Psychological Society, 2020). Participants reported their anxious mood and behaviors after the outbreak of COVID-19 in the past month (e.g., "*I worried that the pandemic would be out of control.*") on a 5-point scale from 1 = "*almost never*" to 5 = "*almost always.*" We summed all the items, with higher scores representing higher levels of COVID-19 anxiety. The Cronbach's alpha values were 0.87 at Time 2 and 0.86 at Time 3.

Covariates at Time 1 (Pre-pandemic Stage)

Participants reported their gender (1 = male, 2 = female), age, and monthly income (from 1 = "*lower than 5,000 yuan*" to 7 = "*higher than 35,000 yuan*"). The aforementioned covariates were considered in the analyses due to their significant correlations with anxiety in previous studies (e.g., Merikangas et al., 2003; Lofors et al., 2006; McLean et al., 2011).

Data Analysis

In order to investigate the trajectories of perceived social support (measured at all three time points) and COVID-19 anxiety (measured at Time 2 and Time 3) across time, repeated measures ANOVA were conducted. Furthermore, we considered both within-subject and between-subject variability in the models because of (1) the relatively high rate of non-random missing responses in our data, (2) the potential high variability between subjects, and (3) the fact that a participant's response at one time point might depend on his or her response at another time point which would make the data non-independent. Thus, we conducted mixed effects modeling using the nlme package in R and considered the random effect of subjects (Pinheiro et al., 2014). Then, for perceived social support measured at all three time points, the Bonferroni-corrected *post hoc* test was conducted using the multcomp package in R (Bretz et al., 2016).

To explore the possible impact of trait loneliness (measured at Time 1) and perceived social support (measured at all three time points) on both chronic anxiety (Time 1) and COVID-19 anxiety (Time 2 and Time 3), we conducted structural equation modeling (SEM) using the lavaan package in R (Rosseel, 2012). In order to examine the interaction between trait loneliness and perceived social support on anxiety, we followed the procedure suggested by Marsh et al. (2004). After being centered, three indicators of

TABLE 1 | Descriptive statistics of study variables.

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Trait loneliness Loneliness	22.12	6.48	–												
2. PSS (SO) T1	20.37	4.08	−0.19**	–											
3. PSS (FA) T1	22.12	4.31	−0.09	−0.51**	–										
4. PSS (FR) T1	21.02	4.10	−0.11	−0.73**	−0.52**	–									
5. PSS (SO) T2	21.54	3.36	−0.15	−0.60**	−0.30**	−0.47**	–								
6. PSS (FA) T2	23.16	4.26	−0.09	−0.41**	−0.70**	−0.38**	−0.41**	–							
7. PSS (FR) T2	22.09	2.97	−0.15	−0.58**	−0.51**	−0.66**	−0.65**	−0.55**	–						
8. PSS (SO) T3	21.17	3.70	−0.19*	−0.66**	−0.47**	−0.60**	−0.70**	−0.52**	−0.62**	–					
9. PSS (FA) T3	23.77	3.53	−0.21*	−0.34**	−0.59**	−0.32**	−0.42**	−0.70**	−0.46**	−0.59**	–				
10. PSS (FR) T3	21.73	3.23	−0.16	−0.42**	−0.40**	−0.54**	−0.49**	−0.55**	−0.67**	−0.67**	−0.56**	–			
11. CA T1	39.76	9.57	−0.19**	−0.40**	−0.45**	−0.35**	−0.31**	−0.45**	−0.33**	−0.36**	−0.40**	−0.40**	–		
12. COVA T2	24.79	6.42	−0.03	−0.03	−0.12	−0.01	−0.01	−0.01	−0.06	−0.07	−0.09	−0.09	−0.20*	–	
13. COVA T3	23.14	6.19	−0.07	−0.03	−0.12	−0.04	−0.14	−0.15	−0.08	−0.20*	−0.24**	−0.28**	−0.30**	−0.75**	–
Covariates															
Gender	45.53[a]	–	−0.09	−0.03	−0.08	−0.03	−0.08	−0.03	−0.10	−0.04	−0.02	−0.01	−0.05	−0.01	−0.02
Age	31.53	8.17	−0.18**	−0.08	−0.13	−0.04	−0.09	−0.07	−0.03	−0.12	−0.07	−0.02	−0.15*	−0.04	−0.03
Monthly Income	43.69[b]	–	−0.11	−0.13	−0.16*	−0.14*	−0.00	−0.20**	−0.12	−0.08	−0.02	−0.12	−0.27**	−0.07	−0.03

*T1–3, Time points of assessment (T1: pre-pandemic stage; T2: peak COVID-19 stage; T3: decline COVID-19 stage); PSS (SO), Perceived Social Support (Significant Other); PSS (FA), Perceived Social Support (Family); PSS (FR), Perceived Social Support (Friends); CA, Chronic Anxiety; COVA, COVID-19 Anxiety. Means (M), standard deviations (SD). [a]The percentage of male participants. [b]The percentage of participants with monthly income between 5,000 and 10,000. *$p < 0.05$, **$p < 0.01$.*

perceived social support were multiplied by trait loneliness to form three indicators of the latent interaction term. To examine whether perceived social support buffered the harmful effects of trait loneliness to anxiety at different stages of the pandemic, three models were examined, respectively. For the model of Time 1 (Model 1), trait loneliness, perceived social support, and the latent interaction term were involved in the model as the predictors of chronic anxiety. For both models of Time 2 (Model 2) and Time 3 (Model 3), trait loneliness (measured at Time 1), the concurrent perceived social support, and their interaction term were involved in the model as the predictors of COVID-19 anxiety at that time point. In Model 2 and Model 3, given that our aim was to examine the protective effect of the concurrent perceived social support at peak and decline stages of the pandemic, perceived social support at Time 1 was included as a control variable. If a significant interaction was found in the model, the simple slopes would be examined to see the specific direction of the interaction.

We would use the following fit indices to evaluate the models' goodness of fit: χ^2 (Chi-Square statistics) could be accepted when the p-value is greater than 0.05 or when the ratio of χ^2/df is less than 5, CFI (the comparative fit index) with okay fit when being more than.90, RMSEA (root-mean-square error of approximation) close to or less than 0.08, and SRMR (standardized root mean squared residual) indicating good fit when it is less than 0.08 (Kenny, 2015). However, among all the indices, χ^2 would usually be less weighted when evaluating the model due to its sensitivity to sample size (Bentler, 1990).

Due to the relatively high percentage of missing data, Little's (1988) missing completely at random (MCAR) test was conducted by using BaylorEdPsych package in R. We involved all the variables of this study in the test, and the results indicated that the data is non-MCAR [$\chi^2(22) = 56.54\ p < 0.001$], Therefore, full information maximum likelihood estimation (FIML) was used to deal with non-MCAR missing data so that all participants would be taken into account in the analyses.

RESULTS

First, the trajectories of perceived social support and COVID-19 anxiety were represented in **Figure 2**. For perceived social support, the mixed effects model had better goodness of fit as compared to the model with only fixed effects [$\chi^2_{diff}(1) = 219.25$, $p < 0.001$], as there was considerable variance in intercepts across participants (i.e., for different participants, there would be distinct regression expressions with different intercepts but the same slope), SD = 8.38, 95% CI [7.48, 9.39], accounting for 73% of the variance of the model. The results of mixed effects modeling suggested that there were discrepancies among the levels of perceived social support assessed at three time points [$F_{(2,\ 285)} = 12.04, p < 0.001$]. Specifically, perceived social support increased from Time 1 (pre-pandemic stage) to Time 2 (peak COVID-19 stage; $M_{support2-1} = 2.69$, $p < 0.001$), and remained relatively congruent from Time 2 to Time 3 (decline COVID-19 stage; $M_{support3-2} = -0.88$, $p = 0.350$). For COVID-19 anxiety, the mixed effects model also outperformed the model with only fixed effects [$\chi^2_{diff}(1) = 99.05$, $p < 0.001$], with considerable variance in intercepts across participants (SD = 5.49, 95% CI [4.80, 6.27]), accounting for 75% of the variance of the model. As shown in the mixed effects model, COVID-19 anxiety decreased from Time 2 (peak COVID-19 stage) to Time 3 (decline COVID-19 stage; $t = -3.39$, $p < 0.001$).

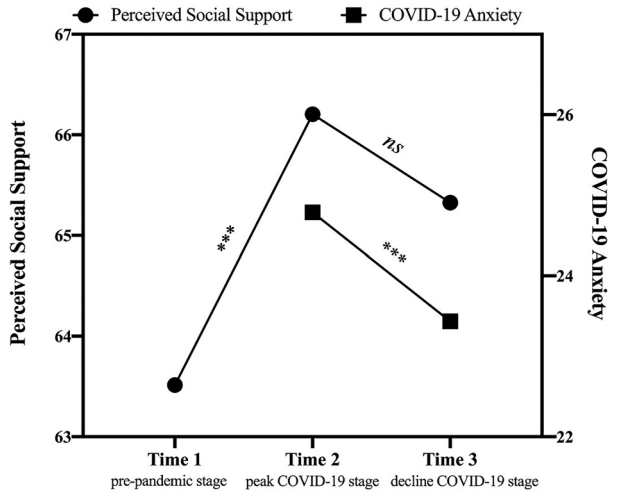

FIGURE 2 | The trajectories of perceived social support (from Time 1: pre-pandemic stage to Time 3: decline COVID-19 stage) and COVID-19 anxiety (from Time 2: peak COVID-19 stage to Time 3: decline COVID-19 stage). Perceived social support was computed by summing scores of three subscales. ***$p < 0.001$.

Second, three models examining the interactive effect of trait loneliness and perceived social support on anxiety at different stages of the pandemic were represented in **Figures 3–5**. For Model 1 (Time 1: pre-pandemic stage; see **Figure 3**), the goodness of fit was generally acceptable [$\chi^2(16) = 43.140$, $p < 0.001$, CFI = 0.95, RMSEA = 0.087, SRMR = 0.058]. Both perceived social support ($\beta = -0.58$, $p < 0.001$) and trait loneliness ($\beta = 0.31$, $p < 0.001$) independently predicted chronic anxiety. The latent interaction term also significantly predicted chronic anxiety ($\beta = -0.25$, $p < 0.001$, D$R^2 = 0.058$). Specifically (see **Figure 6**), for individuals with lower perceived social support (-1 SD), trait loneliness predicted heightened level of chronic anxiety ($\beta = 0.58$, $p < 0.001$). However, for those with higher levels of perceived social support ($+1$ SD), trait loneliness did not predict chronic anxiety ($\beta = 0.03$, $p = 0.734$).

Model 2 (Time 2: peak COVID-19 stage; see **Figure 4**) examined the interaction between trait loneliness (measured at Time 1) and perceived social support (measured at Time 2) on COVID-19 anxiety at the peak stage of COVID-19 in China (i.e., Time 2) after controlling for baseline perceived social support assessed at the pre-pandemic stage (i.e., Time 1). The model fit the data well [$\chi^2(33) = 52.26$, $p = 0.018$, CFI = 0.98, RMSEA = 0.051, SRMR = 0.041]. Neither trait loneliness ($\beta = 0.06$, $p = 0.477$) nor the concurrently perceived social support ($\beta = 0.12$, $p = 0.413$) predicted COVID-19 anxiety. However, there was a significant interaction between trait loneliness and perceived social support on COVID-19 anxiety

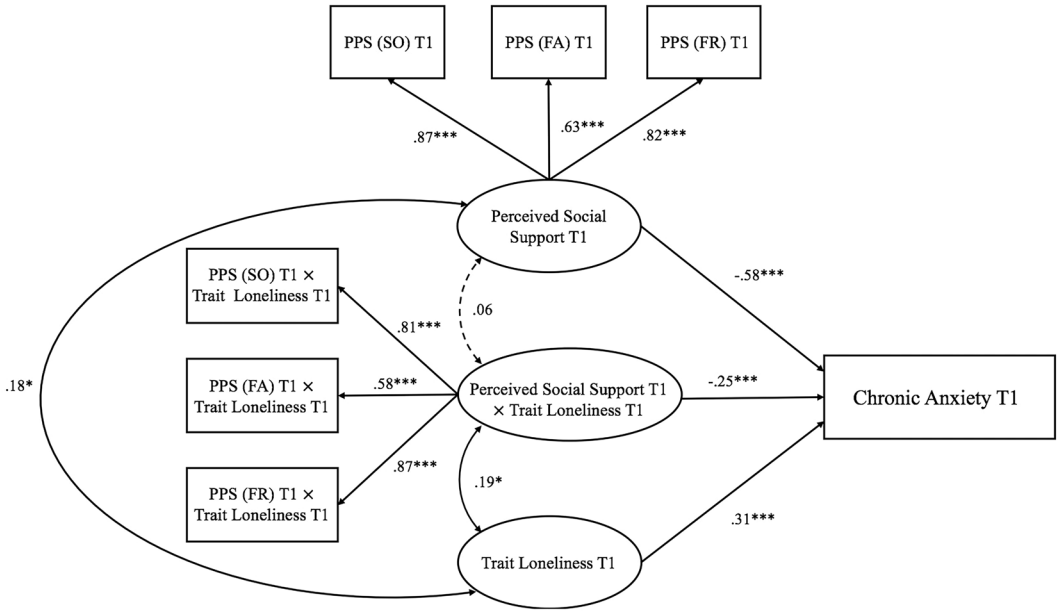

FIGURE 3 | Trait loneliness interacted with perceived social support predicting chronic anxiety at Time 1 (pre-pandemic stage). Numbers represented standardized coefficients. T1–3, Time points of assessment; PSS (SO), Perceived Social Support (Significant Other); PSS (FA), Perceived Social Support (Family); PSS (FR), Perceived Social Support (Friends). $^{*}p < 0.05$, $^{***}p < 0.001$.

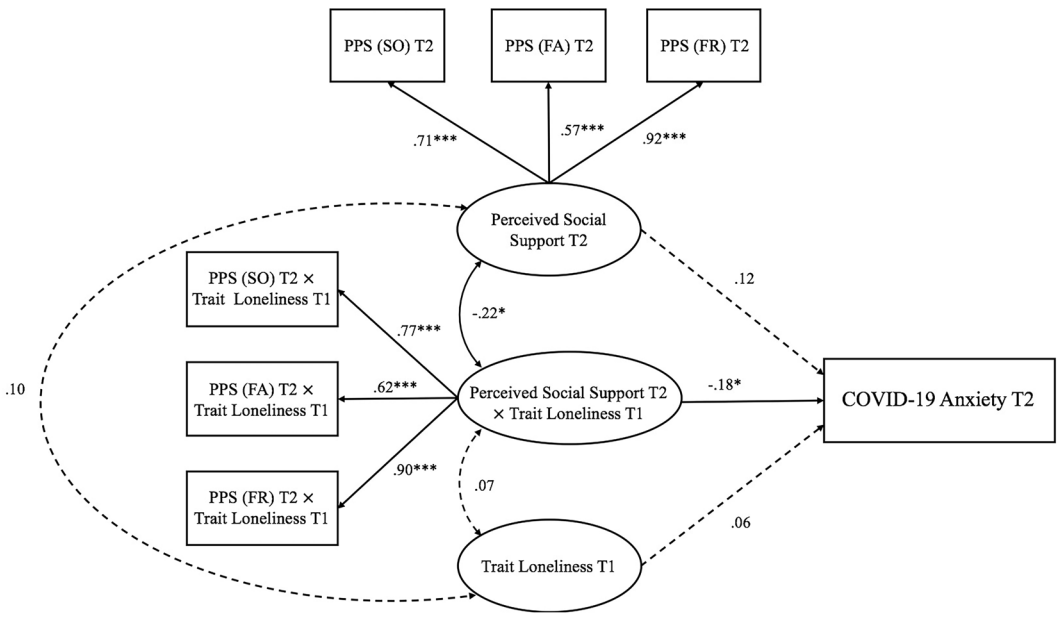

FIGURE 4 | Trait loneliness interacted with perceived social support predicting COVID-19 anxiety at Time 2 (peak COVID-19 stage). Numbers represented standardized coefficients. T1–3, Time points of assessment; PSS (SO), Perceived Social Support (Significant Other); PSS (FA), Perceived Social Support (Family); PSS (FR), Perceived Social Support (Friends). Predicting pathway from perceived social support at Time 1: pre-pandemic stage to COVID-19 anxiety at Time 2: peak COVID-19 stage; $\beta = -0.15$, $p = 0.326$) was not depicted to increase clarity. $^{*}p < 0.05$, $^{***}p < 0.001$.

($\beta = -0.18$, $p = 0.042$, $DR^2 = 0.029$). Specifically (see **Figure 7**), for individuals with low (-1 *SD*) perceived social support, trait loneliness marginally, but positively, predicted COVID-19 anxiety ($\beta = 0.22$, $p = 0.067$); for individuals with high ($+1$ *SD*) perceived social support, trait loneliness did not predict COVID-19 anxiety ($\beta = -0.11$, $p = 0.335$).

Model 3 (Time 3: decline COVID-19 stage; see **Figure 5**) examined the interaction between trait loneliness (measured at

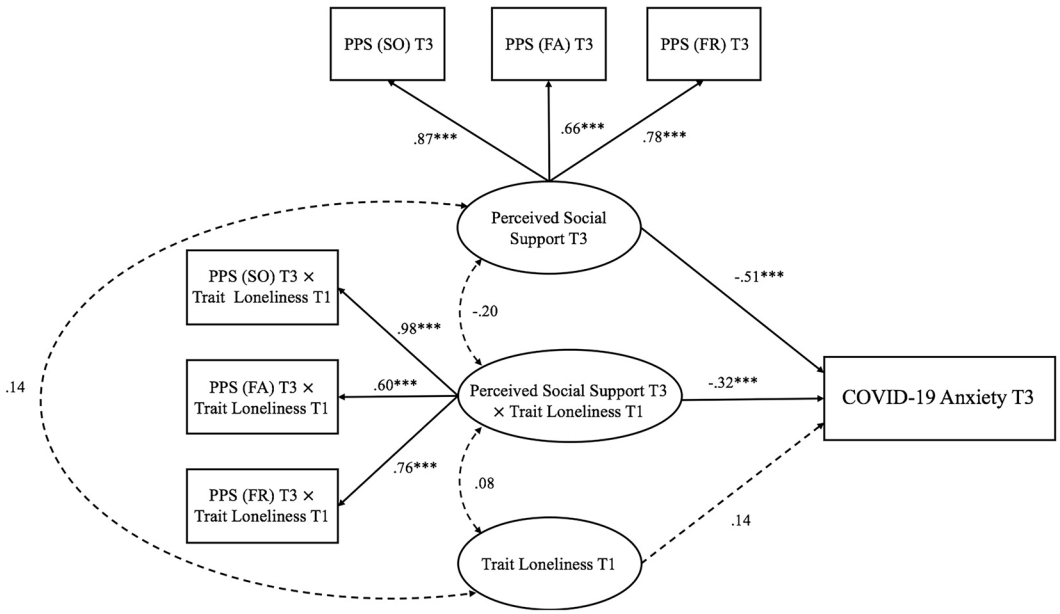

FIGURE 5 | Trait loneliness interacted with perceived social support predicting COVID-19 anxiety at Time 3 (decline COVID-19 stage). Numbers represented standardized coefficients. T1–3, Time points of assessment; PSS (SO), Perceived Social Support (Significant Other); PSS (FA), Perceived Social Support (Family); PSS (FR), Perceived Social Support (Friends). Predicting pathway from perceived social support at Time 1: pre-pandemic stage to COVID-19 anxiety at Time 3: decline COVID-19 stage; β = 0.20, p = 0.164) was not depicted to increase clarity. ***$p < 0.001$.

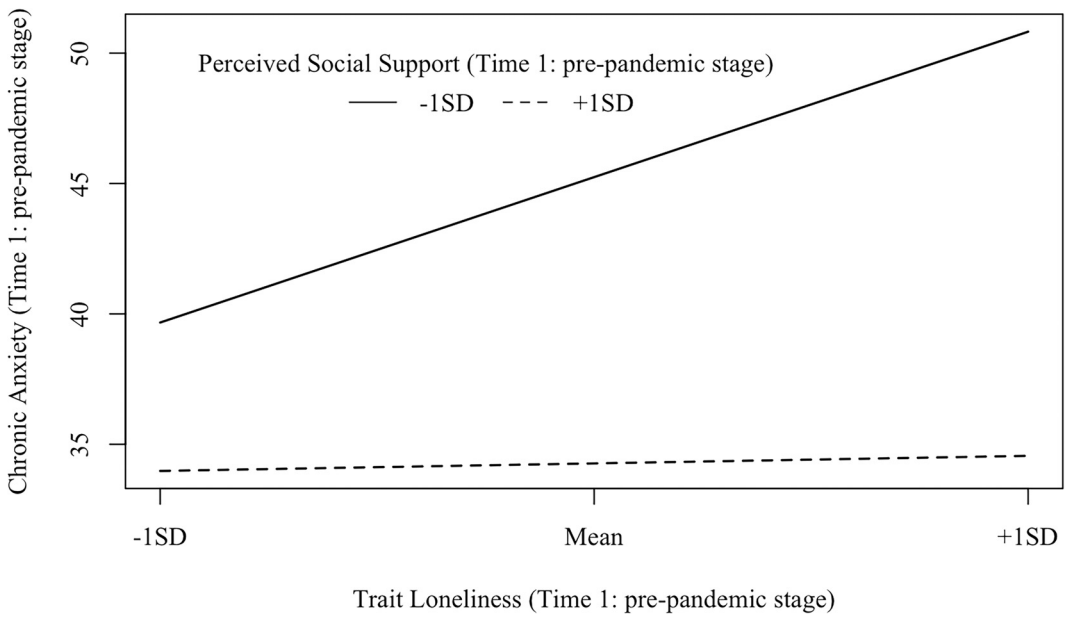

FIGURE 6 | Interaction effects between trait loneliness (Time 1: pre-pandemic stage) and perceived social support (Time 1: pre-pandemic stage) on chronic anxiety (Time 1: pre-pandemic stage). β (–1 *SD*) = 0.58, p<0.001; β (+1 *SD*) = 0.03, p = 0.734.

Time 1) and perceived social support (measured at Time 3) on COVID-19 anxiety at the decline stage of COVID-19 in China (i.e., Time 3). The goodness of fit was acceptable [$\chi^2(33) = 63.18$, p = 0.001, CFI = 0.96, RMSEA = 0.064, SRMR = 0.065]. COVID-19 anxiety at Time 3 could be directly predicted by perceived social support (β = −0.51, p< 0.001), but not trait loneliness (β = 0.14, p = 0.107). The latent interaction term significantly predicted COVID-19 anxiety (β = −0.32, p< 0.001, DR^2 = 0.095). Specifically (see **Figure 8**), trait loneliness positively predicted COVID-19 anxiety for individuals with a low level of perceived

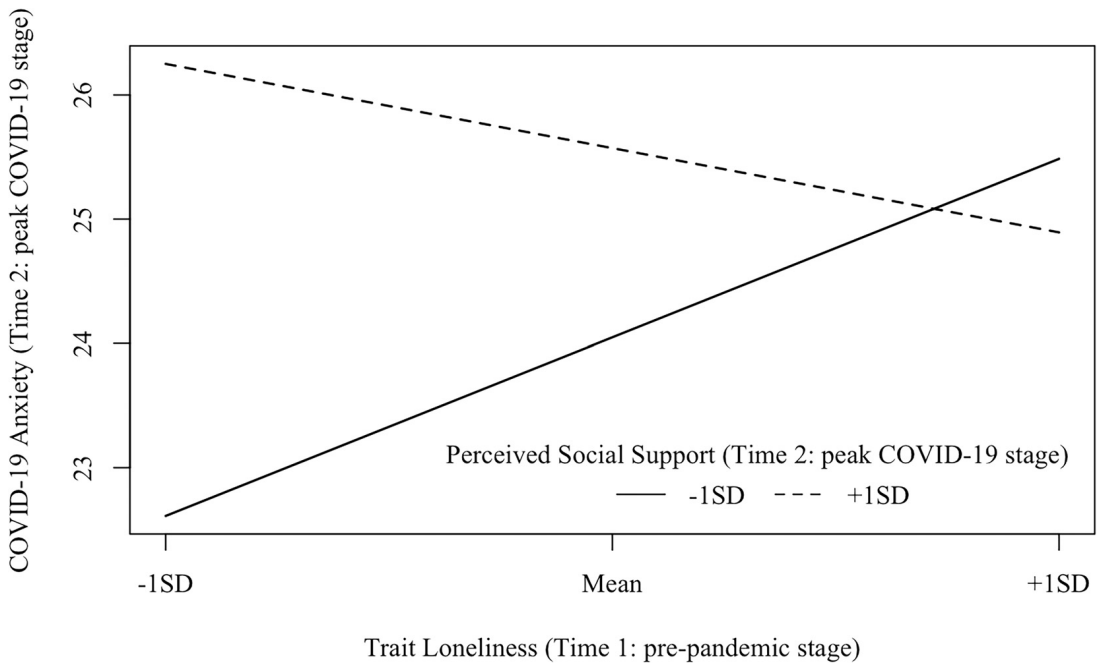

FIGURE 7 | Interaction effects between trait loneliness (Time 1: pre-pandemic stage) and perceived social support (Time 2: peak COVID-19 stage) on COVID-19 anxiety (Time 2: peak COVID-19 stage). β (–1 *SD*) = 0.22, $p = 0.067$; β (+1 *SD*) = −0.11, $p = 0.335$.

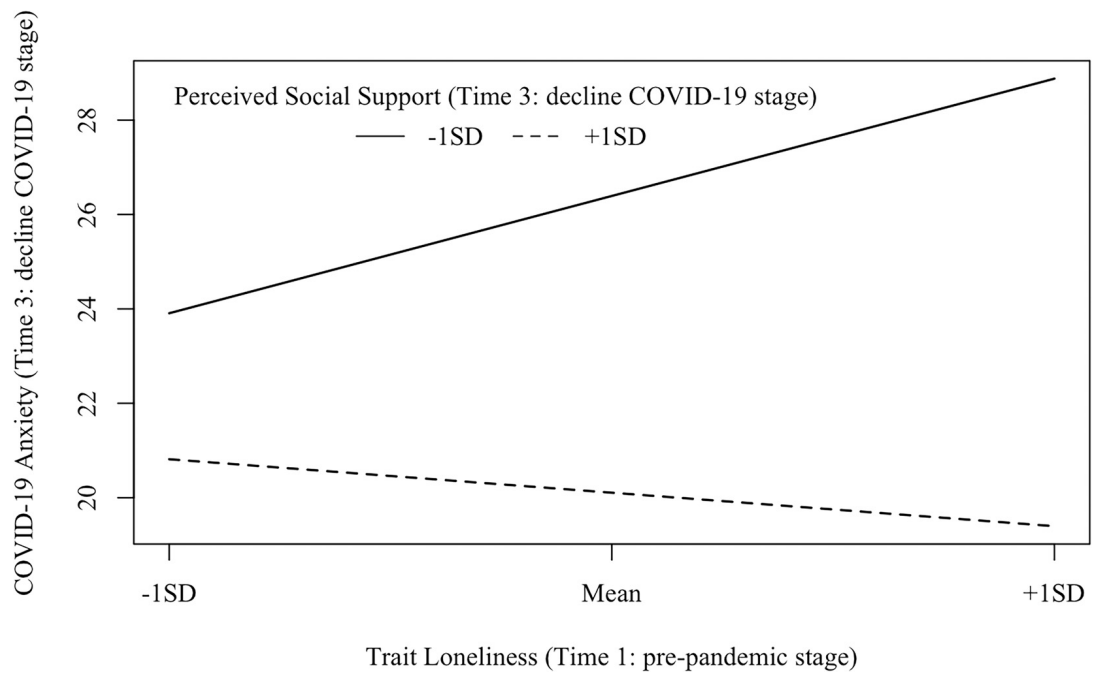

FIGURE 8 | Interaction effects between trait loneliness (Time 1: pre-pandemic stage) and perceived social support (Time 3: decline COVID-19 stage) on COVID-19 anxiety (Time 3: decline COVID-19 stage). β (–1 *SD*) = 0.40, $p = 0.001$; β (+1 *SD*) = −0.11, $p = 0.40$.

social support (−1 *SD*, β = 0.40, $p = 0.001$), but not for those with a high level of perceived social support (+1 *SD*, β = −0.11, $p = 0.40$).

Finally, considering the potential impact of covariates, we then examined the model again controlling for age, gender, and monthly income for all three models. In addition, chronic anxiety

measured at Time 1 was also controlled in Model 2 and Model 3. For Model 1 and Model 3, the results stayed the same after considering the covariates. However, for Model 2, after entering the covariates into the model, the interaction between perceived social support and trait loneliness was no longer significant ($\beta = -0.12$, $p = 0.177$). In order to investigate what the exact factor leading to the insignificance of the interaction in Model 2 was, we tested the model by controlling only one variable at a time. The results suggested that both monthly income ($\beta = -0.13$, $p = 0.123$) and chronic anxiety at Time 1 ($\beta = -0.17$, $p = 0.050$) accounted for the insignificance of the interaction between trait loneliness and perceived social support in the model.

DISCUSSION

To examine the relationship among trait loneliness, perceived social support, and anxiety among Chinese adults, we conducted a three-wave longitudinal study during three stages of the COVID-19 pandemic. There were three main findings in the present study. First, perceived social support moderated the relationship between loneliness and chronic anxiety. Second, perceived social support sharply increased from the pre-pandemic stage to the peak COVID-19 stage, and remained relatively stable from the peak to the decline COVID-19 stage; COVID-19 anxiety decreased from the peak to the decline COVID-19 stage. Third, perceived social support moderated the relationship between loneliness and COVID-19 anxiety at the peak and decline COVID-19 stages of the pandemic. We discuss these in more detail below.

First, the fluctuation of perceived social support with the development of the COVID-19 pandemic might be explained by the terror management theory (Greenberg et al., 1994). The outbreak of COVID-19 makes mortality salient, which may then arouse people's anxiety. To resist death anxiety, people might engage in social interaction and acquire social support (Heine et al., 2006; Pinson, 2010).

Second, the finding that perceived social support moderated the relationship between loneliness and anxiety across three stages of the COVID-19 pandemic was consistent with the social support buffering hypothesis (Cohen and Pressman, 2004). At the pre-pandemic stage, lonely people's maladaptive social attention, cognition, and emotion may contribute to high chronic anxiety in daily life (the pre-pandemic stage; Hawkley and Cacioppo, 2010). In this case, heightened levels of perceived social support might provide them with a sense of companionship and belongingness, which can serve as a psychological resource to mitigate chronic anxiety (Taylor and Broffman, 2011). Furthermore, the moderating effect of social support in the prediction of loneliness to COVID-19 anxiety remained consistent across the peak and decline stages of the COVID-19 pandemic. As an acute stressor, the outbreak of the COVID-19 pandemic and its related social isolation policy might intensify lonely people's vulnerability to anxiety (Brooks et al., 2020). However, the perception of more social support can make them feel cared for, understood, and valued by others, which can strengthen one's self-efficacy in coping with the uncertainty of the future (Casale and Flett, 2020). Confirming and extending previous findings on the benefits of social support in disasters (Arnberg et al., 2012; Gabert-Quillen et al., 2012; Guilaran et al., 2018; Skalski et al., 2020), findings from the present study demonstrated the protective role of social support for lonely people across different stages of the COVID-19 pandemic.

Third, when controlling for the covariates (e.g., monthly income and chronic anxiety at the pre-pandemic stage), the moderating effect of perceived social support in the relationship between loneliness and COVID-19 anxiety at the peak COVID-19 stage was insignificant. One potential reason for this finding is that there are many other factors apart from loneliness and social support that might give rise to people's anxiety at the peak COVID-19 stage, such as potential financial difficulties, relationship breakdowns, and uncertainty about the future (Fiorillo and Gorwood, 2020; Holmes et al., 2020). These factors might weaken the predictive power of the interaction of loneliness and social support to COVID-19 anxiety.

Moreover, we also tentatively analyzed whether different social support domains (i.e., significant other, family, and friends) played different roles in the relationship between loneliness and anxiety across the three stages of the pandemic (see **Supplementary Table S1**). The results showed that at the pre-pandemic and decline COVID-19 stages, perceived social support from significant others and friends buffered the detrimental effects of trait loneliness to chronic anxiety and COVID-19 anxiety. However, the results inversed at the peak COVID-19 stage, such that only perceived social support from family buffered the detrimental effects from trait loneliness to COVID-19 anxiety, whereas perceived social support from significant others and friends did not moderate the relationship between trait loneliness and COVID-19 anxiety. Therefore, it seems that in daily life and at times when the acute stressor has generally passed, social support from significant others and friends tends to protect lonely people from anxiety, whereas this source of social support was weakened when confronting the life-threatening stressor and shelter-in-place policy. Instead, the connection among family members had become the most important relationship for most people at the peak COVID-19 stage when almost everyone was confined at home. Future studies are needed to further examine the role of the family system (e.g., parent–child relationship, marital relationship, and family environment) in protecting individuals from anxiety.

Findings from the present study point to some practical implications for public policies and intervention strategies. First, although being isolated, people could strengthen their emotional connection with others through network-based ways, which might lower their COVID-19 anxiety. Second, mental health organizations and practitioners should consider developing online social support programs to cater to the public's need for more social connections. Third, policymakers are encouraged to find ways to address individuals' financial stress and threat of unemployment. Finally, we should pay more attention to lonely individuals, who are sensitive to both chronic and state stressors. For example, clinicians can use crisis

intervention programs together with cognitive behavioral therapy to correct the irrational beliefs and negative thoughts of lonely individuals about the crisis (Diefenbach and Goethe, 2006; Subramanyam et al., 2018).

Some limitations of the current study, as well as future directions, are worth noting. First, all measurements were self-reported in our study, which might inflate the correlations among variables. Future studies are suggested to use multiple approaches (e.g., daily diary) and multi-informant methods. Second, most of the participants in the sample are middle-aged. However, recent reviews and studies have shown that loneliness and social isolation might have a more negative influence on children and the elderly (Armitage and Nellums, 2020; Brooke and Jackson, 2020; Xiang et al., 2020). Therefore, studies focusing on protective factors for the mental health of children and the elderly under the social distancing policy are warranted. Third, social support can be further divided into several domains (e.g., instrumental support and emotional support; House, 1981). Cutrona and Russell (1990) proposed that emotional support could serve as a stronger buffer against the harmful influence of the uncontrollable stressors than other types of support. Future studies are needed to examine the protective role of emotional support for the public's health in the COVID-19 period. Fourth, the current study only had information on individuals' income before the outbreak of the pandemic, without considering the updated income which might be influenced by the pandemic situation (e.g., losing jobs and receiving no income). It would be beneficial for future studies to explore the effects of updated income on the relationship between loneliness and COVID-19 anxiety.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the ethics board of the Faculty of Psychology, Beijing Normal University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JX and YW designed the study. JX, JO, SL, ZW, EC, CN, and YW wrote and critically revised the manuscript. All authors reviewed, edited and approved the manuscript.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.566965/full#supplementary-material

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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frontiers in Psychiatry

BRIEF RESEARCH REPORT
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Mental Health Consequences of the Coronavirus 2020 Pandemic (COVID-19) in Spain. A Longitudinal Study

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Background: Covid-19 remains a pandemic that most countries in the world are still dealing with. This is study aims to report the psychological impact of Covid-19 over time on the Spanish population.

Methods: A longitudinal study ($N = 1041$) was carried out with two measurements: after 2 and 5 weeks starting from the declaration of the state of emergency in Spain. The presence of depressive symptoms, anxiety, and posttraumatic stress disease (PTSD) was evaluated by means of screening tests. Sociodemographic data, variables about Covid-19, loneliness, spiritual well-being, social support, discrimination, and a sense of belonging were collected.

Results: The data showed how depressive symptomatology increased significantly over time, while anxiety and PTSD did not show statistically significant changes. Spiritual well-being and loneliness were the main predictors of psychological impact. A younger age was a significant predictor of depression and anxiety, while female gender was associated with anxiety and PTSD.

Conclusions: The impact of the pandemic is sustained over time, even increasing in depression, and vulnerable groups that need greater psychological health support could be identified.

Keywords: COVID-19, anxiety, depression, quarantine, postraumatic stress disorder

INTRODUCTION

Covid-19 has spread throughout the world and most countries have implemented severe health and social measures to deal with it. The pandemic, which began in China, has had a special incidence in Europe and North America, with Spain being one of the most affected countries. On 14 March, a state of emergency was declared with drastic stay-at-home measures. Since then, the population has had to remain in their homes and have only been able to go out in certain cases. From 30

March to 12 April, all non-essential work activity was suspended, which aggravated the already serious economic crisis. By 27 April 2020, a total of 210,773 confirmed cases of COVID-19 had been detected by Polymerase Chain Reaction (PCR) tests. The pandemic had caused 23,822 deaths and 102,548 people had recovered (1). At this point, Spain was the European country with the most infections, only behind the United States, and close behind Italy in terms of the total number of deaths.

The psychological consequences of this crisis are multiple. Studies are now being published, especially from China, and indicate the presence of anxiety, depression, post-traumatic stress disorders, or insomnia in a significant percentage of the population (2–6). In a previous study by this research team, we showed the short-term psychological impact of the pandemic on the Spanish population (7), revealing the presence of depression, anxiety, and post-traumatic stress. Although we are beginning to understand the most immediate effects of the pandemic on our psychological health, little is known about how this psychological impact evolves over time, with only one longitudinal study examining this to date. Wang et al. (8) studied the evolution of the psychological impact in the Chinese population 4 weeks after the start of the pandemic in 333 people, observing that the initial levels of stress, anxiety, and depression continued. This type of research, although requiring a great deal of effort, is very valuable, as it provides data that can explain the evolution of the impact on our mental health and the main predictive and protective variables involved, which will then enable more effective measures to be taken to combat the psychological effects of the pandemic.

The present study aims to longitudinally study the effects that the Covid-19 emergency and the stay-at-home measures have had on the psychological health of the Spanish population, together with the identification of the main predictors and protectors, from mid-March to the end of April 2020.

METHODS

Procedure

The longitudinal study took place between 21 March and 27 April and used two measurements, one from 21 to 28 March and the other from 13 to 27 April. The evaluation was carried out using an online survey. This option was considered the most appropriate since it was impossible to conduct personal interviews, it reduced the cost per participant, and because this type of evaluation has shown good performance when assessing certain variables (9).

At the end of the first survey (80 items, 7-min duration approximately) an independent section was included informing the respondents that they could participate in a second evaluation, if they were willing. Those who agreed completed the second evaluation. In both cases, the signature of the informed consent and acceptance of the data protection laws were included. The study also received the approval of the Deontological Commission of the Faculty of Psychology of the Complutense University of Madrid (pr_2019_20_029).

Participants

In the first evaluation, participants were recruited through snowball sampling ($N = 3480$) using social networks and the website www.contraelestigma.com to send the survey. For the second evaluation, those people who had agreed to participate in the study ($N = 1{,}041$) were directly contacted by email on a longitudinal basis.

The inclusion criteria were: (1) to be over 18 years old; (2) to be living in Spain during the Covid-19 health emergency; (3) to have agreed to participate in the second evaluation of the study.

Instruments and Variables

The variables and instruments included in the assessment were the following:

Sociodemographic variables and variables related to Covid-19 were collected through questions developed *ad hoc*.

Psychological Impact

The possible symptomatology was measured using the following screening instruments: Patient Health Questionnaire-2 (PHQ-2) (10, 11). Generalized Anxiety Disorder Scale-2 (GAD-2) (12, 13). Civilian version of the Post-traumatic Stress Disorder Checklist-Reduced version (PCL-C-2) (14, 15). The PHQ-2 and the GAD-2 are brief self-report screening questionnaires that address the frequency of depressive symptoms and anxiety. They consist of two Likert-type questions ranging from 0 to 3. The PCL-C-2 was used to detect the presence of certain phenomena related to traumatic experience. The Likert-answers range from 0 to 4.

Discrimination

Day-to-Day Discrimination Index (InDI-D) (16). We used the main scale formed by nine Likert-type items with four response options (1–4) referring to the intersectional discrimination that can be produced by different conditions: gender, ethnicity, mental health diagnosis, and in this case, the presence of Covid-19.

Loneliness

Three-item version of the UCLA Loneliness Scale (UCLA-3) (17), Spanish version (18). Three items in Likert-type format with three response options.

Social Support

Multidimensional Scale of Perceived Social Support (EMAS) (19), adapted to Spanish (20). The scale has 12 Likert-type items with a scale of seven possible responses (1–7).

Spiritual Well-Being

Spiritual well-being understood as a personal search for meaning and purpose in life, in connection with a transcendent dimension of existence, and the experiences and feelings associated with that search and that connection (21). It was evaluated through the Spanish version of the Functional Assessment of Chronic Illness Therapy Spiritual Well-Being (FACIT-Sp12) (22). The answers were Likert-type from 0 to 4.

Self-Compassion

Self-Compassion measured by the Self-Compassion Scale (SCS) (23) Spanish version (13) evaluating how the subject usually acts toward himself in difficult moments in different dimensions. The items are Likert type (1–5).

Sense of Belonging

Sense of belonging was evaluated by means of four Likert-type items (1–4) previously used in other studies (24). These questions evaluated being a member of different groups.

Analysis

The graphical representation of change for the psychological impact variables (PHQ-2, GAD-2, and PCL-C-2) was made using the standardized differences between the two measurements (T0 and T1). In addition, descriptive statistics, and coefficients for Time (and its *p*-value) from a linear mixed model are included in the results table.

To analyze the longitudinal data, linear mixed models (LMM) with random slopes (time nested to subjects) were calculated for each mental health variable. The estimation method was maximum likelihood (ML) and models were built with a step-up and theory driven approach, testing the significant change associated with fixed effects terms. As a goodness of fit index, Nakawaga's marginal pseudo-R2 statistic, which reports the percentage of variance explained by fixed effects, is provided. The analyses have been performed in R (v3.5.6) with the lme4 package.

RESULTS

Characteristics of the Sample

The sample was composed of a majority of women (81%), and the 40–59 year old age group predominated (64%). About half of the sample had a partner and shared the same home with them (56%), had children in their care (55.71%) and a higher proportion had university or postgraduate studies (72%). Sixty-six percent of the persons had a job at the time of the interview, and considered that their economic situation was good-very good (66%). Fifteen percent of the sample had shown Covid-19 symptoms, while only 1% had been diagnosed, although 29% had a person or close relative with a positive diagnosis. Overall, about half of the people felt they were well-informed about the pandemic (54%), although 29% felt they had too much information.

Longitudinal Changes in Psychological Impact

The results in the second assessment showed a significant increase in depression scores ($B = 0.31$, $p < 0.01$), while anxiety and PTSD scores showed no statistically significant change, only decreasing slightly ($B = -0.014$, $p = 0.752$; $B = -0.072$, $p = 0.193$). These results can be seen in **Figure 1**.

Linear Mixed Models for the Psychological Impact

The regression models for the different variables showed that, for depression, the model explained 42% of the variance of the fixed effects, with the variables of spiritual well-being, loneliness, and a younger age as the main predictors. For anxiety, the model explains 30% of the fixed-effect variance, with spiritual well-being, loneliness, younger age, and female gender as the main predictors. For PTSD, the model explains 11% of the variance of the fixed effects, with spiritual well-being, loneliness, the obligation to work face-to-face, and female gender as the main predictors. This results can be seen in **Table 1**.

DISCUSSION

The results of the present study reflect the psychological impact of Covid-19 over time on the Spanish population. After 44 days of confinement, there was a significant increase in depressive symptoms, with no statistically significant changes in anxiety and PTSD symptoms, which even decreased slightly compared to the first evaluation (7). In China, another longitudinal study (8), showed that depression, stress, and anxiety did not present statistically significant changes, the results being consistent with our study except for depression. On the other hand, another longitudinal study carried out in Spain (25) revealed that anxiety, depression, and stress increased after 1 month. These results show discrepancies in terms of the evolution of anxiety, although it should be noted that the second evaluation of this study was made in early April, while that of the present study was made at the end, so that the greater time elapsed and the changes in the country's situation may explain these results.

Having the same or lower values for anxiety over time may be explained by the fact that the initial origin of the anxiety was based on the novelty of the situation with the consequent uncertainty and fear of contagion, a common response to a stressful situation (26). However, with the implementation of isolation measures and verification of their effectiveness, this anxiety does not intensify. Some authors have shown how the anxiety associated with Covid-19 decreases as social isolation measures such as staying home and not traveling are increased (27), which is consistent with our results. On the other hand, the increase in depression can be explained by several factors. Increased confinement time may have increased apathy and feelings of sadness, which may also be exacerbated by continued isolation and loss of social relationships and rewarding activities. In addition, it should be noted that during this second evaluation, changes at work occurred in a large part of the population. All non-essential activities were restricted, thus aggravating the economic crisis. This could also have had negative consequences on our psychological health. Some studies point to links between suicide and the economic recession of their countries, which played a more important role than fear of contagion (28, 29).

The prediction models are comparable to those found in the first evaluation of the longitudinal study (7). The main protective variable for the appearance of symptoms was spiritual well-being, while loneliness reappears as the main predictor. On the

	T0	T1	Diff	P-value
Phq2	1.49 (1.45)	1.80 (1.43)	0.31 (1.30)	0.000
Gad2	1.81 (1.61)	1.80 (1.57)	-0.01 (1.47)	0.752
Pclc	1.45 (1.86)	1.38 (1.81)	-0.07 (1.81)	0.193

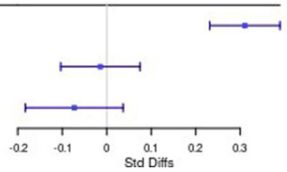

FIGURE 1 | Mixed longitudinal models for depression (PHQ-2), anxiety (GAD-2), and PTSD (PCL-C-2) over time. The mixed longitudinal models presented significant time effect for the variable Phq2 ($B = 0.31$, $p < 0.01$) but not for the variables Gad2 ($B = -0.014$, $p = 0.752$) and PCL-C-2 ($B = -0.072$, $p = 0.193$). The standard deviations for the random slopes were 1.04, 1.18, and 1.49, respectively.

TABLE 1 | Linear mixed models for depression (PHQ-2), anxiety (GAD-2), and PTSD (PCL-C-2).

	T0	T1	PHQ2	GAD2	PCL-C-2
Time			0.284***	−0.053	−0.084
Psychological wellness *M* (Sd)	15.61 (3.26)	15.54 (3.33)	−0.185***	−0.188***	−0.129***
Loneliness *M* (Sd)	4.43 (1.58)	4.52 (1.65)	0.221***	0.166***	0.155***
Age *M* (Sd)	39.39 (13.02)		−0.016***	−0.014***	
Gender: male *N* (%)	200 (19%)			–	–
Gender: female *N* (%)	841 (81%)			0.444***	0.673***
Not aplicable *N* (%)	413 (40%)	427 (41%)			–
Face-to-face work *N* (%)	156 (15%)	147 (14%)			0.740***
Remote working *N* (%)	474 (45%)	469 (45%)			0.061
		Time:id	1.08	1.31	1.75
		Residual	0.38	0.25	0.21
		Pseudo-R2	0.42	0.30	0.11

other hand, when taking into account all of the confinement time, it seems that age as a predictor variable becomes more important, as pointed out by other studies (8, 30). Young students may have initially suffered more depressive symptoms, as their lives were more affected when their daily routines were abruptly interrupted. Moreover, the initial confusion and uncertainty about the situation meant that the information received was more important in generating or reducing anxiety (5, 31). However, with the passage of time and normalization of the situation, it appears that a stronger predictor for depression and anxiety is a younger age. In addition, the female gender is a predictor of anxiety and PTSD, and this group may also be identified as more vulnerable, perhaps due to the greater burden that may arise from combining work or telework with childcare and other gender roles during the pandemic (32). The role of gender has been further studied in detail in this same sample, concluding that women have shown a greater psychological impact during confinement and highlighting the need of special attention for this group (33). On the other hand, in relation to post-traumatic symptomatology, the variables of working on site vs. teleworking or not working arise as a predictor in this model. The people who have had to work on site at their place of work during the state of emergency are those who have been on the front line of the fight against the virus, and have probably had to live through situations that can be categorized as stressful (34).

The limitations of the study include the selection of the sample using the snowball effect, which may result in an unrepresentative sample, with a higher proportion of women and younger people. Furthermore, although this is a longitudinal study, there is no control group, so the results should always be taken with caution, as other authors have pointed out (35).

The present study shows the psychological impact of Covid-19 over time on the Spanish population. The results show how, after more than 6 weeks living under an emergency situation, there has been an increase in depressive symptomatology, with anxiety and PTSD scores remaining the same. Spiritual well-being and loneliness are confirmed as the main predictors of psychological health. A younger age is associated with greater depression and anxiety, and the female gender with greater anxiety and PTSD. The results underline the importance of paying special attention to the most vulnerable groups, as well as promoting interventions to reduce loneliness and foster spiritual well-being.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Deontological Commission of the Faculty of Psychology of the Complutense University of Madrid (pr_2019_20_029). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

CG-S wrote the manuscript and participated in the design and development of the study. BA and JS reviewed the manuscript and participated in the design and development of the study. MC performed the data analysis and participated in the design and development of the study. AL-G and CU participated in the design and development of the study. MM participated in the development of the study and coordination of the group through his work as director. All authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Poor Sleep Quality and Its Consequences on Mental Health During the COVID-19 Lockdown in Italy

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Background: Coronavirus disease 2019 (COVID-19) seriously affected the whole of Italy. The extreme virulence and the speed of propagation resulted in restrictions and home confinement. This change was immediately perceived by people who found themselves exposed to feelings of uncertainty, fear, anger, stress, and a drastic change in the diurnal but above all nocturnal lifestyle. For these reasons, we aimed to study the quality of sleep and its connection to distress levels and to evaluate how lifestyle changed in the Italian population during the lockdown.

Methods: By means of an Internet survey we recruited 6,519 adults during the whole of the COVID-19 lockdown (from March 10–1st phase to May 4–2nd phase). We investigated the sociodemographic and COVID-19-related information and assessed sleep quality using the Medical Outcomes Study–sleep scale (MOS-SS) and mental health with the short form of Depression, Anxiety, and Stress Scales–21 Items (DASS-21). Multiple logistic regression model was used to evaluate the multivariate association between the dependent variable (good sleeper vs. poor sleeper) and all the variables that were significant in the univariate analysis.

Results: A total of 3,562 (55.32%) participants reported poor sleep quality according to the MOS-Sleep Index II score. The multiple binary logistic regression results of poor sleepers revealed several risk factors during the outbreak restrictions: female gender, living in Central Italy, having someone close who died because of COVID-19, markedly changed sleep–wake rhythms characterized by earlier or postponed habitual bedtime,

earlier habitual awakening time and reduced number of afternoon naps, and extremely severe levels of stress, anxiety, and depression.

Conclusion: This is the first study designed to understand sleep quality and sleep habits during the whole of the lockdown period in the Italian population that provides more than 6,000 participants in a survey developed specifically for the health emergency related to COVID-19. Our study found that more than half of the Italian population had impaired sleep quality and sleep habits due to elevated psychological distress during the COVID-19 lockdown containment measures. A multidisciplinary action should be undertaken in order to plan appropriate responses to the current crisis caused by the lockdown for the COVID-19 outbreak.

Keywords: sleep quality, sleep habits, COVID-19, Italian lockdown, depression, anxiety, stress, clinical psychology

INTRODUCTION

Coronavirus disease 2019 (COVID-19) was first identified as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in December 2019 by healthcare professionals in Wuhan City (China). Since then, it has spread rapidly throughout Hubei Province and other areas in China soon becoming a worldwide health problem affecting over 100 nations. During the same period, the World Health Organization indicated "COVID-19" as the official name to refer to the severe acute respiratory syndrome caused by SARS-CoV-2 (World Health Organization, 2020). Italy was the most seriously impacted country in Europe.

The Italian prime minister introduced the "I stay home" government decree (Italian Ministry of Health, 2020), which concerned the entire country and formally ordered people to stay at home. Travel restrictions, lockdown of schools and workplaces were the key measures of the "I stay home" decree together with the use of protective devices.

It is beyond doubt that this decision helped to prevent the further spread of the virus and was a necessary imposition to limit the number of patients being admitted to hospital. Nevertheless, from a psychological point of view, people undergoing this first form of intervention were exposed to feelings of uncertainty, fear, anger, and frustration that may easily lead to anxiety, boredom, and/or uneasiness (Brooks et al., 2020; De Giorgio, 2020; Holmes et al., 2020; Rubin and Wessely, 2020; Wang et al., 2020a).

This new situation where people were forced to manage work or study at home, with all the burden of worries stemming from almost inevitable health risks and social distancing, has had a strong impact on daily functioning and night-time sleep (Altena et al., 2020).

Sleep and stress have been described in a bidirectional relationship across the life span (Lo Martire et al., 2019) with stressors impacting on sleep quality and vice versa. In particular, high levels of cognitive and physiological arousal in response to stressors have been hypothesized to interfere with sleep according to the hyperarousal model of insomnia within the framework of a self-reinforcing loop (Morin et al., 1993, 2002; Harvey, 2002; Morin and Espie, 2003; Harvey et al., 2005, 2014; Bonnet and Arand, 2010; Riemann et al., 2010, 2015). In this difficult period, vigilance was constantly high: feelings of loss, excessive use of the Internet to seek information or to maintain social relationships, worries about getting infected, impulsive decisions, and rigid expectations were just some of the factors that could have interfered with a good sleep quality in the Italian population. Moreover, quarantine could have reduced the daylight exposure, which is essential for synchronizing the circadian body clock, consequently affecting many processes including sleep and mood (McClung, 2013; Vadnie and McClung, 2017). Hence, the current study aimed to investigate the quality of sleep and the lifestyle changes in the Italian population during the lockdown imposed by the "I stay home" decree-law issued by the Italian government (March 10) to its end (May 4–the so-called 2nd phase) expecting to find disrupted sleep.

In addition, since sleep quality is well known as being a crucial element of psychological health and a disturbed sleep has been related to psychopathology (Hertenstein et al., 2019), we wanted to study levels of anxiety, depression, and stress in the Italian population in relation to the quality of sleep experienced during the lockdown.

MATERIALS AND METHODS

Study Design

We conducted a cross-sectional study using a short sociodemographic and COVID-19-related information chart and self-administered questionnaire delivered by means of an Internet survey. Data were collected from the issue of the "I stay home" Italian government decree-law ("1st phase" –total lockdown) on March 10 to May 4, 2020 ("2nd phase" –end of lockdown).

Ethics Statement

This study was conducted in accordance with the Declaration of Helsinki, and the study protocol was approved by the Ethics Committee of the Center for Research and Psychological Intervention (CERIP) of the University of Messina. Electronic informed consent was obtained from each participant prior to starting the investigation. Participants could withdraw from the survey at any moment without needing to provide a reason.

Procedure and Participants

The data were collected through an online survey (conducted with Microsoft Azure). On the Microsoft Azure platform, information and consent to the processing of personal data were prepared, and furthermore, consent was requested to provide an email contact; the subject was asked to create an identification code in order to anonymize it. Only after expressing consent the URL of the Google Form (Google Form) was available, and the subject needed to affix the identification code previously created to secure anonymity for all the partners and collaborators involved in this multicenter project. Questionnaires were created on the Google Cloud platform, which was anonymous. The survey study was advertised via university communication systems as well as online forums (e.g., through virtual learning environments and Facebook accounts) or WeChat groups. Our questionnaire was set to proceed only when each option was completed before the final submission.

The study surveyed a convenience sample of 6,519 adults from 18 years old or above who lived in Italy and were recruited via notices in several Italian universities (University of Parma; University of Messina; Catholic University of Milan; University of Milan, La Statale; University of Napoli, Federico II). People who do not live in Italy or participants who do not complete all the questionnaires were excluded ($n = 43$ and $n = 37$, respectively).

Data reported in the current study were part of a wider project called "Resilience and the COVID-19: how to react to perceived stress. Effects on sleep quality and diurnal behavior/thoughts." This multipurpose project was designed to investigate the impact of lockdown in the Italian population.

Measures

Demographic Information

The variables examined in the sociodemographic section included gender, age, marital status (single or not), education level (secondary education or higher), occupation (employed or unemployed), region of origin, and general information about family and home (having or not children, number of people living in the house, size of the house, presence/absence of garden or balcony).

According to the Italian Institute of Statistics (ISTAT), the Italian territory can be divided into three macro-areas: North (1): Valle D'Aosta, Piedmont, Lombardy, Liguria, Emilia Romagna, Friuli-Venezia Giulia, Trentino-Alto Adige, Veneto; Center (2): Lazio, Marche, Tuscany and Umbria; South (3) Abruzzo, Molise, Campania, Apulia, Basilicata, Calabria, Sardinia, and Sicily.

Work-Related Data

This section assessed information on participants' employment data and any changes that occurred following the onset of the lockdown due to the COVID-19 pandemic: occupation, presence/absence of public contacts on workplace, working or not after the onset of COVID-19 pandemic, and information about work changes (at the office or smart working; number of hours: increased/reduced or loss of work).

The classification of occupations is based on an official list ("Nomenclatura e Classificazione delle Unità Professionali–CP2011, ISTAT). Moreover, we added the following categories: unemployed or job-seekers; retired persons; working students or not, and last, we extrapolated the health professions from the ISTAT categories.

Issues Related to COVID-19 Data

We collected data about participants and their relatives/friends' possible COVID-19 contacts/infection and the effects that the new emergency had on their social relationships (decreases/improvements of face-to-face or online contacts) with *ad hoc* items according to the Chinese findings (Wang et al., 2020b; Zhang et al., 2020): positivity or not to the COVID-19 virus, having been forced or not to stay in an obligatory quarantine, having people close who tested positive or not, having lost someone close due to COVID-19, and possible changes in psychical or online relationships (from a decrease to an improvement).

Sleep-Related Data

The participants' sleep habits during the lockdown period were assessed. In particular, we evaluated the changes in the habitual bedtime, awakening time, and napping. Answers regarding bedtime and waking time ranged from bringing forward to postponing the usual time. Instead, for the napping time, the answers were aimed at understanding if they were increased or reduced compared to usual.

The Medical Outcomes Study–Sleep Scale (MOS-SS)

The sleep quality of the Italian population during the lockdown period was assessed using the Medical Outcomes Study–Sleep Scale (MOS-SS) (Hays and Stewart, 1992). The MOS-SS is a self-administered validated instrument with 12 self-reported questions to determine sleep quality and quantity within a 4-week period. We decided to adopt only the global index of MOS-SS to assess the quality of sleep defined as Sleep Index II (score range from 0 to 100), with higher scores indicating greater sleep problems. A cut-off scoring of 25.8 (Hays et al., 2005; Rejas et al., 2007; Martin et al., 2009) is considered as having poor sleep. The Italian version is available (Palagini and Manni, 2016). In this study, reliability of Sleep Problem II index scales was good, with a Cronbach's α of 0.85.

The Depression Anxiety Stress Scale–21 (DASS-21)

Symptoms of common mental health status were assessed using the short form of Depression, Anxiety, and Stress Scales–21 Items (DASS-21) (Lovibond and Lovibond, 1995). The DASS-21 is a self-report measure in which participants rate the frequency and severity of depression, anxiety, and stress (emotional reactions).

As measured by the DASS-21, depression assesses dysphoria, anhedonia, lack of incentive, and low self-esteem; anxiety refers to somatic and subjective symptoms of anxiety and an acute response of fear; and stress evaluates irritability, impatience, tension, and persistent arousal.

Subscale scores are calculated as the sum of the responses to the seven items from each subscale multiplied by 2 to suit the original 42 items. The cutoffs for severe depression, anxiety, and stress are $\geq$21, $\geq$15, and $\geq$26, respectively (Lovibond and Lovibond, 1995).

In the current study, the Italian version of DASS-21 showing excellent psychometric properties was adopted (Bottesi et al., 2015).

Excellent levels of reliability were detected in this sample (depression, $\alpha = 0.89$; anxiety, $\alpha = 0.83$; stress, $\alpha = 0.90$).

Statistical Analysis

Continuous variables were presented as mean and standard deviation (SD), while categorical variables as absolute (n) and relative frequency (%). Chi-square test was used to evaluate the univariate association between MOS-Sleep Index II (sleep disturbance vs. no sleep disturbance) and all the variables described in the section "Materials and Methods." Multiple logistic regression model was used to evaluate the multivariate association between the dependent variable (good sleeper vs. poor sleeper) and all the variables that were significant in the univariate analysis. The results were presented as odds ratio (OR) with 95% confidence interval (95% CI). The false discovery rate (FDR) correction was applied to adjust the statistical significance to account for multiple comparison (adjusted critic $p = 0.008$) (Benjamini and Hochberg, 1995).

Cronbach's alpha was used to evaluate the reliability of the questionnaires used in the survey.

Statistical analysis was performed using the statistical package Stata SE, 14.2.

RESULTS

Our study sample consisted of 6,439 participants: 4,707 (73.1%) females and 1,732 (26.9%) males. The mean age of the sample was 33.9 (SD = 27.6; range 18–82 years), and most of the participants were living in Northern Italy (67.4%). Less than half of the samples had a high school diploma (46.9%) and 28.7% were students. With regard to marital status, 34.9% were unmarried and 28.6% had children.

In **Tables 1A,B**, we show all the characteristics and differences of the good sleeper and poor sleeper groups in terms of demographic data, living situation during the COVID-19 outbreak, COVID-19 outbreak-related questions, sleep-related data, and mental health in terms of stress, anxiety, and depression. There were 6,439 participants in our study. A total of 3,562 (55.32%) participants reported poor sleep quality according to the MOS-Sleep Index II score. All participants were divided into two groups, poor sleeper (MOS-Sleep Index II total score $\geq$25.8) and good sleeper (MOS-Sleep Index II total score $<$25.8). In **Figures 1A,B**, we show the graphical representation of percentages of poor sleepers stratified for the variables. Also, in **Figures 1C,D** we show the graphical representation of percentages of good sleepers stratified for the variables.

Sixty-seven participants who gave no answers to questions about forced quarantine or being positive to COVID-19 were removed to perform the multivariate logistic regression. **Table 2** shows the multiple binary logistic regression results of poor sleepers. Significant factors were found in female gender (OR: 1.66; 95% CI: 1.45–1.90), living in Central Italy (OR: 1.39; 95% CI: 1.10–1.76), having someone close who died due to COVID-19 (OR: 1.41; 95% CI: 1.09–1.81), earlier (OR: 1.59; 95% CI: 1.22–2.07) or postponed (OR: 2.10; 95% CI: 1.81–2.41) habitual bedtime, earlier habitual awakening time (OR: 1.47; 95% CI: 1.14–1.90), reduced number of afternoon naps (OR: 1.32; 95% CI: 1.13–1.56), experiencing mild (OR: 2.10; 95% CI: 1.76–2.52), moderate (OR: 2.60;95% CI: 2.16–3.16), severe (OR: 3.37; 95% CI: 2.59–4.39), or extremely severe (OR: 4.83; 95% CI: 2.95–7.92) stress, having mild (OR: 1.61; 95% CI: 1.29–2.02), moderate (OR: 2.39; 95% CI: 1.98–2.89), severe (OR: 3.11; 95% CI: 2.23–4.53), or extremely severe (OR: 3.74; 95% CI: 2.54–5.51) anxiety, and having mild (OR: 1.53; 95% CI: 1.30–1.81), moderate (OR: 1.67; 95% CI: 1.38–1.98), severe (OR: 1.77; 95% CI: 1.32–2.30), or extremely severe (OR: 2.39; 95% CI: 1.69–3.53) depression. Furthermore, being positive to COVID-19 was almost significant (OR: 1.96; $p = 0.066$).

DISCUSSION

As far as we know, this is the first study to assess sleep quality and its negative consequences on mental health in the Italian population during the whole of the COVID-19 lockdown (from March 10–1st phase to May 42nd phase). This survey interestingly highlights how quarantine and restriction measures worsened sleep habits, leading to a whole series of consequences on people's health. In particular, our study found that 55.32% of the sample of 6,439 Italian participants experienced disrupted sleep patterns during the outbreak restrictions.

In our study, the poor sleeper group presented with more negative effects on psychological well-being related to the COVID-19 lockdown. We outlined some risk factors for the development of sleep disturbance: female gender (79.9%), living in Central Italy, losing a loved one due to COVID-19, having markedly changed sleep–wake rhythms (specifically, going to bed earlier or later than the usual time), getting up earlier than usual and having increased the habitual napping time, having moderate to very severe stress (22.8–10.2%), anxiety (19.5–14.1%), and depression levels (25.9–14%).

The prevalence rate of poor sleepers in our population is consistent with 52.4 and 57.1% of two Italian resident surveys [lockdown period: from March 17 to 23 (Cellini et al., 2020) and from March 18 to April 2 (Casagrande et al., 2020)] and higher than in China's general population (36.38%) (online survey from to February 18 to 25) (Zhao et al., 2020) during the outbreak. In addition, our sample with sleep problems reported a remarkable alteration in their sleep habits: 63.8% reported postponing or bringing forward (7.4%) bedtime; 59.8% reported the need for delayed awakening and an increased napping time in 23.6% during the daytime. All these lifestyle changes seem to be followed by worrying symptoms, such as altered sleep–wake rhythms, which can be interpreted by the negative psychosocial changes observed by Brooks et al. (2020), especially in sleep habits during the COVID-19 outbreak. Evidence (Lo Martire et al., 2019) shows that temporally close excessive and unpredictable stress can impact on the defense system and the central nervous system: stress is modulated by the individual's

TABLE 1-A | Comparisons between the good sleeper vs. poor sleeper sample with chi-square tests on demographic data and living situations.

	Good sleeper (*n* = 2,877)	Poor sleeper (*n* = 3,562)	*P*
Demographic data			
Gender, n (%)			<0.001
Males	1, 017 (58.7)	715 (41.3)	
Females	1, 860 (39.5)	2, 847 (60.5)	
Age (years old), n (%)			
18–25	1, 026 (39.4)	1, 579 (60.6)	<0.001
26–30	427 (40.7)	622 (59.3)	
31–40	406 (44.3)	511 (55.7)	
41–50	413 (52.1)	380 (47.9)	
51–60	455 (54.9)	374 (45.1)	
>60	150 (61.0)	96 (39.0)	
Italian territory, n (%)			
North	2, 022 (46.6)	2, 321 (53.4)	<0.001
Center	175 (37.5)	292 (62.5)	
South	680 (41.7)	949 (58.3)	
Education, n (%)			
Elementary/middle school	99 (45.0)	121 (55.0)	<0.001
High school	1, 358 (44.9)	1, 663 (55.1)	
Bachelor's degree	480 (39.3)	741 (60.7)	
Master's degree	685 (46.9)	775 (53.1)	
Doctoral degree	255 (49.3)	262 (50.7)	
Marital status n (%)			
Single	946 (42.1)	1, 303 (57.9)	<0.001
Married or re-married	845 (52.3)	771 (47.7)	
Cohabitant	285 (48.1)	305 (51.9)	
In a relationship	657 (38.8)	1, 035 (61.2)	
Divorced/separated/widowed	144 (49.3)	148 (50.7)	
Children (yes), n (%)			<0.001
Yes	925 (50.2)	919 (49.8)	
No	1, 952 (42.5)	2, 643 (57.5)	
People living with you, n (%)			
0	213 (45.0)	260 (55.0)	<0.001
1	694 (49.9)	695 (50.1)	
2	687 (43.6)	887 (56.4)	
3	848 (44.0)	1, 079 (56.0)	
4	318 (39.0)	496 (61.1)	
5+	117 (44.7)	145 (55.3)	
Home size (sq. m.), n (%)			
≤80	693 (42.1)	954 (57.9)	<0.001
81–100	703 (43.8)	902 (56.2)	
101–150	800 (46.5)	922 (53.5)	
>150	681 (46.5)	784 (53.5)	
Having a Garden or Balcony, n (%)			
Yes	2, 624 (45.1)	3, 198 (54.9)	<0.001
No	253 (41.0)	364 (59.0)	
Work-related data			
Working with the public, n (%)			<0.001
Yes	1, 749 (42.7)	2, 347 (57.3)	
No	1, 128 (48.1)	1, 215 (51.9)	
Still working (yes), n (%)			<0.001
Yes	1, 622 (47.8)	1, 772 (52.2)	
No	1, 255 (41.2)	1, 790 (58, 8)	

(Continued)

TABLE 1-A | Continued

	Good sleeper (*n* = 2,877)	Poor sleeper (*n* = 3,562)	*P*
Work modality, n (%)			
Only in office	343 (47.6)	378 (52.4)	0.033
Only through smart working	991 (45.5)	1, 187 (54.5)	
In office and through smart working	138 (54.8)	114 (45.2)	
Mostly in office	58 (50.4)	57 (49.6)	
Mostly through smart working	142 (51.1)	136 (48.9)	
Consequences on work, n (%)			
Increased working hours	340 (45.8)	403 (54.2)	0.582
Work interruption	687 (44.8)	846 (55.2)	
Stable, with same starting time	60 (45.5)	72 (54.5)	
Stable, with earlier starting time	532 (45.7)	633 (54.3)	
Stable, with postponed starting time	189 (48.6)	200 (51.4)	
Reduced working hours	577 (43.5)	751 (56.5)	
Unemployed	502 (42.9)	669 (57.1)	
Other	1 (50.0)	1 (50.0)	
Occupation, n (%)			
Retired	69 (59.9)	48 (41.0)	< 0.001
Student	717 (38.8)	1, 133 (61.2)	
Working student	317 (37.2)	534 (62.8)	
Healthcare employee (public/private)	150 (40.4)	221 (59.6)	
Police/military	33 (62.3)	20 (37.7)	
Artisan, laborer, farmer	59 (58.4)	42 (41.6)	
Employee/manager/owner of business activity	298 (49.3)	306 (50.7)	
Employee/manager/owner of industrial activity	241 (59.2)	166 (40.8)	
Intellectual profession	255 (47.7)	280 (52.3)	
Unemployed/searching	108 (36.2)	190 (63.8)	
Office executive job	21 (60.0)	14 (40.0)	
Technical profession	175 (54.0)	149 (46.0)	
Non-qualified profession	381 (48.3)	408 (51.7)	
Other	53 (51.0)	51 (49.0)	

psychological responses, which include neuro-endocrine and behavioral components, such as changes in the activity and immune function of the hypothalamic pituitary adrenal (HPA) axis. Consequently, the activation of the HPA system by stress is incompatible with physiological sleep leading to lower sleep quality, longer sleep latency, increased awareness during the night, and more sleep complaints (Tempesta et al., 2013). On the other hand, impairment of sleep quality is a common behavioral consequence of the acute and chronic response to sleep, stress, and trauma (Lo Martire et al., 2019) and determines further increases in the HPA system, thereby promoting a vicious cycle of stress and worsened sleep quality (Lo Martire et al., 2019).

In addition, our results showed that sleep habits affected by quarantine had a strong impact on sleep quality: individuals who go to bed earlier or after the usual time and wake up earlier than usual or have increased habitual napping time have poor sleep quality. Regular schedules also played a role: there is an association between irregular schedules and the complaint of poor sleep (Pilz et al., 2018). Quality sleep requires regular schedules: numerous studies on the deleterious effects of shift work and social jet-lag prove the negative effects of these disturbed rhythms, both metabolically and psychiatrically (Rutters et al., 2014; Levandovski et al., 2011; Sűdy et al., 2019). The biological clock depends on a strong light signal in the morning to update the central clock (Roenneberg et al., 2013). Exposure to intense light in the evening directly stimulates the arousal systems; thus, the individual remains more vigilant and goes to bed later (Phipps-Nelson et al., 2003). In addition, exposure to light in the evening may affect melatonin secretion, resulting in altered night sleep duration (Gooley et al., 2011). This lag may become confusing for the subject once the confinement measures had been lifted: resetting the clock can be difficult, with severe drowsiness and sleeplessness in the evening.

The present study also found a strong association, also recently documented in the Italian population (Casagrande et al., 2020; Cellini et al., 2020), between those who have poor sleep quality and psychological distress. In particular, our study reveals that those who have high levels of stress, anxiety and depression had a higher probability of have sleep problems.

Since quarantine is characterized by self-isolation, social estrangement, separation, loss of freedom, and uncertainty, negative emotions such as fear, anger, and frustration are common and may lead to anxiety, boredom, and/or a feeling of uneasiness (Brooks et al., 2020; Holmes et al., 2020;

TABLE 1-B | Comparisons between the Good Sleeper vs. Poor Sleeper sample with chi-square tests on COVID-19 related data, sleep habits and mental healths.

	Good sleeper (*n* = 2,877)	Poor Sleeper (*n* = 3,562)	*P*
COVID-19-related data			
COVID-19 positive, n (%)			
No	2, 803 (44.9)	3, 431 (55.1)	0.303
Yes	18 (34.6)	33 (65.4)	
Had symptoms but no swab test	42 (38.9)	66 (61.1)	
No answer/other	8 (30.4)	10 (69.6)	
Forced quarantine, n (%)			
No	2, 649 (45.1)	3, 219 (54.9)	0.037
Yes	221 (40.2)	329 (59.8)	
No answer	7 (33.3)	14 (66.7)	
Someone close positive, n (%)			0.002
Yes	377 (40.0)	566 (60.0)	
No	2, 500 (45.5)	2, 996 (54, 5)	
Someone close died, n (%)			
Yes	160 (38.3)	258 (61.7)	0.004
No	2, 717 (45.1)	3, 304 (54.9)	
Changes in physical relationships, n (%)			
Decreased	2.554 (45.1)	3, 108 (54.9)	< 0.001
Stable	171 (47.8)	187 (52.2)	
Improved	152 (36.3)	267 (63.7)	
Changes in online relationships, n (%)			
Decreased	147 (42.7)	197 (52.3)	0.020
Stable	958 (47.3)	1, 068 (52.7)	
Improved	1, 772 (43.5)	2, 297 (56.5)	
Sleep-related data			
Changes in the habitual bedtime, n (%)			
Earlier	151 (36.3)	265 (63.7)	< 0.001
Stable	1, 494 (59.3)	1, 025 (40.7)	
Postponed	1, 232 (35.2)	2, 272 (64.8)	
Changes in the habitual awakening time, n (%)			
Earlier	154 (30.3)	354 (69.7)	< 0.001
Stable	1, 284 (54.3)	1, 079 (45.7)	
Postponed	1, 439 (40.3)	2, 129 (59.7)	
Changes in the habitual napping, n (%)			
Reduced	1, 085 (43.9)	1, 387 (56.1)	< 0.001
Stable	1, 249 (48.3)	1, 336 (51.7)	
Increased	542 (39.2)	839 (60.8)	
Mental Health			
Stress, n (%)			
Extremely severe	25 (6.4)	362 (93.6)	< 0.001
Severe	121 (14.9)	694 (85.1)	
Moderate	274 (25.2)	811 (74.8)	
Mild	291 (36.9)	498 (63.1)	
Normal	2, 166 (64.4)	1, 197 (35.6)	
Anxiety, n (%)			
Extremely severe	38 (7.9)	504 (92.1)	< 0.001
Severe	49 (12.1)	355 (87.9)	
Moderate	203 (22.7)	693 (77.3)	
Mild	159 (33.2)	320 (66.8)	
Normal	2, 428 (59.0)	1, 690 (41.0)	

(Continued)

TABLE 1-B | Continued

	Good sleeper (*n* = 2,877)	Poor Sleeper (*n* = 3,562)	*P*
Depression, n (%)			
Extremely severe	55 (10.0)	497 (90.0)	< 0.001
Severe	107 (19.4)	444 (80.6)	
Moderate	338 (27.6)	888 (72.4)	
Mild	411 (41.1)	590 (58.9)	
Normal	1, 966 (63.2)	1, 143 (36.8)	

(A,B) *show frequencies and percentages of good and poor sleepers for all investigated variables.*

Qiu et al., 2020; Roychowdhury, 2020). Such feelings endorse negative beliefs about the individual ability to cope. In this context, Brooks et al. (2020) present the main factors that seem to negatively influence our system during the quarantine period: (1) duration of the quarantine; (2) fear of getting infected/spreading the infection; (3) feelings of frustration and boredom; (4) inadequate supply capacity; and (5) lack of sufficient/salient information (Brooks et al., 2020). Moreover, the impossibility to take part in usual day-to-day activities, like outdoor physical activity or physical contact with others, together with dramatic changes in working modalities might encourage a dysregulation of the wake/sleep cycle (Panahi and Tremblay, 2018) as well as increasing psychological distress (Chirico et al., 2020).

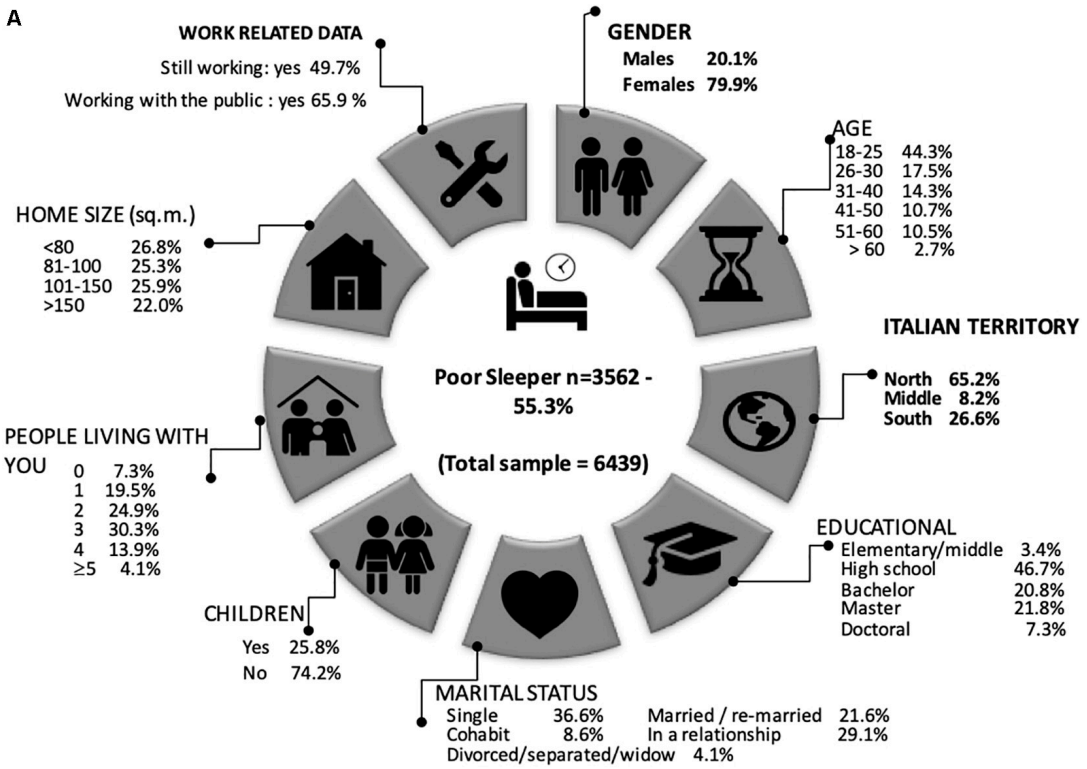
According to the cognitive–behavioral model of insomnia, the 3P model, stress is the most common precipitating factor (Spielman et al., 1987). Therefore, all the highlighted COVID stressors seem to trigger elevated cognitive and physiological hyperarousal in a vicious circle that may have impaired sleep quality. Furthermore, when the perceived stress exceeds an individual's resources, the consequent change in the emotional state (e.g., anxiety) affects wellbeing (Lazarus and Folkman, 1984; Lazarus et al., 1985). Moreover, recent studies underlined how sleep deprivation (Spiegelhalder et al., 2013) significantly reduces the functional connectivity in frontal brain regions, including the ventromedial regions involved in strategies of decision making based on reward and punishment. These alterations have been related with a loss in emotional control and a general tendency to take impulsive and risky decisions that may contribute to maintaining the mood disorder (Kalmbach et al., 2018).

Furthermore, in line with scientific evidence on sleep disturbances (Ohayon and Smirne, 2002; Terzano et al., 2004; Léger et al., 2008) the female gender is more exposed than the male to having problems with sleep. According to other studies on epidemic and quarantine conditions, in nation-wide pandemic catastrophes, sleep disorders are more present in women than in men (Kendler et al., 2001; McLean and Anderson, 2009). Some evidence (Driver et al., 1996; Baker and Driver, 2004; Dzaja et al., 2005; Zhang and Wing, 2006; Davidson, 2009) shows that the changing hormone profile across the reproductive life of a woman, from puberty through the reproductive period to the postmenopausal years, may have a significant influence on sleep leading to sleep alteration or disruption and other vulnerabilities specific to psychological disorders in women (Soni et al., 2013).

Moreover, in our study, the death of someone close due to COVID-19 seems to be a risk factor in the onset of a sleep disorder, as described in the literature (Healey et al., 1981; Morin et al., 2003; Monk et al., 2008). The death of family members or close friends can be very traumatic, especially when the circumstances are unexpected as in this period. Surely, in this dramatic period, not being able to bid farewell and give loved ones a dignified burial have certainly worsened the grief over the loss, with consequences on sleep.

Paradoxically, in our sample, neither age nor the type of occupation seemed to represent a risk factor in developing sleep disorders, as it has been instead described in the Chinese healthcare staff and attributed to the grueling work shifts and the constant witnessing of death and suffering. Most likely, our sample of healthcare professionals was too small (5.7%) compared not only to the other professions but also to the Chinese sample, since our survey was voluntary and did not involve direct administration (Pappa et al., 2020; Xiao et al., 2020; Xue et al., 2020; Zhang et al., 2020) in the front line (hospitals), where these workers were active. In addition, with age, nighttime sleep becomes more fragmented, and total sleep time is reduced (Ohayon et al., 2017). In this stressful condition where COVID induced profound changes in sleep habits, we may all find ourselves, regardless of age differences, experiencing sleep in a problematic way.

Another interesting result that we reported is a risk of sleep problems in Central Italy, although those who live in Northern Italy have been considered the main Italian core of the emergency, due to the greater number of infections and deaths (Istituto Superiore di Sanità, 2020). Perhaps the worries about personal safety, transmitting the disease to family members, stigmatization from being infected, shift work, and interpersonal isolation can manifest by hyperarousal states, as well as problems with anxiety and stimulus control. Stigma can lead to continued fear as people with a disease anticipate discrimination (Audet et al., 2013), and we know at the same time that stigma can be one of the most powerful barriers to delivering prevention, treatment, and care to the most vulnerable, who are at the same time the ones most in need. Moreover, it is possible to hypothesize that another explanation of this result is due to the fact that residents of this area, following the violent L'Aquila earthquake, have developed greater psychological consequences and are more prone to developing posttraumatic stress disorder symptomatology affecting sleep (Tempesta et al., 2013; Ferrara et al., 2016). Finally, the people living in this location perceive themselves to be at higher risk of infection. In fact, some studies (Alexander and Klein, 2001; Cacciaglia et al., 2017) suggested



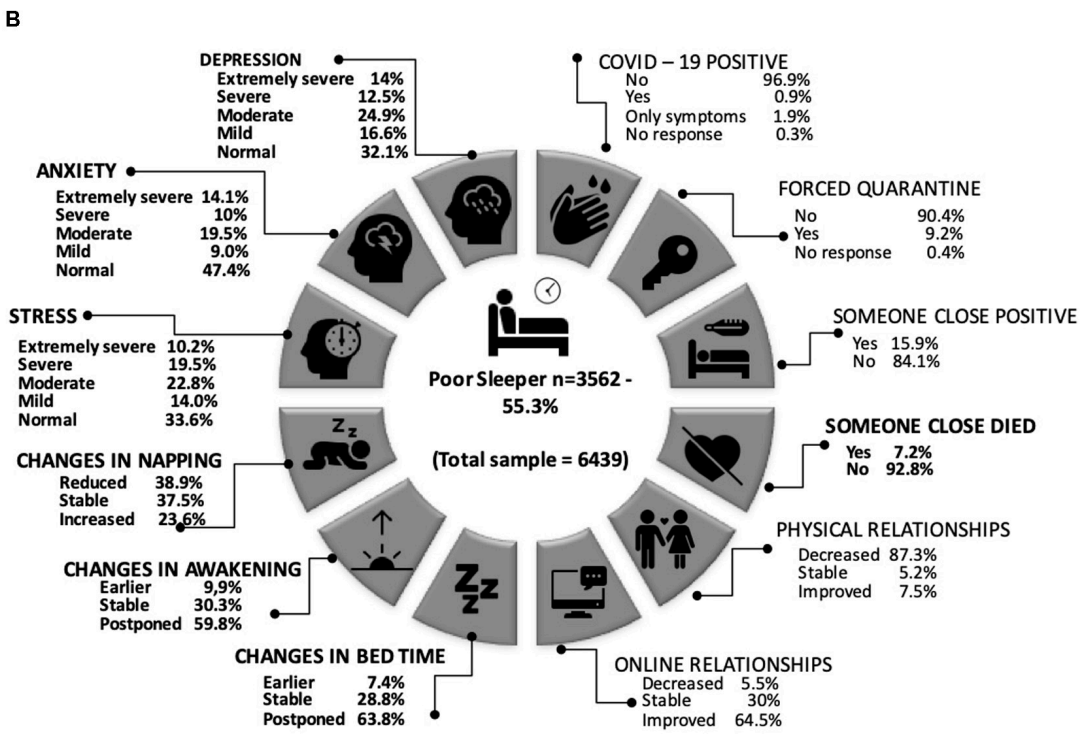
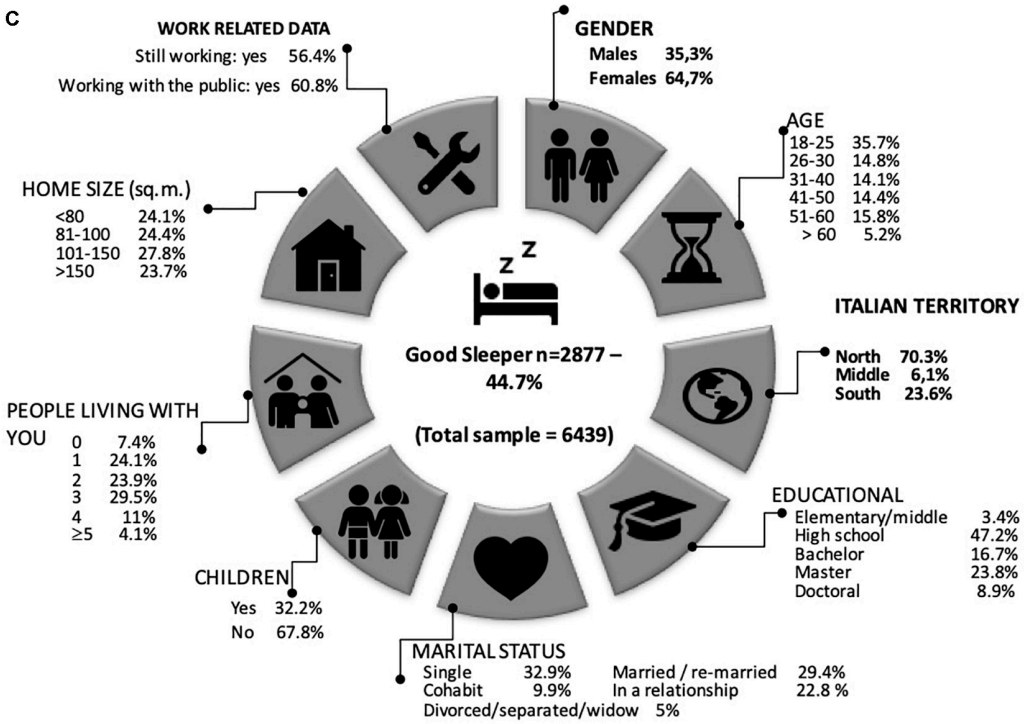


FIGURE 1 | Continued



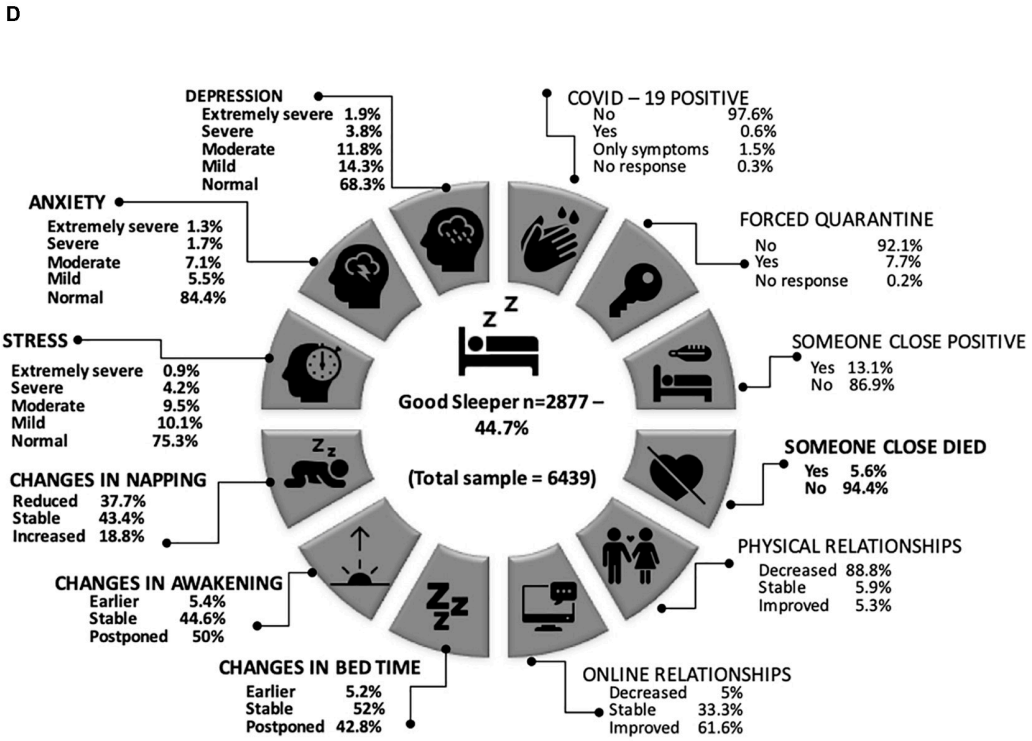


FIGURE 1 | (A) Percentages of poor sleeper stratified for the variables. In bold the significations in the multivariable logistic regression model. The icons are selected from the https://icons8.it. **(B)** Percentages of poor sleeper stratified for the variables. In bold the significations in the multivariable logistic regression model. The icons are selected from the https://icons8.it. **(C)** Percentages of good sleeper stratified for the variables. In bold the significations in the multivariable logistic regression model. The icons are selected from the https://icons8.it. **(D)** Percentages of good sleeper stratified for the variables. In bold the significations in the multivariable logistic regression model. The icons are selected from the https://icons8.it.

TABLE 2 | Multivariable logistic regression analysis of the poor sleeper sample.

Variable	OR	*P*	95% CI
Demographic data			
Gender (female)	1.66	<0.001	1.45–1.90
Age			
18–25	1.04	0.764	0.67–1.70
26–30	1.20	0.920	0.79–1.91
31–40	1.17	0.458	0.79–1.77
41–50	0.98	0.920	0.66–1.49
51–60	1.06	0.764	0.72–1.55
>60	Reference		
Italian territory			
North	Reference		
Center	1.39	0.006	1.10–1.76
South	1.13	0.104	0.95–1.31
Education level			
Elementary/middle school	Reference		
High school	0.86	0.394	0.61–1.21
Bachelor's degree	0.95	0.826	0.67–1.38
Master's degree	0.95	0.765	0.66–1.36
Doctoral degree	0.89	0.594	0.59–1.35
Marital status			
Single	Reference		
Married or re-married	0.93	0.603	0.72–1.21
Cohabit	0.84	0.183	0.65–1.09
In a relationship	0.89	0.155	0.77–1.04
Divorced/separated/widowed	1.00	0.991	0.70–1.43
Children (no)	1.31	0.037	1.01–1.69
People living with you			
0	Reference		
1	0.80	0.119	0.61–1.06
2	0.91	0.527	0.69–1.21
3	0.88	0.372	0.66–1.17
4	1.10	0.553	0.80–1.51
5+	0.81	0.293	0.54–1.20
Home size (sq. m.)			
≤80	Reference		
81–100	1.00	0.995	0.84–1.19
101–150	0.88	0.170	0.74–1.05
>150	0.89	0.223	0.73–1.07
Having a garden or balcony (yes)	0.89	0.266	0.72–1.09
Working with the public (yes)	1.12	0.085	0.98–1.28
Still working (yes)	0.99	0.883	0.86–1.13
Occupation			
Retired	Reference		
Student	1.04	0.897	0.59–1.81
Working student	1.00	0.973	0.57–1.78
Healthcare employee (public/private)	1.37	0.287	0.77–2.43
Police/military	0.93	0.856	0.40–2.12
Artisan, laborer, farmer	0.65	0.226	0.32–1.31
Employee/manager/owner of business activity	0.88	0.637	0.50–1.52
Employee/manager/owner of industrial activity	0.81	0.479	0.46–1.44
Intellectual profession	0.83	0.506	0.47–1.45

(Continued)

TABLE 2 | Continued

Variable	OR	*P*	95% CI
Unemployed/searching	1.29	0.398	0.72–2.32
Office executive job	0.83	0.687	0.32–2.10
Technical profession	0.77	0.367	0.43–1.37
Non-qualified profession	0.89	0.687	0.52–1.54
Other	0.73	0.372	0.37–1.45
COVID-19 positive			
No	Reference		
Yes	1.96	0.066	0.95–4.03
Had symptoms but no swab test	1.36	0.196	0.85–2.20
Forced quarantine			
No	Reference		
Yes	0.88	0.270	0.70–1.10
Someone close positive (yes)	0.97	0.749	0.81–1.16
Someone close died (yes)	1.41	0.008	1.09–1.81
Changes in physical relationships			
Decreased	Reference		
Stable	1.10	0.478	0.85–1.42
Improved	1.18	0.178	0.93–1.52
Changes in online relationships			
Decreased	Reference		
Stable	0.97	0.838	0.73–1.29
Improved	1.02	0.900	0.78–1.33
Changes in the habitual bedtime			
Earlier	1.59	0.001	1.22–2.07
Stable	Reference		
Postponed	2.10	<0.001	1.81–2.41
Changes in the habitual awakening time			
Earlier	1.47	0.004	1.14–1.90
Stable	Reference		
Postponed	1.01	0.735	0.88–1.17
Changes in the habitual napping			
Reduced	1.32	0.001	1.13–1.56
Stable	Reference		
Increased	1.11	0.114	0.94–1.28
Stress			
Extremely severe	4.83	<0.001	2.95–7.92
Severe	3.37	<0.001	2.59–4.39
Moderate	2.60	<0.001	2.16–3.16
Mild	2.10	<0.001	1.76–2.52
Normal	Reference		
Anxiety			
Extremely severe	3.74	<0.001	2.54–5.51
Severe	3.11	<0.001	2.23–4.35
Moderate	2.39	<0.001	1.98–2.89
Mild	1.61	<0.001	1.29–2.02
Normal	Reference		
Depression			
Extremely severe	2.39	<0.001	1.69–3.53
Severe	1.77	<0.001	1.32–2.30
Moderate	1.67	<0.001	1.38–1.98
Mild	1.53	<0.001	1.30–1.81
Normal	Reference		

that people who were repeatedly exposed to traumatic events were prone to suffering from many psychological problems and consequently have sleep disorders.

We believe that multidisciplinary action should be taken in order to plan appropriate responses to the current crisis caused by the COVID-19 health emergency. According to Holmes et al. (2020), the consequences of COVID-19 epidemic in the global population are truly unknown and worrying. Therefore, a range wealth of collaborative work is necessary where psychologists, psychiatrists, neurologists, pulmonologists, and virologists cooperate to finalize a policy that will help the population not only to reduce fear and stigma but also to treat mental health and poor quality of sleep caused by the COVID-19 outbreak (Castelnuovo et al., 2020). In particular, as our results highlight, the poor quality of sleep, especially in predisposed subjects, might represent a risk factor for the development of chronic insomnia or other sleep disorders. Moreover, we confirm the negative psychosocial changes observed by Brooks et al. (2020), especially in sleep habits. These are probably caused not only by factors such as poor exposure to sunlight, reduced physical activity, and psychological distress (Altena et al., 2020) but also by the lack of regular and scheduled activities. Moreover, the European Academy for Cognitive–Behavioral Treatment of Insomnia has developed some useful recommendations for the family or single people adapted from the key points of cognitive–behavioral therapy for insomnia to manage the risks attendant to home confinement and to give practical advice about how to handle sleep problems (Altena et al., 2020).

In Italy, the Italian Associations of Sleep Medicine, a multidisciplinary association of specialists on sleep disorders and their treatments, have started an intensive awareness campaign about sleep problems during the lockdown and developed an online help desk[1] where the best sleep medicine experts (neurologists, pulmonologists, psychiatrists, and psychologists) respond online to requests of whoever feels the need to improve sleep in this period of time.

As a whole, the results of our study seem to be relevant to outline risk factors for sleep quality in the Italian population during the COVID-19 emergency, but some limitations need to be considered. First, our study is not representative of the sample compared to the Italian population: it was a convenience sample. In addition, the data and results were derived from a cross-sectional design: it was difficult to make cause-and-effect hypotheses. Second, having adopted an online survey limits the generalizability of the results, although it currently represents the only solution for data collection in the time of outbreak. Subsequently, recruitment bias emerged in our sample, which is characterized by a high number of students and women. This aspect should be considered in the interpretation of the results. Third, in this survey we only adopted a self-report questionnaire. Despite the importance of measuring the subjective perception of sleep and distress, semi-objective or objective measures of sleep (such as a sleep diary or actigraphy) and distress would be useful to support our findings.

[1] http://www.sonnomed.it/

CONCLUSION

This is the first study designed to understand sleep quality and lifestyle in the Italian population during the lockdown period that provides more than 6,000 participants in a survey developed specifically for the health emergency related to COVID-19. Our study found that more than half of the Italian population had impaired sleep quality and sleep habits during the COVID-19 lockdown containment measures.

The related factors included female gender, Italian territory, loss of a loved one due to COVID-19 during the lockdown, changes in sleep habits, and elevated psychological distress. A multidisciplinary intervention for sleep disorders and related psychological discomfort is fundamental with a view to taking action to deal with the current crisis caused by the restrictions adopted to reduce the COVID-19 outbreak and to cope with the eventuality of new lockdown periods.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

This study was conducted in accordance with the Declaration of Helsinki and the study protocol was approved by the Ethics Committee of the Center for Research and Psychological Intervention (CERIP) of the University of Messina. Electronic informed consent was obtained from each participant prior to starting the investigation. Participants could withdraw from the survey at any moment without needing to give a reason.

AUTHOR CONTRIBUTIONS

CF provided substantial contributions to the conception of the work, deep analysis of the literature, study design, development, and final approval of the manuscript. AM contributed in the design of the study, participated in the development and revision of the work, and agreement for final approval of the manuscript. CZ and SS contributed to data analysis and agreement for final approval of the manuscript. MQ, VL, MF, DL, EV, LB, ES, and RC contributed to the revision of the work and agreement for final approval of the manuscript. LP, LD, DR, GP, and GC contributed to deep revision of the work, with literature analysis and agreement for final approval of the manuscript. All authors contributed to the article and approved the submitted version.

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A Network Analysis of Post-traumatic Stress Disorder Symptoms and Correlates During the COVID-19 Pandemic

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Background and Objective: The coronavirus disease 2019 (COVID-19) outbreak has been suggested as a collective trauma, which presents a continuing crisis. However, the specific post-traumatic implication of this crisis has not been adequately studied yet. The current study was aimed to ascertain the most central symptom and the strong connections between symptoms of post-traumatic stress disorder (PTSD). At the same time, exploring the relationship between covariates and the network of PTSD symptoms, by taking sex, anxiety, depression, suicidal ideation, quality of life, and social support as covariates, may help us to know the arise and maintenance of PTSD symptoms and give specified suggestions to people under the shadow of COVID-19.

Method: The Post-traumatic Stress Disorder Checklist for Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), was used to assess the PTSD symptoms extent of 338 healthy participants over the past month. Networks were analyzed using state-of-the-art regularized partial correlation models. In addition, the centrality of the symptoms and the robustness of the results were analyzed.

Results: The network analysis revealed that the especially strong connections emerged between avoidance of thoughts and avoidance of reminders, hypervigilance and exaggerated startle response, intrusive thoughts and nightmares, flashbacks and emotional cue reactivity, and detachment and restricted affect. The most central symptoms were self-destructive/reckless behavior. Incorporation of covariates into the network revealed the strong connections path between self-destructive/reckless behavior and loss of interest and depression.

Conclusion: Self-destructive/reckless behavior was the most central symptom in the network of PTSD symptoms related to the COVID-19 pandemic, which as an important target of interfere may have great benefits.

Keywords: network analysis, coronavirus disease 2019 (COVID-19), centrality, post-traumatic stress disorder (PTSD), suicide, public

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INTRODUCTION

Coronavirus disease 2019 (COVID-19) presents one of the greatest global public health threats of the twenty first century. On March 11, 2020, the World Health Organization (WHO) declared the COVID-19 coronavirus outbreak a pandemic. In China, the government advised citizens into home quarantine and inhibited most public transportations on January 23, 2020. COVID-19 has impacted every aspect of society (1). It has not only caused physical health issues, the pandemic and the need for isolation have also increased psychological health problems, including post-traumatic stress disorder (PTSD), depression, anxiety, and widespread fear (2, 3). Moreover, due to unprecedented levels of documentation and public exposure, COVID-19 may affect the majority of the population and cause vicarious trauma (4). The COVID-19 outbreak has been suggested as a collective trauma, which is a continuing crisis for everyone (5–7). However, the specific post-traumatic implication of this crisis has not been adequately studied yet. To prevent potential PTSD, it is necessary to investigate the characteristics of symptoms related to traumatic stress in people exposed to the COVID-19 crisis.

PTSD follows traumatic events and is characterized by symptoms of avoidance, intrusions, excessive arousal, and emotional numbing, etc (8). Previous studies on PTSD mostly adopted the reflective models based on the common cause hypothesis (9, 10). According to these models, symptoms reflect an underlying latent construct (i.e., disorder), which means the symptom covariance is caused by the latent construct, and it is causally independent among the symptoms themselves (11). For example, based on this perspective, studies on the prevalence of PTSD during COVID-19 found that about 10% of the population meet the PTSD criteria, and subthreshold disturbances accounted for a large proportion of PTSD disturbance (6, 12–15). Recently, McNally et al. (16) have proposed a causal system and suggested causal connections among PTSD symptoms that occur. For example, survivors who are exposed to trauma cues will likely be reactive and aroused, leading to avoidance behaviors. In addition, Ehlers and Clark (17) have assumed that individuals may have a negative bias in the evaluation of trauma and its outcomes after experiencing a traumatic event, and negative bias will cause avoidance of trauma cues, thereby increasing the sensitivity to threat and level of anxiety, leading to a vicious circle, which tend to maintain the PTSD symptoms. Empirical studies also showed that the factor structure of PTSD symptoms was varying in different traumatic experiences (18–20). Moreover, the relationships between PTSD symptoms and other psychological symptoms (e.g., anxiety, depression, and quality of life) (21–24), as well as the responses to treatment are changeable for different PTSD symptoms (25). However, neither the most central PTSD symptoms related to COVID-19 nor the related covariates were clear yet.

Network analysis has emerged as an approach involved in causal systems perspective. Specifically, network analysis is a methodology based on graph theory. Such methodology could be used to visualize the interaction between all observed variables, including psychopathology symptoms (26). The underlying hypothesis is that symptoms are interdependent, and a psychological disorder constitutes a network of symptoms that interact (11, 27, 28). Furthermore, network analysis enables computation of centrality that reveals the most important target of clinical interventions (9). Recently, network analysis has been applied to examine the constructs of mental disorders such as depression, schizophrenia, and anxiety disorders (29–32).

Network analysis has been used to identify the construct of PTSD, revealing that the factor structure of symptoms varied in different traumatic events. The studies have consistently found strong connections between hypervigilance and exaggerated startle response and between flashbacks and nightmares (16, 33–37). However, there is no agreement on the most central symptoms yet. The following symptoms have been identified as central symptoms of PTSD: negative trauma-related emotions (33), feeling emotionally numb (34), intrusions and concentration deficits (35), intrusive recollections and flashbacks (36), feeling detached (27), hypervigilance (16), and emotional cue reactivity (37). The researchers attributed the discrepancy to the different traumatic events, including natural disasters, wars, accidents (e.g., car accidents), man-made disasters (e.g., abuse), etc. However, a cross-cultural study showed moderate to high correlations of network structure and centrality estimates between four trauma patient samples with different cultures and types and severity of trauma (38). COVID-19 has been suggested as a new type of mass trauma (5) or a collective trauma (7), which was different from trauma on an individual level. It is necessary to investigate the PTSD symptom network related to the COVID-19 pandemic and further examine the most central symptoms so as to develop more targeted interventions.

In addition, previous studies have revealed individual difference in the network of PTSD symptoms. For example, Armor et al. (33) included sex, age, anxiety, depression, suicidal ideation, mental and physical functioning, and quality of life in the PTSD symptom network and found a strong connection between self-destructive/reckless behavior and suicidal ideation. They also found associations between difficulty concentrating and anxiety and depression, as well as associations between quality of life and restricted affect and depression. The findings suggested considering depression, anxiety, and suicidal ideation when diagnosing and treating PTSD. In order to expand the PTSD symptom network, Birkeland and Heir (34) included sex, severity of exposure, and social support as covariates. The results showed that women had a stronger physiological cue activity compared to men and a correlation between low social support and difficulty sleeping. Cao et al. (36) emphasized the impact of sex and revealed sex differences in both global connectivity and individual symptoms' connectivity of PTSD symptom networks. These findings indicate that females and persons who receive less social support are relatively more vulnerable to PTSD when they are exposed to traumatic events.

Conclusively, network analysis reveals the interactions among symptoms and the relationships between symptoms and covariates. It is still unclear for the PTSD symptom network and the relationships between covariates and symptoms of the people who were exposed to the COVID-19 outbreak. Therefore, the present study aimed to investigate the network of PTSD

symptoms and the most central symptoms on populations who were exposed to the COVID-19 outbreak to examine the role of covariates including sex, anxiety, depression, suicidal ideation, social support, and quality of life in the PTSD symptom network.

METHODS

Participants

This study was conducted between April 4 and April 10, 2020, when the government ended the lockdown of Wuhan and the COVID-19 crisis was under control in China (April 8). Questionnaires were distributed online using a snowball sampling approach. Specifically, we posted advertisements that described the purpose of the study and the principle of voluntary participation on well-known social software (WeChat and Tencent QQ) in China. The participants recruited in the study voluntarily shared the advertisements to relatives and friends. We used online questionnaires to collect data through the Questionnaire Star platform. A total of 361 questionnaires were completed. A total of 338 (252 females) valid questionnaires were analyzed after deleting recurring responses. The subjects were paid 3 yuan after completing the survey.

The average age of participants was 25.76 years (SD = 9.61). Among them, 19.8% of the participants were in Hubei Province, among which 48.5% of them were in Wuhan, the hardest-hit area in China during the COVID-19 outbreak. Moreover, 67.9% of the participants had a bachelor's degree, and 20.3% had a master's degree or above. Additionally, most of the participants were unmarried (81.3%). Also, 64.6% of the participants were students, 28.9% had a stable job, and 6.5% were unemployed. In addition, 16.7% of the participants worked as a volunteer during the COVID-19 outbreak, and 0.3% had been infected with COVID-19. The studies involving human participants were reviewed and approved by the Ethic Institutional Review Board of Central China Normal University.

Measures

Post-traumatic Stress Disorder Symptoms

PTSD symptoms were assessed by the Post-traumatic Stress Disorder Checklist for Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) (PCL-5) (39, 40). The PCL-5 is a self-report measure and contains 20 items that correspond to the DSM-5 symptoms of PTSD. It measures the severity of PTSD symptoms over the last 1 month, rated on a 5-point Likert scale ranging from 0 (not at all) to 4 (extremely). To ensure that the PTSD symptoms we measured were related to the COVID-19 pandemic, we specified traumatic event as the COVID pandemic in the instructions. The Cronbach's alpha coefficient of PCL-5 was 0.94 in our study.

Depression and Anxiety Symptoms

Depression and anxiety symptoms were measured using Patient Health Questionnaire-4 (PHQ-4) (41), which is a self-assessment screening tool for depression and anxiety. The PHQ-4 consists of four items; the depression subscale includes two items and the anxiety subscale includes two items. The response options range from 0 (never) to 3 (nearly everyday). Each total score of the subscales indicates the severity of depression and anxiety, respectively, in which higher scores reflect greater severity of symptoms. In the present study, the Cronbach's alpha coefficient of depression subscale was 0.74, and the Cronbach's alpha coefficient of anxiety subscale was 0.81.

Suicidal Ideation

Suicidal ideation was assessed by the revised suicidal ideation subscale of PHQ-9 (42). The subscale contains two items, which evaluates passive and active suicidal ideation, respectively (43). Specifically, the items are "How often have you been bothered by the thoughts that you would be better off dead?" and "How often have you been bothered by the thoughts of hurting yourself?" over the last 2 weeks. The response options range from 0 (never) to 3 (nearly everyday). Higher summary scores indicate stronger suicidal ideation. The Cronbach's alpha coefficient of suicidal ideation subscale was 0.90 in our study.

Social Support

The Crisis Support Scale (CSS) (44) was used to measure the social support that the participants received during the COVID-19 outbreak. The CSS includes seven items that are answered on a 7-point Likert scale ranging from 1 (never) to 7 (always). Higher total scores reflect higher social support. The Cronbach's alpha coefficient of CSS was 0.82 in the present study.

Quality of Life

The quality of life was measured using the 12-item Short-Form Health Survey (SF-12) (45). The SF-12 has been widely used to evaluate the quality of life related to health, reflecting individual health status and impact of health status on daily life. The questionnaire contains two subscales including 12 items: physical health and mental health. The raw scores have been transformed into standard score (mean = 50, SD = 10) (46). The range of standardized score was 0 to 100. The quality of life was indicated by average score of the two subscales, and higher scores reflect better quality of life. In this study, the Cronbach's alpha coefficient of SF-12 was 0.80.

Data Analysis

We used SPSS 24.0 (IBM Corp., Armonk, USA) to analyze participant characteristics. Estimations of network, centrality, and robustness were carried out in the free statistical environment R, following the suggestion of the developers on network analysis (47).

Network Estimate and Visualization

Two networks were estimated and visualized using R-package qgraph (48). We build a network containing 20 PTSD symptoms. In addition, we included six covariates (sex, anxiety, depression, suicidal ideation, social support, and quality of life) in the PTSD symptom network. The network consists of nodes and edges. In this present study, symptoms and covariates are "nodes," and the relationships between the nodes are "edges." We estimated the network of partial correlation coefficients *via* Gaussian Graphical Model. That is, the edge between two nodes was weighted connection controlling for all other edges in the network. It can be understood as a partial correlation, representing conditional

independence associations, in which the range of the weight is from −1 to 1 (49).

Specifically, we estimated all the association parameters among the nodes of the network using the cor_auto of R package qgraph. It estimates a large number of parameters (i.e., 190 pairwise association parameters in the network with 20 nodes, 325 pairwise association parameters in the network with 26 nodes) that may result in some false-positive connections. To minimize the false-positive connections, we set small edges to zero by applying a regularization method (EBOCglasso) that was revised from the least absolute shrinkage and selection operator (50, 51). In addition, we calculated and visualized the networks using R package qgraph and bootnet. Nodes with stronger average associations were placed closer to the center of the graph via Fruchterman–Reingold algorithm (52). The green edges indicate positive associations, while the red edges represent negative associations. Furthermore, the thickness of the edges reflects the magnitude of the connection; that is, thicker edges indicate stronger connections.

Centrality Estimate

We calculated node centrality in the PTSD symptom network to identify the most central symptoms. Higher centrality indicates that the symptom has stronger connections with other symptoms (26, 47). For each node, we estimated three commonly used indices of centrality: strength, closeness, and betweenness (53). Strength was calculated as the sum of edge weights of a node, reflecting direct connection strength of a node with other nodes in the network. Closeness was indexed by the inverse of the sum of distance from the node to all other nodes, indicating indirect connection strength of a node with other nodes in the network. The path between one node and the other node is shorter, the influence of this node on the other one is greater. Betweenness was assessed as the frequency that a node lies on the shortest path between two nodes, which indicated how central the node was when connecting all other nodes in the network.

In addition, expected influence (EI) indicates centrality by estimating the sum of the original score of each node (54), which was involved with the weight of connections as well as the direction of connections (55). Exploratively, we estimated one-step EI using R package bootnet (47) and compared it with the centrality index above. Higher EI represents higher centrality of a node (27, 56, 57).

Robustness Estimation and Testing for Significance

Estimation of robustness (i.e., accuracy and stability) of a psychopathology network is still a main challenge in network analysis. As suggested by Epskamp et al. (47), we used R package bootnet to assess the robustness of networks in our study. Bootstrapping of R package bootnet was used to test the robustness of edge weights and the robustness of centrality indices.

First, we calculated 95% confidence intervals for the edge weights and tested for differences in edge weights and centrality indices based on 1,000 bootstrap iterations at the alpha level of 0.05. Second, a node-dropping subsetting bootstrap technique and the correlation stability (CS) coefficient were applied to estimate the stability of centrality indices. That is, if the correlation between centrality values calculated from a subsample with participants missing and centrality values calculated from the complete data set is high (>0.7 by default), we would consider that the centrality metric is stable. The CS coefficient is an index for centrality stability, and the value should be more than 0.25, preferably higher than 0.5 (47).

We estimated the robustness of edge weights in both the PTSD symptom network and the network with covariates, while we only assessed the stability of centrality indices in the PTSD symptom network.

RESULTS

Sample Characteristics

The mean PCL-5 score was 12.90 (SD = 11.07). Also, 3.5% of the 338 participants reported a sum of PTSD symptoms over the PCL-5 cut point at 38 (58), 25.44% fulfilled two or more than two criteria of the B-E diagnosis criteria but with total PCL-5 scores of

TABLE 1 | Means and standard deviations of post-traumatic stress disorder (PTSD) symptoms and covariates.

	Mean	SD
INTRUSIONS		
B1: Intrusive thoughts	0.88	0.84
B2: Nightmares	0.38	0.69
B3: Flashbacks	0.71	0.87
B4: Emotional cue reactivity	0.87	0.83
B5: Physiological cue reactivity	0.45	0.69
AVOIDANCE		
C1: Avoidance of thoughts	0.67	0.86
C2: Avoidance of reminders	0.55	0.79
COGNITION AND MOOD ALTERATIONS		
D1: Trauma-related amnesia	0.57	0.80
D2: Negative belief	0.54	0.80
D3: Blame of self or others;	0.62	0.77
D4: Negative trauma-related emotions	0.70	0.79
D5: Loss of interest	0.68	0.88
D6: Detachment	0.84	0.96
D7: Restricted affect	0.60	0.84
AROUSAL AND REACTIVITY ALTERATIONS		
E1: Irritability	0.73	0.91
E2: Self-destructive/reckless behavior	0.18	0.58
E3: Hypervigilance	0.68	0.86
E4: Exaggerated startle response	0.59	0.78
E5: Difficulty concentrating	0.96	0.96
E6: Sleep disturbance	0.69	0.87
COVARIATES		
Anxiety	1.14	1.28
Depression	1.09	1.17
Suicidal ideation	0.29	0.88
Social support	30.94	7.96
Quality of life	49.33	6.12

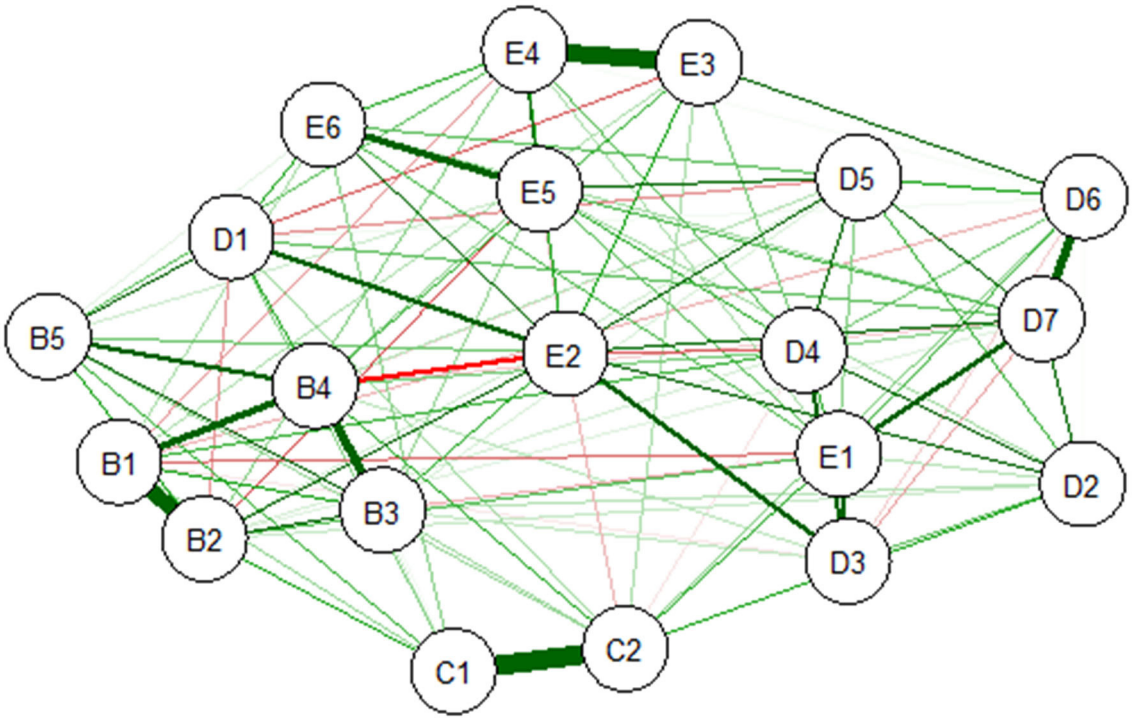

FIGURE 1 | Estimated network of DSM-5 PTSD symptoms. B1, Intrusive thoughts; B2, Nightmares; B3, Flashbacks; B4, Emotional cue reactivity; B5, Physiological cue reactivity; C1, Avoidance of thoughts; C2, Avoidance of reminders; D1, Trauma-related amnesia; D2, Negative belief; D3, Blame of self or others; D4, Negative trauma-related emotions; D5, Loss of interest; D6, Detachment; D7, Restricted affect; E1, Irritability; E2, Self-destructive/reckless behavior; E3, Hypervigilance; E4, Exaggerated startle response; E5, Difficulty concentrating; E6, Sleep disturbance; PTSD, post-traumatic stress disorder; DSM-5, Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition.

under 38 (59). **Table 1** shows the means and standard deviations (SDs) of PTSD symptoms and covariates.

Post-traumatic Stress Disorder Symptom Network

Figure 1 shows the network structure of the 20 PTSD symptoms. Most of the connections between symptoms were positive. The bootstrap difference test indicated five associations significantly higher than at least half of the other edges: between avoidance of thoughts (C1) and avoidance of reminders (C2), hypervigilance (E3) and exaggerated startle response (E4), intrusive thoughts (B1) and nightmares (B2), flashbacks (B3) and emotional cue reactivity (B4), and detachment (D6) and restricted affect (D7) (shown in **Supplementary Figure 1** in Supplemental Material).

The centrality indices (strength, closeness, and betweenness) are shown in **Figure 2**. The three indices were significantly intercorrelated with each other (the correlation between strength and closeness was 0.59 ($p < 0.01$), the correlation between strength and betweenness was 0.72 ($p < 0.01$), and the correlation between closeness and betweenness was 0.81 ($p < 0.01$). Recent studies have suggested that betweenness and closeness were unstable (56, 57). Thus, we only focused on strength because of its reliability and the high correlations with other indices. The results showed that five symptoms [Self-destructive/reckless behavior (E2), Emotional cue reactivity (B4), Nightmares (B2), Restricted affect (D7), and Intrusive thoughts (B1)] had a high node strength. Significance testing indicated that only strength for Self-destructive/reckless behavior (E2) was significantly higher than other nodes (shown in **Supplementary Figure 2** in Supplemental Material). Trauma-related amnesia (D1) and blame of self or others (D3) showed a relatively lower node strength.

Additionally, the results showed that EI was significantly correlated with strength ($r = 0.80$, $p < 0.01$). EI analysis revealed that the restricted affect (D7), Self-destructive/reckless behavior (E2), exaggerated startle response (E4), nightmares (B2), and avoidance of reminders (C2) were significantly intercorrelated with each other (**Supplementary Figure 3**).

Post-traumatic Stress Disorder Network With Covariates

Figure 3 shows the network of PTSD symptoms including six covariates, namely, sex, anxiety, depression, suicidal ideation, social support, and quality of life. The results indicated strong connections between self-destructive/reckless behavior (E2) and suicidal ideation (0.83) and between loss of interest (D5) and depression (0.66). In addition, anxiety and depression were positively correlated (0.73), and suicidal ideation and quality of life were negatively associated (−0.61).

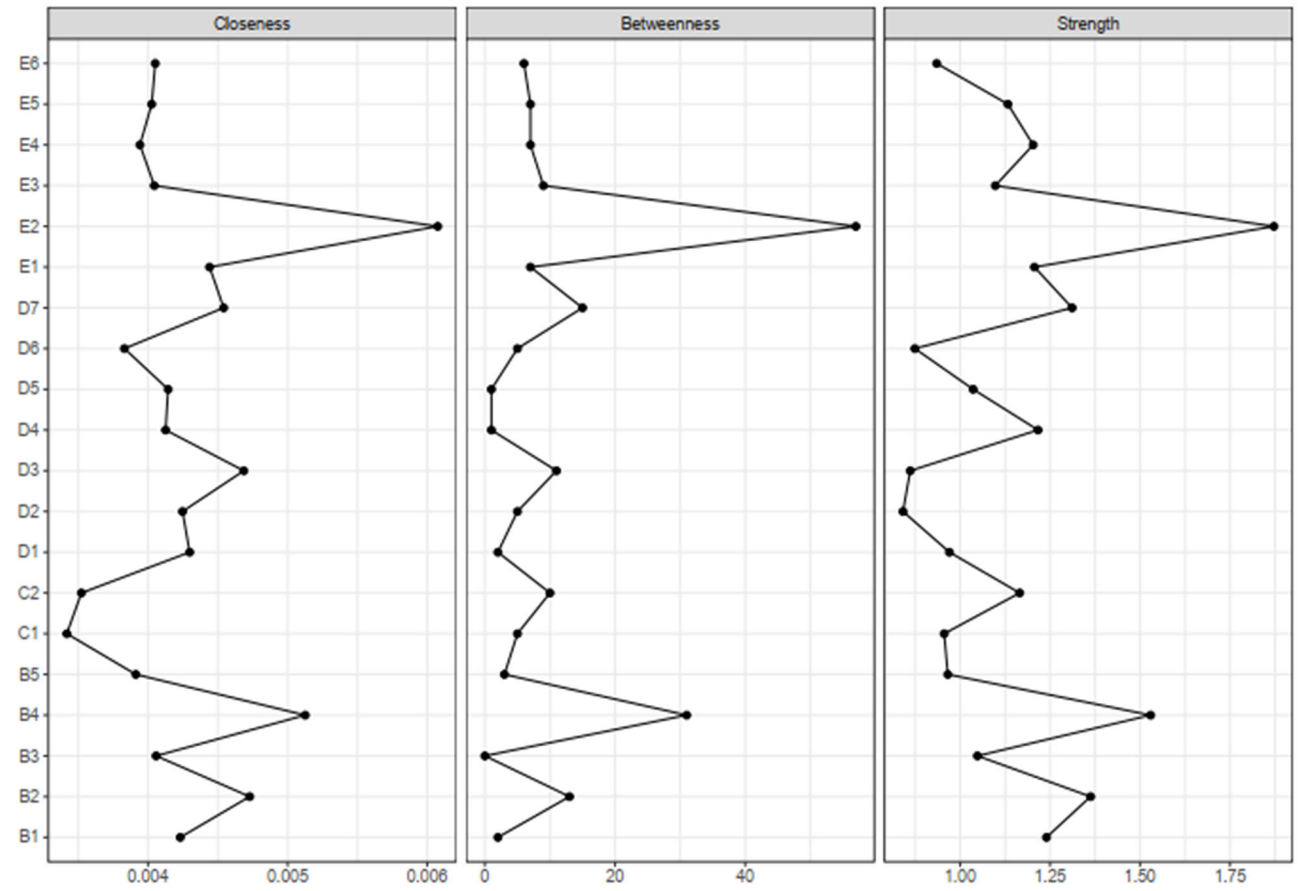

FIGURE 2 | Centrality indices for the estimated network of DSM-5 PTSD symptoms. PTSD, post-traumatic stress disorder; DSM-5, Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition.

Robustness of Networks

The estimated robustness (i.e., stability and accuracy) of 20 PTSD symptom network was presented in **Figure 4A**. The estimated robustness of PTSD symptom network with covariates (26 nodes) was shown in **Figure 4B**. The results showed that 95% confidence intervals for the edge weights were mostly overlapping in both networks. The bootstrap testing for the edge weights indicated that the estimation of the PTSD symptom network and the significance were accurate in both networks.

Figure 5 shows the estimated stability of the centrality indices for the 20 PTSD symptom network *via* node-dropping bootstrap technique. The results indicated a CS coefficient of 0.28 for strength.

DISCUSSION

The present study investigated the network of PTSD symptoms on people who were exposed to the COVID-19 outbreak. Specifically, we estimated and tested the accuracy and stability of two networks. One network contained 20 PTSD symptoms, and the other one included the 20 PTSD symptoms as well as six covariates. We will discuss the connections between the PTSD symptoms and the most central symptoms. We then discuss the relationships between the PTSD symptoms and the covariates.

Post-traumatic Stress Disorder Symptoms

The results showed strong connections between avoidance of thoughts (C1) and avoidance of reminders (C2), between hypervigilance (E3) and exaggerated startle response (E4), between intrusive thoughts (B1) and nightmares (B2), between flashbacks (B3) and emotional cue reactivity (B4), and between detachment (D6) and restricted affect (D7) in the network of PTSD symptoms related to the COVID-19 pandemic. It suggested that the most central symptom was self-destructive/reckless behavior (E2).

In the 20 PTSD symptom network, the strong connections between hypervigilance and exaggerated startle response and between intrusive thoughts and nightmares were consistent with previous studies (16, 27, 33–35, 37). The strong connection between hypervigilance and exaggerated startle response indicated that the two symptoms affect each other through a feedback loop (16). It was supported by the Sensitization Model of PTSD. According to this model, survivors may become sensitive to the threat and show an exaggerated startle response

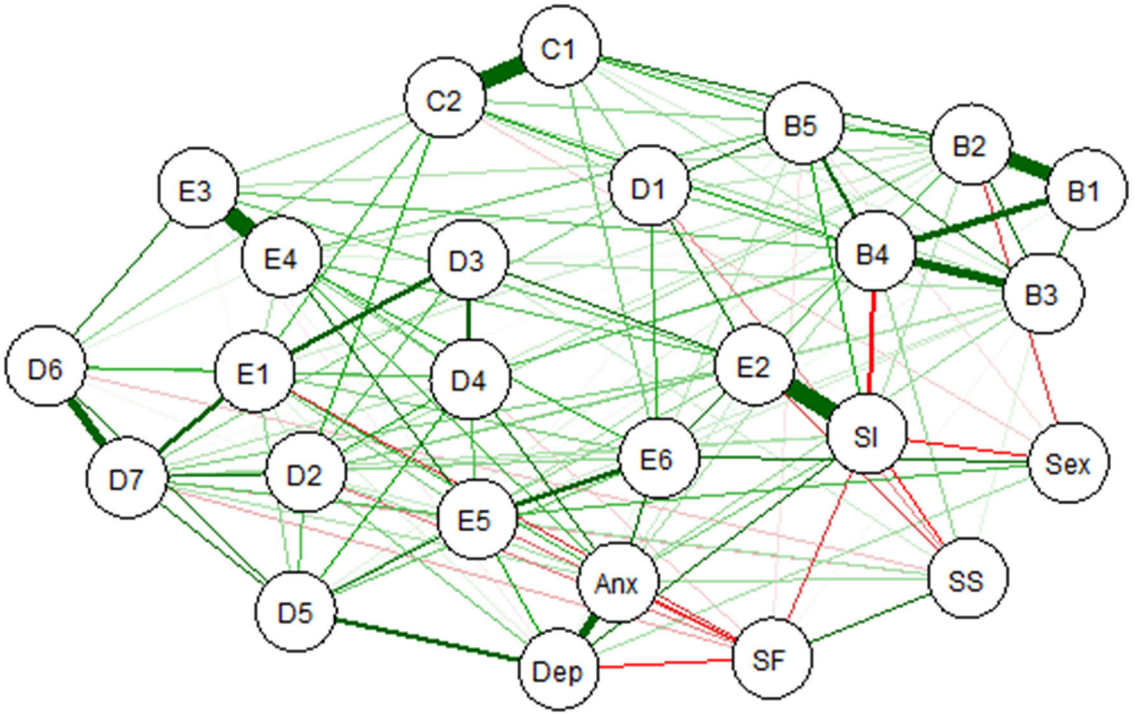

FIGURE 3 | Estimated network of DSM-5 PTSD symptoms including covariates. Anx, anxiety; Dep, depression; SI, suicidal ideation; SS, social support; SF, quality of life; PTSD, post-traumatic stress disorder; DSM-5, Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition.

after exposure to traumatic occurrences (60). Similarly, the strong connection between intrusive thoughts and nightmares indicated a loop in which intrusive thoughts about the traumatic event increase the possibility of nightmares associated with trauma, and in turn, the nightmares may make traumatic recollections more intrusive (34). In addition, the strong connection between detachment and restricted affect was also consistent with previous studies (16, 33, 35, 36, 38). This finding reflected that individuals with PTSD symptoms may regulate their emotions by disengaging from their emotions rather than engaging in the emotions. As a result, they may not only disengage from negative emotions related to trauma but also disengage from positive emotions after trauma (61, 62).

Trauma-related amnesia showed the lowest node strength in the network of DSM-5 PTSD symptoms. This finding was compatible with previous findings of PTSD network analysis (16, 33, 34, 37). Trauma-related amnesia has been suggested to be less useful in PTSD diagnosis (63, 64). Furthermore, trauma-related amnesia showed a very weak factor loading in confirmatory factor analysis (65). It seems that PTSD associated with vivid traumatic memories rather than trauma-related amnesia (66). These findings suggested that trauma-related amnesia might not be a central symptom of PTSD. Moreover, when we excluded "amnesia" from the network analysis, the structure was hardly influenced (see **Supplementary Materials** for more details).

The finding of strong connection between avoidance of thoughts and avoidance of reminders conflicted with previous studies in which there was no strong connection. This incongruence may be partly the result of different types of trauma (18). Similarly, network analysis for depression also found different connections among symptoms due to different life events (67, 68). The different intervals between traumatic event and conducting studies may also have contributed to this discrepancy. We conducted the investigation around 1 month after COVID-19 was controlled in China, while previous studies performed the studies much later after trauma than this present study (16, 33–35, 37).

Additionally, the strong connections among symptoms found in this study suggested that fear-conditioning models and dysphoric response might be central to the development of PTSD. That is, physiological and emotional responses to trauma cues and intrusive memories may lead to thoughts about traumatic events and avoidance of trauma cues (17), and intrusiveness and avoidance increase the sensitivity of perceived threats (35, 69), as suggested in the fear-conditioning models (35, 70, 71). Subsequently, increased sensitivity of threats eventually results in dysphoric responses such as hypervigilance and exaggerated startle responses (17). However, whether the development of PTSD symptoms in the context of the COVID-19 outbreak is compatible with these models or not still needs to be tested in longitudinal studies (69, 72).

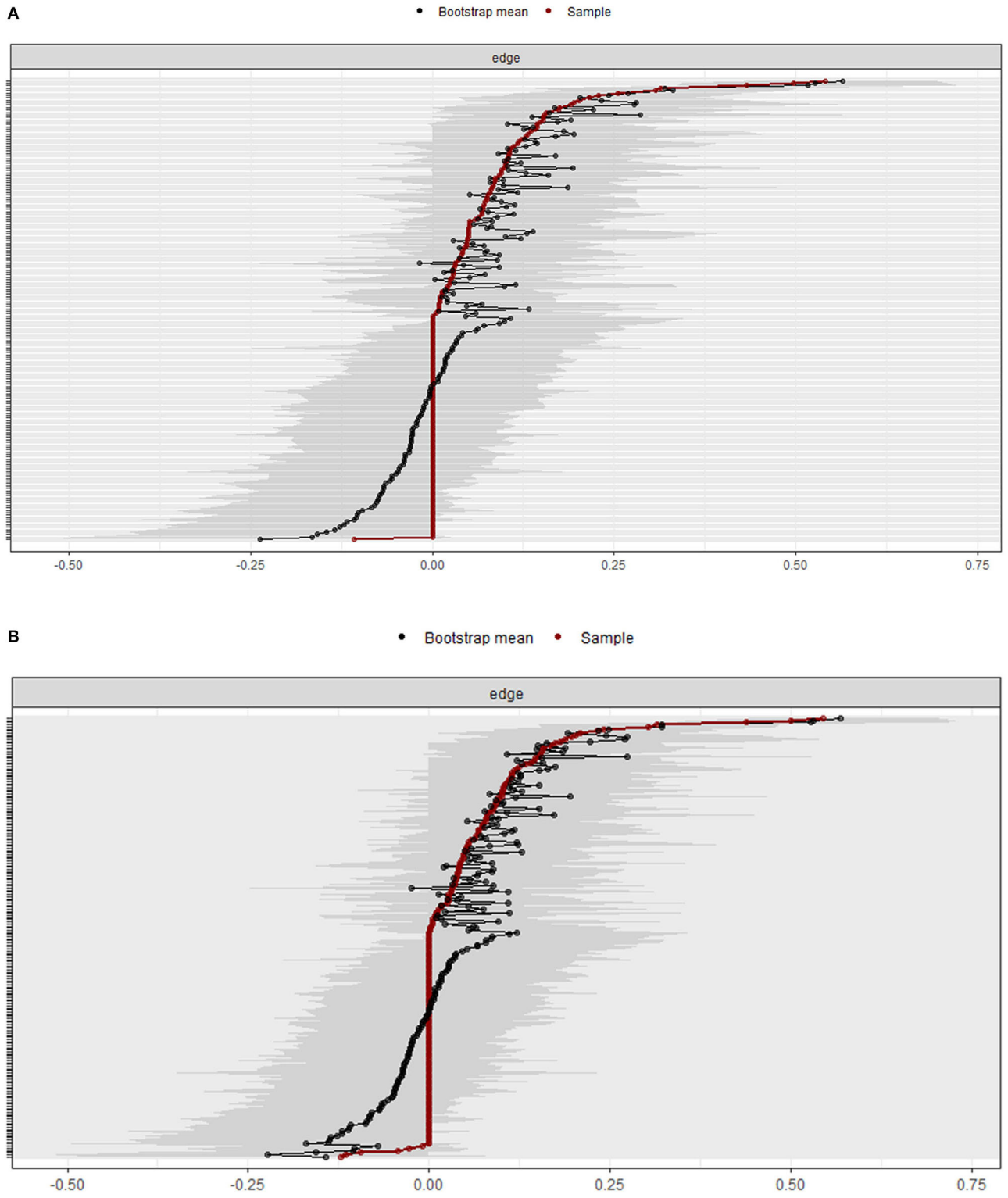

FIGURE 4 | Robustness of networks. **(A)** Bootstrap 95% confidence intervals for estimated edge weights in 20 PTSD symptom network. **(B)** Bootstrap 95% confidence intervals for estimated edge weights in PTSD symptom network with covariates. Red line presents the edge weights. The 95% confidence intervals are presented by the gray area. PTSD, post-traumatic stress disorder.

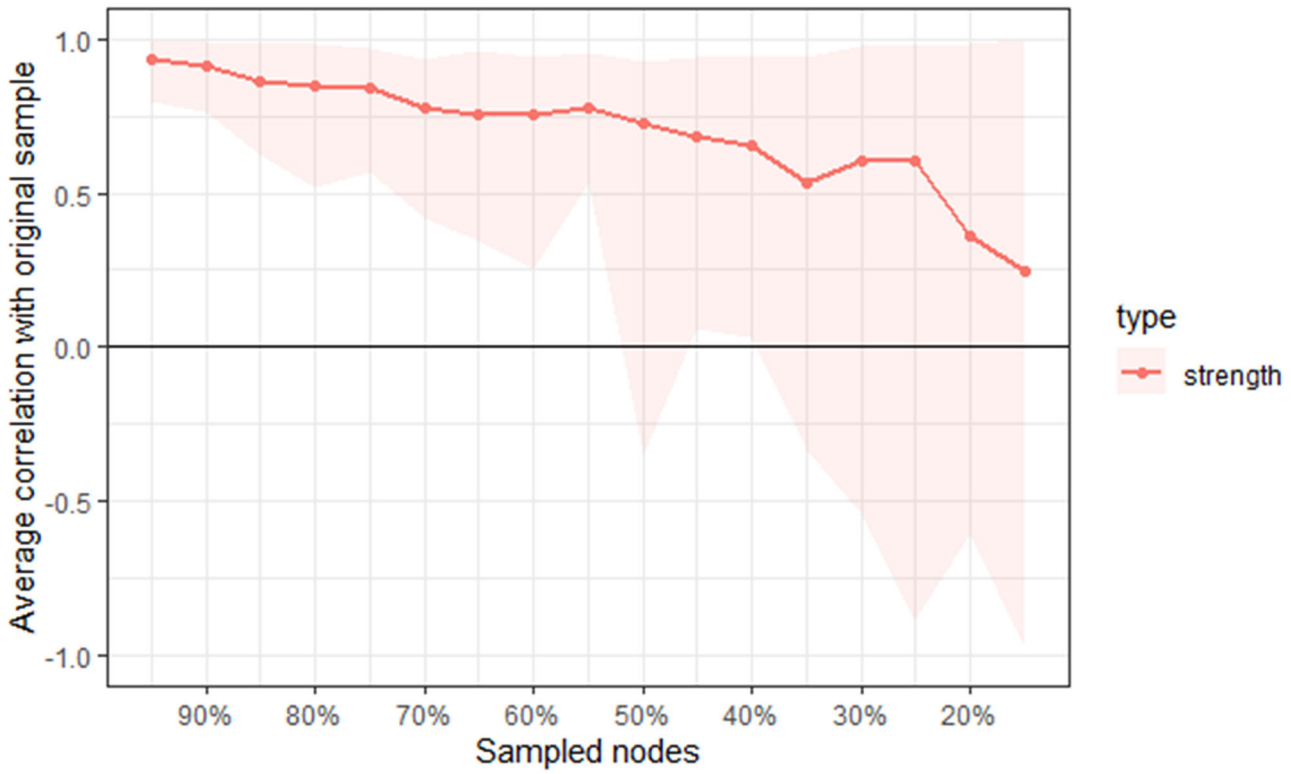

FIGURE 5 | The average correlation between bootstrap centrality indices of networks sampled with node-dropping and network of the DSM-5 PTSD symptoms. PTSD, post-traumatic stress disorder; DSM-5, Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition.

In terms of the most central symptom, this study found that self-destructive/reckless behavior was at the center of the PTSD symptom network. The centrality analysis revealed that the strength of self-destructive/reckless behavior was significantly higher than that of other symptoms, while there was no significant difference of node strength between all the other symptoms. Therefore, self-destructive/reckless behavior might have the greatest clinical significance for the diagnosis of PTSD related to the COVID-19 pandemic. This symptom reflected high symptomatic burden and need for treatment. It is necessary to further investigate the factors that influence this symptom so as to develop more targeted interventions. However, this finding contrasted with most previous studies (16, 33, 35), which found self-destructive/reckless behavior to have only moderate centrality. This discrepancy may partly result from different types of trauma and different time points of investigating, as mentioned before. Additionally, different PTSD diagnostic criteria may also have contributed to this difference. For example, in some studies, the PTSD symptom networks were based on DSM-4 (16, 34, 35, 38), in which self-destructive/reckless behavior was not included as one of the PTSD symptoms.

The findings of the strongly connected symptoms and core symptom in this study have important implications for PTSD symptoms associated with the COVID-19 pandemic. The alleviation of these symptoms may benefit for reducing other symptoms (73–75). However, some studies failed to support this statement (76). A recent study found no difference between central symptoms and other symptoms in terms of their influences on symptom network (77). In addition, the centrality measurement is unable to reveal the direction of correlations between central nodes and other symptoms. Thus, some researchers suggested the most different symptoms as effective treatment targets (78). Moreover, the present study was conducted on healthy populations. Therefore, further longitudinal studies are needed to test directly on populations whether the identified strong connections and central symptom in this study can provide a viable treatment in psychotherapy.

Post-traumatic Stress Disorder Symptom Network With Covariates

To extend the network of 20 PTSD symptoms, we included six clinically relevant covariates in the network. The strong connection between self-destructive/reckless behavior and suicidal ideation agreed with previous research, which revealed that self-destructive/reckless behaviors predicted suicidal ideation (33, 79). Moreover, PTSD itself was highly associated with suicidal thoughts (80). Self-destructive/reckless behavior may be a risk factor for suicide, and clinicians should pay more attention to trauma survivors with increased self-destructive behaviors. In addition, the results showed a strong association between loss of interest and depression. A recent study revealed

that loss of interest was one of the hub symptoms within a network of PTSD and severe depression (81). The hub symptoms serve as bridges between disorders, increasing risk for comorbidity and severity of comorbidity. Additionally, it was unsurprising to find a strong connection among covariates between depression and anxiety symptoms. These two symptoms were frequently reported to be interrelated in previous network studies, and depression and anxiety are common comorbidities (82, 83). Therefore, it is necessary to consider depression and anxiety in the future studies of PTSD related to COVID-19.

In this present study, there was no impact of sex on the PTSD symptom network. This different finding from previous studies (36) might indicate that the impact of sex is on the overall connections of symptom network. Alternatively, this difference might due to our sample in which the number of females was much more than that of males. Interestingly, previous research has found that females were more vulnerable to PTSD than males (84, 85), while COVID-19-related studies found the opposite pattern (13, 15). Additional research that recruit equal female and male participants is necessary to investigate the effect of sex on the PTSD symptom network associated with COVID-19.

Consistent with previous studies, the PTSD symptom network has hardly changed when including covariates. It seems that the network of PTSD symptoms was relatively stable. However, it might also be due to the low scores of these variables in this study. More studies with larger samples are needed to test the effect of covariates on the PTSD symptom network.

In summary, the network analysis offers new insights into the interactions between PTSD symptoms themselves and other clinical conditions. The results had significant implications for understanding and intervention of PTSD related to the COVID-19 pandemic. Additionally, the sample set in this study included not only the participants who fulfilled the clinical diagnosis but also those who have not yet met clinical criteria. Previous studies have revealed that it is different between networks constructed based on clinical samples and non-clinical samples (86). Therefore, it is not enough to translate these findings into clinical practice. However, it is noteworthy that the individual difference of response to the COVID-19 outbreak is also clinically informative. COVID-19 is a threatening disease for human beings. It is unpredictable and need for distance and isolation. Moreover, the peri-traumatic phase of COVID-19 may be rather long (5). Therefore, it is important to help individuals who have a pathological burden but do not meet the PTSD diagnostic criteria to manage fears and worries and to develop coping skills for dealing with the ongoing threat.

Limitations and Future Research Directions

Several limitations of this study need to be considered. First, this study collected cross-sectional data, which cannot identify causality between PTSD symptoms. As a result, it was not clear whether the most central symptom caused other symptoms or the other way around—or both. Therefore, future research that uses a longitudinal design is needed. Second, most of samples were college students (64.6%). They were under academic stress and exposed to relatively more social media, leading to serious vicarious trauma (87, 88). Furthermore, most of the samples were female. The findings in this study may be limitedly applied to young female populations. Therefore, these results require careful interpretation and translation into clinical practice. The robustness analyses revealed moderate instability, especially for the estimation of centrality parameters. The low stability of the network may be due to the small sample. Future studies with larger and sex-balanced samples are needed to improve the stability of the COVID-19-related PTSD symptom network. Third, the participants in this study were from different regions in China, where the severities of the COVID-19 pandemic were various. Consequently, the different severities of the COVID-19 outbreak may result in different symptoms and symptom networks. It is especially necessary to investigate the network of PTSD symptoms in the hard-hit regions by COVID-19 in the future. In addition, we have not checked if the participants had a PTSD history, which might interfere with the findings of PTSD symptom network (89). Fourth, this study used self-reported data, which limited objectivity and reliability (90). Future studies need to evaluate the PTSD symptom network more correctly through structured clinical interviews. It may be able to identify PTSD symptoms that are specific to the COVID-19 crisis. In addition, it is necessary to incorporate physiological and behavioral data to reveal the automatic processes that maintain PTSD symptoms in future research.

CONCLUSION

The present study is, to our knowledge, the first to perform a network analysis of PTSD symptoms related to the COVID-19 outbreak. The results showed strong connections between avoidance of thoughts and avoidance of reminders, between hypervigilance and exaggerated startle response, between intrusive thoughts and nightmares, between flashbacks and emotional cue reactivity, and between detachment and restricted affect in the network of PTSD symptoms related to the COVID-19 pandemic. The most central symptom was self-destructive/reckless behavior. These results had significant implications for understanding and intervention of PTSD related to the COVID-19 pandemic. We emphasize the self-destructive/reckless behavior as an important target in the treatment of PTSD, which may facilitate relief of most PTSD symptoms.

DATA AVAILABILITY STATEMENT

All datasets generated for this study are included in the article/**Supplementary Material**.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethic Institutional Review Board of Central China Normal University. The ethics committee

waived the requirement of written informed consent for participation.

AUTHOR CONTRIBUTIONS

All authors reviewed drafts of the paper. WJ: performed the experiments, wrote-original draft, and prepared figures and tables. ZR: designed the experiments and project administration. LY: conceptualization, methodology, and designed the experiments. YT: wrote-review and editing. CS: contributed reagents, materials, analysis tools. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2020.568037/full#supplementary-material

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Emotion Network Analysis During COVID-19 Quarantine - A Longitudinal Study

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Introduction: The coronavirus disease 2019 (COVID-19) emergency has imposed important challenges in the lives of individuals, particularly since the restriction of free movement. In Spain, this mandatory home confinement started on March 14, 2020. In this scenario, some calls have been made to better understand the exact impact of the quarantine on the emotional status of individuals across time.

Materials and Methods: On the first day that the Spanish government imposed the quarantine, our team launched an online longitudinal study to monitor emotional responses to the COVID-19 emergency over time. For 2 weeks, 187 people have responded to a daily diary on emotion functioning. An emotion network analysis was performed to study the network structure of 30 mood states and its changes during the first 2 weeks of the quarantine.

Results: The emotional network showed critical changes in the interactions of emotions over time. An analysis of mean emotional levels did not show statistically significant changes in mood over time. Interestingly, two different network patterns were found when the sample was divided between those with favorable responses and those with unfavorable responses.

Discussion: This new approach to the study of longitudinal changes of the mood state network of the population reveals different adaptation strategies reflected on the sample's emotional network. This network approach can help identify most fragile individuals (more vulnerable to external stressors) before they develop clear and identifiable psychopathology and also help identify anti-fragile individuals (those who improve their functioning in the face of external stressors). This is one of the first studies to apply an emotional network approach to study the psychological effects of pandemics and might offer some clues to psychologists and health administrators to help people cope with and adjust to this critical situation.

Keywords: coronavirus disease 2019, network analysis, mood/emotion, pandemic impact assessment, psychopathology

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INTRODUCTION

The coronavirus disease 2019 (COVID-19) emergency imposed important challenges in the lives of individuals, particularly since the restriction of free movement and limitation of social contact started. This quarantine strategy has been used for centuries because self-isolation can help contain and control the spread of infectious diseases. However, both isolation *per se* and its uncontrollability have important negative psychological effects on individuals. Previous pandemics, such as those associated with severe acute respiratory syndrome (SARS), have been described as a mental health catastrophe due to the widespread psychopathology associated with the disease (Gardner and Moallef, 2015). In fact, some people become so anxious, distressed, avoidant, and functionally impaired under pandemics that end up requiring treatment due to the development of an emotional disorder (Wheaton et al., 2012). In this sense, although SARS was dangerous for the elderly and medically fragile, the psychological impact of SARS also inflicted a great deal of suffering in terms of the number of people affected by it and its duration (Chang et al., 2004; Washer, 2004). In another study, respondents who had been quarantined, those who worked in high-risk locations such as SARS wards, or individuals who had close friends or relatives who contracted SARS were 2–3 times more likely to have post-traumatic stress symptoms than people with lower exposure levels (Wu et al., 2009). Thus, it seems clear that mental disorders can be triggered or exacerbated by pandemic-related situational stressors (Wu et al., 2005; Gardner and Moallef, 2015; Shultz et al., 2015).

However, as evident as the effects of this quarantine during a pandemic in humans can be, we do not fully understand the psychological dynamics of mood during early quarantine stages and its longitudinal changes over the first 20 days of the COVID-19 quarantine period. Being quarantined is a complex psychological phenomenon that is hard to disentangle because there are numerous interactions between emotions and regulatory mechanisms in order to adapt to this strange and threatening new situation (Pfefferbaum and North, 2020; Suso-Ribera and Martín-Brufau, 2020). Cross-sectional studies fall short to investigate the psychological adaptation to quarantine and even pre-post studies have limitations in understanding what happens during the adaptation process (Brooks et al., 2020; Wang et al., 2020). For these reasons, longitudinal research seems to be the gold standard methodology to monitor these trajectories when attempting to better understand human psychological responses to pandemics. In addition and in contrast to the simplistic view of "one-size-fits-all" stress response to a potential traumatic situation, different trajectories have been proposed during the 2003 SARS outbreak using a latent class approach, namely, recovery, resilient, delayed, and chronic responses (Bonanno et al., 2008). To better understand these responses, a complex longitudinal analysis is needed to understand the variation and mutual influences of emotional network dynamic patterns during the early stages of the adaptation response to quarantine. This requires a new framework different to a latent approach.

Following an affective provocation, emotions interact as a dynamic and time-dependent system (Davidson, 2015). This network of emotions changes as a result of internal and external factors (Frijda, 2007). These fluctuations better characterize emotional response than mean levels of emotions (Kuppens et al., 2007; Sperry and Kwapil, 2019) and can be used to predict mood psychopathology (Wichers et al., 2015; Sperry et al., 2020). In fact, emotion dynamics may be key to understand pathways to psychopathology and well-being (Wichers et al., 2015). For these reasons, to study emotion fluctuations as a dynamic temporal network offers a good opportunity to study the response to stressful situations and increase our understanding of basic emotional responses and could suggest sooner and more successful interventions in the future.

The new field of network psychometrics has been used in recent years to investigate the complex structure of various psychiatric disorders (Fried, 2017), including depression (Fried et al., 2016), psychosis (Isvoranu et al., 2016), schizophrenia (Levine and Leucht, 2016), and anxiety (Beard et al., 2016), among others. The network perspective offers a novel way of understanding the dynamics of psychopathology (Borsboom, 2017). In contrast to viewing symptoms as reflective of underlying latent categories or dimensions, network analysis conceptualizes symptoms as constitutive of mental states, not reflective of them (McNally, 2016). At the heart of the theory lies the notion that psychopathological symptoms are causally connected through myriads of biological, psychological, and societal mechanisms. If these causal relations are sufficiently strong, symptoms can generate feedback that maintains symptomatology. In this case, the network can become stuck and develop into a disorder state (Borsboom, 2017). Ultimately, network analysis is a form of time-series analysis that has been recommended for its use in complex models where interactions between system components (e.g., different mood states) need to be modeled. This is done by graphically representing the interactions among system elements by means of edges and nodes (Gao et al., 2016). Thus, mood changes could be studied as networks, and this methodology could detect complex interactions between mood states over time that would be otherwise undetectable using pre–post methodology.

Repeated short-term assessments can detect variations in the presence and severity of states and reveal dynamic processes between them (Ebner-Priemer and Trull, 2009; Myin-Germeys et al., 2009; Bolger and Laurenceau, 2013). Network models can be used to investigate such dynamic processes in repeated assessment data from one participant [vector autoregression models (VARs)] or data from multiple participants (multilevel VAR; Epskamp et al., 2016). These models produce temporal networks depicting a directed network of the lagged associations of symptoms from one time point to the next for which Granger causal connections between symptoms are inferred (Schuurman et al., 2016). Temporal networks can then be used to identify symptoms with a high "out-strength," that is, symptoms that are most predictive of other symptoms at the next time point (Epskamp et al., 2016).

The study of mood and its temporal evolution is important for several reasons. Moods, for example, are different to emotions in a number of characteristics, including the fact that they last longer (Ekman and Davidson, 1994). In fact, moods can

have an impact on emotions (i.e., they lower the threshold that is required to trigger an emotion) (Thorndike et al., 1991). Therefore, moods can predispose individuals to experience situations in a certain manner, which can ultimately impact the way they cope with stressors (Berrocal and Extremera, 2008), such as being quarantined. Research into the determinants of mood states has been dominated by personality theories. For example, personality models like the five-factor model have shown that individuals high in neuroticism tend to present more unstable mood states (e.g., emotionality) and tend to be dominated by negative mood states (e.g., sadness and anxiety), while extraverted individuals tend to report more positive mood states (e.g., vigor; Garrity and Demick, 2001). The literature has shown, however, that mood states are influenced not only by internal factors (i.e., personality) but also by external elements (e.g., stress; Kudielka et al., 2004). As noted earlier, such changes in mood are important as they can lead to differential adaptation to adverse environments as they predispose to certain emotional states and coping efforts (Catanzaro and Mearns, 1999).

During the COVID-19 pandemic, several calls have been made to better understand the impact of the quarantine, an external stressor, on the mood status of individuals across time (Brooks et al., 2020; Lima et al., 2020). To do so, we would need to compare mood during the quarantine with mood prior to the quarantine. In the present study, however, only data after the quarantine were obtained, with the intention to explore how mood states develop over time under such strange situations using complex interaction statistical methods to study the evolution of networks of mood states under a pandemic, which can inform about human adaptation mechanisms under stressful conditions. Thus, the aim of this study was to explore the psychological dynamics of mood changes during the first stages of the COVID-19 quarantine in a sample of Spanish individuals from the general population using longitudinal data in a multilevel framework.

MATERIALS AND METHODS

Sample and Procedure

In Spain, the mandatory home confinement officially started late on March 14, 2020. On the first day after the Spanish government imposed the quarantine, on March 15, our team launched an online longitudinal study to monitor individual adaptation to the COVID-19 emergency over time. For 2 weeks, 187 people responded to a daily diary on mood functioning.

For recruitment, a Qualtrics survey link was created and distributed during the evening of March 15 through online social networks using the virtual snowball recollection technique (i.e., asking participants to share the link with their contacts). This method was proven to be more effective than traditional snowball sampling for social sciences (Baltar and Brunet, 2012). All participants had to be older than 18 years of age, understand Spanish, and live in Spain to be eligible to participate. Eligibility was confirmed with the responses to the survey (date of birth and country of residence).

The baseline assessment was completed by 2,683 individuals (view Suso-Ribera and Martín-Brufau, 2020, for demographic information and mood state comparison of the full sample with pre-pandemic mood states). Of these, cases that missed the last 3 days of assessment and participants who missed 3 days in a row in their longitudinal assessment were excluded from the analyses. As a result, the final sample included in this longitudinal study during the first 20 days of the quarantine in Spain consisted of 187 individuals (7.4% of the baseline sample; M_{age} = 40.57 years, SD = 17.29; 78% were women; marital status = 33.13% were married, 10.07% were divorced, 56% were single, 1.2% widowed; level of education = 4.6% had a primary studies degree, 30.3% had a bachelor degree, 23.1% had a master degree, and 6.3% had a doctorate degree).

Instruments

Sociodemographic and COVID-19-related questions included information about age, sex, marital status, income, job status, educational level, house size, number of people cohabitating, cohabitation with a child, cohabitation with pets, cohabitation with a COVID-19-infected person, perceived exposure to COVID-19, and current use of psychotropic drugs.

In a longitudinal study, we decided to study mood, as there are several differences between mood and emotion (Fox et al., 2018). Emotions are more intense, are shorter in time, are more difficult to regulate, have expressive functions, and are more influenced by specific triggers, while mood is less intense and lasts longer, so measuring mood is more suitable for our study goal (e.g., the study of a long-lasting situation on the status of individuals, as opposed to the study of specific triggers on the emotional status of individuals). The 30-item reduced version of the Profile of Mood States (POMS) Questionnaire was used to evaluate mood states (Andrade et al., 2013). This instrument was proven to be effective and robust when compared with other standardized questionnaires (Rossi and Pourtois, 2012). It evaluates six mood dimensions, namely, depression, anxiety, anger, vigor, fatigue, and friendliness. Each dimension is composed of five items with responses ranging from 0 = "Not at all" to 4 = "Extremely." Reliability measured by Cronbach's alpha in this study was robust for depression (alpha = 0.834), anxiety (alpha = 0.893), vigor (alpha = 0.888), fatigue (alpha = 0.871), and friendliness (alpha = 0.839).

Statistical Analysis

A mood network analysis was performed to study the network structure of the 30 mood states and its changes during the two 2 weeks of the quarantine. Because the network framework proposes radically different views on how to understand psychological constructs and the relationship between observed variables (Bork et al., 2019), instead of trying to reduce the structure of the variables to their shared information using factor analysis, as what was done in latent variable modeling, we followed the network approach and estimated the relationship between all variables directly calculating the item interaction of mutual influences within a network structure (Borsboom and Cramer, 2013). In network analysis, the observed variables are the nodes of the network, and the estimated relations between variables are represented in the edges.

Edges are not shown if their estimated value is zero. These relationships are, thus, not interpreted as relationships explained by underlying latent factors, rather, the relationships between items are interpreted as mutual causal influences between symptoms (Guyon et al., 2017).

All analyses and network graphs have been conducted with the mlVAR and the qgraph R packages, which consist of a model in which all variables in one assessment are regressed on variables of the previous assessment. This method offers a contemporaneous network and a temporal network. For brevity purposes, we only present the temporal networks in this study. Temporal networks estimate lag-1 relationships between moods after controlling for all other lagged associations (Epskamp et al., 2012, 2018). In our study, relations are interpreted as predictions of one mood over other moods at the next day controlling the influence of all other mood states. These interconnections are represented as a directed graph. Positive relationships are depicted in blue; negative relationships in red. Edges also vary in thickness depending on the strength of the connection between two moods. All connections shown are significant regressions at an alpha level of 0.05.

To study the evolution of mean levels of mood states during the first and the 20th day of the quarantine, mean differences in negative moods were compared using *t*-tests. In order to study the sample more in depth, two groups were created based on the evolution of the negative moods. We classified participants in deteriorating or improving by comparing the mood state at the beginning of quarantine with the average negative moods of the first 3 days and the last average negative moods of the last 3 days in a period of 20 days. Those who increased their negative moods were classified as deteriorating and vice versa. The group with higher negative moods (deteriorating) comprised 99 participants, and the group with lower negative moods (improving) included 89 participants.

RESULTS

Total Sample Network

We present the general temporal network in **Figure 1**. Nodes were clustered according to the corresponding dimension, with the exception of depression nodes. Nodes reflecting depression moods (in pink) were distributed near fatigue, anger, and lack of vigor in the network. "Unhappiness" (node 28) showed the strongest association both with "angry" and "grouchy." "Sad" (node 5) activated both "melancholic" and "weary," while "hopeless" (node 17) activated "nervous." Nodes reflecting subjective "tension" (in orange) also showed a positive relationship between them, indicating mutual activation. For example, an increase in "on edge" (node 23) resulted in being more "nervous," which activated feeling more "restless," and being more "tense" activated being "uneasy." Nodes reflecting fatigue (in light purple) were interconnected. "Worned-out" (node 11) activated subsequent "fatigue," "exhaustion," and "weary." Interestingly, feeling "tense" (node 30) also increased feeling "bushed," and feeling "on edge" increased feeling "exhausted." Nodes reflecting anger feelings (in light blue) were also interconnected with tension and depression nodes. "Spiteful" (node 29) activated "resentful," "angry," "uneasy," and "hopeless." "Anger" nodes increased levels of "vigor" and "fatigue."

There was a positive loop between "friendliness" items, with "kind" and "sympathetic" being the most influential nodes. There were some autoregressive feedback loops. "Fatigued," "grouchy," and "angry" showed negative loops with themselves, indicating an inverse relationship across days probably due to daily fluctuations in those nodes. On the other hand, "lonely" showed positive autoregressive loops, indicating an increase in loneliness during the quarantine, which is coherent with the external situation.

We found no statistical change in negative moods across time for the total sample when we compared averaged levels of negative moods from the first 3 and the last 3 days (M-day1 = 25.8; SD = 9.97; M-day 20 = 26.27; SD = 10.64; $t[400] = 0.10$; $p = 0.32$). Because we were interested in studying the dynamic variation of the networks, we repeated the comparison between the first and the last 3 days but divided the sample in those who increased or decreased their levels of negative affect. The evolution of mood in the two subgroups is represented in **Figure 2**. There was a statistically significant difference in negative moods in both the deteriorating group (M-day1 = 24; SD = 8.1; M-day 20 = 29.71; SD = 11.16; $t[196] = -4.08$; $p < 0.001$) and the improving group (M-day 1 = 28.66; SD = 11.148; M-day 20 = 23.37; SD = 9.12; $t[176] = 3.47$; $p < 0.001$). The networks for both groups are represented in **Figure 3**. Only temporal networks are shown in this work for clarity and brevity.

Higher and Lower Negative Moods Networks

Figure 3 represents higher (99 participants) and lower (89 participants) negative moods at the beginning of the quarantine and its variations during the next 20 days. According to the network analysis, those who were feeling worse at the beginning of the study (graph A) showed two main nodes with a strong influence over negative moods, that is, feeling "unhappy"(node 28) and "lonely"(node 24). Feeling "unhappy" activated "sadness" and "bad temper" and inhibited "active" and "lively" moods. "Lonely" was auto-correlated, probably indicating stable tendencies toward "loneliness" moods, and activated feeling "sad" and "restless" nodes. In addition, feeling "bushed" (node 16) was positively associated with feeling "exhausted" and "weary."

On the other hand, the network analysis revealed that those who felt better at the beginning of the quarantine (graph B) showed stronger connections between "friendliness" mood states. Feeling "kind" (node 8) was associated with other pro-social feelings. There were two negative auto-regressive nodes: feeling less "angry" and "grouchy," perhaps as a result of a compensation mechanism to cope with the confinement. Interestingly, feeling "tense" (node 30) showed an auto-loop in the direction of indicating an increase in "tension" over days. Overall, "friendliness" mood states were inversely related to negative moods (e.g., feeling less "sad," less "lonely," less "melancholic," and less "annoyed"). Note that this inverse relationship should not be interpreted as meaning that the existence of a

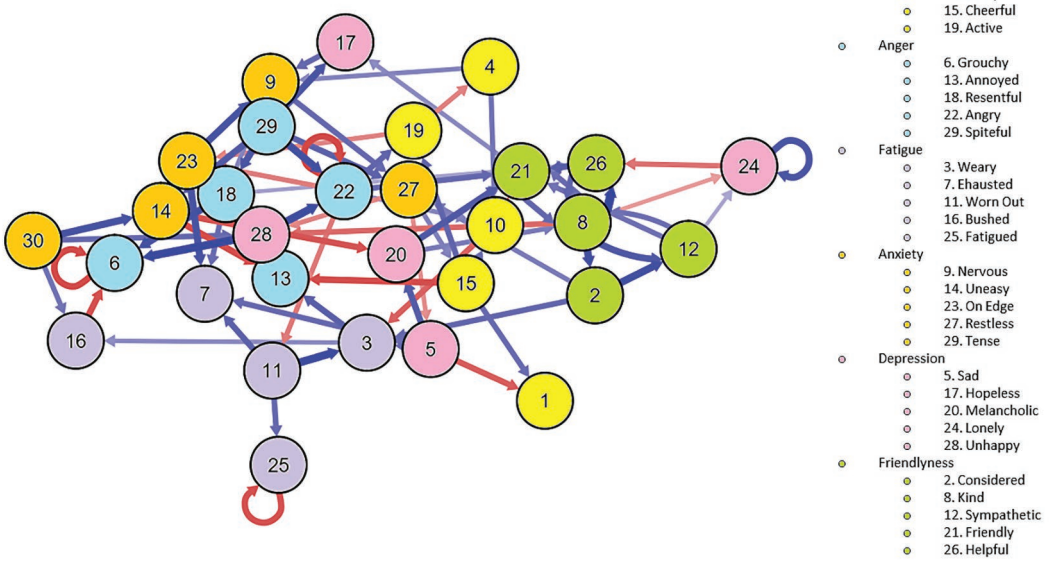

FIGURE 1 | Mood network of the POMS mood dimensions.

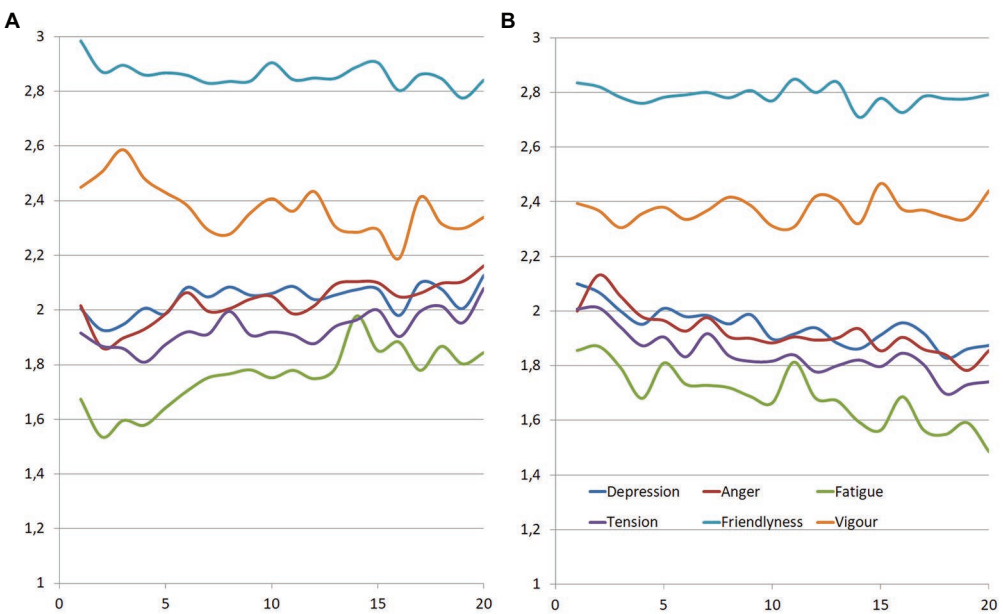

FIGURE 2 | Changes in mood levels for **(A)** mood deterioration and **(B)** mood improvement.

pleasant mood results in not experiencing unpleasant moods. Both might coexist despite their negative relationship.

Overall, the network structure of those who showed higher negative moods activated depressive, anxiety, anger, and fatigue nodes, while the network structure of those who showed lower negative moods activated mood states inversely related with negative moods.

DISCUSSION

Key Findings

In order to understand the complex patterns of mutual influence of mood states during the confinement, which is a potentially stressful situation, a longitudinal study was carried out during the first 20 days of the mandatory quarantine in Spain and

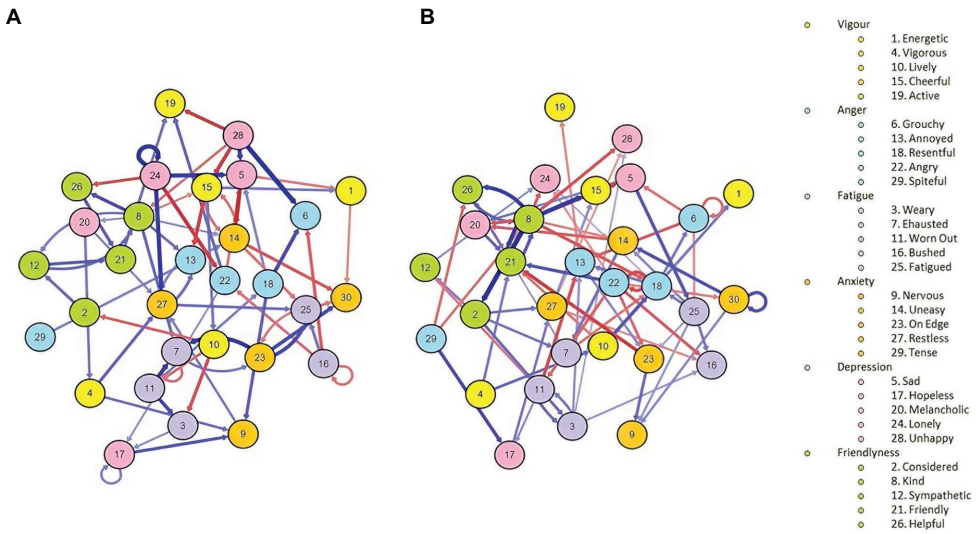

FIGURE 3 | Mood networks of the POMS mood dimensions for the **(A)** deterioration and **(B)** improvement groups.

data were analyzed with complex network techniques. This new/recent approach to the longitudinal mood change dynamics allowed us to identify different patterns of mood relationships across time. The general network showed a pattern where unhappiness, exhaustion, and anxiety influences across time were predominant, indicating an overall effortful adjustment to the lack of freedom and social distancing. To study this phenomenon more deeply, we divided the sample into negative or positive adaptations during the first 3 days compared to days 18–20 of the quarantine. With that comparison, the network structure of each group revealed distinct dynamics.

Paradoxically, individuals in which negative moods, especially loneliness and unhappiness, dominated during the first days showed an improved adaptation to the quarantine after almost 3 weeks of confinement. The reduction of exposure to stress in individuals with bad coping mechanisms might play a role in this observation. In addition to this, an overall reduction in general activation was observed. That is, while mood dynamics activated the negative valence of moods, their intensity decreased across time. In this sense, maybe isolation had this mitigating effect. This might explain why so many depressive patients search for isolation and social withdrawal as coping mechanisms (Repetti, 1992; Girard et al., 2014). On the other hand, individuals with an initial activation of positive mood states, namely, interpersonal feelings and pro-social attitudes, appeared to deteriorate with time. Although this should be interpreted with caution, it is possible that the challenges imposed by the quarantine (e.g., isolation) were initially well dealt with by optimistic and positively valenced individuals, but as isolation persisted, these individuals experienced more difficulties in maintaining their positive mood states while in social isolation.

As far as we know, only another recent study used network analysis to study COVID-19 affective responses. The authors found a direct effect of being alone and an increase in worry about COVID-19, worry about their future, and anhedonia in the temporal dynamic of the network across time (Fried, 2020). Similar to the present study, they did not find a deterioration of mental health in the students, although they did not explore whether different adaptation profiles existed in their sample, as in the present study. Several explanations could be proposed for these findings, although these are all merely hypothetical at this stage. For example, it is possible that changes could only be detected by longer assessment periods (e.g., by incorporating times of significant environmental changes, such as easing or lifting of lockdown measures). It is also possible that the stability of mental health is explained by previous mental and physical health status that is resistant to change (e.g., problems of severe fatigue or depression) or by low perceived risk (e.g., mood remains stable because perceived risk is consistently low—thanks to the quarantine). Further research is required to shed light on some of these questions, but some research has already pointed to functional fear of COVID-19 risk as an adaptive factor for public health during the current pandemic (Harper et al., 2020).

The Depressive Network May Reflect a Temporally Convenient Adaptation Strategy

A higher tendency to negative moods seems to be the logical consequence and characterization of the loneliness and unhappiness network. Even more interesting is the resemblance between this COVID network with the bereavement network of Fried et al. (2015), where they found that the death of a spouse was strongly associated with the feeling of loneliness. This, as in the COVID network, led to unhappiness and sadness. In light of our findings, it is possible that these participants might benefit from a tendency to strategic avoidance and withdrawal from social activities. As clinical psychologists,

we have seen this effect in our consultation practice at the beginning of the quarantine. That is, patients who were doing worse before the quarantine and when this started presented a better adaptation to the social isolation imposed by the quarantine. It might be the case that isolation is a known place for those with a tendency to feel such negative moods (Alpass and Neville, 2003). This is a common observation in the clinical setting, and it has been suggested that depressive patients tend to avoid this social contact in an attempt to recover from their lack of energy (Porr et al., 2010). These intertwined relationships are difficult to disentangle without the passage of time, but for some people, isolation might work for some time (e.g., during a quarantine, where social withdrawal is imposed). However, as shown by extensive literature in the field, isolation can become a problem if maintained and implemented as the main adaptation strategy to life threats (Franck et al., 2016).

There is increasing compelling evidence that links inflammatory responses with depression symptomatology (Dowlati et al., 2010). As fever and the illness behavior are characterized by quietness, reduction in motivation levels, libido, hunger, mating responses, and food search as seen in animals, we humans appear to have inherited this strategy as a starting point when there is an external threat that we cannot fight against (stay still and wait). These inflammatory-induced behaviors could be beneficial at the beginning of an infection, as they save energy and avoid threatening situations. However, this strategy, as adaptive as it can be in the long-term, can only be effectively sustained during a relatively short period of time. Maybe isolation, in parallel, serves a similar function to flight away from danger (e.g., quarantine). In this sense, it is possible that the levels of discomfort would remain approximately stable—thanks to compensation or feedback systems. These individuals would therefore maintain energy levels within adaptive ranges, which would be a characteristic of complex systems. However, this is a matter for another debate that exceeds the purpose of this study (for an evolutionary perspective of depression, see Gilbert, 2016).

The Pro-social Network May Reflect Strategy Costs During Quarantine

On the other hand, our study revealed that the level of tension was auto-regressive in the pro-social network sample. Thus, these individuals characterized by pro-social moods, which could be considered a proxy of agreeableness, appear to regulate their moods with effortful control, inhibition of anger, and higher psychophysiological activation when using emotional suppression (Gračanin et al., 2013). Research has shown that this regulatory strategy that reduces the expression of unpleasant emotions increases the tension levels measured by psychophysiological parameters (Gross and Levenson, 1993; Srivastava et al., 2009), and it has been shown that its use may foster fresh experiences of negative affect (Pavani et al., 2017), which is perhaps one way to understand the increasing levels of unpleasant emotions experienced at the third week of the quarantine in the so-called pro-social network. The previous could also be linked to energy consumption and the increase of costly regulatory processes that might only show their deteriorating effect when other regulatory mechanisms based on social contact and kind interaction with others cannot be used anymore. This view is supported by research showing that individuals high in agreeableness recruit helpful thoughts in hostile contexts (Graziano et al., 1996), presumably in the service of controlling aggressive behavior in order to avoid rejection (Meier et al., 2008). Thus, it is possible that, although they begin from a better starting point, those using more agreeable strategies experience an increase in negative affectivity as the quarantine advances because they are more sensitive to rejection from others or social isolation.

In relation to unpleasant and pleasant emotions, it is also important to note that both might serve adaptive purposes in the face of difficult situations like the current pandemic. For example, both a pleasant mood like friendliness and an unpleasant mood like anxiety might lead to pro-social behavior and compliance with public health recommendations (Harper et al., 2020). The key point, according to recent research during the COVID-19 crisis and vast literature on the topic, lies on the tolerance and acceptance of difficult emotional states in the face of adversity (Ehrenreich et al., 2007; Suso-Ribera and Martín-Brufau, 2020). Transdiagnostic treatments, which have a focus on emotion regulation and foster tolerance to unpleasant emotions, might be important in this direction and scenarios like the present due to their applicability across emotional disorders and their feasibility in an online format (González-Robles et al., 2015).

Limitations

An important limitation of the analysis is that we did not perform group classification based on gender or work status, presence of more people at home, history of mental health problems, and personality characteristics, to name some examples. It is possible that these groups might have experienced different levels of stress. However, there is enough longitudinal evidence showing that loneliness influences depression levels above and beyond what can be explained by initial levels of depression or demographic measures (Cacioppo et al., 2006). An alternative and plausible interpretation of these findings is that the impact of social isolation on physical and emotional health and well-being is mediated by perceived isolation rather than objective physical isolation *per se*, lack of real support, or objective demographic measures. While this is impossible to ascertain at this stage, it would highlight the important role of psychological interpretation of one's social isolation. In other words, loneliness could be seen as a cognitive interpretation of the subjective psychological dynamic of the quarantine situation. Interestingly, these network analysis revealed a possible mechanism by which these links exist, supporting the view that psychopathology could be better understood with these techniques, as has been previously suggested (McNally, 2016). Another shortcoming refers to the generalizability of findings, which should be considered with caution due to the high attrition when comparing baseline and longitudinal data. Finally, in regard to the use of the POMS to study mood states, we acknowledge that it is possible that the dimension structure of the POMS could have influenced the clustering in the networks; future

analysis should include other complementary mood states in addition to those studied by the POMS.

Despite the potential of network analysis methods, some authors have criticized their replicability problems (Forbes et al., 2017). However, these conclusions seem to be due to a misuse of the methodology both in the gathering of data phase and in network estimation (Borsboom, 2017). Thus, the estimation of networks of moods in a sample can be regarded as replicable and reliable, as shown elsewhere (Fried, 2017; David et al., 2018). Another important requirement for the consolidation of this methodology is the replication of the network in larger samples to produce more stable and robust estimates of network indices (Hevey, 2018).

Speculations and Future Direction

Only at a speculative level, it is interesting to think about the evolution of energy and consumption of energy in a mandatory, noncontrollable situation such as a pandemic confinement. In the study, we see a reduction in overall energy, as if energy levels would decrease through the activation of predominantly inhibitory nodes of the network. One interpretation to the functioning of the network is that, as the perception of loneliness increases unhappiness, there is a progressive reduction in energy levels and an increase of despair, tension, and resentment. This could be regarded as a consequence of frustration of compensatory mechanisms to avoid psychological suffering or discomfort, which causes a threat of wasting limited energy. This hypothetical auxiliary mechanism to reduce the exhaustion of energy and resources under threat would resemble a micro-general adaptation syndrome (GAS), as Selye (1946) described it, or learned helplessness during a noncontrollable situation. According to this view, during the pandemic, something like an alarm reaction, resistance, and exhaustion phase could be described. So another possibility to explain the reduction in negative affect is that those more vulnerable to stress had already begun the adaptation process and were already in the exhaustion phase. Following this idea, it is interesting to note that the paradoxical effects could be interpreted as different timings when reacting to stressful situations. In this sense, during the SARS outbreak, different response trajectories were also clear (Bonanno et al., 2008) and resilient responders had a worse response at the beginning but recovered progressively across months. So, it is possible that those more oriented to others in the present study present a similar pattern and will be able to better adapt to the situation in the long run, but not in the mid-term (e.g., as the quarantine is maintained). These hypotheses should be tested in the future.

Conclusion

Our study is, as far as we know, the first to identify different emotional responses in dynamic networks during the quarantine infectious outbreak. Overall, the study evidenced a stability of mood from the onset to the third week of quarantine. Interestingly, the data indicated two different trajectories characterized by differential profiles. On the one hand, those who began their confinement with an emotional profile characterized by kindness ended up experiencing a greater deterioration of mood during the quarantine. In this sense, it has been argued that possibly their expectations of social interaction as a source of well-being are more frustrated by the prolonged duration of the situation (20 days in the present study). It is possible that the lack of direct personal relationships imposes increased frustration in those who place in these pro-social emotions the key to their well-being. On the other hand, those who initiated the confinement with a greater focus on negative emotionality and awareness about the loneliness and sadness feelings associated with the COVID-19 crisis and the initial days of quarantine were more capable to adapt to their daily reality during quarantine probably because they had already anticipated the experience of loss that the quarantine entails. Despite the apparent contradiction that these data suppose with the social expectation that good health and well-being are associated with the predominance of positive emotions and pro-sociality, an important contribution of this study is that it shows that emotional dynamics are more complex than this peripheral vision of well-being, at least under unique circumstances (e.g., quarantine).

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available for public use. Request to access the datasets should be directed to ramonmail@gmail.com.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Comité ético Universidad de Murcia. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

RM-B: Data gathering, data analysis, and manuscript writing. CS-R: Data gathering and manuscript writing. JC: manuscript writing. All authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The Anxiety-Buffer Hypothesis in the Time of COVID-19: When Self-Esteem Protects From the Impact of Loneliness and Fear on Anxiety and Depression

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Introduction: The coronavirus (COVID-19) disease has spread worldwide, generating intense fear of infection and death that may lead to enduring anxiety. At the same time, quarantine and physical isolation can intensify feelings of dispositional loneliness that, by focusing on thoughts of disconnection from others, can trigger intense anxiety. Anxiety, generated by both fear of COVID-19 and dispositional loneliness, can activate negative expectations and thoughts of death, potentially generating alarming depressive symptoms. However, the *anxiety-buffer hypothesis* suggests that self-esteem acts as a shield (buffer) against mental health threats – fear and loneliness – thus hampering anxiety and depressive symptoms.

Objective: This study aims to test the process – triggered by COVID-19 fear and loneliness – in which self-esteem should buffer the path leading to anxiety symptoms, then to depression.

Methods: An observational research design with structural equation models was used. A sample of 1200 participants enrolled from the general population answered an online survey comprising: the fear of COVID-19 scale, the UCLA loneliness scale, the Rosenberg self-esteem scale, and the anxiety and depression scales of the Symptom Checklist-90-Revised.

Results: Structural equation models showed the link between anxiety symptoms (*mediator*) with both the fear of COVID-19 and dispositional loneliness (*predictors*), as well as its association with consequent depressive symptomatology (*outcome*). In line with the anxiety-buffer hypothesis, self-esteem mediated the relationship between the predictors and their adverse psychological consequences.

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Conclusion: Self-esteem represents a protective factor from the antecedents of depression. Targeted psychological interventions should be implemented to minimize the psychological burden of the disease whilst promoting adaptation and positive psychological health outcomes.

Keywords: COVID-19, anxiety buffer hypothesis, terror management theory, anxiety, depression, self-esteem, fear, loneliness

INTRODUCTION

The novel coronavirus (COVID-19) is a new severe and potentially mortal disease threatening to infect the entire human population given that there is no prior immunity and not even a well-established cure or vaccine yet (Baud et al., 2020).

COVID-19 displays a variety of clinical features ranging from asymptomatic presentations (20–50%), fever (>90%), cough (75%), shortness of breath (50%), up to acute respiratory distress syndrome, and death (Byambasuren et al., 2020; Center for Disease Control and Prevention, 2020; Jiang et al., 2020). Categories of people at higher risk of developing severe complications of COVID-19 are older adults and people with previous underlying medical conditions, such as hypertension, cardiovascular disease, respiratory disease, and cancer (Liu et al., 2020; Armitage and Nellums, 2020; Zheng et al., 2020). The contagion occurs from an infected person, even without obvious symptom manifestation, via respiratory droplets that can be inhaled or can land on surfaces which are later in contact with other people.

Due to its high transmissibility, since December 2019 COVID-19 has been rapidly spreading worldwide causing the current pandemic (World Health Organization [WHO], 2020). Across the world, strict preventive policies were adopted to contain the outbreak of COVID-19 – including social distancing and social isolation. Nevertheless, the magnitude of this pandemic has generated serious concerns about its social and economic consequences both in the short and long-term (Cerami et al., 2020). Thus, COVID-19 represents an epochal economic, physical, and biological threat to everyone's lives.

Therefore, beyond threatening people's physical conditions, COVID-19 is accompanied by remarkable psychological burdens heavily affecting people's mental health (Brooks et al., 2020; Torales et al., 2020; Wang et al., 2020). Similar to other physical diseases, COVID-19 represents a specific dangerous trigger activating a *"fight or flight"* reaction of (functional) fear focused on illness and death (Schaller et al., 2015; Harper et al., 2020). The COVID-19 pandemic-related fear also led to counterproductive and detrimental behaviors for the whole society (i.e., demanding unnecessary medical care, excessively protecting against the virus, and overstocking certain supplies) (Lin, 2020).

Moreover, fear of illness and death commonly lead to chronic vigilance for potential threats, thus contributing to the development of anxiety (i.e., the anticipation of a feared threat without a stimulus) that is future-oriented, unfocused, diffused, and extended to non-threatening situations (Barlow, 2002; Harding et al., 2008).

In turn, anxiety might trigger and catalyze depressive symptoms via the activation of processes including persistent preoccupations, negative expectations, thoughts about death (of themselves or significant others), and pervasive pessimism (Thompson et al., 2005; Starr and Davila, 2012). Depressive symptoms include feelings of sadness and loss, a negative view of the self, of the world, and of the future, thought and behavior are slowed down, and positive emotions are absent (Beck, 1979). Noteworthy, depressive symptoms spread widely during the COVID-19 pandemic, representing an alarming predictor of suicide-behaviors (McIntyre and Lee, 2020; Thakur and Jain, 2020).

At the same time, quarantine and physical distancing generated widespread feelings of isolation and loneliness – despite that fact that human connections were facilitated and granted by the use of communication technology (Russell, 1996; Usher et al., 2020). Indeed, the dispositional trait of loneliness may have a crucial role in perceiving and amplifying feelings of isolation, thus exacerbating the adverse psychological impact of the outbreak (Boffo et al., 2012). Indeed, dispositional loneliness is characterized by perceived disconnection from others and unpleasant feelings of isolation. Dispositional loneliness activates distressing thinking processes focusing on comparisons between the actual and the desired socio-relational situation. This contributes to the increase of unpleasant feelings and leads to the development of symptoms of anxiety that – in turn – lead to depressive symptomatology (Cacioppo et al., 2006, 2014; Santini et al., 2020). In other words, by activating (maladaptive) mechanisms and by influencing the brain and behavior, loneliness makes people more susceptible to the onset of anxious and depressive symptoms – thus representing an important risk factor for poor mental health (Fiese et al., 2002; Heinrich and Gullone, 2006; Hossain et al., 2020; Lunn et al., 2020; Zhou et al., 2020), long-term morbidity (i.e., cardiovascular), and mortality (Cacioppo et al., 2014; Leigh-Hunt et al., 2017; Rico-Uribe et al., 2018).

Consequently, both a fear of COVID-19 and dispositional loneliness could be considered as predictors of severe psychological symptoms of anxiety and depression, potentially leading to dismal effects, including extreme life-threatening behaviors (Santini et al., 2020; Thakur and Jain, 2020).

However, self-esteem – that is the individuals' attitudes, beliefs, and evaluations toward the self – may buffer these adverse patterns. According to Becker (1971, 1973), self-esteem is built on deep-rooted personal values derived from a given social, relational, and cultural context, and it is reinforced by social validation and the feeling of being a

valuable human being with a meaningful role in society given by meeting the standards of a given culture and worldview (Pyszczynski et al., 2004). More recently, the terror management theory (TMT) (Greenberg et al., 1986) postulated that individuals' awareness of mortality – in this case elicited by COVID-19 – conflicts with the human intrinsic desire for life and tendency to survive, thus generating terrifying fears of death and then anxiety. In this framework, the anxiety-buffer hypothesis (ABH; Greenberg et al., 1992) theorizes that, by reconnecting the individual with an enlarged universe of meanings and values, self-esteem could act as a protecting shield (buffer) against the detrimental psychological effects of life-threats and stressors.

Aims and Hypotheses

Considering this background, the present study aimed at testing the anxiety-buffer hypothesis during the COVID-19 pandemic. More in detail, self-esteem should buffer the relationships from both a fear of COVID-19 and dispositional loneliness to anxiety symptoms – that in turn lead to depressive symptoms. Moreover, specific hypotheses about each path (relationship) between variables were formulated:

> H1: fear of COVID-19 and dispositional loneliness are positively associated with depressive symptomatology;
> H2a: fear of COVID-19 predicts depressive symptomatology through anxiety symptoms (simple mediation) – without considering the buffering effect of self-esteem;
> H2b: dispositional loneliness predicts depressive symptomatology through anxiety (simple mediation) – without considering the buffering effect of self-esteem;
> H3: fear of COVID-19 and dispositional loneliness predict depressive symptomatology through anxiety symptoms (mediation) – without considering the buffering effect of self-esteem;
> H4: fear of COVID-19 and dispositional loneliness predict depressive symptoms through self-esteem (buffering effect) and anxiety symptoms (multiple mediation).

In other words, it was hypothesized that a fear of COVID-19 and loneliness are associated with depressive symptomatology, but this relationship should be mediated by both anxiety and self-esteem. In particular, self-esteem should play a buffering role.

MATERIALS AND METHODS

Procedure

An online survey was developed and disseminated using the Qualtrics software for data collection.

Firstly, the survey was administered to 20 participants – not included into analysis (A) to ensure whether the items were understandable by the general population and (B) to estimate an acceptable time for its fulfillment (8'–20'), so as to deal adequately with potentially biased responses: too fast – random answers – or too slow –in which the subject could have been interrupted during the completion.

Then, the snowball sampling method (Fricker, 2008) was used to recruit participants from the general population through personal invitations or materials advertised via social media platforms (i.e., Facebook, Twitter).

The recruitment materials provided details of what was required for participation in the study and a weblink to access the online questionnaire. The weblink directed potential participants first to further information on the research project in order to make an informed decision about study participation. Participants were informed that their responses were anonymous as well as that no economic payment was offered for their voluntary participation. Those who provided their consent online proceeded to the online questionnaire.

Inclusion criteria for the participants into the study were: (A) being a native Italian speaker; (B) being over 18 years old; and (C) providing informed consent. We excluded participants from the study who: (D) did not answer all the questions in the survey and (E) spent less than 8 min or more than 20 min completing the survey.

Data were collected in their entirety in a single week interval during the Italian quarantine to avoid confounding effects due to pandemic fluctuations. The study was approved by the Ethic Committee of the University of Padua in accordance with the Ethical standards of the Declaration of Helsinki.

Sample Size Determination

Considering the statistical analyses used in this study (see designated section), the sample size was calculated *a priori* according to the "*n:q* criterion": where n is the number of participants and q is the number of (free) model parameters to be estimated (Hu and Bentler, 1999; Muthén and Asparouhov, 2002; Yu, 2002). Consequently, ten subject per free parameter (10:73; $n_{minimum} = 730$) were guaranteed (Bentler and Chou, 1987; Marsh et al., 1988; Hu and Bentler, 1999; Boomsma and Hoogland, 2001; Muthén and Asparouhov, 2002; Yu, 2002; Flora and Curran, 2004; Tomarken and Waller, 2005).

Participants

According to the inclusion criteria, 62 respondents were excluded from the study due to incomplete surveys (n = 35) and inappropriate completion times (n = 27).

The final sample was composed by 1200 participants [217 males (23.3%) and 713 females (76.7%), aged from 18 to 81 years (*mean* = 39.59, *SD* = 12.334)], the average time competing the survey was 11'0.27" (SD = 3'0.02"). A total of 965 respondents were from Northern Italy (80.4%), 165 were from central Italy (13.8%), and 70 participants were from Southern Italy and the islands (5.8%). Descriptive statistics of this sample are reported in **Table 1**.

Measures

Socio-demographic information included sex, age, education, employment, Italian region of residence, number of persons living with, and confirmed positive COVID-19 diagnosis of the respondent and of his/her significant others. **Table 1** reports the sample characteristics.

TABLE 1 | Socio-demographic characteristics of the sample.

	Mean	SD
Age	39.33	12.283
Number of persons living with	2.63	1.791
	Frequency	**Percentage**
Sex		
Male	217	18.1%
Female	983	81.9%
Civil Status		
Single	237	19.8%
In a relationship	379	31.6%
Married	484	40.3%
Divorced	86	7.2%
Widowed	14	1.2%
Education		
Elementary school	3	0.3%
Middle school	117	9.8%
High school	491	40.9%
Bachelor degree	462	38.5%
Master degree/Ph.D.	127	10.6%
Work position at the time of the survey		
Smart-working/smart studying	409	34.1%
Paid leave	38	3.2%
Time off work	17	1.4%
Compulsory leave	63	5.3%
Laid off	144	12.0%
Closure of the activity	100	8.3%
Still working at the workplace	205	17.1%
Unemployed	164	13.7%
Retired	60	5.0%
Respondent – positive COVID-19 diagnosis		
Yes (given the swab)	4	0.3%
No (given the swab)	139	11.6%
Unknown (not given the swab)	1057	88.1%
Significant other – positive COVID-19 diagnosis		
Yes (given the swab)	136	11.3%
No (given the swab)	166	13.8%
Unknown (not given the swab)	898	74.8%

In addition, the following self-report measures were administered.

Fear of COVID-19 Scale – (FCV-19S)

The FCV-19S (Ahorsu et al., 2020; Soraci et al., 2020) is a 7-item self-report questionnaire aimed at assessing emotional, cognitive, physiological, and behavioral manifestations of COVID-19-related fear in the general population. Respondents are asked to indicate their degree of agreement to each statement on a 5-point Likert-type scale (ranging from 1 = *"strongly disagree"* to 5 = *"strongly agree"*) that provides a single-factor structure. Higher values indicate greater fear of COVID-19. In this study, the FCV-19S showed a high internal consistency (Cronbach's alpha = 0.881).

University of California, Los Angeles, Loneliness Scale-Version 3 (UCLA-LS3)

The UCLA-LS3 (Russell, 1996; Boffo et al., 2012) is a 20-item self-report scale that evaluates the individuals' global and prolonged (dispositional) perceived sense of loneliness through three dimensions: (A) sense "habitual" isolation, (B) perception of being socially isolated, and (C) "traits" and dispositional factors of loneliness (Boffo et al., 2012). In addition, a general dimension of "dispositional" loneliness is assumed. Respondents are asked to rate how often they feel the way described by each sentence on a 4-point Likert-type scale (ranging from 1 = *"never"* to 4 = *"always"*). Higher values indicate the presence of a greater feeling of loneliness. In this study, the UCLA-LS3 showed a high internal consistency for each dimension (A – Isolation: Cronbach's alpha = 0.805; B – Relational connectedness: Cronbach's alpha = 0.822; C – Trait loneliness: Cronbach's alpha = 0.869) and for the general dimension (Cronbach's alpha = 0.913).

Rosenberg Self-Esteem Scale (RSE)

The RSE (Rosenberg, 1965; Prezza et al., 1997) is one the most widely used self-report scales assessing global self-esteem in both clinical settings and in the general population. It consists of 10 positively and negatively worded statements evaluating feelings about one's self. Respondents are asked to express their degree of agreement to each statement on a 4-point Likert-type scale (ranging from 1 = *"not at all"* to 4 = *"always"*), and it provides a single-factor structure. Higher values indicate a greater sense of global self-esteem. In the present sample, the RSE showed a high internal consistency (Cronbach's alpha = 0.869).

Anxiety Subscale of the Symptom Checklist-90 Revised (SCL-90R – ANX)

The SCL-90R ANX subscale (Derogatis and Unger, 2010) is a 10-item self-report tool evaluating psychological, cognitive, and physical manifestations of anxiety during the previous week. For each statement, respondents are asked to rate the severity of their symptoms on a 5-point Likert-type scale (ranging from 1 = *"not at all"* to 5 = *"always"*). The ANX subscale provides a single factor structure. Higher values indicate a greater anxiety symptomatology. In this study, the ANX subscale showed a high internal consistency (Cronbach's alpha = 0.932).

Depression Subscale of the Symptom Checklist-90 Revised (SCL-90R – DEP)

The SCL-90R DEP scale of Derogatis and Unger (2010) is a 13-item self-report tool evaluating emotive, cognitive, and somatic manifestations of depression during the previous week. Respondents are asked to rate the severity of their symptoms on a 5-point Likert-type scale (ranging from 1 = *"not at all"* to 5 = *"always"*). Also the DEP subscale provides a single factor structure. Higher values indicate a greater depressive symptomatology. In the present sample, the DEP subscale showed a high internal consistency (Cronbach's alpha = 0.907).

Statistical Analyses

All analyses were performed with the R statistical software system (v. 3.5.3) [R-core project (R Core Team, 2014, 2017)]. The following packages were used: psych (v. 1.8.12; Revelle, 2018), lavaan (v. 0.6-6; Rosseel, 2012; Rosseel et al., 2015), and semTools (v. 0.5-2; Jorgensen et al., 2019). Graphical representations were performed with graphViz in DiagrammeR (v.1.0.6.1; Iannone, 2018).

Preliminarily, a multivariate multiple regression analysis was performed to exclude the potential confounding effects of the following variables (covariates) on the aforementioned psychological constructs: (A) Italian region where respondents lived – as COVID-19 played out differently in Italy, (B) number of persons respondents lived with, (C) confirmed positive COVID-19 diagnosis of the respondents, and (D) confirmed positive COVID-19 diagnosis of the respondents' significant other. Thus, external variables were simultaneously regressed on all the psychological constructs.

A Pearson correlation coefficient (r) was computed to evaluate the relationships between variables (Tabachnick and Fidell, 2014).

A structural equation modeling (SEM) approach with latent variables was followed (McDonald and Ho, 2002; Frazier et al., 2004; Weston and Gore, 2006; Iacobucci, 2008; Wiedermann and von Eye, 2015). A two-related separated predictors with a sequential multiple mediation model was specified (MacKinnon, 2012; VanderWeele and Vansteelandt, 2014; Daniel et al., 2015; Hayes, 2017). The following procedure was performed.

Step 1

Before examining the hypothesized model, the structural validity of each scale used in this study was tested by means of confirmatory factor analysis (CFAs). Considering the response scale of each of the questions administered in the study, the diagonally weighted least square (DWLS) estimator was used to perform each CFA separately (Hoyle, 2012; Brown, 2015; Kline, 2016; Lionetti et al., 2016). Model fit was assessed by means of the following fit indices – and recommended cutoff values (Bollen, 1989; Yu, 2002; Iacobucci, 2009; Hoyle, 2012; van de Schoot et al., 2012; Kline, 2016): (A) the Chi-square statistics (χ^2), preferably non-statistically significant ($p > 0.05$) (Bentler and Bonett, 1980; Muthén and Muthén, 1998-2017; Barrett, 2007); (B) the root-mean-square error of approximation (RMSEA), with values below 0.08 indicating an "acceptable" model fit and values below 0.05 indicating a "good" model fit (Steiger and Lind, 1980; Steiger, 1990; Hu and Bentler, 1999; Barrett, 2007; van de Schoot et al., 2012); (C) the comparative fit index (CFI), with values between 0.90 and 0.95 for an "acceptable" fit (Browne and Cudeck, 1989; Bentler, 1990; van de Schoot et al., 2012; Brown, 2015) and higher than 0.95 to indicate a "good" fit (Bentler, 1990; Browne and Cudeck, 1992; Hu and Bentler, 1999), and (D) the standard root mean square residual (SRMR), with values lower than 0.08 considered a good model fit (Hu and Bentler, 1999; Hoyle, 2012).

Step 2

The Harman's single-factor test was performed to check the potential "common method bias" (Harman, 1976; Podsakoff et al., 2003; Brown, 2015). Firstly, a correlated factors model was specified: according to the measurement model, seven correlated factors (FCV19 – single factor, UCLA-LS3– three factors, RSE – single factor, ANX – single factor, and DEP – single factor) were specified – each item was specified to load onto its specific factor. Secondly, an alternative model was specified: a first-order single factor model was specified – all the items of the abovementioned scales were loaded onto a single latent dimension. Models were sequentially specified and compared using the test differences in goodness-of-fit indices ($\Delta\chi^2$: $p > 0.050$; ΔCFI: >0.010; ΔRMSEA: >0.015). Model comparisons were based on typical interpretation guidelines: for example, a statistically significant chi-square difference ($\Delta\chi^2$; $p < 0.050$) and a ΔCFI greater than 0.010 suggest the absence of the bias (Meredith, 1993; Vandenberg and Lance, 2000; Cheung and Rensvold, 2002; Chen, 2007; Millsap, 2012; Brown, 2015).

Step 3

Latent factors were defined by using a partially disaggregated parcel approach in which latent constructs were defined by using parcels as indicators (Bandalos and Finney, 2001; Coffman and MacCallum, 2005; Little et al., 2013). More in detail, since four scales were unidimensional (FCV-19S, RSE, ANX, and the DEP), item parcels were created using the "item-to-construct balance strategy" (Bandalos and Finney, 2001; Little et al., 2002; Yang et al., 2010) – by inspecting factor loadings resulting from each measurement model (Little et al., 2002, 2013). However, since the UCLA-LS3 showed a hierarchical second-order structure, item parcels were created by using the "domain-representative strategy" (Kishton and Widaman, 1994; Graham et al., 2000; Little et al., 2002, 2013; Graham, 2004) – for each dimension, items were aggregated together. For each scale, at least a 3-item-parcel *per* latent variable were created – allowing each factor to be at least "just identified" – with factor loadings higher than $|0.5|$ on the related construct (Hoyle, 2012; Little et al., 2013; Brown, 2015; Kline, 2016). Once item parcels were created, descriptive statistics were examined: an almost normal distribution was found for the large majority of parcels. Thus, the maximum likelihood (ML) estimator was used for each SEM described in the following step ("Step 4") (Muthén and Muthén, 1998-2017; Hoyle, 2012; Kline, 2016). In addition, a 10,000 bootstrap resampling procedure was applied to each tested model (MacKinnon, 2012).

Step 4

The two-related separated predictors multiple mediation model was tested using a four-step approach (MacKinnon et al., 2007; Iacobucci, 2009; Rucker et al., 2011; MacKinnon, 2012). *Firstly*, a predictors-only model was specified: fear of COVID-19 (X_1) and dispositional loneliness (X_2) predict depressive symptomatology (Y) – **Figure 1**, Model 1. *Secondly*, a model was specified by excluding the effect of self-esteem (buffering variable) and dispositional loneliness: fear of COVID-19 (X_1) predict depressive symptomatology (Y) through anxiety symptoms (M) – **Figure 1**, Model 2a. *Thirdly*, a parallel model was specified by excluding the effect of self-esteem (buffering variable) and fear of COVID-19: dispositional loneliness (X_2) predicts depressive

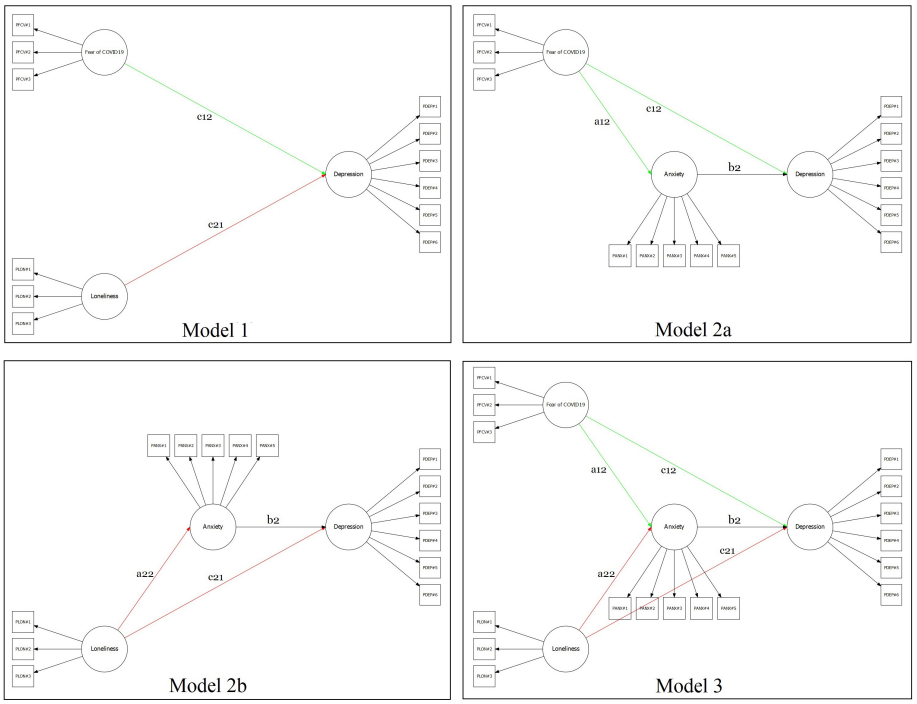

FIGURE 1 | Graphical representation of the several mediation models tested.

symptomatology (Y) through anxiety symptoms (M) – **Figure 1**, Model 2b. *Fourthly*, a semi-completed model was specified by only excluding the effect of self-esteem (buffering variable): fear of COVID-19 (X_1) and dispositional loneliness (X_2) predicts depressive symptomatology (Y) through anxiety symptoms (M) – **Figure 1**, Model 3. *Fifthly*, the final model was specified by including the buffering effect of self-esteem: fear of COVID-19 (X_1) and dispositional loneliness (X_2) predict depressive symptoms (Y) through self-esteem (M_1) and anxiety symptoms (M_2) – Model 4, **Figure 2**.

Each of the five models described in "Step 4" was evaluated using the abovementioned "goodness-of-fit" indices (χ^2, RMSEA, CFI, SRMR) and their cutoffs values – and each tested model had to provide good fit indices (Frazier et al., 2004; Iacobucci, 2010). In addition, to avoid possible biases related to the scaling method (by default, the first factor loading of each latent variable was fixed to 1), an alternative model was specified by fixing the variance of each latent variable to unity (Gonzalez and Griffin, 2001). This procedure was repeated for each of the five models described above. Finally, all regression coefficients (β) reported in the text were unstandardized.

RESULTS

Preliminary Analysis

The multivariate multiple regression analysis showed no statistically significant effects of external variables on psychological constructs. More in detail, controlling for other external variables, no statistically significant effect of (A) *Italian region of residence* was found on FCV-19S (β = 0.515, SE = 0.289, z = 1.786, p = 0.074), UCLA-LS3 (β = 0.290, SE = 0.518, z = 0.561, p = 0.575), RSE (β = −0.191, SE = 0.255, z = −0.751, p = 0.453), and DEP (β = 0.073, SE = 0.041, z = 1.800, p = 0.072). A negligible effect was found on ANX (β = 0.095, SE = 0.043, z = 2.207, p = 0.027). Moreover, controlling for other external variables, no statistically significant effect of the (B) *number of persons living with* was found on UCLA-LS3 (β = −0.377, SE = 0.236, z = −1.599, p = 0.110), RSE (β = 0.089, SE = 0.119, z = 0.747, p = 0.455), ANX (β = 0.029, SE = 0.020, z = 1.444, p = 0.149), and DEP (β = −0.017, SE = 0.019, z = −0.910, p = 0.363). A small effect was found on FCV-19S (β = 0.483, SE = 0.140, z = 3.443, p = 0.001). Moreover, controlling for other external variables, no statistically significant effect of (C) *confirmed positive COVID-19 diagnosis of the respondent* was found on FCV-19S (β = 0.556, SE = 0.544, z = 1.022, p = 0.307), UCLA-LS3 (β = −0.067, SE = 0.863, z = −0.077, p = 0.939), RSE (β = 0.508, SE = 0.394, z = 1.290, p = 0.197), ANX (β = 0.026, SE = 0.087, z = 0.302, p = 0.763), and DEP (β = −0.059, SE = 0.074, z = −0.800, p = 0.424). Finally, controlling for other external variables, no statistically significant effect of the presence of (D) *confirmed positive COVID-19 diagnosis of the respondents' significant other* was found on FCV-19S (β = 0.100, SE = 0.268, z = 0.372, p = 0.710), UCLA-LS3 (β = 0.502, SE = 0.413, z = 1.217, p = 0.223), RSE (β = 0.086, SE = 0.205, z = 0.419, p = 0.675), ANX (β = −0.021, SE = 0.040, z = −0.511, p = 0.609), and DEP (β = −0.022, SE = 0.034, z = −0.667, p = 0.505).

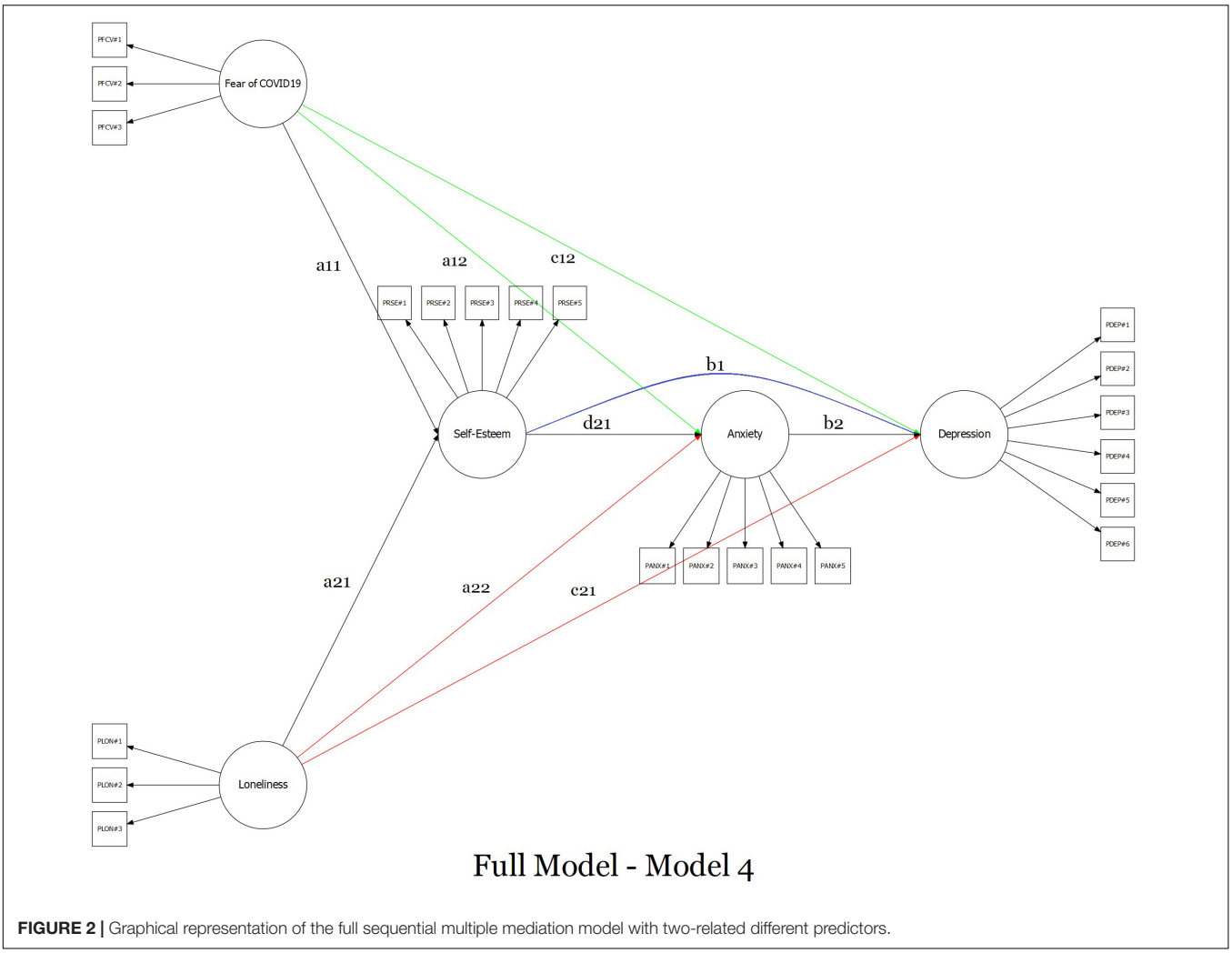

FIGURE 2 | Graphical representation of the full sequential multiple mediation model with two-related different predictors.

TABLE 2 | Mean, standard deviation, and correlations between observed variables.

		M	SD	1	2	3	4	5	6	7	8
1	FCV19S	19.63	5.678	–							
2	UCLA-LS3	43.34	9.353	0.161	–						
3	ISO	7.03	2.073	0.188	0.742	–					
4	REL. CON.	19.77	4.120	0.150	0.895	0.592	–				
5	T. LON	16.54	4.595	0.107	0.898	0.529	0.658	–			
6	RSE	29.44	4.533	−0.218	−0.532	−0.464	−0.494	−0.432	–		
7	ANX	1.05	0.832	0.717	0.296	0.303	0.268	0.226	−0.333	–	
8	DEP	1.19	0.755	0.419	0.578	0.564	0.517	0.459	−0.581	0.664	–

Each correlation is statistically significant at p < 0.001; FCV, fear of COVID-19 scale; UCLA-LS3, UCLA loneliness scale; ISO, UCLA sense of isolation; REL. CON., UCLA sense of relational connectedness; T. LON, UCLA trait loneliness; RSE, Rosenberg self-esteem scale; ANX, SCL-90R anxiety scale; DEP, SCL-90R depression scale.

In addition, correlation analyses suggested small-to-large associations between the variables involved in the multiple mediation model (**Table 2**).

Structural Models

The FCV19S showed adequate goodness-of-fit indices: χ^2 (14) = 88.338; $p < 0.001$; RMSEA = 0.067; 90%CI 0.054–0.080; p(RMSEA < 0.05) = 0.018, CFI = 0.996, SRMR = 0.038. Factor loadings of the items ranged from 0.705 (item#2) to 0.872 (item#5) (*mean* = 0.778; *SD* = 0.065).

The UCLA-LS3 showed adequate goodness-of-fit indices: χ^2 (167) = 1261.908; $p < 0.001$; RMSEA = 0.074; 90%CI 0.070–0.078; p(RMSEA < 0.05) < 0.001, CFI = 0.985, SRMR = 0.059. Factor loadings of the first-order items

TABLE 3 | Parcel descriptive statistics and standardized factor loadings (λ).

	Descriptive statistics				Model 1	Model 2a	Model 2b	Model 3	Model 4
	M	SD	SK	K	λ	λ	λ	λ	λ
FCV-19Ss (X_1)									
pFCV#1	2.905	0.984	0.112	−0.636	0.869	0.876	–	0.876	0.876
pFCV#2	3.015	0.809	0.197	−0.084	0.839	0.839	–	0.839	0.839
pFCV#3	2.595	0.868	0.290	−0.352	0.896	0.890	–	0.890	0.890
UCLA-LS3 (X_2)									
pFCV#1	2.344	0.691	−0.028	−0.548	0.734	–	0.736	0.736	0.735
pFCV#2	2.471	0.515	0.046	−0.205	0.828	–	0.828	0.838	0.830
pFCV#3	1.838	0.511	0.540	0.216	0.757	–	0.757	0.757	0.755
RSE (M_1)									
pRSE#1	2.901	0.562	−0.077	0.191	–	–	–	–	0.790
pRSE#2	3.011	0.449	−0.727	3.481	–	–	–	–	0.725
pRSE#3	3.059	0.580	−0.362	0.263	–	–	–	–	0.807
pRSE#4	3.035	0.492	−0.504	1.815	–	–	–	–	0.766
pRSE#5	2.714	0.662	−0.048	−0.172	–	–	–	–	0.777
ANX (M_2)									
pANX#1	0.617	0.808	1.470	1.820	–	0.836	0.841	0.836	0.836
pANX#2	1.148	0.965	0.787	0.000	–	0.896	0.894	0.897	0.897
pANX#3	0.769	0.908	1.228	0.931	–	0.856	0.861	0.856	0.856
pANX#4	0.987	0.976	1.021	0.417	–	0.882	0.880	0.882	0.881
pANX#5	1.716	1.030	0.193	−0.648	–	0.821	0.817	0.821	0.821
DEP (Y)									
pDEP#1	1.569	0.946	0.398	−0.391	0.782	0.783	0.781	0.780	0.777
pDEP#2	1.379	0.970	0.513	−0.379	0.783	0.770	0.777	0.777	0.783
pDEP#3	1.424	0.955	0.489	−0.252	0.764	0.760	0.760	0.760	0.760
pDEP#4	1.150	0.934	0.735	0.046	0.835	0.843	0.834	0.834	0.835
pDEP#5	0.761	0.703	0.980	0.991	0.789	0.803	0.798	0.797	0.794
pDEP#6	0.985	0.893	0.997	0.505	0.844	0.835	0.845	0.846	0.846

Each item-parcel factor loading (λ) is statistically significant at $p < 0.001$; p(. . .), item parcel; FCV-19S, fear of COVID-19 scale; UCLA-LS3, UCLA loneliness scale; RSE, Rosenberg self-esteem scale; ANX, SCL-90R anxiety scale; DEP, SCL-90R depression scale.

ranged from 0.555 (item#7 – Relational connectedness) to 0.892 (item#14 – Relational connectedness) (*mean* = 0.719; *SD* = 0.157). Factor loadings of the second-order items ranged from 0.785 (Isolation) to 0.939 (Relational connectedness) (*mean* = 0.851; *SD* = 0.079).

Also the RSE revealed good results: χ^2 (35) = 249.239; $p < 0.001$; RMSEA = 0.071; 90%CI 0.063–0.080; p(RMSEA < 0.05) < 0.001, CFI = 0.990, SRMR = 0.052. Factor loadings of the items ranged from 0.541 (item#4) to 0.817 (item#2) (*mean* = 0.704; *SD* = 0.105).

Even the ANX showed good fit indices: χ^2 (35) = 208.462; $p < 0.001$; RMSEA = 0.064; 90%CI 0.056–0.073; p(RMSEA < 0.05) = 0.003, CFI = 0.997, SRMR = 0.036. Factor loadings of the items ranged from 0.768 (item#2) to 0.887 (item#3) (*mean* = 0.830; *SD* = 0.043).

Finally, also the DEP revealed good fit indices: χ^2 (65) = 310.064; $p < 0.001$; RMSEA = 0.056; 90%CI 0.050–0.062; p(RMSEA < 0.05) = 0.053, CFI = 0.994, SRMR = 0.046. Factor loadings of the items ranged from 0.448 (item#1) to 0.896 (item#8) (*mean* = 0.724; *SD* = 0.110).

Harman's Single-Factor Test

The Harman's single-factor test showed the absence of the "common method bias." Indeed, the CFA with seven correlated factors (FCV19 – single factor, UCLA-LS3– three factors, RSE – single factor, ANX – single factor, and DEP – single factor) provided good fit indices [χ^2 (1689) = 8434.991; $p < 0.001$; RMSEA = 0.058; 90%CI 0.056–0.059; p(RMSEA < 0.05) < 0.001, CFI = 0.983, SRMR = 0.060]. Contrarily, the CFA with a single latent factor provided poor fit indices [χ^2 (1710) = 54429.649; $p < 0.001$; RMSEA = 0.160; 90%CI 0.159–0.162; p(RMSEA < 0.05) < 0.001, CFI = 0.866, SRMR = 0.147]. Model comparison suggested the absence of the "common method bias": $\Delta\chi^2$ (21) = 45995, $p < 0.001$; $|\Delta$RMSEA$|$ = 0.103, and $|\Delta$CFI$|$ = 0.117.

Multiple Mediation Model

Model 1

The first model (**Figure 1**, model 1) provided adequate goodness-of-fit indices: χ^2 (51) = 377.938; $p < 0.001$; RMSEA = 0.073; 90%CI 0.066–0.080; p(RMSEA < 0.05) < 0.001, CFI = 0.964, SRMR = 0.043 (**Table 3**). The fear of COVID-19 (X_1)

was positively associated with depressive symptomatology (Y): β = 0.537 (SE = 0.047) [95%CI: 0.452; 0.632], z = 11.551, $p < 0.001$. At the same time, the dispositional loneliness (X_2) was positively associated with depressive symptomatology (Y): β = 0.932 (SE = 0.060) [95%CI: 0.822; 1.057], z = 15.484, $p < 0.001$. Moreover, fear of COVID-19 and loneliness were statistically significantly associated: β = 0.199 (SE = 0.035) [95%CI: 0.129; 0.267], z = 5.601, $p < 0.001$.

Model 2a

The second model (**Figure 1**, model 2a) provided adequate goodness-of-fit indices: χ^2 (74) = 505.982; $p < 0.001$; RMSEA = 0.070; 90%CI 0.064–0.076; p(RMSEA < 0.05) < 0.001, CFI = 0.968, SRMR = 0.039 (**Table 3**). The fear of COVID-19 (X_1) was positively associated with anxiety symptomatology (M): β = 1.257 (SE = 0.064) [95%CI: 1.140; 1.390], z = 19.566, $p < 0.001$. Moreover, anxiety symptomatology (M) predicted depressive symptoms (Y): β = 0.827 (SE = 0.054) [95%CI: 0.724; 0.937], z = 15.321, $p < 0.001$. Also, fear of COVID-19 was negatively associated with depressive symptomatology: β = −0.338 (SE = 0.069) [95%CI: −0.476; −0.205], z = −4.865, $p < 0.001$. Furthermore, the total indirect effect was statistically significant [β = 1.039 (SE = 0.072) [95%CI: 0.908; 1.188], z = 14.372, $p < 0.001$] as well as the total model effect [β = 0.701 (SE = 0.058) [95%CI: 0.590; 0.821], z = 11.986, $p < 0.001$] – thus suggesting a partially mediated path.

Model 2b

The third model (**Figure 1**, model 2b) provided adequate goodness-of-fit indices: χ^2 (74) = 583.259; $p < 0.001$; RMSEA = 0.076; 90%CI 0.070–0.082; p(RMSEA < 0.05) < 0.001, CFI = 0.958, SRMR = 0.043 (**Table 3**). Dispositional loneliness (X_2) was positively associated with anxiety symptomatology (M): β = 0.366 (SE = 0.038) [95%CI: 0.293; 0.442], z = 9.631, $p < 0.001$. Moreover, anxiety symptomatology (M) predicted depressive symptomatology (Y): β = 0.988 (SE = 0.063) [95%CI: 0.874; 1.121], z = 15.752, $p < 0.001$. In this case, dispositional loneliness was positively associated with depressive symptomatology: β = 0.931 (SE = 0.066) [95%CI: 0.806; 1.065], z = 14.025, $p < 0.001$. The total indirect effect was statistically significant [β = 0.361 (SE = 0.042) [95%CI: 0.285; 0.449], z = 8.660, $p < 0.001$] as well as the total model effect [β = 1.292 (SE = 0.080) [95%CI: 1.147; 1.459], z = 16.074, $p < 0.001$] – thus suggesting, a partially meditated model.

Model 3

The fourth model (**Figure 1**, model 3) provided adequate goodness-of-fit indices: χ^2 (113) = 703.306; $p < 0.001$; RMSEA = 0.066; 90%CI 0.061–0.071; p(RMSEA < 0.05) < 0.001, CFI = 0.962, SRMR = 0.043 (**Table 3**). As shown for "Model 1," fear of COVID-19 (X_1) and dispositional loneliness (X_2) were positively associated: β = 0.199 (SE = 0.036) [95%CI: 0.128; 0.270], z = 5.523, $p < 0.001$. Fear of COVID-19 (X_1) was also positively associated with anxiety symptomatology (M): β = 1.256 (SE = 0.064) [95%CI: 1.136; 1.389], z = 19.713, $p < 0.001$. At the same time, dispositional loneliness (X_2) was positively associated with anxiety symptomatology (M): β = 0.330 (SE = 0.040) [95%CI: 0.251; 0.410], z = 8.179, $p < 0.001$. Moreover, anxiety symptomatology (M) predicted depressive symptomatology (Y): β = 0.722 (SE = 0.060) [95%CI: 0.661; 0.896], z = 12.938, $p < 0.001$. Also, as shown in "Model 2a" fear of COVID-19 was negatively associated with depressive symptomatology [β = −0.288 (SE = 0.079) [95%CI: −0.451; −0.138], z = −3.639, $p < 0.001$] and, as for "Model 2b," dispositional loneliness was positively associated with depressive symptomatology: β = 0.924 (SE = 0.067) [95%CI: 0.801; 1.064], z = 13.852, $p < 0.001$.

The first total indirect effect (fear of COVID-19 → anxiety symptomatology → depressive symptomatology) was statistically significant [β = 0.970 (SE = 0.082) [95%CI: 0.822; 1.145], z = 11.785, $p < 0.001$] as well as the total model effect [β = 0.682 (SE = 0.060) [95%CI: 0.579; 0.806], z = 11.306, $p < 0.001$] – thus suggesting a partially mediated model. In addition, the second total indirect effect (dispositional loneliness → anxiety symptomatology → depressive symptomatology) was statistically significant [β = 0.255 (SE = 0.034) [95%CI: 0.191; 0.326], z = 7.427, $p < 0.001$] as well as the total model effect [β = 1.179 (SE = 0.078) [95%CI: 1.187; 1.714], z = 15.102, $p < 0.001$] – thus suggesting a partially mediated model.

Model 4

The final model (**Figure 2**) provided satisfying goodness-of-fit indices: χ^2 (199) = 918.943; $p < 0.001$; RMSEA = 0.055; 90%CI 0.051–0.059; p(RMSEA < 0.05) = 0.012, CFI = 0.962, SRMR = 0.039 (**Table 3**). As shown for "Model 1," fear of COVID-19 (X_1) and dispositional loneliness (X_2) were positively associated: β = 0.199 (SE = 0.036) [95%CI: 0.126; 0.269], z = 5.484, $p < 0.001$. According to the ABH, fear of COVID-19 (X_1) was negatively associated with self-esteem (M_1): β = −0.160 (SE = 0.040) [95%CI: −0.237; −0.082], z = −4.015, $p < 0.001$, and self-esteem – in turn – negatively predicted anxiety symptomatology (M_2): β = −0.127 (SE = 0.045) [95%CI: −0.216; −0.039], z = −2.797, p = 0.005 – thus revealing the buffering effect of self-esteem. Finally, anxiety symptomatology (M_2) positively predicted depressive symptomatology (Y): β = 0.769 (SE = 0.060) [95%CI: 0.657; 0.894], z = 12.775, $p < 0.001$. In addition, in line with the ABH, self-esteem (M_1) was negatively associated with depressive symptomatology (Y): β = −0.371 (SE = 0.052) [95%CI: −0.474; −0.269], z = −7.095, $p < 0.001$ – further suggesting the buffering effect of self-esteem. Furthermore, fear of COVID-19 (X_1) was positively associated with anxiety symptomatology (M_2) [β = 1.245 (SE = 0.065) [95%CI: 1.128; 1.380], z = 19.283, $p < 0.001$] and in line with "Model 2a" and "Model 3" fear of COVID-19 (X_1) was negatively associated with depressive symptomatology (Y) [β = −0.309 (SE = 0.079) [95%CI: −0.471; −0.159], z = −3.924, $p < 0.001$].

At the same time, according to the ABH, dispositional loneliness (X_2) was negatively associated with self-esteem (M_1): β = −0.798 (SE = 0.055) [95%CI: −0.913; −0.695], z = −14.403, $p < 0.001$ – revealing the buffering effect of self-esteem. Furthermore, dispositional loneliness (X_2) was positively associated with anxiety symptomatology (M_2) [β = 0.231

TABLE 4 | Summary of parameter estimates (beta) with 95% confidence intervals for key pathways tested full model, Model 4 – **Figure 2**.

Path		B	β (SE)	95% CI [L–U]	*z-value*	*p*-value	R^2
Fear of COVID-19 (X_1) → self-esteem (M_1)	(a11)	−0.122	−0.160 (0.040)	[−0.237; −0.082]	−4.015	$p < 0.001$	
Loneliness (X_2) → self-esteem (M_1)	(a21)	−0.610	−0.798 (0.055)	[−0.913; −0.695]	−14.403	$p < 0.001$	0.416
Self-esteem (M_1) → anxiety (M_2)	(d21)	−0.098	−0.127 (0.045)	[−0.216; −0.039]	−2.797	$p = 0.005$	0.655
Anxiety (M_2) → depression (Y)	(b2)	0.633	0.769 (0.060)	[0.657; 0.894]	12.775	$p < 0.001$	0.766
Fear of COVID-19 (X_1) → anxiety (M_2)	(a12)	0.732	1.245 (0.065)	[1.128; 1.380]	19.283	$p < 0.001$	
Fear of COVID-19 (X_1) → depression (Y)	(c11)	−0.149	−0.309 (0.079)	[−0.471; −0.159]	−3.924	$p < 0.001$	
Loneliness (X_2) → anxiety (M_2)	(a22)	0.136	0.231 (0.052)	[0.125; 0.341]	4.211	$p < 0.001$	
Loneliness (X_2) → depression (Y)	(c21)	0.340	0.703 (0.072)	[0.570; 0.854]	9.700	$p < 0.001$	
Self-esteem (M_1) → depression (Y)	(b1)	−0.235	−0.371 (0.052)	[−0.474; −0.269]	−7.095	$p < 0.001$	
Indirect effect of X_1 on Y via M_1	(a11*b1)	0.029	0.059 (0.017)	[0.029; 0.094]	3.495	$p < 0.001$	
Indirect effect of X_1 on Y via M_2	(a12*b2)	0.463	0.958 (0.082)	[0.813; 1.134]	11.714	$p < 0.001$	
Indirect effect of X_2 on Y via M_1	(a21*b1)	0.143	0.296 (0.044)	[0.214; 0.386]	6.744	$p < 0.001$	
Indirect effect of X_2 on Y via M_2	(a22*b2)	0.086	0.178 (0.043)	[0.097; 0.268]	4.098	$p < 0.001$	
Indirect effect of X_1 on Y via M_1 and M_2	(a11*d21*b2)	0.008	0.016 (0.007)	[0.004; 0.030]	2.324	$p = 0.020$	
Indirect effect of X_2 on Y via M_1 and M_2	(a21*d21*b2)	0.038	0.078 (0.030)	[0.023; 0.140]	2.634	$p = 0.008$	
Total effect X_1 on Y		0.350	0.724 (0.064)	[0.604.; 0.858]	11.252	$p < 0.001$	
Total effect X_2 on Y		0.561	1.154 (0.083)	[1.008; 1.332]	13.967	$p < 0.001$	

B, standardized beta; β, unstandardized beta; 95%CI, 95% confidence intervals for the unstandardized beta. SE, standard error.

(SE = 0.055) [95%CI: 0.125; 0.341], $z = 4.211$, $p < 0.001$] and, in line with "Model 2b" and "Model 3," also positively associated with depressive symptomatology (Y) [β = 0.703 (SE = 0.072) [95%CI: 0.570; 0.854], $z = 9.700$, $p < 0.001$].

The first total indirect effect (fear of COVID-19 → self-esteem → anxiety symptomatology → depressive symptomatology) was statistically significant [β = 0.016 (SE = 0.007) [95%CI: 0.004; 0.030], $z = 2.324$, $p = 0.020$] as well as the total model effect [β = 0.724 (SE = 0.064) [95%CI: 0.604; 0.858], $z = 11.252$, $p < 0.001$] – suggesting a partially mediated model that highlighted the buffering effect of self-esteem.

In addition, the second total indirect effect (dispositional loneliness → self-esteem → anxiety symptomatology → depressive symptomatology) was statistically significant [β = 0.078 (SE = 0.030) [95%CI: 0.023; 0.140], $z = 2.634$, $p = 0.008$] as well as the total model effect [β = 1.154 (SE = 0.083) [95%CI: 1.008; 1.332], $z = 13.967$, $p < 0.001$] – thus suggesting a partially mediated model with the buffering effect of self-esteem (**Table 4**).

DISCUSSION

Recently, the potential negative impact that the adverse psychological consequences of COVID-19 further had on the disease itself have been highlighted in the literature (Center for Disease Control and Prevention, 2020; Lima et al., 2020; Parola, 2020; Parola et al., 2020; Thakur and Jain, 2020; Wind et al., 2020). Indeed, the advent of COVID-19 generated intense fear and anxiety about contagion, disease, and thoughts of death in the general population. At the same time, the sense of isolation was amplified by dispositional loneliness during the COVID-19 lockdown, with a consequent increase of anxiety symptoms. Therefore, both a fear of COVID-19 and dispositional loneliness represent major risk factors for the development of symptoms of anxiety and following symptoms of depression.

This study highlighted the buffering-effect of self-esteem on the relationships between negative psychological constructs, such as a fear of COVID-19 and dispositional loneliness feelings (predictors), and their consequent adverse psychological correlates – anxiety and depression (outcomes) during the COVID-19 pandemic.

In line with the scientific literature showing that (prolonged) fear can lead to depression (Bowman, 2001), this study revealed that a fear of COVID-19 and loneliness might lead to depressive symptoms (Santini et al., 2020; Thakur and Jain, 2020). Indeed, the first model that has been tested (Model 1 – predictors only) showed a positive relationship between a fear of COVID-19 and depressive symptomatology, with higher fear predicting higher depressive symptomatology. Indeed, when controlling for loneliness, an increase of 1 point in fear of COVID-19 was associated with an increase of 0.537 points in depression. At the same time, loneliness was positively associated with depressive symptoms: an increase in 1 point in dispositional loneliness was associated with an increase of 0.932 points in depression. These results suggest that a prolonged state of fear and dispositional feelings of loneliness might lead to the development of adverse psychological symptoms – thus representing major risk factors for the onset of symptoms of depression.

However, when controlling for anxiety activation (Model 3), fear (of COVID-19) and depression showed a negative association, probably due to the different nature of these emotional states. Indeed, on one hand, fear represents an activating emotion prompting the organism to react with the well-known *"fight or flight"* response. On the other hand, depression is characterized by a generalized de-activation, reflected in slowed-down behavior and thinking as well as flattened affectivity and pleasure (Beck, 1979; Harper et al., 2020). At the same time, fear was positively strongly associated with

anxiety symptoms (Barlow, 2002; Harding et al., 2008), which might lead to depression (Bowman, 2001) – thus suggesting a partially mediated model starting from fear up to depression through anxiety.

Simultaneously – when controlling for anxiety – dispositional loneliness was positively associated with depressive symptoms, further highlighting the existence of a strong relationship between these two constructs (Cacioppo et al., 2014; Santini et al., 2020). Also, dispositional loneliness was positively associated with anxiety symptoms leading to depression (Thompson et al., 2005; Starr and Davila, 2012) – suggesting, a partially mediated model (Model 3).

However, in line with the hypotheses, the final model (Model 4) highlighted the buffering role of self-esteem: despite positive associations held between fear of COVID-19, dispositional loneliness, and anxiety, the effect of self-esteem slowed down these negative adverse paths. Indeed – in line with the ABH and the TMT (Greenberg et al., 1986, 1992) – self-esteem had negative relationships with all the other psychological constructs (negative β values) due to its buffering effect hampering the relationships between adverse psychological variables. A partial mediation model was, therefore, suggested given that the relationship between fear of COVID-19, dispositional loneliness, anxiety, and depression held even when their paths were buffered by self-esteem.

Summarizing, results showed that self-esteem had a buffer effect protecting against anxiety symptoms triggered by a fear of COVID-19 and dispositional loneliness. Thus, these findings confirmed the validity of the ABH in the context of the COVID-19 pandemic.

Results also highlighted that both a fear of COVID-19 and dispositional loneliness were able to trigger unbearable feelings of anxiety that, in turn, were strongly linked to depressive symptomatology.

The strict interconnection between self-esteem and loneliness was probably due to the fact that loneliness is often related to negative self-evaluations, and feelings of being worthless, inferior, or unlovable (Heinrich and Gullone, 2006). Previous studies suggested that self-esteem may impact on loneliness as a reinforcer or a buffer, as instances of influencing the relational competences (Olmstead et al., 1991; Brage and Meredith, 1994; Heinrich and Gullone, 2006).

These results are in line with previous scientific literature highlighting that self-esteem can be a mediator in the relationship between loneliness, anxiety, and depression (Brage and Meredith, 1994; Heinrich and Gullone, 2006; Çivitci and Çivitci, 2009).

Regarding the clinical implications of this study, its findings suggest a possible intervention strategy to provide psychological support to people suffering from the emotional consequences of COVID-19 and other COVID-19-related issues in order to alleviate the psychological outbreak of the pandemic. Indeed, according to the ABH, if self-esteem provides protection against stressors, such sources of stress should increase the need for self-esteem to relieve psychological burden (Harmon-Jones et al., 1997). Consequently, increased self-esteem should function as a buffer toward anxiety, reducing the adverse psychological issues in response to threats or stressors. Thus, psychological interventions targeting self-esteem can represent an effective strategy to attenuate the distressing psychological responses to COVID-19 fear and dispositional feelings of loneliness – particularly among populations most susceptible and vulnerable to the negative psychological effects of the COVID-19 pandemic, including people with psychiatric disorders, those at risk of domestic violence, elderly people, and health-care practitioners (Lai et al., 2020; Armitage and Nellums, 2020; Yao et al., 2020).

Moreover, given that loneliness derives from the perceived discrepancy between the actual and desired quality of relationships (Peplau and Perlman, 1982), these results highlight the importance of perceived social support and positive relationships for people (Ratti et al., 2017; Panzeri et al., 2019; Duan and Zhu, 2020). Individuals should, therefore, be guided and educated in strengthening their relationships and social support resources when physical contact is not possible (i.e., quarantine, hospitalization) by adopting tele-communication tools, such as smartphones. In line with the debated internet-paradox, proper technology use should be promoted to prevent distressing feelings (Moody, 2001; Enez Darcin et al., 2016; Király et al., 2020).

Some noteworthy limitations of this study need to be acknowledged. Due to the observational/correlational nature of the research design, it was not possible to establish a causal relationship among variables, but only predictive relationships – still in line with the study purpose (Fiedler et al., 2011). Moreover, the self-report nature of the online survey may convey intrinsic biases related to social desirability and other well-known issues (Vidotto et al., 2018). Other limitations of this study were the prevalence of females in the sample and that the fact that geographical areas in Italy were not equally represented – although preliminary analyses showed no associated effects. Likewise, no differences emerged from sociodemographic characteristics, but future studies should deepen their possible role as protective/risk factors (i.e., presence vs. absence of social support) (Mannarini et al., 2017a). In addition, multi-group analyses assessing tested models across sex (males vs. females) were not performed. However, due to the small male sample size, multi-group mediation analyses would not be able to provide an accurate estimation of model parameters (Hoyle, 2012; Kline, 2016). Future studies should, therefore, further test potential effects of sex on the suggested models. Moreover, all participants were Italian and possible effects of cross-cultural differences cannot be considered. Even though the ABH was successfully replicated in various countries as well as in different contexts (Pyszczynski et al., 2004), future studies specifically examining the impact of COVID-19 on people's lives should compare these results among different countries thus increasing the generalizability of these findings.

Finally, a mediation model was preferred to a moderation one for both theoretical and statistical reasons. Indeed, from a theoretical perspective a mediation-based approach is closer and more related to the original ABH and the TMT (Greenberg et al., 1986, 1992), conceptualizing self-esteem as an intermediating buffer between life-threatening stressors and anxiety (Pyszczynski et al., 2004). In fact, self-esteem not only

is able to influence individuals' levels of anxiety and depression, but it is itself influenced by negative psychological experiences – such as fear and loneliness – activating negative cognitions and emotions that significantly affect the idea of oneself (Greenberg et al., 1986; Heinrich and Gullone, 2006; Sowislo and Orth, 2013). Research show that fear can threaten self-evaluation (Greenberg et al., 1986), and that people experiencing higher feelings of loneliness also have a worse self-evaluation (Heinrich and Gullone, 2006). More in detail, negative experiences can activate both negative cognitions and emotions that significantly affect the idea of oneself (i.e., "I am a failure", "I am worthless") (Beck, 1979) – thus, leaving scars in the self-concept, as well as persistently threatening and reducing self-esteem and self-efficacy (Mannarini, 2010; Sowislo and Orth, 2013). Thus, a moderation approach would not suit the theoretical background of this study, and would not allow us to properly take into account the complexity of relationships among the considered psychological constructs. Regarding the strengths of the present study, it relies on a well-grounded theoretical basis supported by several experimental and longitudinal studies (Greenberg et al., 1992; Brage and Meredith, 1994; Pyszczynski et al., 2004; Heinrich and Gullone, 2006). A wide sample of individuals from the general population was analyzed with strong statistical methodologies (Iacobucci et al., 2007; MacKinnon, 2012; MacKinnon et al., 2012, 2013) providing good results (McDonald and Ho, 2002; Hayes, 2009; Iacobucci, 2010; Preacher, 2015). Moreover, the hypothesized models resulted in having a good fit, even if other solutions would have been possible but with lower fit indexes.

Given that individuals faced similar problems during past epidemics, findings from this study could also be generalized and applied to support people still coping with the negative consequences that previous disease outbreaks had on their mood (i.e., Ebola, SARS, MERS, and tuberculosis) (Brown and Lees-Haley, 1992; Betancourt et al., 2016; Huremović, 2019; Chew et al., 2020). In a broader sense, these results could be extended to relieve the psychological burden of dysfunctional psychological reactions in response to physical and/or psychological illnesses (Rossi Ferrario and Panzeri, 2020).

Overall, this study contributes to the current debate about the psychological implications of the COVID-19 pandemic, a prolonged and distressing situation triggering or worsening psychological issues. These findings may also be useful to help clinicians develop efficient and tailored interventions for increasing individuals' mental health – with particular attention to the more fragile categories, such as young people and elderly people (Parola and Donsì, 2018, 2019; Balestroni et al., 2020).

Although, a considerable number of individuals may avoid seeking professional psychological help (Rossi and Mannarini, 2019) due to the associated stigma (Mannarini et al., 2017b, 2018, 2020; Faccio et al., 2019; Mannarini and Rossi, 2019) or because of defensive denial reactions toward their psychological difficulties (Sareen et al., 2007; Rossi Ferrario et al., 2019), thus choosing to manage the psychological issues on their own (Wilson and Deane, 2012).

Future research will provide further insight about the evolution over time of the psychological issues related to COVID-19. Future studies might examine the role of social support as well as the changes in the dynamics of social and family relationships (Mannarini et al., 2013, 2017a; Balottin et al., 2017).

Still, the role of other psychological constructs that may act as protective or risk factors, such as anger, post-traumatic symptoms, hopelessness, and denial should be further explored in future research in order to find effective treatment strategies to adopt in order to deal with consequences of both the COVID-19 and future pandemics.

CONCLUSION

The present research offers further support for the anxiety-buffer role of self-esteem, confirming TMT to be a well-grounded theoretical framework offering interesting and useful clinical insights in the context of the COVID-19 pandemic. Targeted psychological interventions should be implemented to properly support individuals suffering from COVID-19-related issues in order to minimize the psychological burden of the disease whilst promoting adaptation and positive psychological health outcomes.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, on reasonable requests.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethic Committee of the University of Padua. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AR conceived the study, performed the statistical analyses, and wrote the first draft. AP wrote a large part of the first draft and collected the data. GP helped with data collection and wrote part of the first draft. GM, GC, and SM provided important intellectual revisions. All authors contributed to the article and approved the submitted version.

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Managing Children's Anxiety During COVID-19 Pandemic: Strategies for Providers and Caregivers

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The Coronavirus Disease 2019 pandemic by virtue of its sudden, unprecedented and widespread nature, has led to a multitude of psychological effects on individuals across societies. This includes anxiety which has important implications on the daily functioning, physical and mental health of individuals. Children are a vulnerable group of the population who can experience anxiety which potentially can lead to long-lasting implications on their health for years to come. It is thus important that their caregivers, including parents and healthcare professionals be aware of strategies that can help with anxiety in children. This article discusses anxiety in children in the context of the COVID-19 pandemic and outlines strategies that may be helpful.

Keywords: anxiety, COVID-19, children, caregivers, pandemic

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INTRODUCTION

The Coronavirus Disease 2019 (COVID-19) pandemic has had multiple implications on individuals worldwide (1). Society members are facing unprecedented changes to their usual routines as governments implement measures to mitigate the spread of the pandemic. Examples include closure of schools with children doing home-based learning (2) in many countries including Singapore and parents working from home as part of social distancing regulations. These measures inevitably lead to changes in the family structure and routine for children (3, 4). Furthermore, as part of the pandemic response, there are also restrictions on regular psychological support systems, such as meeting with friends, physical exercise, and religious activities. The combination of risk factors such as the multitude of change in daily lives, information overload about the pandemic, fear of the unknown, coupled with the reduction in psychological support, can result in heightened anxiety in adults and children alike (5). This has also been described in research on previous epidemics (6, 7).

While worries and fears are a natural and adaptive part of development, when these feelings are persistent and excessive, they can cause distress and significant impairment of an individual's daily functioning (8). It is thus important to identify and address anxiety promptly. In particular, it is important to address anxiety in children. According to the American Psychological Association (APA), anxiety disorders are the most prevalent of all mental health disorders that present in children and youth (9). Anxiety in children can often be harder to detect as children are still maturing cognitively and thus manifest anxiety differently from adults. Symptoms of anxiety manifest differently in different children (10). Some children may present with physical symptoms such as nausea, or stomach aches (11). They may also appear distracted or more inattentive than

usual, have increased separation anxiety from caregivers and may have changes in their appetites, feeding and sleeping habits. Some may express their anxiety verbally if they are able to do so. They may also do so through new internalizing behaviors such as being more withdrawn and quiet or by externalizing behaviors such as tantrums and challenging behaviors (12). Healthcare professionals may come across children with anxiety in various settings. This article outlines four main strategies that healthcare professionals can share with families to help children manage their anxiety and feel safe during this turbulent period: Acknowledge, Discuss, Do, and Reflect.

Acknowledge: Acknowledge Change

The simple step of recognizing and being aware of the changes that have occurred can help children feel that their concerns are validated (13). Often, caregivers may attempt to comfort their child with statements such as "there's no need for you to worry." These are well-intentioned, but may actually appear to dismiss the child's concerns (14). With younger children, it might be helpful to create a visual list of what has changed and what has not changed in their lives. This could help children feel less alone in their feelings when they know that the changes that they perceive are recognized by another person as well. Further, not only should caregivers acknowledge the changes, but they should recognize that these changes can lead to fears and possibly anxiety in children. This will then prompt caregivers to look out for potential behavioral manifestations of anxiety, and address it earlier. When their caregivers acknowledge the change and its possible consequences, children will in turn be aware that they can go to their caregivers for support.

Asking children specifically to express their feelings and thoughts is another strategy that is helpful. This is because how a child perceives the morbidity and mortality related to COVID-19 and the range of mitigating measures to curb its spread can lead to feelings of fear, confusion, anger and even guilt. Hence, providing regular opportunities for them to express themselves will be an opportunity to better address underlying fear and anxiety. This can be done through verbal expression (for example, initiating a conversation), writing (for example, journal entries), art and play- depending on the child's developmental age and cognition. It is important not to dismiss their feelings or react negatively to their anxiety. Apart from facilitating acknowledgment and validation of their feelings, their perspectives can also be gently corrected where required to reduce anxiety (15).

Discuss: Provide an Avenue to Discuss the Situation and the Child's Feelings

Providing children with accurate information from reliable sources tailored to their age and level of understanding will help them understand the pandemic better. It is vital that children be able to trust their caregivers to be a reliable source of information as this will help to assuage their anxiety. Where appropriate, update children as the situation evolves so that they can better grasp the need for the constant changes around them. Having an accurate understanding of the situation, can be empowering, and it can help them to better regulate their feelings of anxiety.

Discussing with children the rationale behind the changes implemented and the positive aspects of the situation can be helpful as well. Framing the measures in the light of public safety, i.e., to keep everyone safe, is an example of shifting the child's focus to a positive angle. Common terms that are now associated with the pandemic can be used as both a teaching tool and as a means of assurance. For example, the term "essential services" can be a discussion point about the people who are an integral part of society and are crucial to the fight against COVID-19. This can also help assure children of the people and steps being taken to safeguard the public. Understanding that there are reliable systems, resources and people (e.g., healthcare workers, essential workers, scientists, government officials, etc.) dedicated to managing the pandemic can reduce the sense of helplessness and anxiety levels of children. Caregivers can also talk to their child about the specific steps taken by the family and school to deal with the pandemic.

While discussing the pandemic with children, it is important to be mindful of one's own emotions and thoughts (16). The caregiver's emotions and behaviors influence the child's response. Caregiver/parental co-regulation, through scaffolding of the child's emotions and with strategies to help the child regulate emotions, is crucial in helping the child develop emotional regulation as an individual (17, 18). In addition, caregivers should refrain from discussing their own concerns about the pandemic (for example, financial or employment concerns) and avoid having arguments around the child as this can lead to heightened anxiety in him/her. While not all children can understand or discuss the information and their own feelings, they can pick up on cues from the adults around them. Caregivers should also be aware of their tone and choice of words. Use a calm and matter of fact tone. Extreme statements meant to induce fear and compliance to instructions should be avoided (19). For example, a sweeping statement such as "If you go out to play, you will get sick with COVID-19" will not be helpful. These can inadvertently increase the child's paranoia around this pandemic.

Do: Maintain Routines and Empower the Child

Predictability is very important for an anxious child as it establishes a sense of stability which can help him/her to feel safe (20). Caregivers can actively plan to maintain consistency in the child's environment and follow a daily routine especially during this period. Anchor a child's routine in daily activities like mealtimes, sleep, and family time and inform the child about his/her schedule. A routine can also distract the child from anxiety-provoking thoughts and keep him/her focused on the present (21). Families should continue to have bonding time, and discussions should not revolve solely on COVID-19 content. This can be an opportunity for families to be more deliberate about incorporating dedicated bonding time through the week; families may learn new skills, develop new routines and traditions together as a family unit. A strong and intact family unit can increase one's resilience in weathering the storm and stressors of the pandemic (22).

Giving children some degree of control over their daily choices can be helpful as anxiety can be reduced when a child feels in control (23). Whenever there is an opportunity, allow a child to make choices about daily matters (for example, a meal choice). Directing children to focus on activities that they can do themselves, for example, practicing good hand hygiene, can empower them as well. Focus on what the child can control, and tangible actions that the child can perform such as having healthy meals, adequate sleep and regular exercise rather than worrying about a situation that is not within their control. Including even short durations of physical activity as part of the daily routine has been found to be helpful in alleviating anxiety (24).

Equipping children with coping strategies is important. Different children also react differently to fears, especially when they become overwhelming. For the child who worries constantly and is unable to focus on the task at hand, dedicated "worry time" can be useful- set aside 10 to 15 min each day to allow a child to talk or write about his/her worries. During this time, be a good listener and allow the child to have uninterrupted time to express themselves. However, once this dedicated time is over, the child is firmly encouraged to no longer focus on their anxieties and do other tasks. For the child who is withdrawn and hard to engage, provide outlets for them to express their feelings, for example, through writing and drawing. Caregivers can then start the conversation by asking them about what they wrote or drew. Children who internalize their worries may also benefit from talking about it from a 3rd person's point of view. For example, they can pretend that it's their toy that is feeling worried and the parent and child can then have a chat with the toy about its feelings. Further, some physical methods of coping with anxiety include deep breathing exercises and progressive muscle relaxation, which can be practiced jointly by the caregiver and the child (25).

Technology and social media is a double-edged sword. Excessive exposure to COVID-19 related news can result in greater anxiety, hence caregivers should limit the child's exposure. Specific times of the day could be set aside for watching and discussing such news. Monitoring the content that children are exposed to through various media is essential (26). Graphic images and threatening content on media can result in long lasting fears in children (27). On the other hand, social media can be used to help children (and adults) maintain their social networks. For example, children can have video calls with their grandparents who are unable to physically visit, have "play dates" or engage in activities with their friends/schoolmates, or keep in touch with their teachers over social media platforms with caregiver supervision.

Reflect: Self-Care and Caregiver Wellness

Unchecked parental anxiety can result in higher anxiety levels in the child and make them feel unsettled (28). As the child's feelings can be influenced by the caregiver's own emotions (16), caregivers should regularly reflect on their own feelings and be mindful not to project this on their children. Parents of children with chronic illness have higher anxiety levels than parents of healthy children (29). Predictors of anxiety in these caregivers include a heavy caregiver burden, poor emotional well-being, low self-esteem and a negative coping style (30). It is not unexpected that given the pandemic situation, caregivers may feel even higher levels of anxiety. Hence it is essential that the caregivers actively set aside time for their own mental and emotional well-being, for example, to unwind or pursue their own hobbies. It is important for caregivers to take care of themselves so that they can better care for their children. They should also seek professional help if they are facing significant strain and anxiety at home for any reason. By demonstrating active seeking of self-care, parents act as positive role models for children in coping with anxiety.

DISCUSSION

In conclusion, the current pandemic may lead to many children having heightened levels of anxiety. As healthcare professionals, we encounter children in many settings and have an opportunity to help their caregivers positively. Fortunately, children are resilient. They can adjust and adapt to new situations quickly; this is especially so if they have secure attachments and a responsive relationship with a caregiver (31). We hope that these strategies can empower healthcare professionals to support children and their families as they navigate this COVID-19 pandemic. Teachers and educators, and other individuals who work closely with children, may likewise find these strategies useful. It is also prudent for healthcare professionals to have heightened vigilance for anxiety in children, especially in those with a known medical history of developmental disabilities and chronic medical illnesses. Beyond these strategies, if parents are concerned, they should be encouraged to seek professional help early to manage their child's anxiety before it causes functional impairment. Likewise, parents should also be encouraged to seek professional help for themselves if they feel overwhelmed.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

YK and RA conceptualized and wrote the manuscript. TL, MT, and ER contributed to the literature review, critically reviewed the manuscript, and gave comments. All authors agree to be accountable for the content of the work.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The Wealth State Awareness Effect on Attention Allocation in People From Impoverished and Affluent Groups

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Previous studies have shown that poverty influences cognitive abilities and that those who have a negative living environment exhibit worse cognitive performance. In addition, eye measures vary following the manipulation of cognitive processing. We examined the distinctive changes in impoverished and affluent persons during tasks that require a high level of concentration using eye-tracking measures. Based on the poverty effect in impoverished people, this study explored how wealth state awareness (WSA) influences them. It was found that the pupillary state indexes of the impoverished participants significantly changed when their WSA was regarding poverty. The results suggest that awareness of poverty may cause impoverished individuals to engage in tasks with more attention allocation and more concentration in the more difficult tasks but that a WSA regarding wealth does not have such effect on them. WSA has no significant effects on their more affluent peers. The findings of this study can contribute to research on WSA effects on impoverished individuals from the perspective of eye measures.

Keywords: poverty, wealth state awareness, attention resource allocation, different income level, eye-movement study

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INTRODUCTION

Poverty poses a major issue as it can restrict the development of human beings and society. Defined as a scarcity of financial resources or material possessions (Flythe, 2013; Akfirat et al., 2016), poverty has a cumulative long-term impact on cognition from childhood. It can hinder brain development (Cowell, 2008) and eventually reduce adult cognitive capacity (Evans and Schamberg, 2009), especially damaging attention (Hunt, 2011). However, studies of Mani et al. (2013) have shown that the damage caused by poverty is not irreversible. They found that cognitive performance improved after the farmers' harvest (when they were rich) compared to before the harvest (when they were poor). This demonstrates that a change in the financial situation can affect the cognitive performance of poor people. Based on poverty damage cognition being not irreversible, we aim to explore the influence of poverty on people from the eye movement perspective, which suggests a close relationship between eye movement and cognition.

Mani et al. (2013) put forward the idea of the "scarcity mindset"; this posits that attentional resources are allocated to scarce things, while other important matters are ignored. Financial

scarcity is one of the key factors that cause the scarcity mindset, and it is the most direct manifestation of poverty. Previous studies have found that the concept of money can have a dual effect on human behavior (Vohs et al., 2006; Zhou et al., 2009). For instance, Vohs et al. (2008) found that even subtle reminders of money could elicit some behavior changes, such as being less helpful, preferring solitary activities, and being less physically intimate, but also working harder. In short, the concept of money leads to alterations in human beings (Vohs et al., 2008). It is important to note that the scarcity mindset has a great effect on poor people and that a change in their financial state could change their cognitive performance. Thus, we hypothesized that wealth-related information may perhaps cause a certain mindset and may have distinct effects on people from families with different income levels. To explore it, we introduced a kind of awareness – the wealth state awareness (WSA) – which could be caused by wealth-related information.

As evidenced by previous studies mentioned above, awareness, including WSA, can have a profound influence on people. However, WSA has a more profound effect on poor people (Gopinath and Nair, 2015). Haushofer and Fehr (2014) found that a negative income shock had a greater negative effect on poor people than on rich people. In other words, income shock has different influences on impoverished and affluent persons. Thus, by combining the results of studies of the dual effect of money on human behavior and the influence of different wealth states on the cognitive capacities of poor individuals, we boldly propose the following hypotheses: changes in WSA might have different effects on the cognitive task performance of people who come from families with different income levels, reflecting on the attention resources allocation; and perhaps changes in WSA might have a more profound and different effect on impoverished people. These differences could be observed from the eye movements in this cognitive study, which can contribute to the understanding of the potential effect of WSA on people.

Due to the trait of the eye movement technique and negative effect of poverty on human's attention, we conducted a research to explore people's attention by eye movement methods, a method which can examine attention more directly. Attention has two basic characteristics: orientation and concentration. Orientation manifests the selection of stimuli. Concentration is shown as the inhibition of interference. As such, concentration requires a combination of attentional stability and resistance to distractions. The current study aims to explore the effects of WSA on participants' attention from the perspective of concentration. Furthermore, eye movements and pupillary response are essentially motor movements in humans, which are closely associated with cognition (Schutz et al., 2011; Jang et al., 2014; Wang and Munoz, 2015). Not only are eyes used for scanning, but they also provide information on how and where the human gaze is based on intentions (Jang et al., 2014). It was shown that pupil size and variation were related to cognitive processing and visual information (Privitera et al., 2008; Wang and Munoz, 2015). This verifies the positive correlation between task-evoked pupil diameter, the cognitive load (Dionisio et al., 2001; Peysakhovich et al., 2015), and the attention required (Hoecks and Levelt 1993; Iqbal et al., 2004) to perform specific tasks. To illustrate, more fixations of eye movement are required to absorb more information from the surrounding environment (Gareze et al., 2008). It was also found that the length of fixations could reflect people's attention (Hoecks and Levelt, 1993). The advantage of eye movement study is that it can directly provide insight into the spatial and temporal behaviors and mental effort in the tasks, reflected by fixation counts, fixation duration, pupil size, etc. And eye tracking is an objective method (Hessels et al., 2015). Basing on previous findings of the eye movement method and the aims of this study, we conducted visual searching studies by adopting the eye movement method. Eye-tracking metrics regarding fixations and pupil size were utilized to provide evidence for attentional allocation in this study.

Specifically, the design was to utilize the visual search task (VST) and a revised Stroop task, both of which require highly centralized attentional resources to process information and avoid interference. This study collected the data regarding only the physical parameters which are objective. In this study, we took into account the possibility that if it required participants to press the keys, there might be involuntary saccading, which perhaps would lead the view angle to be shifted or lead the tension to affect the pupil size. Therefore, behavioral performance or recording was not required in this study. Both tasks are based on the following ideas: the first task is used to test the basic attentional concentration, while the second task is designed to explore attentional concentration and inhibitory abilities with a higher difficulty level. To test inhibitory abilities, changing stimuli was employed in the VST as the distractor, and VST was used as a supplementary explanation for the revised Stroop task. WSA was created by manipulating the experimental design and instructions. All of the details are provided in the next section.

MATERIALS AND METHODS

Sample Size Considerations

Sample size was determined *a priori* by utilizing G*Power 3.1.9.4 (Faul et al., 2007) for *F* tests (analysis of variance or ANOVA: repeated measures, within-between interaction). As for the action simulation paradigms (for reviews, see Horchak et al., 2014), we expected the large effect size to set the parameters as follows: effect size $f = 0.25$, alpha level = 0.05, and power = 0.95. The calculation suggested a minimum total sample size of 36 (repeated-measures ANOVA for group × condition × stimulus type × part × task type, in which the WSA condition and group were between-subject factors and others were within-subject factors). As we analyzed the different effects on each group, we computed the sample size as well with the same parameters, and the calculation suggested a minimum total sample size of 24 (repeated-measures ANOVA for WSA condition × stimulus type × part × task type, in which the WSA condition was a between-subject factor and others were within-subject factors).

Participants

Sixty-seven volunteers were recruited from Southwest University. There were 45 females and 22 males, with a mean age of 19.6 years (M = 19.597, SE = 1.349). Thirty-one participants were selected from poor families, and 36 were from more affluent families. All participants were native Chinese speakers who have normal or corrected-to-normal vision and are naïve to the purpose of the experiment. Based on the family socioeconomic status, the participants were divided into a poor group (PG) and a rich group (RG; those who were more affluent) by referring to the Income Standard of Poverty Households of Southwestern China. To be more rigorous, we also computed the per capita income by dividing the total income of the household by the square root of the household size (Smeeding et al., 1988). We then defined the PG and RG using the standards of poverty and calculated the median split of the per capita income to verify this. Finally, the PG included participants who had grown up in and lived in poor families, with a current per capita income of less than 1,300 RMB for urban residents and less than 1,000 RMB for rural residents. The RG included the remaining participants who had rarely experienced poverty in their childhood or until now and whose per capita income exceeded the standard. **Table 1** showed the descriptive statistics for the per capita income of groups.

This research was approved by the ethics committee of Southwest University and was performed in accordance with relevant guidelines. All volunteers provided their written informed consent before the experiment.

Design

A VST and a Chinese Stroop Search Task (CSST) were conducted on a computer. The CSST combines the original version of the Stroop task with a VST. Regarding WSA manipulation, the instruction notified participants that there would be a wealth value conversion and accumulation based on the performances in the tasks, which was accomplished by computer back-office automatic processing. In each trial, the less reaction time spent to find and focus on the target stimuli and the more stable to focus on the target stimuli (that is, the more successfully ignore distractions), the higher the converted wealth value. The accumulated wealth value of each trial would range from 0.1 to 1. After the end of the experiment, the accumulative wealth value would be compared with the wealth value of others collected in this study, and a distribution report of wealth value will be issued to the participants. Fake feedback was then used to prime WSA by randomly showing the participants that they were extremely poor (EP; "you are located in the extremely poor section") or extremely rich (ER; "you are located in the extremely rich section"; see **Figure 1A**). After receiving the feedback, the participants were required to perform the same tasks once more. Therefore, the experiment was divided into two parts based on the feedback: Part 1 and Part 2.

TABLE 1 | Descriptive statistics for the per capita income of groups.

Group	Urban residents		Rural residents	
	Mean	SD	Mean	SD
PG	878.278	619.462	576.692	154.206
RG	1,849.346	244.972	1,420.000	300.051

The experiment was a 2 (group: PG vs. RG) × 2 (WSA: EP vs. ER) × 2 (part: 1 vs. 2) mixed factorial design for the two tasks (VST or CSST) with three stimulus types (pre-distractor vs. distractor vs. post-distractor), in which the group and WSA were between-subject variables and the remaining variables (part, tasks, and stimulus types) were within-subject variables. Due to the different display times of each kind of stimulus and the task requirements, we did not analyze the eye movement parameters regarding duration in the current study. Therefore, measurements of eye movement on the first run fixation count percent (FRFCP), fixation count, and pupil size were conducted. Fixation count is defined as the number of fixations within the area of interest (AOI; Lin and Lin, 2014), and FRFCP is the total number of fixations on AOI when entered for the first time of all number of fixations in the trial (Glaholt and Reingold, 2011). It is deemed that the number of fixations in a search task can reflect task difficulty (Vlaskamp and Hooge, 2006; Köerner and Gilchrist, 2008). Furthermore, researchers confirmed that pupil size variation could reflect the human's emotion, arousal, stress, cognitive load, or efforts during tasks (Goldwater, 1972; Beatty, 1982; Hoecks and Levelt, 1993). Furthermore, because WSA was a between-subject factor in this study, we calculated the mean pupil size of the fixation point of each participant to be the individual baseline. Then, the individual baseline was subtracted from the pupil size of each individual's response in the tasks. Therefore, the change of pupil size was finally analyzed in the current study.

The statistical analysis was a mixed model of 2 (group: PG vs. RG) × 2 (WSA: EP vs. ER) × 2 (part: 1 vs. 2) × 2 (task: VST vs. CSST) × 2 (distractor: pre-distractor vs. distractor) repeated-measures ANOVA. The significance level ($p < 0.05$) was adjusted according to sphericity violations, and the Greenhouse-Geisser correction was employed. When significant interactions emerged, the data were analyzed using the Bonferroni correction by *post hoc* analysis for simple effects. All analyses were performed using the Statistical Package for Social Sciences (SPSS version 22.0; IBM Corp., Armonk, NY, USA).

Materials and Procedure

Visual Search Task

The visual search array was composed of eight geometric shapes that were arranged around a central fixation point; that is, seven rectangles and one rectangle that was randomly missing a corner (**Figure 1B**). Their height-to-width ratio was above 17:12, and the outlines were 0.4 cm thick. The rectangle with the missing corner was the target, the remaining seven shapes were uniformly colored and shaped non-targets (neither target nor distractor), and one colored rectangle was used as a distractor (**Figure 1C**). The distractor's color was varied using the complementary color of the primary colors. Green, red, yellow, blue, and white were utilized in this study. The target and distractor were randomly presented in one of these colors.

Each trial began with a white fixation point presented for 700 ms in the center of a black screen. All rectangles appeared in fixed positions for 750 ms. After this, one of the non-targets changed color for 400 ms as the distractor. Then, it changed back to the original color and was presented for another 350 ms (see **Figure 2**). Both types of fake feedback were randomly shown to the participants (see **Figure 2**) during a 5-min break. Before beginning the experiment, the participants were instructed to quickly find the shape that was different from the other shapes, to maintain fixation on it, and to ignore the changing distractor. A total of 180 trials were conducted, which consisted of two random blocks of 90 trials each. Five practice trials were completed before the formal experiment began for each part.

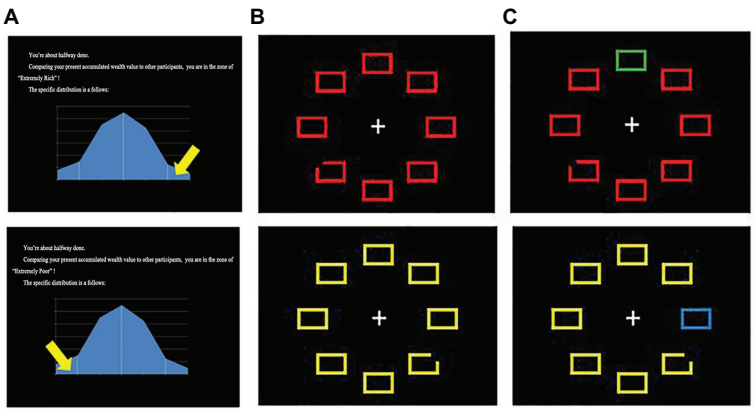

FIGURE 1 | (A) Examples of the false feedback, **(B)** example stimuli without distractor of the visual search task, and **(C)** examples of the distractor in the present study.

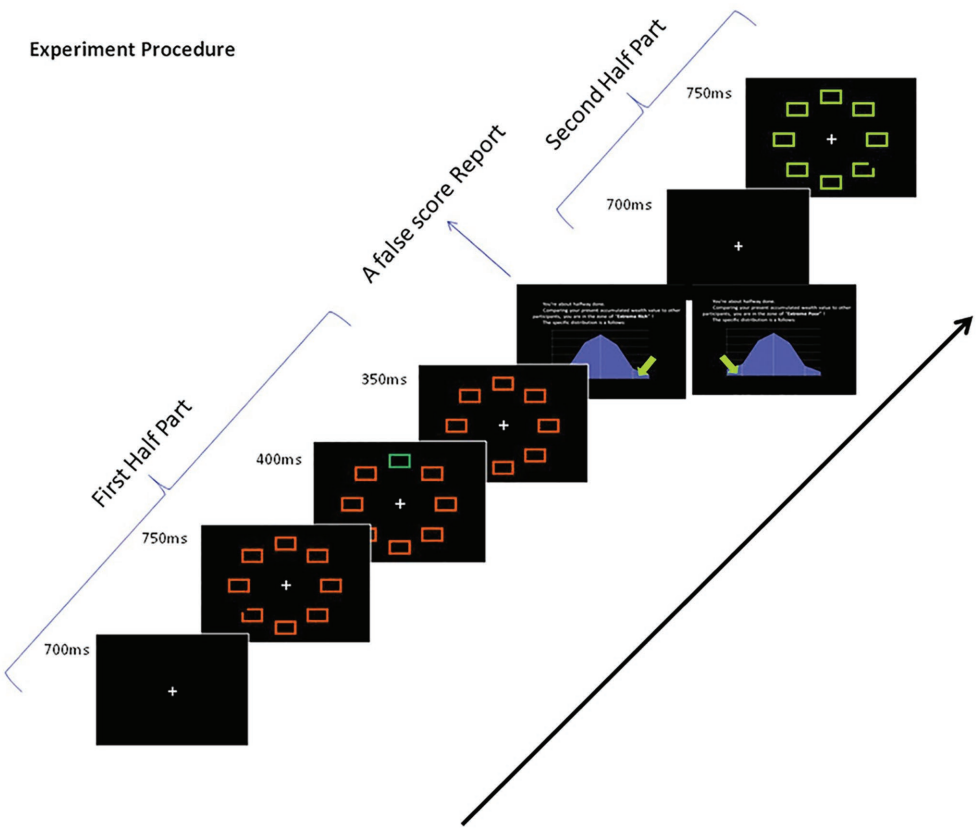

FIGURE 2 | Sample of the visual search task trial sequence.

Chinese Stroop Search Task

Five color words (red, green, yellow, blue, and white) were drafted in Chinese. Four words randomly appeared in each display; three words were congruent in terms of their color and meaning, and one incongruent word was used as the target. The remaining congruent word was then quickly replaced with one of the three congruent ones as the distractor. Each trial began with a white fixation point that was displayed for 700 ms in the center of the black screen. The stimuli appeared in fixed positions for 2,000 ms. After this, a congruent word randomly replaced one of the non-targets (congruent word) for 400 ms as the distractor. For example, four words were displayed in a certain trial, such as red in white ink (target stimulus), green in green ink, yellow in yellow ink, and white in white ink (non-target stimuli); and a distractor, blue in blue ink, replaced yellow. The distractor then disappeared, and all of the original stimuli were presented for another 600 ms (see **Figure 3**). The instructions and procedure were the same as in the VST. A total of 210 trials were conducted, which were mixed across three random blocks that had 70 trials each. There were five practice trials at the beginning.

Apparatus

An SR Research EyeLink 1000 eye tracker (SR Research, Mississauga, ON, Canada) was used to record the participants' eye movements with a sample rate of 1,000 Hz. A cathode ray tube (CRT) monitor is connected to a Pentium IV 3.2-GHz mainframe. All stimuli appeared on the 21-in. CRT monitor with an 85-Hz refresh rate, a 0.1° spatial resolution, and a 1,024 × 768-pixel resolution, and they were viewed at the fixed distance of approximately 50 cm. Participants were positioned using a chin rest. Before the formal task began, the experimenters inspected the eye-tracking trajectory using the EyeLink proprietary algorithm. After the fixation was measured, nine points were presented randomly on the default positions using the calibration techniques. The calibration was validated by repeatedly measuring the pupil detection and corneal reflection. "Good" or "perfect" reports were accepted as accurate calibration. Following this, the drift correction was also performed. If the drift was greater than 5°, it was recalibrated. Furthermore, the pupil size unit used in this study is pixels. When the participants blink, the eye tracker fails to detect the eyes, the pupil, or the corneal reflection, resulting in loss of data in the recording. Therefore, the lost data were removed, and the means were calculated for analysis.

RESULTS

The experiment revealed significant interaction effects for task × distractor × group [$F(1, 63) = 5.101$, $p = 0.027$, $\eta_p^2 = 0.075$] and task × distractor × WSA [$F(1, 63) = 5.521$,

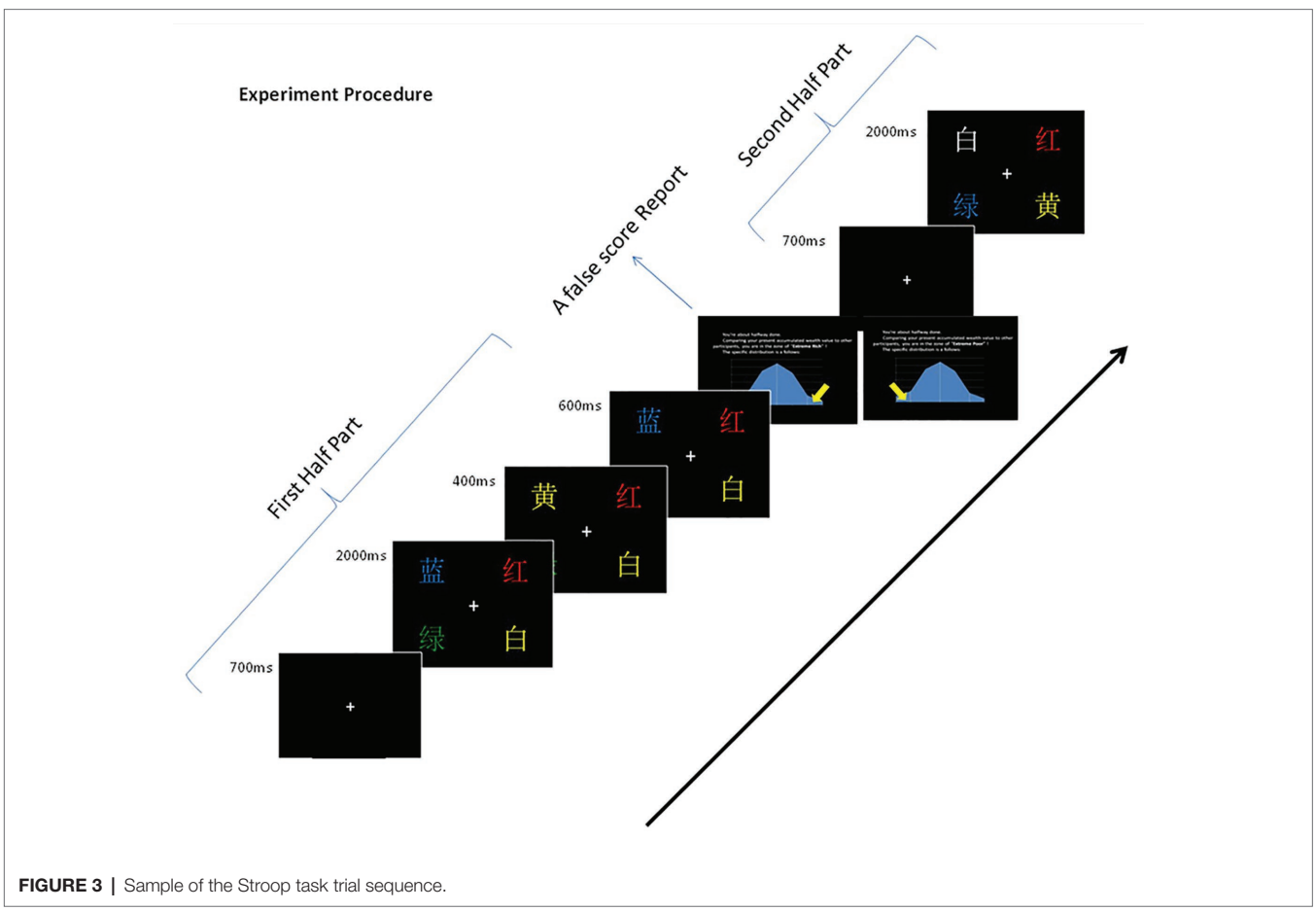

FIGURE 3 | Sample of the Stroop task trial sequence.

$p = 0.022$, $\eta_p^2 = 0.081$] of the change in pupil size. The *post hoc* analysis for the simple effects of interaction effects did not find significant differences of group or WSA.

Furthermore, we found several interesting differences in both groups by further analysis; that is, the WSA effect resulted in significant differences in PG as compared to the RG, which did not exhibit significant differences. Repeated-measures ANOVA for task × part × distractor × WSA was conducted, in the PG or in the RG separately. Specifically, regarding the change in pupil size, it was found that there was a significant interaction effect for task × distractor × WSA [$F(1, 29) = 9.550$, $p = 0.004$, $\eta_p^2 = 0.248$] in PG. The *post hoc* analysis for the simple effects found that, with the EP feedback, the change in pupil size of CSST was significantly larger than that of VST whether it was for the pre-distractor or the distractor [pre-distractor: $F(1, 29) = 5.763$, $p = 0.023$, $\eta_p^2 = 0.166$; distractor: $F(1, 29) = 11.524$, $p = 0.002$, $\eta_p^2 = 0.284$]. The change in pupil size of the distractor was significantly larger than that of the pre-distractor in CSST [$F(1, 29) = 6.524$, $p = 0.016$, $\eta_p^2 = 0.184$]. We did not find any significant difference when ER feedback was shown to them (see **Figure 4**). Repeated-measures ANOVA for task × part × distractor × group was conducted, in the condition of EP and ER separately. It did not find any significant differences regarding group.

Regarding the pupil size, the difference of pupil size for the fixation point was analyzed as well, by conducting *t*-test for group × mean pupil size of the fixation point. It did not reveal significant differences between both groups ($t = -0.728$, $p = 0.469$; PG: M ± SD = 572.814 ± 176.875, RG: M ± SD = 603.090 ± 163.400).

A significant interaction effect was also found for task × distractor × WSA of the FRFCP [$F(1, 29) = 5.742$, $p = 0.023$, $\eta_p^2 = 0.165$] in the PG. The *post hoc* analysis found that the FRFCP of CSST was significantly higher than that of VST in all conditions ($ps \leq 0.001$), except for the distractor with ER feedback; all FRFCPs of the distractor were significantly higher than that of the pre-distractor (all $ps < 0.001$, see **Figure 5**).

In other words, there were no significant interaction effects of pupil size change [$F(1, 34) = 0.576$, $p = 0.453$, $\eta_p^2 = 0.017$] or of FRFCP [$F(1, 34) = 0.209$, $p = 0.651$, $\eta_p^2 = 0.006$] of task × distractor × WSA or other significant differences regarding WSA in RG.

DISCUSSION

The present study utilized eye-tracking methods to investigate the WSA effect on resistance to interference in people from families with different income levels by combining revised visual searching tasks with a distractor. The results revealed that eye measures did not have typical interaction effects on the group and WSA. Based on the pupil size for fixation of the RG individuals, it showed slightly larger pupil size than that of the PG individuals, although the differences were not significant. We think that perhaps due to this difference of the change in pupil size between both crowds or perhaps because RG individuals may devote more mental resources to the tasks than PG peers, thus, the increase and decrease of changes might not be directly reflected in the significant interaction effect in the tasks. The results indicated that WSA had more significant effects on the impoverished group than on its counterpart. Generally, we found that the WSA of EP had broader effects on the

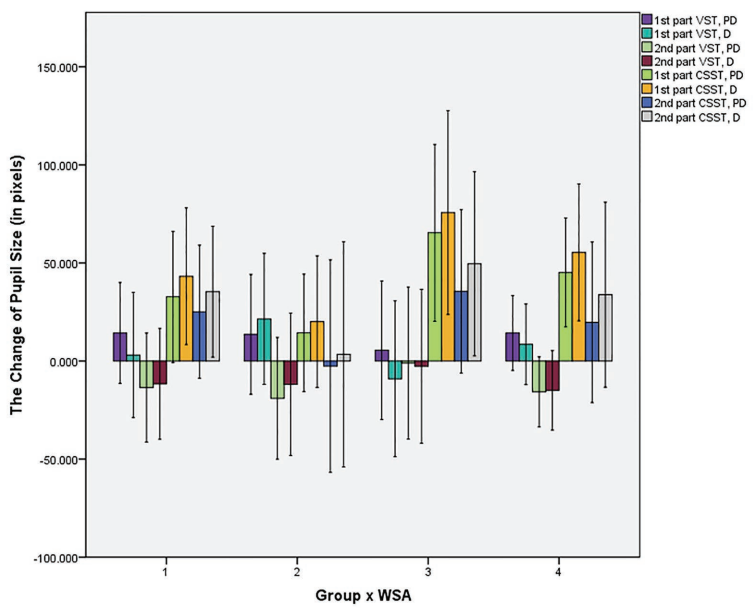

FIGURE 4 | Bar chart of differences of the change in pupil size (in pixels) in all conditions. PD, pre-distractor; D, distractor; Condition 1, PG with EP feedback; Condition 2, PG with ER feedback; Condition 3, RG with EP feedback; Condition 4, RG with ER feedback.

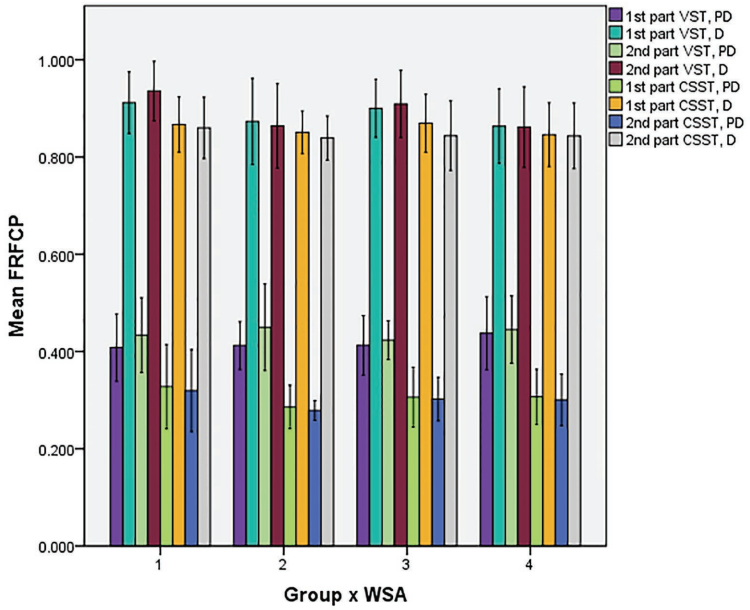

FIGURE 5 | Bar chart of differences of FRFCP in all conditions. PD, pre-distractor; D, distractor; Condition 1, PG with EP feedback; Condition 2, PG with ER feedback; Condition 3, RG with EP feedback; Condition 4, RG with ER feedback.

impoverished group than had the WSA of ER, shown by the eye measures of the pre-distractor and distractor.

Although image processing and word processing are based on different neural mechanisms, the studies were utilized to explore concentration in participants to require them to only sustain attention on the obvious physical property and resistance to interference. Therefore, VST and CSST are the same based on the final reaction requirements. It is a probability that WSA will influence people's cognitive psychology, especially when they are aware of the poverty. This study found that WSA had a wider range of effects on impoverished persons instead of their more affluent peers, as shown by eye measures. With this, we argue that there may be distinct effects of WSA in people from families with different income levels on abilities of concentration and that it could be reflected by the eye movement of individuals. However, we did not find any significant effects of WSA on affluent people, and WSA had more significant effects in impoverished ones.

When impoverished people's feedback was regarding EP WSA, it was found that the change of their pupil became larger in size, and they had less FRFCP of CSST for stimuli than that of VST. The feedback about poverty resulted in more significant task differences in the distractor set as shown by the FRFCP and can lead to significant differences between pre-distractor and distractor situations in CSST in the impoverished group, as shown by the change in their pupil size.

From these findings, we can surmise that feedback regarding their performance would have no significant effects on affluent people's concentration in the cognitive performance but would have a modulation effect on impoverished people. Impoverished people will make some change to their performances in the following tasks, which perhaps can improve their task goals. However, because the data of behavioral responses were not collected, we could not directly posit that WSA changed behavior; however, the collected data of eye movement did have significant differences, and it has been established in previous studies that eye movement is closely related to cognition.

The findings show that WSA perhaps has a deeper effect on impoverished people, which resulted in more attention allocation in the tasks performed and showing significant differences on eye movement. In particular, when the feedback about EP was shown to the impoverished group, their pupil size grew larger, and there was less FRFCP of CSST than that of VST. Previous studies have shown that fixations could indicate how people acquire information, and the number of fixations in the search task could reflect task difficulty (Vlaskamp and Hooge, 2006; Köerner and Gilchrist, 2008; Alotaibi et al., 2017). Due to this study requiring participants to find and focus on the targets, less FRFCP means more concentration on the control target (that is, pre-distractor) and stronger anti-interference capability (to distractor). The findings that there was a lower number of fixation percentage in the first run suggest that impoverished people concentrate more and maintain stronger ability to avoid interference in the more difficult tasks compared to the easier tasks when they are aroused with the awareness of poverty. The pupil size differences help prove this point. In addition, pupil size variation also reflected the transient variations of a subject's effort of the performance (Goldwater, 1972). Thus, the pupillary response could be considered as a potential measurable trait to help recognize people's implicit intentions and behaviors (Jang et al., 2014).

The findings regarding pupillary variation suggest that, when the poverty awareness was aroused in impoverished people, the pupil size of CSST was significantly larger than of VST

and that the pupil size of the distractor was significantly larger than the pre-distractor (control stimuli), especially in the CSST. Therefore, it is suggested that poverty awareness has a deeper influence on impoverished people and that the differences may become more apparent as the task difficulty increases. However, this needs to be examined further. Combined with the differences of FRFCP, it was shown that impoverished people were more sensitive to the awareness of poverty, and it could elicit some changes in cognitive performances. In contrast, the awareness of wealth has no such influence on the impoverished people, and WSA has no obvious effects on the more affluent subjects' cognitive performances as well.

Mani et al. (2013) verified that rich and poor people treat tasks differently – that is, poor people are usually more engaged in the task and pay more attention. Thus, it is posited that poor people apply different processing strategies from those applied by rich people. Hence, the findings in this study may help to highlight these points, as awareness of poverty can lead impoverished people to have a higher involvement in the tasks. It is suggested that WSA of EP might play an active role in the impoverished individuals' cognitive ability, which showed that more attentional resources are utilized. Mani et al. (2013) posited that poverty affects cognitive resources, and Bertrand et al. (2004) also suggested that internal factors promoted development in poor people.

Therefore, the findings of this study suggest that impoverished people can show an increased and outstanding cognitive ability within the WSA of poverty with flexible processing strategy such as utilizing more mental resources and making more effort. Furthermore, it has previously been found that poverty is a circumstance in which individuals have deficits in cognitive function (Nelson et al., 2007; Evans and Schamberg, 2009; Forssman et al., 2017). The findings of this study reaffirm the differences in cognitive capacity about attention allocation and concentration abilities between impoverished and more affluent people.

Generally, the aforementioned eye measure findings suggest that awareness of poverty does have a promoting influence on impoverished persons to allocate more cognitive resources on more difficult tasks. However, WSA has no significant effects on their more affluent peers.

It is important to note that there are limitations in this study. First, due to the pursuit of a more authentic response of the pupil in individuals, we did not collect behavioral data. If behavioral data were collected, it would perhaps find other differences in behavioral performances. Second, because we aimed to analyze the results of the corresponding response before and after the feedback only, the presentation times of stimuli in both tasks were not the same. If we designed them to be presented with the same length of time, we could have several other interesting findings by analyzing them together. However, it is unlikely that it will yield any differences due to either the ceiling effect or the floor effect. To address these limitations, we will explore them by conducting further studies.

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found in the article/supplementary material.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the ethics committee of Southwest University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

SW and DY contributed to the conception and design of the study and wrote the first draft of the manuscript. SW organized the database and performed the statistical analysis. Both the authors contributed to manuscript revision, read and approved the submitted version, and agreed to be accountable for the content of the work.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Antecedents of Public Mental Health During the COVID-19 Pandemic: Mediation of Pandemic-Related Knowledge and Self-Efficacy and Moderation of Risk Level

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Background: COVID-19 affects not only patients' physical health but also their mental health. For the general public, although their physical health may not be directly affected, their mental health may be affected by stress, anxiety, and social panic caused by COVID-19. Controlling the pandemic should focus on not only physical health but also mental health. For the general public, mental health is even more important, as good mental health at the individual level can form a positive social mentality conducive to pandemic prevention and control. Therefore, it is important to assess mental health during the pandemic, and analyze risk and protective factors.

Methods: A self-compiled COVID-19 Social Mentality Questionnaire was used to conduct an online survey. A total of 16,616 participants responded, with 13,511 valid questionnaires.

Results: Results showed that 10.7% of participants rated their mental health as "worse than usual" during the pandemic, and there were gender, age, and educational differences. Social support was positively correlated with pandemic-related knowledge and self-efficacy, and could indirectly predict mental health. Pandemic-related knowledge was positively correlated with self-efficacy and mental health, and risk level was negatively correlated with mental health. Hierarchical regression analysis showed that pandemic-related knowledge played a partial mediating role in the relationship between social support and self-efficacy, while self-efficacy played a complete mediating role in the relationship between social support and mental health. Logistic regression analysis showed that risk level moderated the relationship between self-efficacy and mental health.

Conclusions: Social support can increase pandemic-related knowledge, thus improving self-efficacy and maintaining/promoting mental health. High risk levels can undermine the role of self-efficacy in promoting mental health. Therefore, in the fight against the COVID-19, people need to support and cooperate with each other, to improve self-efficacy and reduce risk, thus maintaining and promoting mental health.

Keywords: COVID-19, mental health, pandemic knowledge, self-efficacy, risk level, family-based social support

INTRODUCTION

Coronavirus Disease 2019 (COVID-19) is an acute respiratory disease that is caused by a novel coronavirus (1). It is highly infectious, and mainly transmitted through droplets and close contact with others (2). The incubation period is usually 0–14 days, and the longest is 24 days (3). The mortality rate is about 5.22% in China (4). Currently, there is no specific drug treatment for this virus. On the early morning of 31 January, 2020, Beijing time, the World Health Organization (WHO) declared the COVID-19 outbreak to be a "public health emergency of international concern," and the need for pandemic prevention and control became increasingly severe. On 29 February, the Director-General of WHO, Dr. Tedros, announced that the global risk level of COVID-19 had been raised from "high" to "very high," the highest level, given the spread of COVID-19 in many countries, and the severity of the pandemic in some countries. By 13 September, 2020, more than 29 million cases had been confirmed, and over 926,900 deaths had been recorded worldwide (4).

As a new infectious disease, COVID-19 not only affects patients' physical health but also may negatively impact mental health, due to the unclear information about the virus's source, pathogenesis, high infectivity, and lack of specific drugs for treatment. In the study of the antecedent variables of mental health, scholars have expressed strong concern over stressful events (5–8). There are various types of stressful events, including disasters similar to the COVID-19 pandemic, and these are characterized by unpredictability, suddenness, rapid speed, and high-intensity stress. When individuals are under constant, excessive stress, they will experience adverse effects and threats to their physical and mental health (6). Several studies have found that stressful events are an important factor related to mental health (7, 8). For example, researchers found that stressful events can negatively predict the mental health of college students (8). Therefore, for the general public, even if their physical health is not directly affected by COVID-19, their mental health may be affected, due to such factors as individual stress and anxiety caused by the pandemic.

Thus, in preventing and controlling the spread of COVID-19, it is necessary to pay attention to public physical and mental health. Further, for the general public, mental health may be even more important, as good psychological health at the individual level can form a positive social mentality that is conducive to pandemic prevention and control. Therefore, it is particularly important to assess people's mental health during the pandemic period, especially various risks and protective factors and their action mechanisms.

As a stress theory, the conservation of resource theory holds that individuals have a tendency to strive to acquire, maintain, nurture, and protect their cherished resources (9). Therefore, both the potential resource loss threat and the actual resource loss will cause individual tension and stress (9, 10). In other words, both at the perceptual level and the objective level, the loss of existing resources and the failure to obtain new resources will trigger the individual's stress response, which will affect the individual's health. In the face of a stressor as significant as a pandemic, people often need to consume more resources to maintain their original and normal state. However, individuals have limited resources; therefore, on the one hand, they will use their key resources to cope with the stressful situation in the current environment; on the other hand, they will deal with the possible stressful situation in the future through the active construction and protection of their existing resource reserves (usually the way to obtain new resources).

Hobfoll (9) believed that resources were the items that individuals thought valuable to them or the ways that could help them get valuable items, including Object resources, Conditions resources, Personal characteristics resources, and Energies resources. Specifically, the value of Object resources comes from their inherent physical properties or the individual identity information contained therein, such as houses, tools, etc. The value of Conditions resources derives from their positive significance for the future work and life of individuals, such as family and occupation. While the Personal characteristics resources refer to a variety of skills and characteristics possessed by an individual, such as self-efficacy, that are conducive to his/her resistance to pressure. And the value of Energies resources lies in their ability to help individuals acquire other resources they need, such as knowledge. In the COVID-19 pandemic, due to the influence of home quarantine order, the range of activities of individuals is limited and the object resources they have are relatively fixed and stable. Therefore, the resources that individuals can flexibly allocate are the conditions resources, personal characteristics resources, and energies resources they have, namely, family, occupation, self-efficacy, knowledge, and other resources. From the motivation of individuals to preserve and obtain resources, Halbesleben et al. (11) emphasized the subjective perception and appraisal of whether specific items contribute to the realization of their goals, and regardless of whether they actually contribute to the realization of goals. Thus, resources that are not normally considered of outstanding value may be of great significance to individuals in a particular

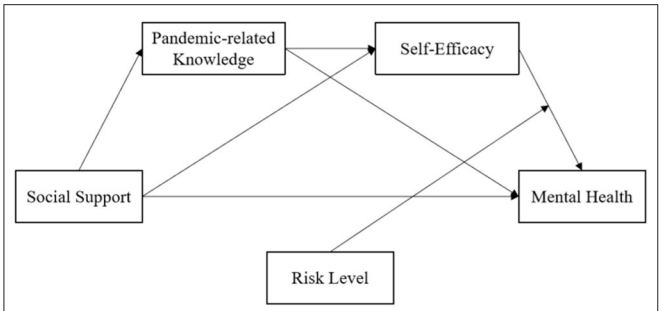

FIGURE 1 | The conceptual model.

situation. In a major pandemic, family members become a direct source of resources when people are under home quarantine order. In particular, those family members who are engaged in health care industry are not only the conditions resource of their family, but also the energies resource by sharing professional knowledge, so as to promote the accumulation of their family's personal characteristic resources and maintain mental health. However, a major pandemic cannot be resisted by a person or a family, and the effectiveness of its resource response is bound to be affected by external risks. Based on this, this study constructed a moderated mediation model with family-based social support as the independent variable, pandemic-related knowledge and self-efficacy as the mediating variable, and risk level as the moderating variable to investigate the impact of these variables on individual's mental health during the COVID-19 pandemic, as shown in **Figure 1**.

THEORY AND HYPOTHESES

Social Support and Mental Health

As an individual resource, social support includes mental and material support from various kinds of interpersonal relationships, including parents, other relatives, and friends. According to conservation of resources theory (9, 10), in a resource-losing context, the replenishment and increase of resources will be particularly important and more valuable to individuals. Which means, when an individual is under external pressure, his/her demand for resources will be more vigorous, and when new resources are injected at this time, the efficacy of new resources will be played to a greater extent. At the same time, according to effort-recovery theory, if an individual's consumed resources are not replenished in time, or if the replenishment is insufficient, his or her nervous system will remain active, making the individual unable to regain a state of self-equilibrium (12). However, a serious pandemic cannot be prevented by one person alone. Thus, despite using internal resources to cope with challenges, individuals will also use the external resource of social support to address current problems and threats.

According to the buffer model of social support, social support can provide individuals experiencing a state of stress with protection and exert a "buffer" effect to reduce individual adverse reactions (13, 14). Moreover, previous studies have shown that social support can effectively predict mental health (15, 16). Social support primarily includes two dimensions: objective support and subjective support (17). Previous studies have shown that in the action mechanism between mental health and social support, social support enables individuals to generate different views and corresponding emotions for certain objectives and events, and by perceiving and making use of these supports, individuals may change their attitudes toward life (17). Therefore, they could significantly reduce the negative impact of the objectives and events, and even obtain more satisfaction from the experience, thus naturally improving their mental health (18). Additionally, based on their findings, Xiao and Yang (13) proposed support utilization as the third dimension of social support. The results of a meta-analysis showed that subjective support and support utilization had positive effects on mental health, while objective support had a comparatively smaller positive effect on mental health (19). Besides, previous studies have confirmed that being lacking of social support may increase individuals' insomnia and suicide ideation during the COVID-19 pandemic (20–22). For example, Staines (20) and Killgore et al. (21) conducted an investigation on loneliness, suicide ideation, and insomnia of 1,013 English-speaking U.S. adults during the COVID-19 pandemic, in which it reported that 43% of the participants suffered loneliness and 56% of the participants had sleep difficulty, and consequently increased their mental health decline, and even triggered suicide ideation.

During the COVID-19 pandemic, as people are affected by home quarantine orders, family members have become important sources of social support, especially those with professional medical and nursing knowledge and skills. For individuals, this is not only an objective support, but also a strong perceived subjective support. Further, as it is convenient to acquire relevant knowledge and skills from health-care professional family members, this has a high level of support utilization. Therefore, social support was operationally defined in this study as family-based social support that whether individuals had family members in healthcare professions. Thus, Hypothesis 1 was proposed as follows: social support can positively predict individual mental health.

Mediating Effects of Pandemic-Related Knowledge

Family members are important sources of social support, especially those with professional medical and nursing knowledge and skills. According to spillover theory, people tend to bring the knowledge, experience, emotions, skills, and behaviors they have constructed in the workplace into the home domain (23). A number of studies have also confirmed the existence of positive spillover. For example, Greenhaus and Powell (24) posited that instrumental paths and affective paths in work–family relationships can foster resource distribution from work to family, thus benefiting family members. Further, social support is an important driving factor for informal learning, which can promote knowledge-sharing (25), and thus increase individual knowledge. As a result, family members of healthcare workers may directly benefit from this, and have more access

to pandemic-related knowledge than others. In a survey on public cognition of COVID-19 in China, researchers found that participants with healthcare workers in their families had more knowledge about COVID-19 and a higher level of cognition about the pandemic than the general public (26).

According to social cognition theory (27), indirect experience from others will affect the formation and development of individual self-efficacy. Pandemic-related knowledge gained from family members working in healthcare fields is a typical indirect experience that could, in theory, improve people's self-efficacy in dealing with the pandemic. Additionally, Lieberman (28) posited that children and adolescents can increase their knowledge by playing video games containing self-help and self-care skills, and improve their health decision-making ability, prevention efficacy, and self-rescue ability. In studies with adult participants, knowledge has been shown to mediate the association between social influences and self-efficacy in the prediction of health-related behaviors, such as eating habits (29). Ievers-Landis et al. (30) found that family social support for exercise could predict knowledge of physical activity designed to prevent osteoporosis. Therefore, Hypothesis 2 was proposed as follows: pandemic-related knowledge mediates the relationship between social support and self-efficacy.

Mediating Effects of Self-Efficacy

Self-efficacy refers to the belief and confidence that an individual has in his or her ability to accomplish behavioral goals in a particular field (27). Bandura et al. (27) argued that individual cognition can have an impact on behavioral regulation, and self-efficacy, as a cognitive factor, is an important psychological motivator for maintaining individual self-regulation. More than that, in conservation of resources theory (9), self-efficacy is confirmed to be a typical resource of personal characteristics resources, which empowers individuals to accomplish tasks by adjusting their cognition of self-evaluation. Therefore, in this study, the operational definition of self-efficacy was individuals' self-efficacy to help themselves and others during the pandemic, which refers to an individuals' prediction of their success when they initiate self-help and help-seeking behaviors. It reflects an individual's confidence in being able to complete a behavior, and is the embodiment of individual self-efficacy in a specific situation. Studies have identified a positive correlation between self-efficacy and social support, and the stronger an individual's perception of social support, the higher his or her level of self-efficacy, and vice-versa (31). Freeman and Rees (32) found that the more external support athletes perceived, the more confident they would be during a competition. Yusoff (33) discovered that in stressful situations, social support from friends can have a comforting effect on individuals and help overseas students make positive mental adjustments. In a survey on the help-seeking efficacy of Chinese individuals during the COVID-19 pandemic, researchers found that participants with healthcare workers at home had stronger self-efficacy than others (34).

Moreover, the idea that self-efficacy can directly and indirectly affect mental health is also supported by research findings. Arabian et al. (35) demonstrated that self-efficacy can improve individual mental health. Lei et al. (36) found that individuals with low general self-efficacy tend to focus on their own shortcomings and are more likely to show emotional reactions, such as anxiety and depression. However, individuals with high general self-efficacy tend to be more willing to accept challenges and show more active and positive emotional responses by constantly improving their ability to cope with difficulties. Additionally, self-efficacy can encourage individuals to maintain healthy behaviors, so as to maintain psychological stability (37). Ievers-Landis et al. (30) found that self-efficacy plays a partial mediating role in the association between family support and calcium intake to prevent osteoporosis. Further, individuals with high self-efficacy may experience more positive outcomes from help-seeking behavior. Therefore, the psychological cost of seeking help is lower and, in turn, people will actively seek help to relieve stress and maintain, or even improve, their physical and mental health. A cross-sectional study of 250 individuals showed self-efficacy working as a mediator in the relationship between social support and serious mental illness recovery (38). Therefore, Hypothesis 3 was proposed as follows: self-efficacy plays a mediating role in the relationship between social support and mental health.

Moderating Effects of Risk Level

The mental model of risk proposed by Svenson (39) describes individuals' factual cognition of the contingency formed by risk events and their overall value judgment. The threshold of people's risk acceptability is closely related to their potential reactions, while a single risk event with strong signal value may cause risk amplification. When the risk exceeds a level that an individual finds acceptable, he or she will show a strong reaction, which will lead to aggravation of difficulty in risk communication, and psychological reactions such as anxiety and panic, which will harm one's mental health (39, 40). COVID-19 is highly infectious, current scientific understanding of the coronavirus is insufficient, and the treatment of COVID-19 lacks targeted and efficient medical methods. It can be said that COVID-19 is a huge disaster for all of society and even for all humankind. Therefore, in this study, risk level was defined as whether there were confirmed/suspected cases in one's vicinity (workplace or home, including residents in the same community).

Because COVID-19 is highly contagious, there is a significant risk that other people will be infected if there is a confirmed or suspected case nearby. For community residents, although the "home quarantine order" objectively reduces people's risk of infection and protects people's lives to a large extent, due to the high-risk characteristics of COVID-19 itself, people's subjective panic about COVID-19 may persist, and their mental health will remain threatened. Moreover, according to previous psychological research during the SARS outbreak, individuals without direct experience were vulnerable to the influence of geographical and media information factors, resulting in psychological reactions, such as anxiety and panic, toward SARS. Particularly, when relevant information did not provide clear guidance, individuals were found to be prone to have adverse psychological reactions that endangered their mental health (40, 41). Therefore, whether there are confirmed or suspected cases

within one's proximity is a specific and direct source of risk, and will have an impact on individual mental health.

However, due to differences in experience, ability, and knowledge, different groups may construct different psychological patterns, and these differences can affect people's ability and willingness of risk-acceptance (39). Studies have shown that under COVID-19, the self-efficacy of individuals with advanced educations and with medical and nursing workers at home (34) is higher than that of those without medical and nursing workers in the family or with a low-level educational background. Thus, it can be speculated that experience—including indirect experience provided by family members working in healthcare fields—and knowledge give individuals more psychological energy (self-efficacy), which may make them more receptive to risks and less likely to have their mental health impacted. However, according to research conducted during the SARS epidemic, both healthcare workers and residents in affected areas experienced certain levels of stress, and even panic, anxiety, and other adverse psychological reactions, resulting in impaired physical and mental health (42). Therefore, when the risk level is high, the maintenance/promotion effect of self-efficacy on mental health appears to be weakened. Therefore, Hypothesis 4 was proposed as follows: risk level moderates the relationship between self-efficacy and mental health.

MATERIALS AND METHODS

Samples and Procedures

In this study, 16,616 questionnaires were collected online. Of those, 1,551 questionnaires for healthcare workers were deleted, and 1,554 invalid questionnaires that were answered in <200 s, or the respondents were than 16 or more than 100 years old, were also deleted. Finally, 13,511 valid questionnaires were included for analysis (response rate = 81.3%). The sample included respondents from all 18 cities in Henan province, China. Among them, there were 4,267 men (31.6%) and 9,244 women (68.4%). Mean participant age was 32.10 (± 11.11) years, with an age range of 16–77 years. Among the participants, 2,930 (21.7%) had a high school education, 2,761 (20.4%) had a junior college education, and 7,820 (57.9%) had a bachelor's degree or above. Additionally, 1,900 (14.1%) had healthcare workers in their families, while 11,611 (85.9%) had no healthcare workers in their families.

In the present study, the convenient sampling (snowball sampling) method were conducted to collect data from 17:00 Jan 27th to 17:00 Jan 29th, during the growing period of the pandemic in China. The online platform we used to upload the questionnaire named wjx, which is enpowered by www.wjx.cn. It is the largest and most widely used questionnaire survey platform in China that provides functions equivalent to Amazon Mechanical Turk. The questionnaire was uploaded to the platform, which automatically generates a network link. The link was then posted via the researcher's social media account and the organization's website, inviting people to answer the questions and forward the questionnaire of their own accord. It is totally anonymous, and participants were told that they can withdraw at any time they want in the instructions. This is an unpaid public interest survey, and in both the instruction and the conclusion of the questionnaire, we asked participants if they would like to forward the questionnaire to others.

Measures

A self-compiled COVID-19 Social Mentality Questionnaire was used as a measurement tool in this study. The questionnaire was prepared by psychology professors and doctoral students during the early stage of the COVID-19 pandemic, after referring to previous studies of the SARS epidemic and relevant literature on sudden public health events. Based on important documents and public voices during the COVID-19 pandemic, this measurement tool was designed to investigate public mentality during the pandemic based on seven aspects: (1) the cognition of the COVID-19 pandemic; (2) knowledge of how to prevent COVID-19; (3) physical and mental symptoms of COVID-19 patients and the public; (4) the public's irrational behaviors during the COVID-19 pandemic; (5) the public's need for psychological assistance; (6) the public's self-efficacy in seeking help during the COVID-19 pandemic; and (7) the public's interest behaviors (intention) during the COVID-19 pandemic. After determining the basic framework, the team members modified and improved the questionnaire items through several discussions, and screened and integrated similar questions. After standardizing and modifying the content, expression, and format of the first draft of the questionnaire, the final draft was completed. Then, the questionnaire was uploaded to an online platform, and psychology scholars and postgraduates were invited to participate in a pilot test. The questionnaire was refined according to their feedback, and finally, the formal questionnaire was completed. The formal questionnaire was then uploaded to an online platform, where it was distributed within a wide-ranging population.

Mental Health

In the present study, respondents' mental health was measured by a self-report question: "In general, how do you feel about your mental health?" Answers choices were "better than usual," "as usual," and "worse than usual." Those who chose "better than usual" or "as usual" were considered to be mentally healthy, and their score was "1." Those who chose "worse than usual" were considered to be in poor mental health, and their score was "0."

Social Support

Social support was measured by a self-report question: "Is someone in your family a healthcare worker?" The answer "yes" was scored as "1," and the answer "no" was scored as "0."

Pandemic-Related Knowledge

The sub-scale "Cognition Questionnaire on COVID-19 Pandemic" from the self-compiled COVID-19 Social Mentality Questionnaire was used to measure respondents' pandemic-related knowledge. The questionnaire consists of eight items, which, respectively, examine the participants' cognition on the characteristics of COVID-19 infection, main symptoms, route of transmission, knowledge of prevention and the difference between its symptoms and those of the common cold/flu, and research progress related to the disease and development stage of

TABLE 1 | Descriptive statistics and correlations among the variables ($N = 13,511$).

Variables	M ± SD	1	2	3	4	5	6	7	8
1. Gender	0.32 ± 0.31	1.000							
2. Age	32.08 ± 11.09	0.039**	1.000						
3. Education	1.36 ± 0.82	−0.049**	−0.102**	1.000					
4. Social support	0.14 ± 0.35	−0.009	0.019*	0.111**	1.000				
5. Risk level	0.05 ± 0.22	−0.010	−0.078**	0.060**	0.045**	1.000			
6. Pandemic-related knowledge	6.61 ± 1.39	−0.040**	0.035**	0.099**	0.043**	−0.032**	1.000		
7. Self-efficacy	2.85 ± 1.34	0.093**	0.018*	0.012	0.034**	−0.043**	0.298**	1.000	
8. Mental health	0.89 ± 0.31	0.038**	−0.017*	−0.022*	−0.006	−0.061**	0.042**	0.149**	1.000

*$P < 0.05$, **$P < 0.01$.

the pandemic (see **Appendix 1**). Total scores range from 0 to 8; answers of "very unclear" and "relatively unclear" are scored as "0," and answers of "very clear" and "relatively clear" are scored as "1." Cronbach's alpha for this questionnaire was 0.697.

Self-Efficacy

The sub-questionnaire "The Public's Self-Efficacy in Seeking Help During the COVID-19 Pandemic" from the self-compiled COVID-19 Social Mentality Questionnaire was used to measure respondents' self-efficacy. It includes four items, which, respectively, examine participants' information acquisition efficacy, information identification efficacy, medical treatment acquisition efficacy, and psychological assistance acquisition efficacy (see **Appendix 1**). Answers of "yes" are scored as "1," and answers of "no" or "uncertain" are scored as "0," for a total score ranging from 0 to 4. Cronbach's alpha for this questionnaire was 0.750.

Risk Level

Risk level was evaluated by a single self-report question: "Are there confirmed or suspected cases in your area?" Answers of "yes" were scored as "1," and answers of "no" were scored as "0."

Data Analysis

SPSS 25.0 (IBM, Armonk, NY) was used to analyze the collected data. Descriptive analysis was used to describe participants' mental health profiles and other study variables. Pearson's test was applied to examine correlations among the variables. A hierarchical regression analysis was conducted to investigate the mediating effect of pandemic-related knowledge in the relationship between social support and self-efficacy, the mediating effect of self-efficacy in the relationship between social support and mental health, and the moderating effect of risk level in the relationship between self-efficacy and mental health.

RESULTS

Mental Health Profile

Overall, 1,450 (10.7%) participants rated their mental health as "worse than usual" during the pandemic, 11,649 (86.2%) rated it as "usual," and 412 (3.0%) rated it as "better than usual."

Variables Correlations

The descriptive statistics and correlation matrices of each research variable are shown in **Table 1**. As can be seen from **Table 1**, there were significant positive correlations between social support and risk level ($r = 0.045$, $p < 0.01$), pandemic-related knowledge ($r = 0.043$, $p < 0.01$), and self-efficacy ($r = 0.034$, $p < 0.01$); however, no significant correlation was found between social support and mental health ($r = -0.006$, $p = 0.52 > 0.05$). Pandemic-related knowledge was positively correlated with self-efficacy ($r = 0.298$, $p < 0.01$) and mental health ($r = 0.042$, $p < 0.01$). There was a significant positive correlation between self-efficacy and mental health ($r = 0.149$, $p < 0.01$). Risk level was negatively correlated with pandemic-related knowledge ($r = -0.032$, $p < 0.01$), self-efficacy ($r = -0.043$, $p < 0.01$), and mental health ($r = -0.061$, $p < 0.01$).

Test of the Moderated Mediation Model

The results of the moderated mediation model testing method recommended by Wen and Ye (43) are shown in **Table 2**. In Equation (1), social support had a significant positive predictive effect on pandemic-related knowledge ($\beta = 0.022$, $t = 5.021$, $p < 0.001$), which indicated that individuals who have family members in the healthcare industry receive more knowledge/information about the pandemic. In Equation (2), social support had a significant positive predictive effect on self-efficacy ($\beta = 0.020$, $t = 2.524$, $p = 0.012 < 0.05$), indicating that the higher a participants' level of social support, the higher his or her level of self-efficacy. Additionally, pandemic-related knowledge had a significant positive predictive effect on self-efficacy ($\beta = 0.574$, $t = 36.212$, $p < 0.001$), which indicated that the more pandemic-related knowledge a participant acquired, the higher his or her self-efficacy would be. Therefore, pandemic-related knowledge was found to play a partial mediating role in the relationship between social support and self-efficacy. In Equation (3), social support ($\beta = -0.074$, $Z = -0.929$, $p = 0.353 > 0.05$) and pandemic-related knowledge ($\beta = -0.079$, $Z = -0.497$, $p = 0.619 > 0.05$) had no significant predictive effect on mental health, while self-efficacy had a significant positive predictive effect on mental health ($\beta = 1.350$, $Z = 16.065$, $p < 0.001$). This indicated that self-efficacy has a fully mediating role in the relationship between social support and pandemic-related knowledge and mental health. In Equation (3), the interaction

TABLE 2 | Test of the moderated mediation model ($N = 13,511$).

Variables	Equation (1) (criterion: pandemic-related knowledge)			Equation (2) (criterion: self-efficacy)			Equation (3) (criterion: mental health)		
	β	se	*T*	*B*	se	*t*	*β*	*se*	*Z*
Constant	0.823	0.002	509.680***	0.234	0.013	17.493***	1.360	0.127	10.702***
Social support	0.022	0.004	5.021***	0.020	0.008	2.524*	−0.074	0.080	−0.929
Pandemic-related knowledge				0.574	0.016	36.212***	−0.079	0.159	−0.497
Self-efficacy							1.350	0.084	16.065***
Risk level							−0.276	0.196	−1.409
Self-efficacy × risk level							−0.602	0.282	−2.133*
R^2		0.002			0.090			0.047	
F		25.214***			664.008***				
-2LL								8892.164***	

*$P < 0.05$, ***$P < 0.001$.

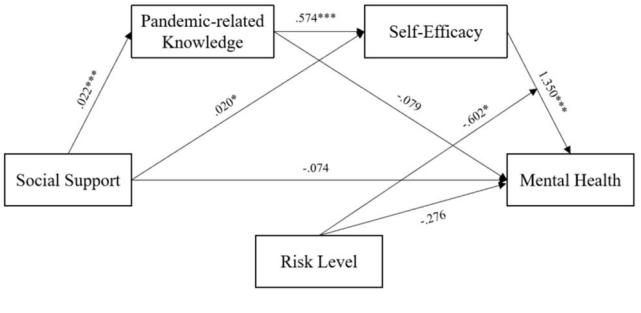

FIGURE 2 | The moderated mediation model. Pandemic-related knowledge mediated the relationship between social support and self-efficacy, self-efficacy mediated the relationship between social support and mental health, and the risk level moderated the relationship between self-efficacy and mental health. *$P < 0.05$, ***$P < 0.001$.

between self-efficacy and risk level had a significant negative predictive effect on mental health ($\beta = -0.602$, $Z = -2.133$, $p < 0.05$). Therefore, risk level was found to have a moderating effect on the relationship between self-efficacy and mental health, which constituted a moderated mediation model. Based on the above results, the moderated mediation model proposed in this study was supported (see **Figure 2**).

Omnibus tests were used to examine the integration of the regression model ratio. The likelihood ratio test results ($\chi^2 = 318.964$, $p < 0.001$) of all model parameters indicated that among the variables included in the fitted model, the OR value of at least one variable was statistically significant; that is, the overall model was significant. The Hosmer–Lemeshow Test was used to test the goodness of fit of the regression model, and the results ($\chi^2 = 4.959$, $p = 0.175 > 0.05$) showed that the information in the current data had been fully extracted, and the goodness of fit of the model met the requirements.

To further analyze the size and confidence interval of the moderated mediation model effect, a total of 13,511 samples with 1,000 iterations were conducted in the conditional indirect effect test program developed by Preacher et al. (44). According to the No. 87 model in PROCESS, the parameters were estimated with the bias-corrected non-parametric percentile Bootstrap method, and the results are shown in **Table 3**. When the risk level was 0, the mediating effect of self-efficacy was 1.350, accounting for 64.3% of the total effect. This suggested that individuals with high self-efficacy are more likely to maintain or improve their mental health during the pandemic when risk levels are low. When the risk level was 1, the mediating effect of self-efficacy was 0.748, accounting for 35.7% of the total effect. This indicated that during the pandemic, when the risk level is high, the promotion effect of self-efficacy on mental health will be weakened.

TABLE 3 | Mediating effects and confidence intervals at different levels of the moderating variable ($N = 13,511$).

Risk level	Effect	*SE*	Bootstrap (95% CI)
0.000	1.350	0.084	(1.185, 1.515)
1.000	0.748	0.272	(0.215, 1.281)

DISCUSSION

The results of the present study showed that during the COVID-19 pandemic, the majority of participants rated their mental health status as usual; however, 10.7% reported that their mental health had declined due to the pandemic. The result is consisted with the previous study that Wang and Li (45) found that only 6.8% of participants claimed that they have sleep problems during the COVID-19 pandemic. However, it is noted that there are large data differences among studies by different scholars, especially those of samples from different countries. Staines (20) and Killgore et al. (21) reported that during the COVID-19 pandemic, 43% of the English-speaking U.S. adults suffered loneliness and 56% of them had sleep difficulty, which finally resulted in mental health decline, and even suicide ideation rise. The differences between the two countries may attributed to the

following reasons. First, the home quarantine order in China happens to be during the Spring Festival holiday, which is a time to get together with family members and get family comfort. Most people have been reunited with their families before the home quarantine order begin, thus, individuals are less likely to feel being lonely. Second, the successful experience of the Chinese people in overcoming SARS in 2003 may strengthen their confidence in overcoming the COVID-19 pandemic.

Besides, although the results of this paper show that 10.7% of the participants have a decline in mental health, considering China's huge population base and limited psychological assistance ability, 10.7% is not a small proportion, and it may bring great challenges to the social psychological service system and the stability of society. Therefore, it is necessary to pay attention to public mental health. When sharing knowledge and prevention methods for the coronavirus with the public, it is also necessary to include knowledge of mental health protection, so as to use scientific and professional knowledge to prevent the public's mental health decline. Furthermore, it is suggested that more professional psychological resources should be devoted to the prevention and control of the pandemic, and more information on the psychological change process and effective coping measures should be provided to the public. Additionally, more psychological assistance hotlines should be opened to allow people more access to mental health assistance and create a positive and healthy social psychological atmosphere.

The findings further demonstrated that social support is not a direct predictor of mental health. According to the research of Chinese scholars Xiao and Yang (13), social support is divided into objective support, subjective support and support utilization, which are not completely consistent with the correlation or predictive role of mental health. A meta-analysis of social support using Chinese academic papers also showed that the objective support dimension was slightly positively correlated with the total mental health score, while the subjective support dimension and the utilization dimension of support were moderately negatively correlated with the total mental health score, while objective support was negatively correlated with depression, anxiety, compulsion, somatic symptoms and other factors in SCL-90 (19). In addition, some research results show that basing on different operational definitions (such as subjective support, overall social support, etc.), social support has a small/moderate negative correlation with mental health (19). Since the operational definition of social support in this study was defined as family-based social support that is different from that used in previous studies, it was considered as a resource in the present study. However, considering the social support was measured by the question of "whether someone in the family is a healthcare worker," in this study, social support actually refers to objective support based on the family. Nevertheless, whether the role of this support can work and how effect its role is depends to a large extent on participants' subjective perception of objective support and support utilization. The results of this study show that self-efficacy is an important mediator between social support and mental health (two paths). In terms of the definition of self-efficacy, it is an individual's subjective evaluation of his/her effectiveness in coping with the pandemic, which is based on the subjective perception of objective support. Therefore, although social support was not found to directly predict mental health, they are still closely related, and social support indirectly affects mental health. Besides, in the current context, healthcare workers are on the frontlines in the fight against the pandemic, and COVID-19 is highly contagious. People's concerns regarding family members who are healthcare workers may create feelings of anxiety, which can negatively impact mental health.

Furthermore, social support can maintain/improve mental health through pandemic-related knowledge and self-efficacy. The results of the present study supported a partial mediating effect of pandemic-related knowledge on the relationship between social support and self-efficacy, and the complete mediating effect of self-efficacy on the relationship between social support and mental health. Social support can directly increase people's self-efficacy, and can also promote self-efficacy by improving pandemic-related knowledge, so as to maintain and even improve individual mental health during major pandemics. Precisely, individuals who have family members in the healthcare industry have more opportunities to acquire more information about the pandemic. By this way, their self-efficacy would be fostered to benefit their mental health when facing with serious crisis events. This is consistent with previous research results (26, 46, 47). During the SARS epidemic, the public's lack of knowledge about SARS led to them to experience panic; however, as related information became clear, the epidemic's impact on public mental health gradually weakened (46). Moreover, the better the public's awareness was regarding knowledge of and preventive measures for SARS, the less possibility of them to show symptoms of mental health issues/disorders (47). Chen et al.'s (26) survey on the public's mentality during the COVID-19 outbreak also indicated that the clearer the public's understanding of the pandemic and the progress of COVID-19 research, the less fluctuations there were in public mental health indicators. Therefore, public awareness of COVID-19 knowledge should be strengthened, and information about the epidemic should be released quickly, accurately, and transparently. Not only could this promote the public's understanding of COVID-19, but it would also lessen their anxiety and panic. Moreover, it is also conducive to mobilizing society as a whole to take coordinated actions and participate in pandemic control.

Nevertheless, the complete mediating effect of self-efficacy indicated that the positive effects of pandemic-related knowledge and social support on mental health are realized by improving individual self-efficacy. Social cognition theory posits that self-efficacy is a cognitive factor, and individual cognition can effectively regulate thoughts and behaviors (27). Previous studies have reached similar conclusions. Zhao and Wang (34) investigated self-efficacy during the COVID-19 pandemic, and found that the family members of healthcare workers affected by positive spillovers tended to have higher self-efficacy, as did individuals with higher knowledge reserves. According to previous studies (19), under normal circumstances, relatively disadvantaged groups, such as older adults and students, have a higher need for social support and channels of knowledge and information. Thus, in the face of the raging COVID-19 pandemic, people's overall self-efficacy, compared with

normal situations, may decline, and most people could become "relatively disadvantaged," Thus, people will need more social support and sources of knowledge than usual, to maintain their self-efficacy at the normal level. Therefore, people need to show more cooperation and solitary, to support each other and maintain or even improve their mental health, which is more conducive to containing the pandemic, reducing the death toll, and finally defeating COVID-19.

The results also showed that risk level had a moderating effect on the relationship between self-efficacy and mental health; thus, at a high risk level, the role of self-efficacy in maintaining and promoting mental health would be weakened. According to the mental model of risk (39), when individuals face a risk that exceeds their ability and willingness to accept the risk, they may have a strong physical and mental reaction, such as panic and anxiety. Moreover, for individuals, the threat of risk decreases with the increase of geographical distance (48). Thus, when people learn of a confirmed or suspected case nearby, it means they are geographically close to danger, and their sensitivity to the risk will naturally increase. Moreover, since scientists still do not fully understand the novel coronavirus, and there is currently no specific confirmed treatment, the risks posed by the virus are far beyond an individual's control. According to control theory (49), when individuals cannot correctly identify the source of a threat, and do not know which methods and information can effectively protect them, they will feel a loss of control and experience stress, which leads to simple and crude one-sided interpretations of the threat. However, these one-sided interpretations cannot bring meaningful psychological comfort, and will lead to cognitive dissonance, thus further aggravating one's sense of losing control, and increase anxiety and panic. Further, the chaos that accompanies the sense of losing control may be more harmful than the disease itself.

Presently, the pandemic is still a serious threat, and governments should take aggressive prevention and control measures that respect science, focus on quality allocation of resources, and make every effort to reduce the risk level. Further, healthcare authorities should work with psychological support agencies and other industries (e.g., internet industry, news communication industry) to ensure that information channels are fully open and effective, so that everyone can clearly understand how to identify accurate information and help themselves and others. When people have high levels of self-efficacy, they will have more strength and confidence to overcome the circumstances created by the pandemic. Additionally, pandemic prevention and control is related not only to personal safety and health but also to regional stability and the development of the global economy. Therefore, all people should cooperate with each other to realize the optimal allocation of resources, improve the utilization of resources, solve problems, and achieve victory over COVID-19 as soon as possible.

Limitations

First, due to the limitations of the current situation, this study adopted convenient sampling; therefore, the participants could not fully represent the general population, and the generalization of the results is limited. In future studies, it is recommended that researchers adopt a more representative sampling method, and conduct sampling in a wider area, to increase the generalizability of the results. Second, due to the sudden and unpredictable nature of the COVID-19 outbreak, the social mentality questionnaire used in this study still requires improvement. It is expected that in future studies, researchers can design more accurate measurement tools to study social mentality in major pandemics, according to research needs. Third, this study used a cross-sectional design to investigate public mental health and influencing factors within a limited time period. It was impossible to make a longitudinal comparison of people's mental health status and its influencing factors at different stages of the pandemic and conduct a comprehensive investigation. Therefore, it is suggested that researchers should investigate more variables that may affect mental health, and combine multiple research designs to conduct a comprehensive and in-depth study of people's mentality and behaviors during the pandemic.

Conclusions

This study revealed the important impact of social support, pandemic-related knowledge, self-efficacy, and risk on mental health during a major pandemic. In the face of the novel coronavirus, encouragement and support between people can help to promote the transmission of knowledge and information and enhance self-efficacy, so as to maintain physical and mental health. By extension, solidarity and cooperation between countries and regions will help overcome COVID-19 faster and more effectively, and safeguard the health of all humankind. Further, in the face of a major pandemic, aggressive science-based government policies are a key factor to effectively improving people's confidence and reducing external risks. The healthcare workers who are fighting against the pandemic need more encouragement and support from society as a whole.

Hats off to the people who protect and support us during COVID-19 pandemic.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Henan University Institutional Review Board. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

YL and SW are the principal investigators for the study, generated the idea, and designed the study. SW and KF were the primary writers of the manuscript and approved all changes. SW, KF, and YZ supported the data input and data analysis. JL and WW supported the data collection. All authors were involved in developing, editing, reviewing, and providing feedback for

this manuscript and have given approval of the final version to be published.

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We are grateful for the support from our families. Additionally, there is something more we want to say. Previous studies revealed that healthcare workers also have a high need for social support (19). Therefore, while ensuring their safety in the workplace, healthcare workers should also be given more encouragement and support to maintain their mental health in high-risk work environments. This is not only conducive to healthcare workers' physical and mental health, but can also increase the positive spillover of healthcare workers' knowledge to their families, relieve their worries and anxiety, stimulate the circulation and transmission of positive energy, and avoid the occurrence of secondary health emergencies caused by the pandemic, such as PTSD. This manuscript was written in April, and at that time there were some news in internet reported that healthcare workers suffered physical attacks and verbal aggression due to people's ignorance about COVID-19 in several countries. Healthcare workers are directly facing with the virus and working on the front lines to against the COVID-19, they deserve respects and supports as they sacrifice their safety to protect others. Hats off to all the healthcare workers around the world!

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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APPENDIX 1

The 15 items involved in this study are listed below:
Social Support: "Is someone in your family a healthcare worker?"
Mental Health: "In general, how do you feel about your mental health?"
Risk Level: "Are there confirmed or suspected cases in your area?"
Pandemic-related Knowledge:

a) Do you know the main symptoms of COVID-19?
b) Do you know how COVID-19 is transmitted?
c) Do you know the difference in symptoms between COVID-19 and the common cold?
d) Are you aware of the current pandemic?
e) Are you aware of current research progress on COVID-19?
f) Do you think wearing a mask can prevent COVID-19 infection?
g) Do you know how to wash your hands properly?
h) Do you think that the behaviors of dining and gathering is at risk of COVID-19 infection?

Self-efficacy:

a) I am sure I have the resources I can use to gain knowledge about COVID-19.
b) I'm sure I know how to distinguish the rumor from the truth.
c) I'm sure I know how to get proper medical treatment if I need it.
d) I'm sure I know how to get the proper psychological services if I need it.

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How People Evaluate Anti-Corona Measures for Their Social Spheres: Attitude, Subjective Norm, and Perceived Behavioral Control

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Restrictions on outdoor activities, tips for hygiene, and tips for mental health are among the most common initiatives to counter the COVID-19 pandemic. These measures aim to protect people's health and, at the same time, impact their social lives. So far, it is little known how people evaluate those anti-Corona measures with regard to their social spheres (close family, wider family and friends, colleagues, and society). Furthermore, it is plausible that the subjective evaluation of attitudinal objects and especially severe events, like the COVID-19 pandemic and the related counter-measures, is multidimensional. Against this background, we combine the social spheres with the elements of the Theory of Planned Behavior. On the methodological basis of the Means-End Theory of Complex Cognitive Structures, we determine the perceived relevance and quality of the attitude, subjective norm, perceived behavioral control, and social spheres regarding anti-Corona measures. Furthermore, the applied methodology allows the deduction of norm strategies to define the priority of securing or increasing the effectiveness of elements of anti-Corona measures. Based on the answers of 663 participants, we found that the protection from COVID-19 and its consequences (attitude) are more important to people than the practicability of anti-Corona measures in their social lives (perceived behavioral control), which, again, has a higher subjective relevance than the willingness to fulfill the expectations of others (subjective norm). Additionally, people distinguish between their close family (higher subjective relevance) and their other social spheres (lower subjective relevance). The people attribute the highest quality to the tips on hygiene, followed by the restrictions on outdoor activities and the tips for mental health. The protection and practicability of the anti-Corona measures have higher quality ratings than the willingness to fulfill the expectations of others. Based on the norm strategies, policymakers should secure the effectiveness of the current anti-Corona measures with a high priority by focusing on the protection and practicability with regard to close and wider family and friends. Increasing the effectiveness of the protection and practicability of anti-Corona measures in work and society also has a high priority. Focusing on the subjective norm should be of lower priority.

Keywords: COVID-19, COVID-19 and social spheres, anti-Corona measures, COVID-19 and theory of planned behavior, anti-Corona measures and theory of planned behavior, means-end theory of complex cognitive structures, COVID-19 and social groups, theory of planned behavior

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INTRODUCTION

Our study examines the people's evaluation of anti-Corona measures so that approaches for optimizing these measures can be derived. The necessary basis is laid in this section. After briefly characterizing the COVID-19 pandemic, we describe the main measures taken to counter the current crisis. To ensure a differentiated picture of how people evaluate the anti-Corona measures, we introduce the social spheres affected by the pandemic and the Theory of Planned Behavior, which will be combined to a hypothesized model.

The COVID-19 Pandemic

The outbreak of coronavirus disease 2019 (COVID-19) caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) started in December 2019 in Wuhan, China, (ProMED-mail, 2019; ProMED-mail, 2020; WHO, 2020b) and rapidly spread in many countries all over the globe with a dramatically fast increase in new infections (Phan, 2020; Sohrabi et al., 2020; Velavan and Meyer, 2020). In March 2020, the World Health Organization WHO declared the coronavirus outbreak a pandemic (WHO, 2020c) with countries such as Spain, Italy, France, the United Kingdom and the United States being among the most-affected ones on a global level (Johns Hopkins University, 2020). At present (May 28, 2020), more than 5,550,000 cases of COVID-19 have been confirmed globally and more than 350,000 people have died from the disease (WHO, 2020a). The coronavirus is primarily transmitted from person to person via direct contact or respiratory droplets (Guerrero et al., 2020; Rothan and Byrareddy, 2020; Wang and Du, 2020). To date, a COVID-19-specific vaccine or therapeutic medication has not been developed, although many efforts in this direction have been made and are currently undertaken (Ahmed et al., 2020; Lurie et al., 2020; Le et al., 2020; Liu et al., 2020; Rothan and Byrareddy, 2020; Zhang et al., 2020b).

Anti-Corona Measures

In the following two subsections, we will provide a general overview of anti-Corona measures and, then, focus on the German initiatives, as they are the research objects of our empirical analysis.

Overview of Anti-Corona Measures

As there is currently no vaccine or medication available for treating COVID-19, the current anti-Corona measures focus on slowing down the spread of SARS-CoV-2 and primarily contain reducing human social contacts and generating hygiene awareness (e.g., Balasa, 2020; Dalton et al., 2020; Jin et al., 2020; Kissler et al., 2020; Lewnard and Lo, 2020). In this context, numerous countries have introduced unprecedented measures labeled as "social distancing," also called "spatial distancing," which include, on the one hand, a general decrease of social contacts and, on the other hand, an increase of the space between people in order to minimize the risk of infection (Abel and McQueen, 2020; Kissler et al., 2020; Lewnard and Lo, 2020; Sen-Crowe et al., 2020). Some countries like Italy have enforced public distancing measures by imposing lockdowns (e.g., Sjödin et al., 2020); other countries like Sweden have taken less severe measures (e.g., Juranek and Zoutman, 2020). The objective of social or spatial distancing is to slow down the rate of infection and reduce the peak of incidence to a level the healthcare system is equipped to adequately respond to and save lives that would otherwise be left without treatment (Balasa, 2020; Sen-Crowe et al., 2020).

In an attempt to evaluate the initial impacts of anti-Corona measures, Bruinen de Bruin et al. (2020) were able to comprehensively categorize COVID-19 risk mitigation measures which are mobility restrictions, socioeconomic restrictions, physical distancing, hygiene measures, communication, and international support mechanisms. *Mobility restrictions* comprise limitations of public transport, air traffic, private cars, and outdoor activities (some countries only allowed walking outside with a dog or within a certain distance from home). *Socio-economic restrictions* target gatherings for educational, recreational, sportive, or work-related purposes (closing of shops, restaurants and bars, sports clubs, schools and universities, etc.). *Physical distancing* (also referred to as social or spatial distancing) means to maintain a proper distance of currently between 1.5 and 2 m to other people, prohibition of groups larger than 2–3 people, the closing of public spaces, etc. *Hygiene measures* aim to limit the spread of the virus and direct or indirect contamination of others (washing hands, sneezing, or coughing in elbow, avoiding touching face, contactless payments, wearing face masks, etc.). The cluster *communication* is the major drive for public understanding, trust, as well as acceptance and compliance with the measures introduced. Finally, *international support mechanisms* are important because the entire world is fighting the same threat and many countries have limited access to essential goods like medication or protection.

At present, it is hardly possible to clearly distinguish and evaluate the contribution of each cluster of measures to the overall decrease in new infections due to the lack of crucial information, namely, the case fatality rate, start and duration of infectiousness periods of COVID-19, and the existence of a large number of asymptomatic and undetected cases (Anderson et al., 2020). It is, however, believed that a combination of different mitigation measures, among others stopping mass gatherings, mobility restrictions, wearing appropriate face masks, screening programs, and the isolation of households, towns, or cities, could contribute to a faster decrease of new infections (e.g., Anderson et al., 2020; Balasa, 2020; Bruinen de Bruin et al., 2020). However, social or spatial distancing and hygiene measures seem to be at the core of such a mix of measures, promising the biggest effects (e.g., Bruinen de Bruin et al., 2020; Sen-Crowe et al., 2020).

The risk mitigation measures, mentioned above, can lead to enhanced levels of mental stress among individuals of the general population. Research suggests that social isolation, misinformation, and unpredictability and uncertainty about the seriousness of COVID-19 can contribute to stress and mental health concerns (Zandifar and Badrfam, 2020). Due to the permanent presence of inaccurate or exaggerated information, provided by media, and the perceived situation of mass threat, health anxiety and fear-related behaviors might arise and become excessive, possibly leading to maladaptive behaviors like hoarding

or mistrust in authorities (Asmundson and Taylor, 2020). This can lead to risk exacerbation, for example evading medical treatment, and, as a consequence, accelerate the spread of COVID-19 (Espinola et al., 2016; Shultz et al., 2016).

The uncertainty of the current situation, the perceived mass threat, and feelings of isolation can lead to mental disorders, among others posttraumatic stress disorder, depression and anxiety disorders (e.g., Mak et al., 2009; Dar et al., 2017; Zhou et al., 2019; Xiang et al., 2020). Moreover, the isolation of people and the feeling of loneliness cannot only cause mental health issues but also negatively impact the physical health, for example cardiovascular problems, fragmented sleep, and diminished immunity (Leigh-Hunt et al., 2017; for a review, see Cacioppo and Cacioppo, 2014).

Thus, especially in countries with an elevated number of cases, quarantine measures, and isolated people, mental healthcare and psychological interventions should be incorporated in future disaster management plans all over the globe (Bao et al., 2020; Dong and Bouey, 2020; Duan and Zhu, 2020; Li et al., 2020; Xiang et al., 2020; Zhang et al., 2020a) in order to prevent long-term mental disorders, as was the case among SARS survivors (Mak et al., 2009). Against this backdrop, Mental Health Europe released tips for mental health in order to keep a sense of control and ease coronavirus anxiety (Mental Health Europe, 2020).

Anti-Corona Measures in Germany

We focus in our research on the social or spatial distancing and hygiene measures, which are at the core of virtually every country's initiative to counter the COVID-19 pandemic, as well as on measures supporting the mental health of people. In our empirical analysis, we examine the subjective evaluation of these anti-Corona measures by the German population. Therefore, we describe the particular measures taken in Germany in more detail in the following paragraphs.

To mitigate the spread of COVID-19 in Germany, nationwide restrictions on public life were put into place on March 23, 2020. The government's position was (Merkel, 2020): (1) Members of the public are required to reduce their contact with people other than the members of their own household to an absolute minimum. (2) In public, as far as possible, they must keep a distance of at least 1.5 m, preferably 2 m, from all those other than those mentioned in point number one. (3) Visiting public places is only permitted alone, with one other person who does not live in your household, or when accompanied by the members of your own household. (4) Travel to work or to provide emergency care, shopping for essentials, doctors' appointments, attendance of meetings, necessary appointments and examinations, assistance for others, or sport and exercise individually out of doors as well as other necessary activities will, of course, still be possible. (5) Groups meeting for parties in public areas, homes, and private institutions are unacceptable in view of the serious situation in our country. Compliance with social distancing is to be monitored by the authorities responsible for public order and the police, and violations will be penalized. (6) Restaurants and cafés are to be closed. This does not include the delivery and collection of food that can be taken away and consumed at home. (7) Service providers in the personal care sector such as hairdressers, cosmetics studios, massage salons, tattoo parlors, and similar establishments are to be closed, because physical proximity is unavoidable in these professions, and this is not in line with the guidelines we have put in place for ourselves. Necessary medical treatments will still be permitted. (8) It is important that all enterprises, particularly those open to the public, adhere to the hygiene regulations and implement effective protective measures for staff and visitors. (9) These measures will apply for at least 2 weeks.

Those mitigation measures are complementing the following hygiene recommendations released by the Federal Centre for Health Education (BzgA, 2020): (1) Use a paper tissue or hold the crock of your arm in front of your mouth and nose when coughing or sneezing and dispose of the paper tissue immediately. (2) Keep your hand away from your face—do not touch your mouth, eyes, or nose with unwashed hands. (3) Stay away from individuals that have a cough, a cold, or fever—also because of the persistent wave of flue and cold infections. (4) Avoid touching (e.g., shaking hands or hugs) when greeting or saying goodbye to other people. (5) Wash your hands regularly and for a sufficient amount of time (at least 20 s) with soap and water—especially after blowing your nose, sneezing, or coughing.

Additionally, tips for mental health have been introduced by Mental Health Europe (2020), a European non-governmental network organization committed to the promotion of positive mental health across Europe (German version): (1) Seek accurate information from legitimate sources, for example WHO, European Commission, Robert Koch Institute, federal ministries, and public health offices. (2) Set limits around news on COVID-19. (3) Look after yourself including good hygiene, eating healthy, getting enough sleep, developing new daily routines for mental health, and doing things that you enjoy. (4) Reach out to others and support people around you (family, friends, people of need, people feeling lonely). This can benefit both the person receiving support as well as you as the helper. (5) Maintain a sense of hope and positive thinking, for example via focusing on positive news. (6) Acknowledge your feelings. Allow yourself to feel stressed, anxious, or depressed and express your feelings, for example in conversations or by writing them down. (7) Take time to talk with your children about the current situation to give them security. (8) Ask for professional support if necessary, for example at an advisory center or a self-help group.

Social Spheres Affected by the Corona Pandemic

The description of anti-Corona measures, especially social distancing, makes it obvious that these measures do not only affect the individual but also the social lives of the people. Moreover, human life in general is characterized by events and encounters that develop over the course of time in connection to other individuals embedded within a social context (Elder et al., 2003). Human behavior—health related or not—can thus not be assessed without the individual's specific social background and current social context. Germov (2014) suggests the coexistence of a biomedical model of health alongside a social model of

health, highlighting that health and illness always occur within a specific social context.

Dahlgren and Whitehead (1991) describe the individual's health influencing factors not only as inherent in age, sex, and genetic factors but also as embedded in an onion-like structured social environment consisting of the following determinants: (1) individual lifestyle (2) social and community influences, (3) living and working conditions, and (4) general socioeconomic, cultural, and environmental conditions. These determinants can be understood in the context of social groups, which can be specified and distinguished by different attributes, depending on the definition of a social group that is applied: shared experiences, status and roles of the group members, interactions, perception of being a group member etc. (e.g., Lewin, 1948; Bales, 1950; Sherif and Sherif, 1969; Tajfel, 1981). For example, Lickel's et al. (2000) categorized groups in intimacy groups (e.g., families or friends), task-oriented groups (e.g., work groups or sports teams), social categories (e.g., Germans), and loose associations (e.g., people living in the same area).

Based on Lickel's et al. (2000) categorization of social groups, we assume four social spheres to evaluate the social impact of the COVID-19 pandemic and the anti-Corona measures: close family, wider family and friends, colleagues at work, and society in general. The social spheres of close family and wider family and friends cover the intimacy groups. Colleagues at work represent the task group that, for most people, takes up the most of their time. The society in general can be roughly associated with a social category or a loose association. Thus, our categorization of social groups aims to cover the main social spheres affected by the COVID-19 pandemic and the referring counter measures.

Theory of Planned Behavior as the Basic Structure for the Subjective Evaluation of Anti-Corona Measures

COVID-19 pandemic and the related counter measures represent a complex situation with potentially severe consequences for both the individuum and his or her social spheres, described in the previous section. The pandemic and its consequences cannot be controlled and eased without the cooperation of the population (Dayrit and Mendoza, 2020). Cooperation in this context can be translated into the people actively supporting the COVID-19 mitigation measures, introduced by governments and related organizations. Thus, the people's positive evaluation of these measures with regard to their social spheres can be seen as pre-condition for their behavior and, therewith, the success of anti-Corona initiatives.

Social psychological theories, like the *Health Belief Model* (Becker, 1974; Rosenstock, 1974) and the *Theory of Planned Behavior* (Ajzen, 1985, 1988, 1991), provide a potentially fruitful framework to understand how people evaluate COVID-19 mitigation measures against the background of the current situation that can be perceived as complex and severe.

The Health Belief Model was applied in numerous health-related contexts, including the use of preventive screening and behaviors and compliance with medical regimes (for a review, see Sheeran and Abraham, 1996; Abraham and Sheeran, 2005), and is based on four main components: perceived susceptibility to a disease, perceived severity of a disease, perceived benefits of a specific preventive health action, and perceived costs of a specific preventive health action (Becker, 1974; Rosenstock, 1974). In the context of COVID-19, the Health Belief Model has already been applied to the topic of preventive communication of healthcare providers (Carico et al., 2020) as well as to the topic of its mental health and emotional impact (Mukhtar, 2020). For the present study, we decided against the Health Belief Model because it does not integrate social norms, which we believe are essential due to our focus on social spheres.

Instead, we apply the Theory of Planned Behavior which a number of studies suggest has more predictive power than the Health Belief Model (Bish et al., 2000; Lajunen and Räsänen, 2004; Şimşekoğlu and Lajunen, 2008).

The Theory of Planned Behavior is a social-cognitive model that stipulates the direct correlation between the individual's behavioral intentions and his or her actual behavior (Ajzen, 1985, 1988, 1991). The Theory of Planned Behavior is an extension of the Theory of Reasoned Action (Fishbein and Ajzen, 1975; Ajzen and Fishbein, 1980), which is in turn based on the Fishbein model (Fishbein, 1963). Central idea of the Theory of Planned Behavior is that human behavior is determined by the following three constructs: *attitude*, *subjective norm*, and *perceived behavioral control*. *Attitude* is defined as an individual's positive or negative evaluation of the consequences (benefits or drawbacks) of performing or not performing a specific behavior (Ajzen, 1988). *Subjective norm* refers to the degree of social pressure (opinion of significant others, e.g., peer pressure) an individual feels regarding the performance or non-performance of a specific behavior (Ajzen, 1988). *Perceived behavioral control* is an element extending the Theory of Reasoned Action (Ajzen, 1988) and describes an individual's perception of personal capacities or constraints (factors like time, money, and chance) of performing a specific behavior.

The Theory of Planned Behavior provides a conceptual framework for determining the complexities of human behavior and has received empirical support in a wide range of applications in different domains (e.g., Manstead and Parker, 1995; Conner and Armitage, 1998; Armitage and Conner, 2001; Bamberg, 2003; Castanier et al., 2013). Studies have also demonstrated the predictive value of the Theory of Planned Behavior for understanding human decision-making processes that lead individuals to both pro-environmental (e.g., Boldero, 1995; Taylor and Todd, 1995; Cordano and Frieze, 2000; Holdsworth et al., 2019; Alzubaidi et al., 2020) and health conscious (e.g., Blue, 1995; Godin and Kok, 1996; Povey et al., 2000; O'Connor and Armitage, 2003; Lajunen and Räsänen, 2004; Şimşekoğlu and Lajunen, 2008) behaviors and decisions. The measures taken by governments to mitigate the spread of the Corona virus aim to protect both, the individuum and the society as a whole. As stated before, none of those measures would be effective without the collective contribution of every individuum. By complying with the measures applied (physical distancing, hygiene measures etc.), the individuals protect themselves while at the same time protecting others from infection with the Corona virus. In this context, the anti-Corona

measures are comparable to pro-environmental as well as health-conscious behaviors.

The Theory of Planned Behavior (Ajzen, 1985, 1988, 1991) and its forerunner, the Theory of Reasoned Action (Fishbein and Ajzen, 1975; Ajzen and Fishbein, 1980), focus on the prediction of the behavioral intention by looking at the consequences of a specific behavior. The attitude, which is the central element of these theories, is modeled as the multiplication of the valance of a behavioral consequence with the probability that this consequence is an outcome of the behavior. This principal is not limited to the prediction of behavioral intentions but is also applied in other areas, e.g., motivation (Atkinson, 1964) or, as in Fishbein's (1963) original theory, the evaluation of objects. It was also used to evaluate attitudinal objects and attitudinal structures within the Means-End Theory of Complex Cognitive Structures (Godbersen, 2016, 2019; Godbersen and Kaupp, 2019), which will be applied in our empirical research. In this context, the multiplicative model focuses on the subjective relevance of attributes of an attitudinal object and their perceived quality rather than the behavioral consequences.

In the previous section, we argued that the anti-Corona measures should be assessed with regard to four social spheres. Based on the content of this section, we propose that the subjective relevance and perceived quality of the attitude, subjective norm, and perceived behavioral control should be added to a model determining the people's evaluation of anti-Corona measures.

Hypothesized Model and Research Questions

Virtually all of the countries on the globe have taken measures to counter the spread of the Corona virus and ease its negative consequences on people's health. The main measures to counter the Corona crisis in Germany are, among others, the restrictions on outdoor activities, tips for hygiene, and tips for mental health, as shown in Section "Anti-Corona Measures." These three measures are examined in this paper.

In Section "Social Spheres Affected by the Corona Pandemic," it was pointed out that the Corona virus and the referring counter-measures can impact different spheres of peoples' social life: close family, wider family and friends, colleagues at work, and society in general. Furthermore, it was highlighted that one's condition of health is not an individual phenomenon but should be understood in the context of the aforementioned social spheres. Therefore, we assume that the four social spheres, mentioned above, form the relevant context for people to evaluate anti-Corona measures.

People rarely evaluate attitudinal objects one-dimensionally or only based on one reason. Instead, the psychological evaluation of an object should be understood as a poly-causal process that contains multiple elements, even if people do not fully consciously go through this process. To account for this fact, the Theory of Planned Behavior (Ajzen, 1985, 1988, 1991) was introduced in Section "Theory of Planned Behavior As the Basic Structure for the Subjective Evaluation of Anti-Corona Measures." Its three constructs, attitude, subjective norm, and perceived behavioral control, should form the main elements to evaluate the anti-Corona measures in our model.

Against this background, we propose a model (**Figure 1**), representing the people's evaluation of anti-Corona measures, that consists of three levels. The overall evaluation of a measure to counter the Corona crisis is situated as a single construct on the top level. This can be the people's evaluation of the restrictions on outdoor activities, tips for hygiene, and tips for mental health. The second level of the model consists of the attitude toward the respective measure, the subjective norm, and the perceived behavioral control in context with this measure. The social spheres—close family, wider family and friends, colleagues at work, and society in general—are situated on the third and most concrete level of the model. We assumed that these constructs are subordinated to the attitude, subjective norm, and perceived behavioral control when people evaluate anti-Corona measures. We also assume that the social spheres are of different relevance for the superordinated elements of our model.

In Section "Theory of Planned Behavior As the Basic Structure for the Subjective Evaluation of Anti-Corona Measures," we did not only introduce the attitude, subjective norm, and perceived behavioral control as relevant constructs for a differentiated and comprehensive model of people's evaluation of objects but also pointed out, in accordance with the Theory of Planned Behavior (Ajzen, 1985, 1988, 1991) and the more general expectancy value theories (e.g., Atkinson, 1964; Fishbein and Ajzen, 1975; Vroom, 1995), that the psychological overall evaluation of an object depends on the subjectively perceived relevance of its subordinate elements and their subjective assessment. Against this background and based on our hypothetical model, described above, we formulate the following research questions:

RQ1 (subjective relevance): Which relevance do the attitude, subjective norm, and perceived behavioral control as well as the social spheres have for the people's evaluation of anti-Corona measures?

RQ1.1: Which relevance do the attitude, subjective norm, and perceived behavioral control have for the people's evaluation of anti-Corona measures?

RQ1.2: Which relevance do the social spheres—close family, wider family and friends, colleagues at work, and society in general—have for the people's evaluation of anti-Corona measures?

RQ2 (subjective quality): How well do people evaluate anti-Corona measures—restrictions on outdoor activities, tips for hygiene and tips for mental health—with regard to their attitude, subjective norm, and perceived behavioral control as well as their social spheres?

RQ2.1: How well do people evaluate anti-Corona measures—restrictions on outdoor activities, tips for hygiene, and tips for mental health—with regard to their attitude, subjective norm, and perceived behavioral control?

RQ2.2: How well do people evaluate anti-Corona measures—restrictions on outdoor activities, tips for hygiene, and tips for mental health—with regard to their social spheres?

RQ2.3: How well do people evaluate anti-Corona measures—restrictions on outdoor activities, tips for hygiene, and tips for mental health—overall?

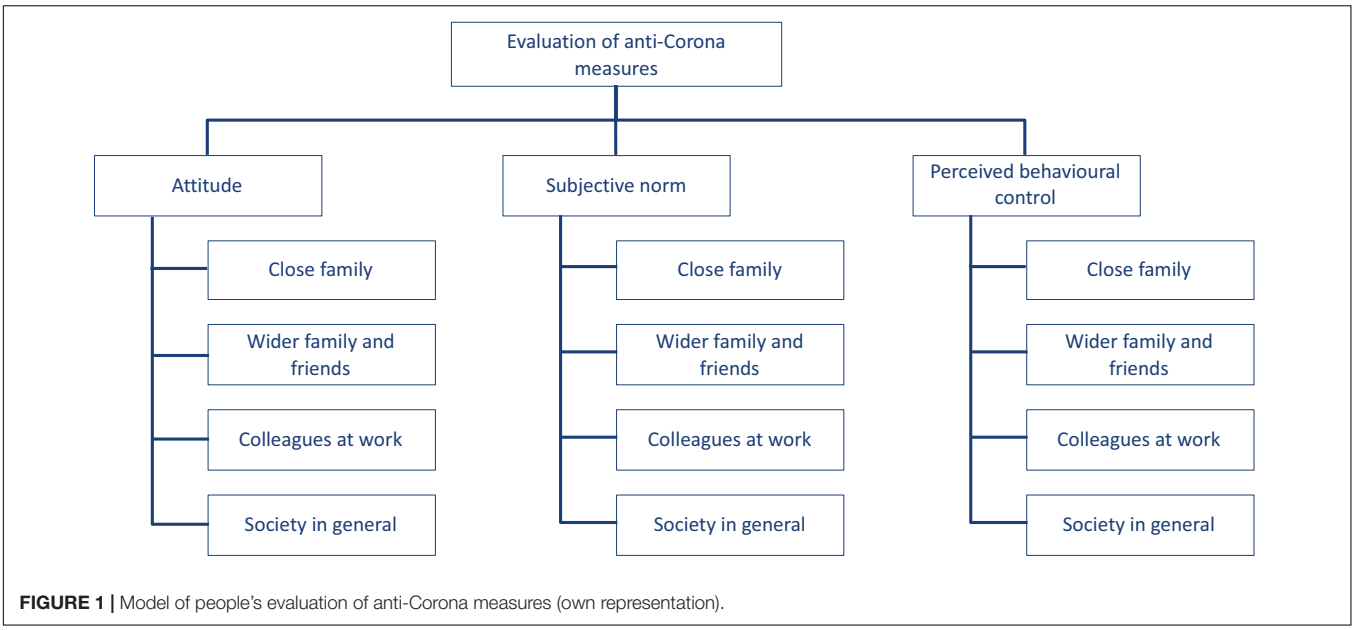

FIGURE 1 | Model of people's evaluation of anti-Corona measures (own representation).

RQ3 (optimization): What is the potential of and the need for increasing the effectiveness of anti-Corona measures from the people's perspective, and with what priority should the current effectiveness of these measures be secured or increased with regard to attitude, subjective norm, and perceived behavioral control within the social spheres of people?

RQ3.1: From the people's perspective, what is the potential of and the need for increasing the effectiveness of anti-Corona measures with regard to attitude, subjective norm, and perceived behavioral control within the social spheres of people?

RQ3.2: Based on the potential of and need for increasing the effectiveness of anti-Corona measures, with which priority should the effectiveness of anti-Corona measures be secured or increased with regard to attitude, subjective norm, and perceived behavioral control within the social spheres of people?

MATERIALS AND METHODS

The design and the measurement instruments of the empirical research are explained in this section.

Research Design

A standardized online questionnaire was used to evaluate the subjective relevance and quality of the attitude, subjective norm, perceived behavioral control, and social spheres regarding anti-Corona measures. The data collection was realized from 25 March until 15 April. The data collection falls into the time when the German chancellor announced the restrictions on outdoor activities on 22 March and her following speech about easing these measures on 15 April. Participants of the study were students of FOM University of Applied Sciences in Germany. These students work in regular jobs and parallelly study business psychology. Eventually, the survey resulted in 663 completed questionnaires. The average age of the participants is 26.73 years with a standard deviation of 5.03. The youngest participant is 19 years, and the oldest 55 years of age. 25.34% are male and 74.66% female. 69.98% of the sample lives in a relationship while 30.02% are singles. 26.85% live in a single household, 47.66% live in a household with a second person, 13.27% live in a household of three persons, and 12.22% live in a household having four or more persons.

Measurement With the Means–End Theory of Complex Cognitive Structures

At its core, the content of the questionnaire is based on the hypothesized model, presented in Section "Hypothesized Model and Research Questions." To analyze this hierarchical system of cognitive representations on three levels, the Means–End Theory of Complex Cognitive Structures (Godbersen, 2016, 2019; Godbersen and Kaupp, 2019), which has its roots in the more general expectancy value theories (e.g., Atkinson, 1964; Fishbein and Ajzen, 1975; Vroom, 1995), was applied and is explained with regard to the evaluation of anti-Corona measures in the following subsections.

Subjective Relevance, Normed Values, and Total Normed Values

Measuring the subjective relevance, continuous rating scales, ranging from 0 (not important) to 100 (very important), were used. The participants were asked how important it is to them that anti-Corona measures lead to the protection from the disease and its consequences to measure the subjective relevance of the attitude. The subjective relevance regarding the subjective norm was operationalized through asking how important it is to the participants to fulfill the expectations of others during the Covid-19 epidemic. To measure the perceived behavioral control, the participants were asked how important the practicability of anti-Corona measures is for them. The subjective relevance of the social spheres—close family, wider

family and friends, colleagues at work, and society in general—for the attitude, subjective norm, and perceived behavioral control were measured accordingly.

The analysis of the collected data starts with the calculation of the normed values. The normed values of the attitude, subjective norm, and perceived behavioral control are calculated through the following equation:

$$nV_{\mathrm{i}} = \frac{V_{\mathrm{i}}}{\sum_{i=1}^{n} V_{\mathrm{i}}}$$

nV_i, normed value of element i on the middle level of the model (attitude, subjective norm, and perceived behavioral control) for the evaluation of the overall anti-Corona measure.

V_i, empirically determined subjective relevance of element i on the middle level of the model (attitude, subjective norm, and perceived behavioral control) for the evaluation of the overall anti-Corona measure.

The sum of all of the normed values (nV_i) equates to 1 or 100%. The normed values can be understood—similar to a regression coefficient—as the strength of the impact the attitude, subjective norm, and perceived behavioral control has on the evaluation of an anti-Corona measure. The normed values of the social spheres for the aforementioned constructs are calculated in the same way so that the influence of the social spheres on the elements on the next (second) level of the model can be determined.

To determine the influence of the elements on the lowest level of the model (close family, wider family and friends, colleagues at work, and society in general within the attitude, subjective norm, and perceived behavioral control) on the element on the highest level (overall evaluation of an anti-Corona measure), the total normed values are calculated by applying the following equation:

$$tnV_{\mathrm{j}} = nV_{\mathrm{i}} * nV_{\mathrm{j}}$$

tnV_j, total normed value of element j on the lowest level of the model (close family, wider family and friends, colleagues at work, and society in general within the attitude, subjective norm, and perceived behavioral control).

nV_i, normed value of element i on the middle level of the model (attitude, subjective norm, and perceived behavioral control).

nV_j, normed value of element j on the lowest level of the model (close family, wider family and friends, colleagues at work, and society in general within the attitude, subjective norm, and perceived behavioral control).

As with the normed values (nV_i) underneath an element of the next-higher level, the sum of the total normed values (tnV_j) of all of the elements on the lowest level of the model equate to 1 or 100%. Therefore, the total normed value can be interpreted as the relative influence of an element on the lowest level of the model on the element on the highest level.

Subjective and Calculated Quality

The subjective quality of the anti-Corona measures was operationalized on the lowest level of the model, presented in **Figure 1**. The subjective quality regarding the restrictions on outdoor activities, the tips for hygiene, and the tips for mental health were evaluated in three different sections of the questionnaire. In each section, it was asked how good the respective anti-Corona measure is to protect the close family, wider family and friends, colleagues at work, and society in general (attitude); how well these groups evaluate the anti-Corona measure; and how practical the anti-Corona measure is for the participant of the questionnaire in these four social spheres. As a measurement tool, a continuous rating scale from 0 (not good) to 100 (very good) was used.

The quality of the attitude toward anti-Corona measures is calculated by summing up the empirically measured qualities of the subordinated social spheres (protection of the close family, wider family and friends, colleagues at work, and society in general) weighed with their respective normed values. This calculation is conducted accordingly for the qualities of the subjective norm and perceived behavioral control. The following equation represents the described procedure:

$$cQ_{\mathrm{i}} = \sum_{j=1}^{n} \frac{V_{\mathrm{j}}}{\sum_{j=1}^{n} V_{\mathrm{j}}} * eQ_{\mathrm{j}}$$

cQ_i, calculated quality of element i on the middle level of the model (attitude, subjective norm, and perceived behavioral control).

eQ_j, empirical quality of element j on the lowest level of the model (close family, wider family and friends, colleagues at work, and society in general within the attitude, subjective norm, and perceived behavioral control).

V_j, perceived value of element j (empirically measured) on the lowest level of the model (close family, wider family and friends, colleagues at work, and society in general within the attitude, subjective norm, and perceived behavioral control).

The overall quality of an anti-Corona measure is calculated in the same way, using the calculated quality (cQ_i) of the attitude, subjective norm, and perceived behavioral control and their normed values (nV_i). Furthermore, the overall quality of each anti-Corona measure was empirically measured by asking the participants how good they evaluate the respective measure on a continuous rating scale from 0 (not good) to 100 (very good).

Norm Strategies

Based on the afore-described analysis, the potential of and need for increasing the effectiveness of anti-Corona measures with regard to the attitude, subjective norm, and perceived behavioral control within the social spheres (close family, wider family and friends, colleagues at work, and society in general) and respective norm strategies can be "automatically" derived. The normed values and total normed values represent the relative influence that an element has on the overall evaluation of an anti-Corona measure. Therefore, the normed values and total normed values can be understood as being equivalent to the potential of increasing the effectiveness of anti-Corona measures. The subjective quality—empirical and calculated—of an element of the model corresponds with the need for increasing the effectiveness of anti-Corona measures regarding this specific element. The two described dimensions can be combined in a

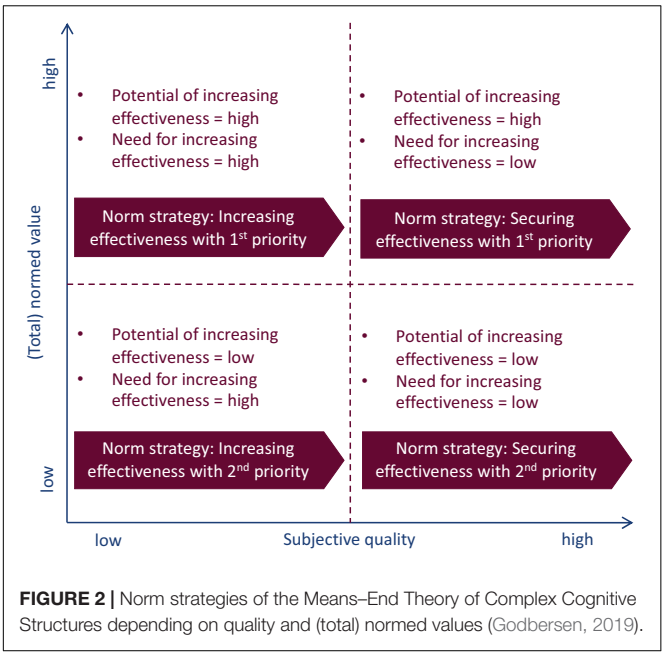

FIGURE 2 | Norm strategies of the Means–End Theory of Complex Cognitive Structures depending on quality and (total) normed values (Godbersen, 2019).

matrix, and norm strategies can be deduced, as shown in **Figure 2**. The four quadrants of the matrix are separated by the arithmetic mean of the normed values or total normed values and the arithmetic mean of the subjective quality.

Further Variables

Apart from the analysis with the Means–End Theory of Complex Cognitive Structures, the subjectively perceived level of information and the relevance of information sources during the Corona crisis as well as the perceived threat posed by the Covid-19 pandemic were measured. It was asked after the subjective level of information about the Covid-19 pandemic on a continuous rating scale from 0 (not good) to 100 (very good). The relevance of the close family, wider family and friends and colleagues at work, and relevance of classic media (television, newspapers, radio etc.) and new media (internet, social media etc.) as information sources for acquiring knowledge about the Covid-19 pandemic was measured on a continuous rating scale from 0 (not important) to 100 (very important). Furthermore, the perceived quality of information from the government and from researchers or research institutes was evaluated by using a continuous rating scale from 0 (not good) to 100 (very good). The perceived threat of the Covid-19 pandemic for the close family, wider family and friends, colleagues at work, and society in general was measured on a continuous rating scale from 0 (not threatening) to 100 (very threatening).

RESULTS

The presentation of the results is structured by four subsections. Firstly, the results for the subjective relevance and the (total) normed values of the elements of our model are described. Secondly, the subjective calculated qualities of the three examined anti-Corona measures and the subordinated elements are presented. Then, the two aforementioned categories of values are combined to "automatically" deduce norm strategies. Finally, the results for the additionally examined variables are described. All data were analyzed using R (R Development Core Team, 2017).

Subjective Relevance and (Total) Normed Values of the Attitude, Subjective Norm and Perceived Behavioral Control, and Social Spheres

One of the research objectives of this paper is to determine the relevance people attribute to the attitude, subjective norm, and perceived behavioral control as well as to the social spheres in the context of anti-Corona measures (research question RQ1). To this end, the empirical values, normed values, and total normed values, which are represented in **Table 1**, are analyzed.

The attitude (the perceived protection from the coronavirus and its consequences) is slightly more important than the perceived behavioral control in the social lives of people (the practicability of anti-Corona measures in one's social life). Of the least importance to people is the subjective norm (the drive or willingness to fulfill the expectations of others).

With regard to the social spheres, the close family is of highest relevance to the participants of our survey. The empirical, normed, and total normed values of the wider family and friends, the colleagues at work, and the society in general are on a lower level with similar arithmetic means. This pattern can be observed in all of the three categories—attitude, subjective norm, and perceived behavioral control. It should be noted, however, that the social spheres, subordinated to the attitude and the perceived behavioral control, have a higher impact on the overall evaluation of anti-Corona measures than those subordinated to the subjective norm. This is due to the fact that the attitude and the perceived behavioral control themselves are of higher subjective relevance to the participants of the survey than the subjective norm.

Subjective Calculated Quality of the Attitude, Subjective Norm and Perceived Behavioral Control, and Social Spheres

The second main research objective of this study is to determine how well people evaluate anti-Corona measures—restrictions on outdoor activities, tips for hygiene, and tips for mental health—with regard to their attitude, subjective norm, and perceived behavioral control as well as their social spheres (research question RQ2).

The subjectively perceived qualities of the restriction on outdoor activities, tips for hygiene, and tips for mental health, calculated according to the Means–End Theory of Complex Cognitive Structures are represented by the first bars of each section in **Figure 3**. This figure also shows the calculated qualities of the attitude, subjective norm, and perceived behavioral control for each of the three anti-Corona measures.

Considering the range of the applied scale from 0 (not good) to 100 (very good), all of the three measures are evaluated rather positively. The tips for hygiene are evaluated best, followed by the

TABLE 1 | Empirical, normed and total normed values (n = 663) (own representation).

Construct	Category	Empirical value		Normed value		Total normed value	
		Mean	*SD*	Mean	*SD*	Mean	*SD*
Attitude		87.84	16.79	0.39	0.08	0.39	0.08
Subjective norm		55.03	28.67	0.23	0.11	0.23	0.11
Perceived behavioral control		83.57	19.37	0.37	0.08	0.37	0.08
Close family (attitude)	Attitude	92.03	15.12	0.27	0.05	0.11	0.04
Wider family and friends (attitude)		86.52	18.90	0.25	0.03	0.10	0.02
Colleagues at work (attitude)		81.61	22.87	0.23	0.05	0.09	0.03
Society in general (attitude)		85.85	18.07	0.25	0.04	0.10	0.02
Close family (subjective norm)	Subjective norm	65.57	29.13	0.30	0.11	0.07	0.04
Wider family and friends (subjective norm)		52.78	29.71	0.23	0.07	0.05	0.03
Colleagues at work (subjective norm)		52.92	29.65	0.23	0.09	0.05	0.03
Society in general (subjective norm)		52.18	29.40	0.23	0.10	0.05	0.03
Close family (perceived behavioral control)	Perceived behavioral control	86.85	18.80	0.29	0.08	0.11	0.04
Wider family and friends (perceived behavioral control)		74.33	25.51	0.24	0.06	0.09	0.03
Colleagues at work (perceived behavioral control)		74.31	25.89	0.23	0.06	0.09	0.03
Society in general (perceived behavioral control)		75.28	24.78	0.24	0.07	0.09	0.03

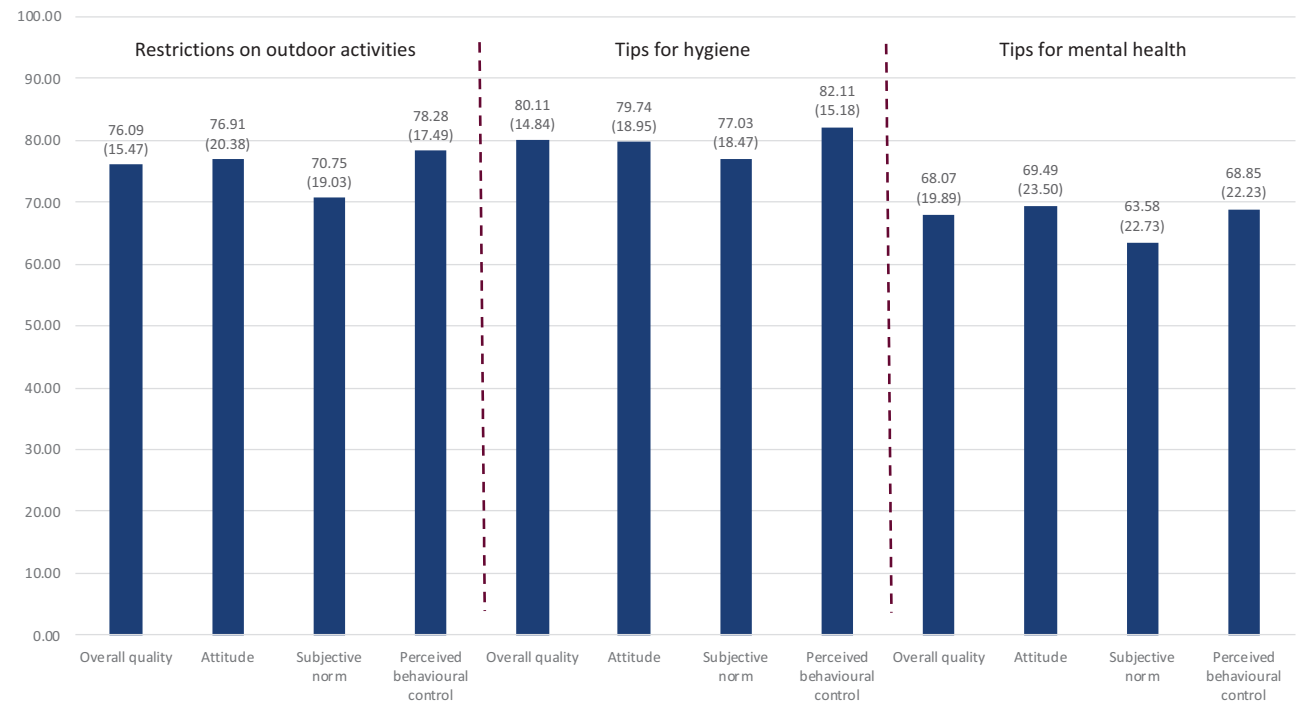

FIGURE 3 | Calculated quality of the anti-Corona measures and their subordinated constructs—attitude, subjective norm, and perceived behavioral control (n = 663, arithmetic mean as number, standard deviation in brackets) (own representation).

restrictions on outdoor activities. The lowest quality is attributed to the tips for mental health.

To validate the calculated qualities of the anti-Corona measures and, with it, the overall model, the participants had to rate the three measures on a scale from 0 (not good) to 100 (very good). An arithmetic mean of 77.98 (*SD* = 21.25) resulted for the restrictions on outdoor activities, an arithmetic mean of 79.39 (*SD* = 19.34) for the tip for hygiene and for the tips for mental health an arithmetic mean of 68.34 (*SD* = 24.08). The differences between calculated and empirical values range between −1.89 and 0.72. Considering the scale from 0 to 100, this indicates a high validity of the measurements and calculations with the Means–End Theory of Complex Cognitive Structures. Furthermore, we confirmed the adequacy of our models by conducting partial least square path modeling, using the R package plspm (Sanchez, 2013), and calculating the variance inflation factors, using the

R package faraway (Faraway, 2016); the results can be found in the **Supplementary Materials**.

For each anti-Corona measure, the qualities of the attitude, subjective norm, and perceived behavioral control show the same pattern. The attitude (the perceived protection from the Corona virus and its consequences) and the perceived behavioral control (the practicability of anti-Corona measures in one's social life) are evaluated roughly on the same level and are better assessed than the subjective norm (the drive or willingness to fulfill the expectations of others).

The subjectively perceived qualities of the three anti-Corona measures with regard to the attitude, subjective norm, and perceived behavioral control within the social spheres are presented in **Table 2**.

The people's evaluation of the protection from the Corona virus and its consequences (attitude) through the three measures is better for the social spheres of close family and wider family and friends than for colleagues at work and the society in general. Within the category of the subjective norm, the perceived qualities of the social spheres have the following descending order: close family, wider family and friends, colleagues at work, and the society in general. The practicability of the measures (perceived behavioral control) is rated higher for the close family and the wider family and friends than for the colleagues at work and the society in general.

Norm Strategies for Optimizing Anti-Corona Measures

The third main research objective concerns the determination of the potential and need for optimizing elements of the anti-Corona measures and, based on that, deducing norm strategies for which elements the effectiveness should be secured or increased and with which priority (research question RQ3).

Norm Strategies for the Restriction on Outdoor Activities

The total normed values (tnV) and the subjective qualities (eQ) of the attitude, subjective norm, and perceived behavioral control for the four social spheres—close family, wider family and friends, colleagues at work, and society in general—regarding the restrictions on outdoor activities are presented in the form of a matrix in **Figure 4**.

According to the norm strategies that can be deduced from **Figure 4**, the effectiveness of the restriction on outdoor activities should be mainly secured with higher priority with regard to the following elements (**Figure 4**, top right quadrant):

- Attitude within the social sphere of the close family.
- Perceived behavioral control within the social sphere of the close family.
- Attitude within the social sphere of the wider family and friends.
- Perceived behavioral control within the social sphere of the wider family and friends.
- Attitude within the social sphere of the society in general.

The effectiveness of the restriction on outdoor activities should be mainly increased with higher priority with regard to the following elements (**Figure 4**, top left quadrant):

- Attitude within the social sphere of the colleagues at work.
- Perceived behavioral control within the social sphere of the colleagues at work.
- Perceived behavioral control within the social sphere of the society in general.

With a lower priority, the effectiveness of the social norm within close families should be mainly secured (**Figure 4**, bottom right quadrant).

The effectiveness of the restriction on outdoor activities should be mainly increased with a lower priority with regard to the following elements (**Figure 4**, bottom left quadrant):

- Subjective norm within social sphere of the wider family and friends.
- Subjective norm within social sphere of the colleagues at work.
- Subjective norm within social sphere of the society in general.

Norm Strategies for the Tips for Hygiene

The total normed values (tnV) and the subjective qualities (eQ) of the attitude, subjective norm, and perceived behavioral control for the four social spheres—close family, wider family and friends, colleagues at work, and society in general—regarding the tips for hygiene are presented in **Figure 5**.

According to the norm strategies that can be deduced from **Figure 5**, the effectiveness of the tips for hygiene should be mainly secured with higher priority with regard to the following elements (**Figure 5**, top right quadrant):

- Attitude within the social sphere of the close family.
- Perceived behavioral control within the social sphere of the close family.
- Attitude within the social sphere of the wider family and friends.
- Perceived behavioral control within the social sphere of the wider family and friends.
- Perceived behavioral control within the social sphere of the colleagues at work.

The effectiveness of the tips for hygiene should be mainly increased with higher priority with regard to the following elements (**Figure 5**, top left quadrant):

- Attitude within the social sphere of the colleagues at work.
- Attitude within the social sphere of the society in general.
- Perceived behavioral control within the social sphere of the society in general.

With a lower priority, the effectiveness of the social norm within close families should be mainly secured (**Figure 5**, bottom right quadrant).

The effectiveness of the tips for hygiene should be mainly increased with a lower priority with regard to the following elements (**Figure 5**, bottom left quadrant):

TABLE 2 | Empirical quality of the social spheres within the attitude, subjective norm, and perceived behavioral control for the anti-Corona measure restrictions on outdoor activities, tips for hygiene, and tips for mental health (n = 663) (own representation).

Construct	Category	Restrictions on outdoor activities		Tips for hygiene		Tips for mental health	
		Mean	*SD*	Mean	*SD*	Mean	*SD*
Attitude: close family	Attitude	79.61	22.62	80.58	22.08	72.54	25.08
Attitude: wider family and friends		78.62	22.21	81.24	20.45	70.39	25.09
Attitude: colleagues at work		71.74	27.36	77.95	22.95	67.46	26.49
Attitude: society in general		75.67	23.67	78.22	22.40	66.12	25.79
Subjective norm: close family	Subjective norm	77.93	21.72	81.48	19.84	67.60	25.24
Subjective norm: wider family and friends		70.34	23.31	77.96	20.44	64.39	24.91
Subjective norm: colleagues at work		67.24	25.61	75.86	22.87	61.72	25.31
Subjective norm: society in general		65.31	20.92	71.70	21.28	59.57	23.87
Perceived behavioral control: close family	Perceived behavioral control	82.24	23.75	82.82	22.55	75.16	25.01
Perceived behavioral control: wider family and friends		84.29	23.37	87.18	17.87	69.95	25.31
Perceived behavioral control: colleagues at work		70.84	31.40	80.60	23.61	65.23	27.23
Perceived behavioral control: society in general		73.18	24.13	76.50	22.85	61.36	27.14

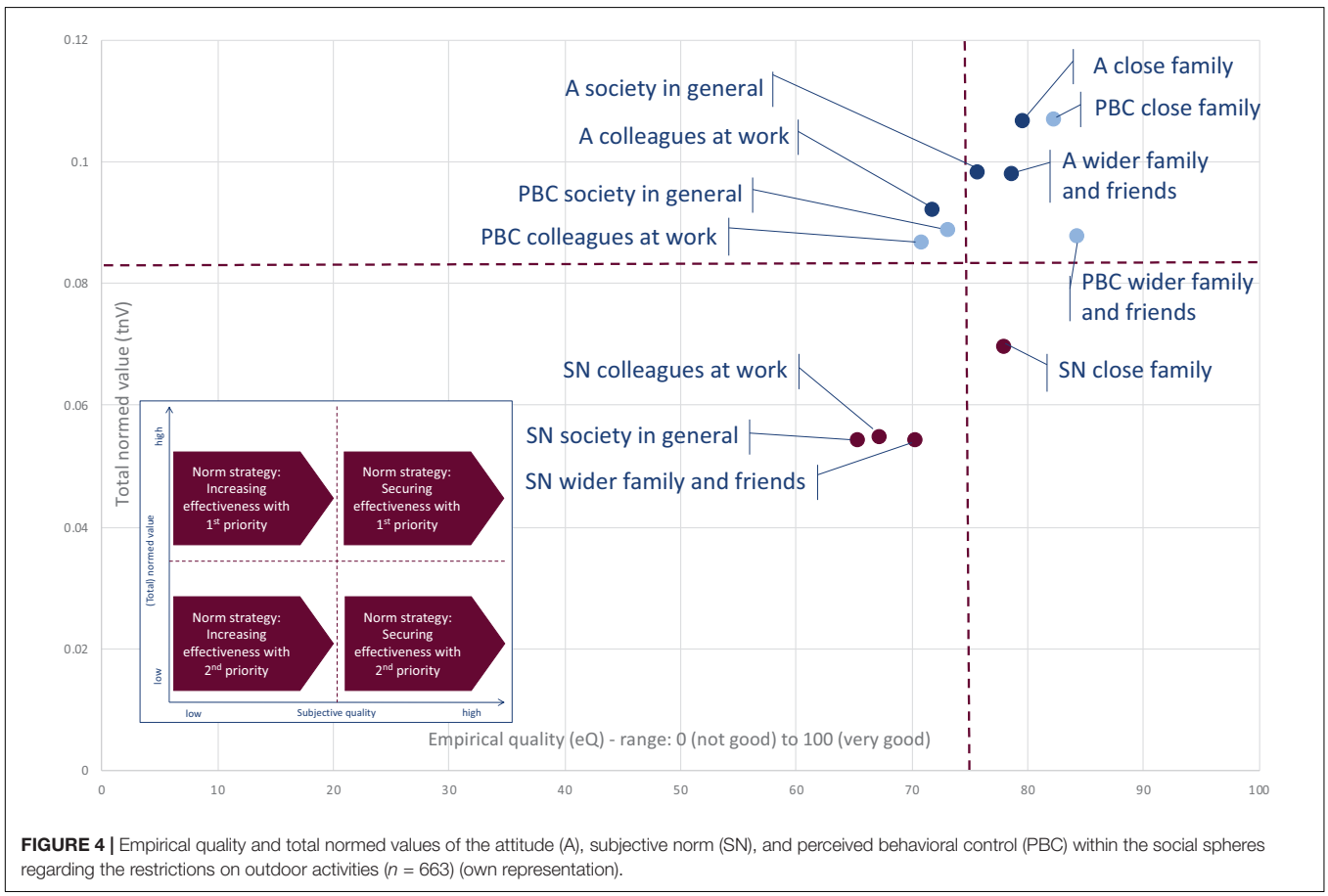

FIGURE 4 | Empirical quality and total normed values of the attitude (A), subjective norm (SN), and perceived behavioral control (PBC) within the social spheres regarding the restrictions on outdoor activities (n = 663) (own representation).

- Subjective norm within the social sphere of the wider family and friends.
- Subjective norm within the social sphere of the colleagues at work.
- Subjective norm within the social sphere of the society in general.

Norm Strategies for the Tips for Mental Health

Figure 6 shows the total normed values (tnV) and the subjective qualities (eQ) of the attitude, subjective norm, and perceived behavioral control for the four social spheres—close family, wider family and friends, colleagues at work, and society in general—regarding the tips for mental health.

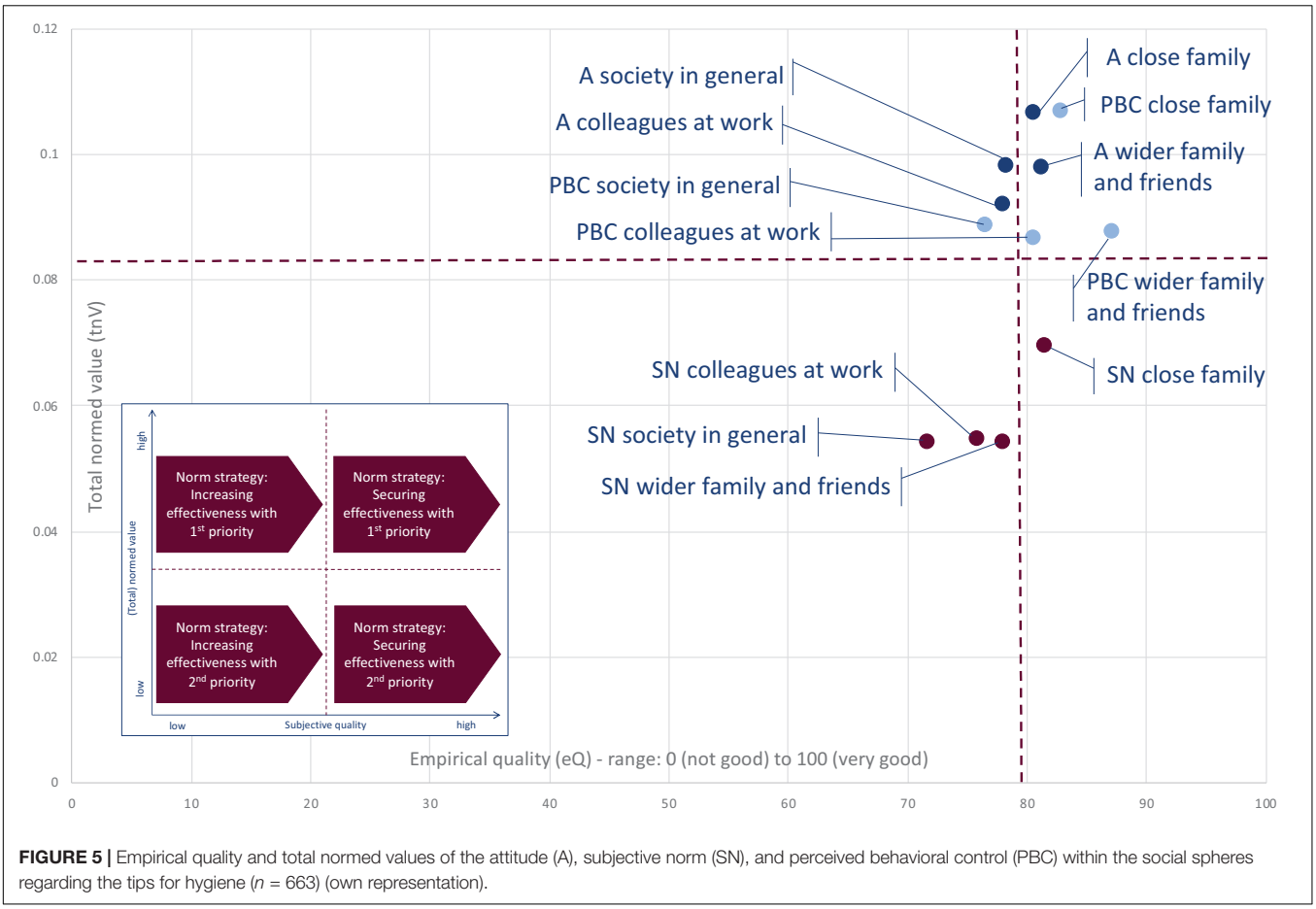

FIGURE 5 | Empirical quality and total normed values of the attitude (A), subjective norm (SN), and perceived behavioral control (PBC) within the social spheres regarding the tips for hygiene (n = 663) (own representation).

According to the norm strategies that can be deduced from **Figure 6**, the effectiveness of the tips for mental health should be mainly secured with higher priority with regard to the following elements (**Figure 6**, top right quadrant):

- Attitude within the social sphere of the close family.
- Perceived behavioral control within the social sphere of the close family.
- Attitude within the social sphere of the wider family and friends.
- Perceived behavioral control within the social sphere of the wider family and friends.
- Attitude within the social sphere of the colleagues at work.

The effectiveness of the tips for mental health activities should be mainly increased with higher priority with regard to the following elements (**Figure 6**, top left quadrant):

- Attitude within the social sphere of the society in general.
- Perceived behavioral control within the social sphere of the colleagues at work.
- Perceived behavioral control within the social sphere of the society in general.

With a lower priority, the effectiveness of the social norm within close families should be mainly secured (**Figure 6**, bottom right quadrant).

The effectiveness of the tips for mental health should be mainly increased with a lower priority with regard to the following elements (**Figure 6**, bottom left quadrant):

- Subjective norm within the social sphere of the wider family and friends.
- Subjective norm within the social sphere of the colleagues at work.
- Subjective norm within the social sphere of the society in general.

Perceived Information Level, Information Sources and Perceived Threat

The perceived level of information about the Covid-19 pandemic, the perceived relevance of information sources, the perceived quality of governmental and research information, and the perceived threat of the Covid-19 pandemic were measured to gain additional insights in the people's evaluation of the Corona crisis. Overall, people feel rather well informed about the Covid-19 pandemic which is indicated by an arithmetic mean of 69.16 (SD = 21.03) on a scale from 0 (not good) to 100 (very good). The subjectively perceived relevance of information sources is

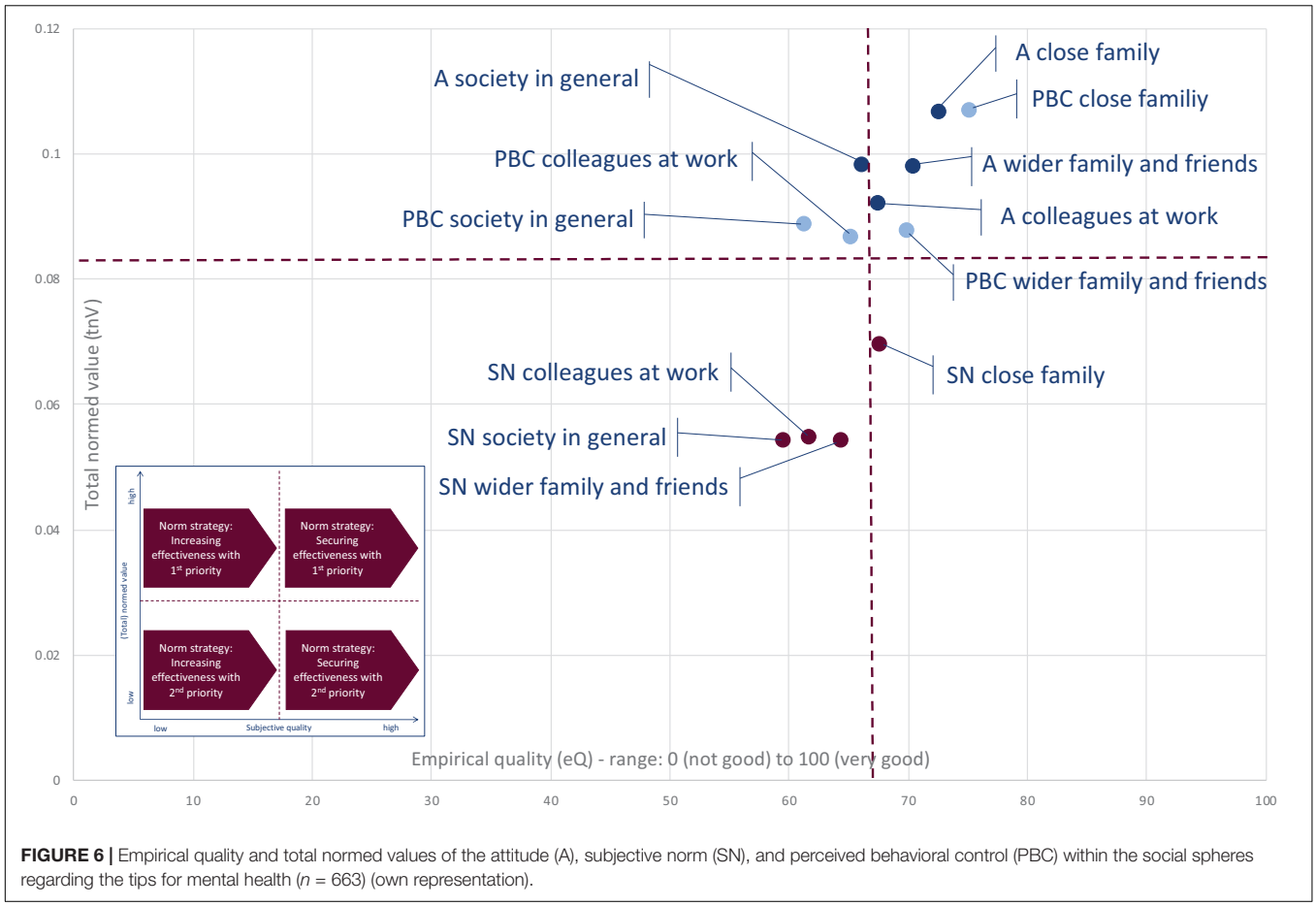

FIGURE 6 | Empirical quality and total normed values of the attitude (A), subjective norm (SN), and perceived behavioral control (PBC) within the social spheres regarding the tips for mental health (n = 663) (own representation).

represented in **Figure 7**. The highest relevance—measured on a scale from 0 (not important) to 100 (very important)—has classic media followed, in descending order, by new media, close family, colleagues at work, and the wider family and friends. On a scale from 0 (not good) to 100 (very good), the information from the government is rated 64.30 (SD = 23.66) on average and the information from researchers and research institutes is rated 69.84 (SD = 24.49) on average.

The perceived threat of the Covid-19 pandemic for the social spheres, which was measured on a scale from 0 (not threatening) to 100 (very threatening), is presented in **Figure 8**. The participants of the survey see the largest threat for the society in general, followed by the perceived threat to the close family. The threats to the wider family and friends, and the colleagues at work, are perceived on a lower level.

DISCUSSION

The objectives of our study, as presented in Section "Hypothesized Model and Research Questions," are examining the people's relevance [discussed in section "People's Expectations on (Governmental) Initiatives and Measures"] and evaluation [discussed in section "People's Evaluation on (Governmental) Initiatives and Measures"] of the main anti-Corona measures (restrictions on outdoor activities, tips for hygiene, and tips for mental health) as well as deducing approaches for optimizing these measures [discussed in section "Improving (Governmental) Initiatives and Measures"]. To gain differentiated insights in the three aforementioned areas we focus, following the Theory of Planned Behavior, on the protection from COVID-19 and its consequences (attitude), the practicability of the anti-Corona measures (perceived behavioral control) and the willingness to fulfill the expectations of others (subjective norm). Furthermore, we also integrate the social spheres of the close family, the wider family and friends, the colleagues at work, and the society in general in our study.

People's Expectations on (Governmental) Initiatives and Measures

The empirical and normed values revealed that the perceived protection from the Corona virus and its consequences (attitude) is slightly more important to the people than the practicability of the anti-Corona measures (perceived behavioral control), which in turn has a substantially higher subjective relevance than the willingness to fulfill the expectations of others (subjective norm).

Interestingly, other studies came to the result that the attitude and subjective norm are more important than the perceived behavioral control to predict health beneficial behavior. That

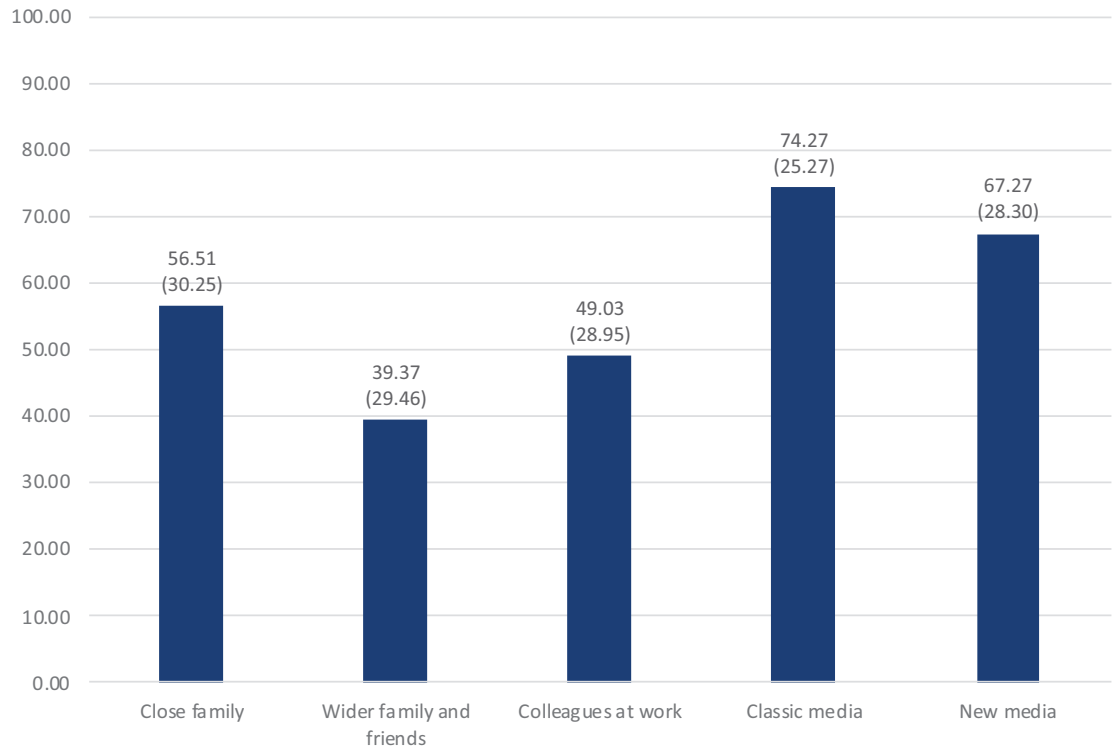

FIGURE 7 | Relevance of information sources on a scale from 0 (not important) to 100 (very important) (n = 663, arithmetic mean as number, standard deviation in brackets) (own representation).

is shown by the studies of Lajunen and Räsänen (2004) and Şimşekoğlu and Lajunen (2008) which examined the intention to use bicycle helmets and seat belts, behaviors that primarily have an impact on the individual health. We, on the other hand, study the people's evaluation of measures that are aimed to stop the Corona virus from "socially" spreading. Thus, it is surprising that the subjective norm, as a social construct, is substantially less important to people in this context.

The order of the subjective relevance—protection from the coronavirus and its consequences (attitude) over the perceived practicability of the anti-Corona measures (perceived behavioral control) and substantially over the willingness to fulfill the expectations of others (subjective norm)—indicates that people judge initiatives in context with the COVID-19 pandemic by their effectiveness and efficiency rather than by social influence or even social pressure. This structure of subjective relevance can be understood as people's expectations or preferences regarding (governmental) measures and initiatives that deeply impact people's lives and even cut their fundamental civil rights. Therefore, policymakers and other relevant institutions should primarily focus on the utility for people (in this case protection from the COVID-19 pandemic and the practicability of anti-Corona measures in the people's lives), when designing campaigns countering severe events like the COVID-19 pandemic.

Furthermore, the order of subjective relevance also indicates that people individually assess anti-Corona measures—at least they believe that they do so—and do not primarily form their opinion based on social interactions. This is backed by the relevance that people attribute to information sources during the COVID-19 pandemic: classic media is most important, followed by new media, which is, in turn, more important than social interactions with family members, friends, and colleagues (see section "Perceived Information Level, Information Sources and Perceived Threat"). Therefore, policymakers should comprehensively and factually communicate and explain the measures they are imposing on citizens. Our data suggests that this approach leads to convincing people of the necessity of strict and severe measures rather than communication campaigns incorporating social pressure, like "what would your grandmother say," which is contrary to deductions of other researchers who see the most efficient way of changing health beneficial behavior in influencing the opinion of peers (Lajunen and Räsänen, 2004). This, however, might be a culturally sensitive aspect. We collected our data in Germany, a country with a rather individualistic culture; the results might differ in countries with a rather collectivistic culture and a stronger focus on social groups other than just the closest family (Triandis, 1995).

With regard to the social spheres, our data revealed that the close family is of higher subjective relevance to people than the wider family and friends, the colleagues at work, and the society in general, when it comes to evaluating anti-Corona measures. In the context of the COVID-19 pandemic, the close family is of highest relevance to the people even though they perceive

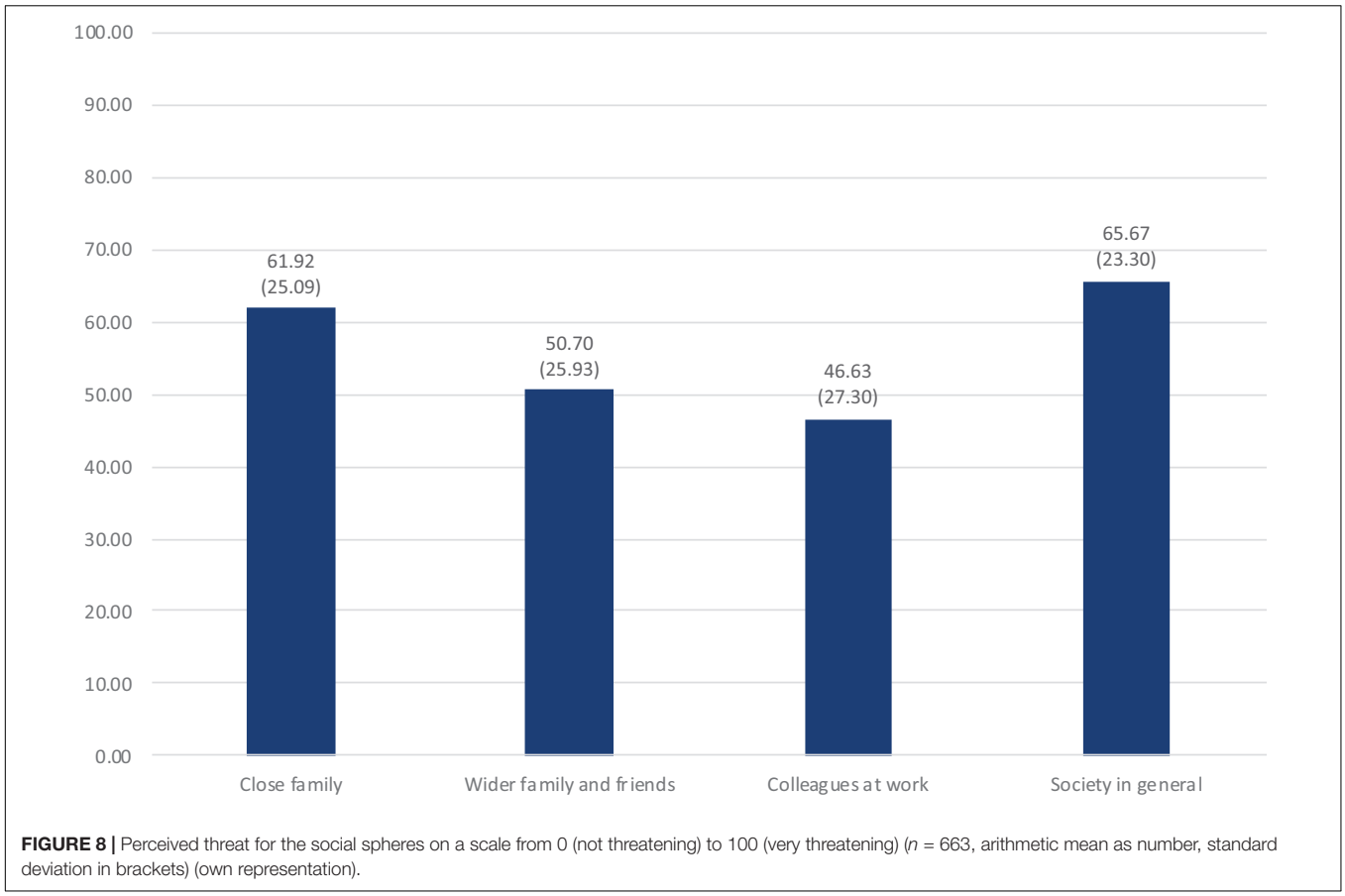

FIGURE 8 | Perceived threat for the social spheres on a scale from 0 (not threatening) to 100 (very threatening) (n = 663, arithmetic mean as number, standard deviation in brackets) (own representation).

a higher threat level for the society in general than for the close family and the other social groups (see section "Perceived Information Level, Information Sources and Perceived Threat"). This fact is, however, not surprising, as the close family normally is the group with the highest emotional closeness. What is, however, surprising is that the subjective relevance of the wider family and friends is perceived on a similar level as the subjective relevance of the colleagues at work and the society in general. One might expect that the emotional closeness and consequently the relevance of the former group are higher. An explanation might be found in the tendency of developed societies to emphasize more on individualistic values so that people predominantly focus on themselves and their small families (Triandis, 1995). Furthermore, cultural aspects might have an influence on these results, as mentioned above.

The highest subjective relevance of the close family implies that the people's expectations on (governmental) initiatives that deeply impact their lives in situations like the COVID-19 pandemic are mainly focused on the protection of their close family and the practicability within this social sphere. Therefore, in a first step policymakers and related institutions need to design and communicate such initiatives with two main questions in mind: How do the small families benefit from the measures and how can small families integrate these measures in their daily lives with relative ease and without too many hurdles? In other words, the close family should be at the core of initiatives like the recent and current anti-Corona measures. It is, however, not sufficient to only focus on the small family. The values of the subjective relevance for the wider family and friends, colleagues at work, and society in general suggest that these social spheres are not as important as the close family but cannot be disregarded from the people's perspective. Thus, the benefits for these social spheres and the referring practicability of measures need to be included as "secondary" aspects in the design and communication of severe (governmental) initiatives.

People's Evaluation on (Governmental) Initiatives and Measures

As described in Section "Subjective Calculated Quality of the Attitude, Subjective Norm and Perceived Behavioral Control, and Social Spheres," the measures against the COVID-19 pandemic and its consequences, taken in Germany, are perceived rather well by the people. This indicates that people accept measures with large impacts on their lives, including the restriction of fundamental civil rights, in the face of a threat that is perceived as being dangerous. The tips for hygiene are evaluated best, followed by the restrictions on outdoor activities which also find a relatively high level of approval. The tips for hygiene are rated positively but with a gap to the measures mentioned before. The tips for hygiene and the restrictions on outdoor activities aim to protect people from infections with the coronavirus while

the tips for mental health focus on easing rather "intangible" psychological consequences that might occur in the long run. This indicates that people focus more on the immediate threats of severe events than on the long-term consequences.

The protection from COVID-19 and its consequences (attitude), the practicability of the anti-Corona measures (perceived behavioral control), and the willingness to fulfill the expectations of others (subjective norm) show the same pattern across the three examined anti-Corona measures. The protection from COVID-19 and its consequences and the practicability of measures in people's lives are on a similar quality level which is higher than the quality of the willingness to fulfill the expectations of others. This pattern roughly mirrors the pattern of the subjective relevance which can lead to two conclusions. On the one hand, it can indicate that the measures were designed and communicated according to the expectations of people. On the other hand, it can mean that the extensive media coverage, the statements of governmental officials, and the public discussion of the COVID-19 pandemic, focusing on the threats and spreading of the virus and, with it, the necessity and benefits of hygiene and social or spatial distancing measures, have influenced the people's expectations. This explanation also corresponds with our finding that classic media is the most important source for the people to be informed about the COVID-19 pandemic (see section "Perceived Information Level, Information Sources and Perceived Threat"). Comparable results were found for the years after the terrorist attacks on September 09, 2001 when the media coverage and statements of the United States President and other United States officials positively correlated with the terrorism threat perceived by the American people (Nacos et al., 2007).

Across the three anti-Corona measures (restrictions on outdoor activities, tips for hygiene, and tips for mental health), the quality ratings for the close family and the wider family and friends, the two groups with a normally smaller size and closer emotional bonds, are higher than for the social groups of colleagues at work and the society in general. The characteristics of the former groups might lead people to believe that their individual behavior to counter the COVID-19 pandemic has a larger effect on the consequences for these particular groups and that they can trust the other group members in thoroughly applying these measures, too.

Improving (Governmental) Initiatives and Measures

In Section "Norm Strategies for Optimizing Anti-Corona Measures," the subjective quality and total normed values of the elements of our model were combined for the three examined anti-Corona measures to "automatically" deduce norm strategies according to the Means–End Theory of Complex Cognitive Structures. Across all of the measures to counter the COVID-19 pandemic and its consequences, a pattern emerged.

The protection of the close family and the wider family and friends from COVID-19 (attitude) as well as the practicability of anti-Corona measures in these social spheres (perceived behavioral control) are above average regarding both the relevance to people and the subjective quality. This accounts for all of the three measures (restrictions on outdoor activities, tips for hygiene, and tips for mental health) to counter the COVID-19 pandemic and its consequences. This means that the taken anti-Corona measures addressed the criteria that are most important for people to evaluate such measures relatively well (during the first phase of the pandemic). Therefore, from the people's perspective, policymakers and related institutions can build on the recent measures in case of a similar crisis. They should analyze which elements of the recent initiatives led to a good protection of close social groups and made applying the measures in the daily lives feasible with relative ease. The identified elements of the recent measures should be used as the core of initiatives taken in case of a similar crisis in the future regarding both the measure itself and its communication and explanation to the people. At this point, however, it should be noted that the quality of the recent anti-Corona measures is evaluated relatively well by the people but not regarded as being perfect. A perfect evaluation would have meant values for the subjective quality of 100 on the scale 0 "not good" to 100 "very good." Therefore, the recent anti-Corona measures still have room for improvement with regard to the protection and practicability within close social groups, even though it is relatively small compared to the other social spheres.

The people attribute an above-average relevance to protecting colleagues at work and the society in general from COVID-19 (attitude) but, with single exceptions across the three examined anti-Corona measures (protection of the society in general by the restrictions on outdoor activities and protection of colleagues at work by the tips for mental health), a below-average quality to the recent measures regarding these social spheres. This means that, based on the people's views, the recent anti-Corona measures have to be assessed with the aim of finding ways to improve their effectiveness in protecting larger groups with relatively loose social ties. The practicability of the recent measures (perceived behavioral control) in the context of work and societal life in general is of above-average importance to the people. With a single exception across the three examined anti-Corona measures (practicability of the tips for hygiene within the social sphere of colleagues at work), the quality of these measures is rated below average by the people. Thus, the recent anti-Corona measures have a relative weakness with regard to people being able to easily integrate a corresponding behavior in their work and wider social life. This means in this area, too, that policymakers and related institutions should identify parts and elements of the recent initiatives that can increase the protection of larger social entities and are, at the same time, relatively easy to be implemented in the people's daily lives. Because of the relatively high relevance perceived by the people, improving both the protection of colleagues at work and the society in general as well as the practicability of measures in these social spheres should be given a high priority for potential future crisis, similar to the current one.

The willingness to fulfill the expectations of others (subjective norm) is of substantially lower relevance to the people than the

two afore-discussed aspects. Against this backdrop, policymakers and related institutions are advised to abstain from integrating any form of social pressure in initiatives like the recent anti-Corona measures [see also section "People's Expectations on (Governmental) Initiatives and Measures"]. An option for future (governmental) reactions to a severe crisis might be to encourage the people to communicate with each other. This should be, however, considered with a lower priority. The focus should be on protecting people from a threat and making it as easy as possible for them to realize restrictive measures in their lives.

Limitations and Outlook

Our data revealed that, in contrast to other studies that investigated healthy behavior like the use of bicycle helmets or seat belts (Lajunen and Räsänen, 2004; Şimşekoğlu and Lajunen, 2008), the subjective norm is of lower relevance to the people in the context of the COVID-19 pandemic and the referring counter-measures [see section "People's Expectations on (Governmental) Initiatives and Measures"]. However, it has to be mentioned that a comparison of daily life healthy behavior can probably only partially be compared to an exceptional situation of a global pandemic. Nonetheless, we suggest that future research should focus more on the subjective norm when examining the Covid-19 pandemic and healthy behavior in general, having the aforementioned limitation in mind. One reason for the divergence of others and our findings might be that we collected our data in Germany and cannot rule out a cultural influence on the results. Therefore, we suggest that our study is replicated in other countries. Such a replication should not aim to find a one-fits-all solution on how to deal with severe crises, like the COVID-19 pandemic, all over the globe but to find solutions that are suited best for the specific expectations of people in different cultures.

Our findings indicate that the three examined anti-Corona measures and all of its subordinated elements are received rather well by the people [see section "People's Evaluation on (Governmental) Initiatives and Measures"]. In this context, it has to be mentioned that we collected the data at an early stage of the Corona crisis in Germany after the measures to counter the pandemic were newly introduced. Therefore, we cannot make any statements about if and how the attitudes toward the anti-Corona measures have changed. Therefore, a longitudinal research approach based on our method is advised to reveal the people's evaluation of the long-term effects of the severe measures, which deeply impact the lives of virtually everyone.

It is fair to assume that the results from our study give solid and reliable insights in the perception of the anti-Corona measures of the average German, as our participants are not only students but also fully integrated in the work life. However, our sample is rather homogenous regarding, among other indicators, age or circumstances of life. Therefore, we could not make any statements about how rather stable characteristics of people, like personality dispositions or the individual situation of life, influence the perceived relevance and quality of anti-Corona measures. Against this backdrop, it might be fruitful to examine this aspect in experimental designs using our model or elements of it.

We could find that the subjective relevance and the perceived quality of the protection from the COVID-19 pandemic and its consequences (attitude), the willingness to fulfill the expectations of others (subjective norm), and the practicability of anti-Corona measures (perceived behavioral control) are showing similar patterns [see section "People's Evaluation on (Governmental) Initiatives and Measures"]. One explanation can be that the media reporting about the COVID-19 pandemic and the counter-measures has formed or at least influenced the expectations of people. We regard a deeper examination of this aspect as worthwhile, especially to gain a better understanding how the media influences people's opinions in times of crisis.

In Sections "Norm Strategies for Optimizing Anti-Corona Measures" and "Improving (Governmental) Initiatives and Measures," we pointed out on which evaluation criteria of the people a government or related institutions should focus when securing or improving the effectiveness of the recent measures to counter the COVID-19 pandemic. Our method did not allow us to specifically pinpoint single elements of the three anti-Corona measures to be persevered or modified. Against this backdrop, we suggest that, in future research, the evaluation criteria of the people are correlated with the elements of the main anti-Corona measures which can contribute to an improved design and communication of (governmental) initiatives countering potential severe crises in the future.

Conclusion

One of the main results of our research is that the protection from the COVID-19 pandemic and its consequences (attitude) and the practicability of the anti-Corona measures (perceived behavioral control) are more important to the people than the willingness to fulfill the expectations of others (subjective norm), as discussed in Section "People's Expectations on (Governmental) Initiatives and Measures." This indicates that policymakers should focus on the utility to people when designing and communicating measures that severely impact people's lives. Furthermore, a factual and comprehensive communication of the taken initiatives is advised. Even though all of the social spheres are relevant to the people in the context of the COVID-19 pandemic, the close family shows the highest importance from the people's perspective. Thus, the close family should be at the core of (governmental) measures in times of crisis.

The perceived quality of the anti-Corona measures shows a similar pattern as subjective relevance, as discussed in Section "People's Evaluation on (Governmental) Initiatives and Measures." This indicates that the German government took measures that structurally mirror the expectations of the people. It, however, can also indicate that the media coverage and governmental statements influenced the expectations of the citizens. Furthermore, we could find that the restrictions on outdoor activities and tips for hygiene are evaluated better than the tips for mental health, which indicates that people focus on immediate threats rather than long-term consequences during a severe crisis.

In Section "Improving (Governmental) Initiatives and Measures," we discussed options of improving the recent anti-Corona measures. In the case of a similar crisis like the current one, (governmental) initiatives can be built on the recent measures with regard to the close family and the wider family and friends, so that the effectiveness in these areas should be secured with a high priority. The effectiveness of anti-Corona measures with regard to protecting colleagues at work and the society in general and their practicability in these social spheres should be increased with a high priority. Social pressure or similar approaches, on the other hand, should not or only with low priority be included in initiatives during a crisis like the COVID-19 pandemic.

Apart from the people's evaluation of anti-Corona measures, we could develop a three-level model that can potentially be used in future research of the COVID-19 pandemic, health-related behavior in the social context, and societal crises and counter-measures in general (see section "Hypothesized Model and Research Questions"). The same accounts for our method, the Means–End Theory of Complex Cognitive Structures (see section "Materials and Methods"), which allows to model and measure cognitions or attitudinal systems with multiple levels. The comparison of empirically measured and calculated values (see section "Subjective Calculated Quality of the Attitude, Subjective Norm and Perceived Behavioral Control, and Social Spheres") and the comparison of our results in Section "Results" and the results of partial least-square path modeling (see **Supplementary Materials**) indicate a good adequacy of our model and method.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

HG and SR-F designed and planned the study and wrote the manuscript. HG processed the data, performed the statistical analysis, and designed the figures and tables. LH conducted literature search and contributed to writing the manuscript, especially the introduction. All authors provided critical feedback and helped in every stage of the research, analysis, and manuscript.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2020.567405/full#supplementary-material

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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BRIEF RESEARCH REPORT
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Perceived Stress and Daily Well-Being During the COVID-19 Outbreak: The Moderating Role of Age

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Objectives: Older adults are considered one of the most vulnerable groups to COVID-19. However, previous studies on emotion and aging have found that older adults report better wellbeing than younger adults in global surveys and daily reports. To better understand older adults' wellbeing during the COVID-19 outbreak, we examined age differences in daily affective experiences in this study.

Methods: Two hundred and thirty-one participants from mainland China aged 18 to 85 were recruited to participate in the 14-day daily diary study, after a pretest. Their trait affect and demographic information were measured in the pretest. Their daily affect and stress levels were measured in the daily assessments.

Results: I found that older adults reported lower perceived stress related to COVID-19 in daily life, compared to younger adults. The negative relationship between daily perceived stress and high arousal positive affect and the positive relationship between daily perceived stress and high arousal negative affect was weaker in older than younger adults.

Discussion: These results provide initial evidence of daily affective wellbeing across different age groups in adulthood during the COVID-19 outbreak. Such information is important for developing interventions to promote better wellbeing during the COVID-19 outbreak.

Keywords: affective experiences, perceived stress, age, daily diary, COVID-19

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INTRODUCTION

The Coronavirus Disease 2019 (COVID-19) epidemic started in December 2019 and quickly spread to more than 215 countries by mid-April 2020. Due to its serious effects on human health, it can also damage mental health by increasing levels of anxiety, stress, and worry among health professionals, and the general public (Qiu et al., 2020). Although older adults are considered one of the most vulnerable groups to COVID-19 (Remuzzi and Remuzzi, 2020), some global surveys found that older adults reported less depression and anxiety (Bruine de Bruin, 2020; Losada-Baltar et al., 2020). However, few studies so far have

examined whether the daily wellbeing of older adults was indeed better than their younger counterparts. To this end, I examined the daily perceived stress of Chinese people across different age groups in adulthood during the COVID-19 outbreak. In addition, I examined age differences in the relationship between daily perceived stress and daily wellbeing.

In the literature on aging and emotion, older adults generally report a higher level of positive affect (e.g., happiness, enthusiastic, and calm) and a lower level of negative affect (e.g., anxiety, sadness, and stress) than younger adults in global surveys and daily diary studies (Gross et al., 1997; Carstensen et al., 2000). These results have been explained by socioemotional selectivity theory (SST) (Carstensen et al., 2003). SST postulates that older adults prioritize emotionally meaningful goals (e.g., experience positive emotions) over knowledge goals (e.g., learn new knowledge) more than younger adults, because they view future time as more limited. Prioritizing emotionally meaningful goals, older adults are more motivated to regulate their emotions toward a positive end (Fung and Carstensen, 2006). Therefore, they report better wellbeing in general even after experiencing negative affect. In a laboratory experiment, Scott et al. (2017) found no age difference in regulating momentary negative stressors (0–10 min), but older adults better regulated stressors after being exposed to stressors for 10 min to 2.5 h. The COVID-19 outbreak is a situation that induces tremendous psychological distress (Qiu et al., 2020). Although older adults reported better mental health in one-off surveys (Bruine de Bruin, 2020; Yang et al., 2020), it is unknown whether older adults can still regulate their emotions better than younger adults in real-time daily life. Therefore, I examined age differences in daily perceived stress and its relationship with daily wellbeing using a 14-day daily diary study in a lifespan sample.

Based on the two-dimensional valence-arousal model (Russell, 1980), I examined people's daily affective experiences during the COVID-19 outbreak using a daily diary method by which participants' affective experiences were measured on a daily basis. In particular, I focused on daily stress, and daily experiences of the positive affect (POS), high arousal positive affect (HAP), low arousal positive affect (LAP), negative affect (NEG), high arousal negative affect (HAN), and low arousal negative affect (LAN). Based on SST (Carstensen et al., 2003), I predicted that older adults would experience a lower level of perceived stress related to COVID-19 (H1). In addition, I predicted that the relationship between daily perceived stress and daily wellbeing (indexed by higher levels of POS, HAP, and LAP, and lower levels of NEG, HAN, and LAN) would be weaker in older than younger adults.

MATERIALS AND METHODS

Participants

Two hundred and thirty-one Chinese participants aged 18 to 85 (M_{age} = 44.74 years, SD_{age} = 17.54 years; 69% women; 70% had a college degree; 41% had a job; 17% had a religion) participated in the study in February 2020. Thirty-three percent of the sample were aged between 18 to 35 years, 51.5% were aged between 36–60 years, and 15% were aged between 61 years and above. They were recruited through mass mailing through a university email system. All participants were born and raised in China, and lived in mainland China during the 14-day daily diary period. They came from 23 of the 32 provinces, cities, and autonomous regions in mainland China. Two participants came from Hubei province. We included their data in the analysis because the results did not change when deleting their data. However, four participants were excluded from the data analysis due to missing data in their daily diaries. Among the remaining 227 participants, 192 completed 14 daily questionnaires (*Range* = 1–14 times; $M_{assessment}$ = 13.26, *SD* = 2.66). One of them was identified as a confirmed or suspected COVID-19 case during the questionnaire period, but the deletion of the data did not change the pattern of the results. Descriptive information about the sample is presented in **Table 1**.

Procedure

The study was conducted during the peak period of COVID-19 spread in China. All questionnaires were completed online using the Wenjuan.com online survey system. After an introductory e-mail and a briefing session via WeChat, the participants were asked to complete an online survey on their demographic information. The daily diary period started from the second day after the first online survey and lasted 14 consecutive days. A WeChat message containing the URL link to the online questionnaire was sent to the participants around 8 pm each day to remind them to complete the daily questionnaire. They received another reminder via WeChat if they had not completed the questionnaire by 9 am the next morning. All participants received HK$200 (approximately US$25) after completing the study. This study was approved by the Human Research Ethics Committee of the Education University of Hong Kong.

Measures

Trait Questionnaire

Actual trait affect

We used the Affect Valuation Index (AVI; Tsai et al., 2006) to measure their actual trait affect. The participants were asked

TABLE 1 | Descriptive statistics of all study variables.

	Minimum	Maximum	Mean	SD
Age	18.00	85.00	44.74	17.54
Overall health	1.00	6.00	4.19	0.93
Subjective socioeconomic status	2.00	10.00	6.20	1.61
Daily HAP*	1.00	5.00	3.00	0.98
Daily LAP*	1.00	5.00	2.94	0.84
Daily HAN*	1.00	5.00	1.90	0.90
Daily LAN*	1.00	5.00	1.92	0.99
Daily stress*	1	5.00	2.32	0.75
Gender (female%)			69%	
Marital%			13%	
Education (% college)			71%	
Religion (% have a religion)			17%	

*N = 231. HAP = high-arousal positive affect; LAP = low-arousal positive affect; HAN = high-arousal negative affect; LAN = low-arousal negative affect. *indicates weighted means by the number of assessments.*

to indicate how often they actually experienced each affective state in a typical week on a 5-point scale, ranging from 1 "*never*" to 5 "*always*." Based on the two-dimensional valence-arousal model, HAP was measured by the aggregate score of "enthusiastic," "excited," and "elated" (Cronbach's α = 0.68); LAP was measured by the aggregate score of "calm," "relaxed," "peaceful," and "serene" (Cronbach's α = 0.76); HAN was measured by the aggregate score of "fear," "hostile," and "nervous" (Cronbach's α = 0.71); and LAN was measured by the aggregate score of "dull," "sleepy," and "sluggish" (Cronbach's α = 0.71).

Demographic information

The participants were asked to indicate their gender (0 = male, 1 = female), partner status (0 = without partner, 1 = with partner), education (0 = did not finish college, 1 = finished college), religion (0 = no religion, 1 = has a religion), and overall subjective health (1 = very poor to 6 = perfect).

Daily Questionnaire

Daily actual affect

The daily version of the AVI (Tsai et al., 2006) was used to assess daily actual affect. The participants were asked to indicate the intensity with which they actually experienced each affective state on that day on a 5-point scale, ranging from 1 "*not at all*" to 5 "*extremely*." In particular, HAP was measured by "enthusiastic" (intraclass correlation coefficients (ICC) = 53%); LAP was measured by "calm" (ICC = 44%); HAN was measured by "anxious" (ICC = 52%); LAN was measured by "dull" (ICC = 55%); positive affect was measured by "happy" (ICC = 51%); and negative affect was measured by "sad" (ICC = 49%).

TABLE 2 | Multilevel hierarchical linear analysis testing the age differences in daily perceived stress.

	Estimate	SE
Level 1		
Day	0.006	0.003
Daily health	**−0.082****	**0.023**
Level 2		
Intercept	**1.801****	**0.173**
Age	**−0.006***	**0.003**
Marital	−0.151	0.124
SES	**−0.059***	**0.025**
Education	−0.106	0.106
Religion	**−0.226***	**0.111**
Random effects	**Variance component**	χ^2
Intercept	**0.604**	**1020.62****
Day	**0.001**	**450.81****
Health	**0.046**	**374.82****

*N for level 1 variables is 3030, and N for level 2 variables is 222. *p < 0.05, **p < 0.001.*

Perceived stress related to COVID-19

The Perceived Stress Scale (Cohen et al., 1983) was adapted to measure the participants' daily perceived stress related to COVID-19. "In the last month" in the original version was changed to "today" to measure daily stress. Three items for unexpected life changes were used in the short daily questionnaire, including "I was upset because of COVID-19 today," "I felt that I was unable to control the important things in my life because of COVID-19 today," and "Despite COVID-19, I felt confident about my ability to handle my personal problems." The participants were asked to indicate how often they agreed with the statement, from 1 "*never*" to 5 "*always*" (ICC = 67%, between-person reliability estimate = 0.71; within-person reliability estimate = 0.68; Cranford et al., 2006).

Subjective health

The participants were asked to rate their daily subjective health on a scale from 1 "*very poor*" to 6 "*perfect.*"

DATA ANALYSIS AND RESULTS

Age differences in perceived daily stress during the COVID-19 outbreak were first examined. Then whether there were age differences in the relationship between daily stress and daily affective experiences were determined. These questions were addressed using Hierarchical Linear Modeling (HLM; Raudenbush, 2004). The results were controlled for daily subjective health, the number of days of assessment, marital status, socioeconomic status, education, and religion because these variables were found to be associated with daily affect and stress. Marital status, religion, and education were included in the model as bivariate variables, while age, daily subjective health, and socioeconomic status were centered on the grand mean. HLM models of the two research questions are reported below.

HLM Model Equations

Age Differences in Daily Perceived Stress

Below are the model equations addressing this question.

Level-1 model

Perceived stress = B0 + B1*(Day) + B2*(daily health) + r

Level-2 model

B0 = G00 + G01*(age) + G02*(marital status) + G03*(socioeconomic status) + G04* (education) + G05*(religion) + u0
B1 = G10 + u1
B2 = G20 + u2

The Relationship Between Daily Affective Experiences and Perceived Stress

Level-1 model

Affective experiences = B0 + B1*(day) + B2*(daily health) + B3*(daily perceived stress) + r

TABLE 3 | Multilevel hierarchical linear analysis testing the age differences in the relationship between perceived stress and daily affective experiences.

	Positive		Negative		HAP		LAP		HAN		LAN	
	Estimated	**SE**	**Estimated**	**SE**	**Estimated**	**SE**	**Estimated**	**SE**	**Estimated**	**SE**	**Estimated**	**SE**
Level 1												
Day	**−0.013***	**0.004**	**−0.013***	**0.004**	0.003	0.005	**−0.026*****	**0.004**	−0.006	0.004	**−0.018**	**0.004**
Daily health	**0.132*****	**0.026**	**−0.064***	**0.024**	**0.140*****	**0.029**	0.020	0.024	**−0.108*****	**0.027**	**−0.121*****	**0.030**
Stress	**−0.282*****	**0.033**	**0.247*****	**0.029**	**−0.153*****	**0.035**	**−0.078***	**0.034**	**0.431*****	**0.032**	**0.302*****	**0.033**
Level 2												
Intercept	**3.388*****	**0.089**	**1.582*****	**0.068**	**2.955*****	**0.109**	**3.117*****	**0.087**	**2.061*****	**0.077**	**2.194*****	**0.092**
Age	−0.001	0.003	−0.000	0.002	0.001	0.003	0.003	0.003	**−0.009*****	**0.002**	−0.005	0.003
Marital	0.014	0.116	−0.018	0.082	−0.255	0.142	−0.200	0.113	0.070	0.099	−0.012	0.120
SES	**0.074***	**0.025**	**−0.044***	**0.017**	0.040	0.030	−0.009	0.024	−0.008	0.021	**−0.071***	**0.025**
Education	−0.064	0.101	0.023	0.071	0.005	0.123	0.063	0.098	−0.142	0.086	−0.151	0.104
Religion	0.122	0.106	0.009	0.069	0.142	0.129	−0.127	0.104	0.040	0.088	−0.132	0.106
L1 X L2 Interaction												
Stress X Age	0.003	0.002	0.002	0.002	**0.005***	**0.002**	0.003	0.002	**−0.005***	**0.002**	0.001	0.002
Random effects	VC	χ^2	VC	χ^2	VC	χ^2	VC	χ^2	VC	χ^2	VC	χ^2
Intercept	**0.270**	**362.433*****	**0.216**	**360.014*****	**0.684**	**469.96*****	**0.238**	**324.001*****	**0.207**	**358.153*****	**0.272**	**384.803*****
Day slope	**0.002**	**256.632*****	**0.002**	**267.800*****	**0.002**	**352.46*****	0.001	179.337	**0.002**	**309.785*****	**0.002**	**284.361*****
Daily health Slope	**0.037**	**218.230****	**0.0352**	**287.927*****	**0.043**	**0.043***	0.019	179.065	**0.051**	**272.732*****	**0.059**	**264.771*****
Stress slope	**0.058**	**175.876**	**0.051**	**205.276***	0.050	183.36	**0.067**	**210.44***	**0.056**	**251.472*****	**0.046**	**198.94***

*N for level 1 variables is 3030, and N for level 2 variables is 222. HAP = high-arousal positive affect; LAP = low-arousal positive affect; HAN = high-arousal negative affect; LAN = low-arousal negative affect. *p < 0.05, **p < 0.01, ***p < 0.001.*

Level-2 model

$$B0 = G00 + G01^{*}(\text{gender}) + G02^{*}(\text{age}) + G03^{*}(\text{marital status}) + G04^{*}(\text{socioeconomic status}) + G05^{*}(\text{education}) + G06^{*}(\text{religion}) + u0$$
$$B1 = G10 + u1$$
$$B2 = G20 + u2$$
$$B3 = G30 + u3$$

Age Differences in Daily Perceived Stress

With perceived stress as the dependent variable, the variance components (VC) suggested that there was significant variance in the intercept to be explained across individuals ($\chi^2 = 1020.62$, $p < 0.001$). Age was associated with daily lesser perceived stress (*estimate* = −0.006, *SE* = 0.003, $p < 0.05$). Ordinal day was associated with less positive affect, (*estimate* = −0.010, *SE* = 0.003, $p < 0.01$), suggesting that participants reported less stress in the later days of the daily diary period. Detailed results are reported in **Table 2**.

The Relationship Between Daily Affective Experiences and Perceived Stress

Age differences in the relationship between perceived stress and daily affective experiences were then examined. Perceived stress was negatively associated with daily positive affect (*estimate* = −0.282, *SE* = 0.033 $p < 0.001$), HAP (*estimate* = −0.153, *SE* = 0.035, $p < 0.001$), and LAP (*estimate* = −0.078, *SE* = 0.034, $p < 0.05$); and was positively associated with daily negative affect (*estimate* = 0.247, *SE* = 0.029, $p < 0.001$), HAN (*estimate* = 0.431, *SE* = 0.032, $p < 0.001$), and LAN (*estimate* = 0.302, *SE* = 0.033, $p < 0.001$). The relationship between stress and HAP was moderated by age so that the negative association was weaker in older than younger adults (*estimate* = 0.005, *SE* = 0.002, $p < 0.05$). The relationship between stress and HAN was also weaker in older than younger adults (*estimate* = −0.005, *SE* = 0.002, $p < 0.05$). Age did not moderate the relationships between stress and other daily affective states. Detailed results are reported in **Table 3**.

DISCUSSION AND CONCLUSION

Using a 14-day daily diary study, we examined people's daily affective experiences across different age groups in adulthood during home quarantine when COVID-19 broke out in mainland China. We found that older adults reported a lower level of perceived stress related to COVID-19 than younger adults. In addition, we found that the negative association between daily perceived stress and daily high arousal positive affect was weaker in older than younger adults; and that the positive relationship between daily perceived health and daily high arousal negative affect was also weaker in older than younger adults.

Consistent with the previous findings on age differences in perceived stress after stress induction (Scott et al., 2017), we found that older adults reported a lower level of daily perceived stress than younger adults during the COVID-19 outbreak. These findings could be explained by SST that found that older adults are more motivated to regulate emotion than younger adults (Carstensen et al., 2003). In addition, these results are consistent with a recent one-off surveys on age differences in loneliness during home quarantine in Spain (Losada-Baltar et al., 2020) and China (Qiu et al., 2020). These findings, taken together, may suggest that older adults indeed perceived less stress during the outbreak of COVID-19.

We only found significant age differences in the relationship between daily stress and high arousal affect, regardless of valence. Such findings may be attributable to the fact that stress is a high arousal affective state. Therefore, the feeling of stress might be more relevant to high arousal positive and negative affect than the low arousal ones. It may also be possible that individuals regardless of age prefer low arousal affect states over high arousal affect states, when they see future time as increasingly limited (Jiang et al., 2016). The situation of COVID-19 induces a more limited future time perspective, because it damages both mental and physical health (Yang et al., 2020). Low arousal affective states are more relevant to the situation of COVID-19 for both younger and older adults. Therefore, the age differences were only observed in high arousal affective states. Future studies should clarify the mechanism of the age differences in the relationship between daily stress and different types of daily affective states. Although older adults are considered as one of the most vulnerable groups during COVID-19, the findings of this study, together with the previous findings, may suggest that older adults indeed have a better ability to cope with the psychological distress caused by COVID-19. However, more support and effort should be given to protect their physical health (Nikolich-Zugich et al., 2020).

Despite its interesting results, the study also has limitations. First, although we included multiple assessment points, this study was based on a correlational design. Thus, we were not able to examine the mechanism underlying the relationship. Second, the sample used may not be representative of the population of mainland China. In particular, the education level in this sample was higher than that of the general population. Although demographic information, such as education level, marital status, religion, and socioeconomic status, was controlled for in data analysis, a larger sample size is needed to validate findings of this initial study on daily affective experiences during the COVID-19 outbreak in future studies. Third and as aforementioned, we could not explain the non-significant interactions between age and fate control on daily affective experiences. Future studies should clarify this issue.

In this 14-day daily diary study, we found that older adults reported a lower level of perceived stress related to COVID-19 than younger adults. The negative relationship between perceived stress and a high arousal positive affective state, and the positive relationship between perceived stress and a high arousal negative affective state were weaker in older than younger adults. These results provide initial evidence of the daily affective wellbeing of adults during the COVID-19 epidemic in China. These findings provide initial evidence on daily affect during home quarantine of individuals across different age groups in adulthood. Such information may be important for preparing different mental health services for people in different age groups.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be available upon sending request to the corresponding author, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Human Research Ethics Committee of the Education University of Hong Kong. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

The author contributes to theoretical framework, data analysis, and manuscript writing of the manuscript.

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Conflict of Interest: The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Behavioral Implications of the Covid-19 Process for Autism Spectrum Disorder, and Individuals' Comprehension of and Reactions to the Pandemic Conditions

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During disasters and pandemics, vulnerable populations such as patients with mental conditions are known to be overly influenced. Yet, not much is known about how the individuals with autism spectrum disorder (ASD), one of the most common neurodevelopmental conditions globally with a prevalence of 1%, are affected from health-related disasters, especially the current Covid-19 pandemic. Therefore, we conducted an investigation of how individuals with ASD responded to Covid-19 in terms of comprehension and adherence to implemented measures; changes in their behavioral problems; and how their caregivers' anxiety levels relate with these behavioral changes. Our sample consisted of 87 individuals with ASD (15 girls; ages ranged from 3–29, with an average of 13.96 ± 6.1). The majority of our sample had problems understanding what Covid-19 is and the measures it requires. They also had challenges in implementing social distance and hygiene-related regulations of the pandemic. The majority stopped receiving special education during this period. We observed a Covid-19-related clinical presentation that resembled PTSD in individuals with ASD in terms of increased stereotypies, aggression, hypersensitivity, behavioral problems, and sleep and appetite alterations. All subscales of Aberrant Behavior Checklist (ABC) differed significantly between before and after the pandemic conditions. The number of hours the children slept significantly decreased from before to during Covid-19. The anxiety levels of caregivers were high and correlated with the current behavioral problem levels of their children, but not with the level of their behavioral problems before the pandemic. The difference in ABC total score and specifically the lethargy/social withdrawal subscale score predicted parents' anxiety score. Our results suggest that the Covid-19 period inflicts specific challenges to individuals with ASD and their caregivers, underlining the need for targeted, distance special education interventions and other support services for this population.

Keywords: anxiety, autism spectrum disorder (ASD), behavior, pandemic (COVID-19), parents, psychopathology

INTRODUCTION

Disasters and plagues, such as Covid-19, impact individuals with severe and chronic mental conditions disproportionately (1). Yet, there seems to be scant evidence on how individuals with Autism Spectrum Disorder (ASD), one of the most common neurodevelopmental conditions worldwide, react to disaster conditions. With the numerous disasters worldwide of terrorist attacks, tsunamis, hurricanes, bombings, and earthquakes, the lack of focus on their psychological implications for children with ASD started coming to attention (2). Yet, beyond one study showing individuals with ASD to have decreased adaptive behaviors after exposure to an earthquake, and another indicating disaster awareness training to increase disaster preparedness of children with ASD, there is no data on how individuals with ASD react to disasters in general (3, 4). Additionally, beyond any previous disasters, there is no information on how individuals with ASD are affected by pandemics. Specifically, the repercussions of the global lifestyle changes induced by the Covid-19 pandemic on the autism population are unknown. Given their specific profiles of social interaction difficulties, restricted and repetitive behaviors, and having special education as the only validated intervention, individuals with ASD likely face difficulties over and beyond those experienced by the general population, and other psychological, physiological, and social implications for this population, which is the focus of the current investigation.

Pandemics are similar to other disasters in their unpredictability, fatalities, and persistent effects, yet, they are dissociate from disasters as they prevent victims from converging and gathering and instead requiring the opposite reactions of separation, isolation, and quarantine, which end up interfering with family norms and rituals that generally protect family functioning during crises (5). Such rituals are especially relevant to the ASD population, where repetitive behaviors and interests are a defining feature of the condition and affected individuals adhere to rigid daily rituals. Beyond their health and fatality consequences, pandemics of infectious diseases tend to induce widespread anxiety and psychological problems (6). The current pandemic, Covid-19, has been declared a public health emergency of international concern by the World Health Organization (7). A recent study found the symptoms of children with attention deficit hyperactivity disorder (ADHD) to significantly worsen during the Covid-19 outbreak and emphasized the need to focus on special vulnerable populations during the pandemic (8). Though no such study exists for individuals with ASD during Covid-19, the Covid-19-related risk factors Zhang et al. speculated for children with ADHD seem applicable to individuals with ASD as well, especially the loss of daily routine, inability to access and receive care from primary care settings, and the increased worry of parents further exacerbating children's psychological well-being and increasing their behavioral problems.

ASD is characterized by disturbances in social communication with limited and repetitive areas of interest, which start in early childhood and usually remain lifelong (9). According to the most recent incidence rate, it affects 1 in 54 individuals (10). Most patients also have comorbid intellectual disability and other psychiatric conditions such as ADHD, anxiety disorders, disruptive/impulse-control/conduct disorders, depressive disorders, and obsessive-compulsive disorder (11). Developmental pediatrician Sharon Smile considers children and youth with ASD to be "vulnerable to the effects of prolonged isolation and quarantine and may have difficulty adapting to this new form, especially as inflexibility and insistence on sameness are hallmark characteristics of this disorder" and highlights the need for easily implemented programs that address the needs of children with ASD and their families (12). One such program was described in Italy, where after parents of children with ASD reported their children no longer being satisfied with their usual reinforcers, becoming increasingly uncooperative, and displaying high stereotypy and problem behavior levels, researchers formulated a protocol through their observations and discussions with parents. Verbally interactive children received tutoring and the parents of preschool-aged and minimally verbal children received parent coaching (13). As they did not yet analyze their data, the effectiveness or mediators thereof are not known. Nonetheless, this paper sheds some light on the potential challenges induced by the current pandemic conditions on the ASD population and an initial intervention attempted to alleviate some of these challenges. Another relevant paper is an editorial that presents 10 tips to help parents and caregivers of young children with ASD during the Covid-19 stay at home period (14).

Not much is known about the effects of the Covid-19-related changes created in living conditions on individuals with an ASD diagnosis. Our clinical experiences and the feedback we have received from patients and their caregivers indicate the presence of particular adversities experienced during the pandemic by this population. These adversities can be classified in four subgroups. Firstly, individuals with ASD seem to have a different understanding and knowledge of Covid-19 compared to their peers. This can be explained by differences in abstract thinking, as understanding the non-visible and non-concrete concept of Covid-19, the comprehension of its potential health threats including death, and related reasoning requires abstract thinking (15). Therefore, individuals with ASD may be unable to understand, follow, and benefit from basic preventive methods that are formulated for the general population, which may be inapplicable or challenging for this group. Examples we observed are particular challenges with social distancing and tolerating long durations in home-isolation. This is corroborated in the recent article written by a researcher with ASD who highlights the importance of support for individuals with ASD to cope with the uncertainties and anxiety of Covid-19 while noting the absence thereof of both social and professional support due to social distancing measures, and the potential mental health consequences of reduced access to their already minimal support networks (16). Secondly, individuals with ASD are strictly bound to daily routines, and the isolation process can disturb them by changing their routine, such as going to school or special education at a specific time. Thirdly, symptoms and

behavioral disturbances of individuals with ASD can be expected to increase because of the interruption of intensive behavioral and educational interventions that are effective in creating positive change in these domains (17). This adversity is expected to gain importance as the pandemic is predicted to continue for some time. Interruptions in behavioral and educational interventions may increase the ASD symptoms and behavior problems of individuals with ASD. Lastly, caregivers of children with ASD experience significantly higher levels of stress and anxiety compared to caregivers of typically developing children (18). Social support is shown to be a protective factor against stress in parents of children with ASD, where support from friends emerged as the most important factor, and support from significant others and family were less potent protectors (19). This social support from friends that carries such importance for stress protection in caregivers in children with ASD likely becomes less available during the social isolation measures of Covid-19. Moreover, parents of children with ASD were found to display higher cortisol response to psychosocial stress compared to parents of typically developing children and this increased physiological reactivity to acute psychosocial stress (18) may result in parents of children with ASD experiencing more stress during the Covid-19 pandemic compared to parents of typically developing children, which may be even more aggravated by increased behavioral problems and quarantine-related challenges of their children with ASD. Therefore, parent's stress and anxiety levels and difficulties experienced by the children including but not limited to behavioral problems may reciprocally exacerbate each other over the course of the pandemic.

On the other hand, some Covid-19-related situations may be dealt with easier by some children with ASD and their families. The higher adherence to rules and routines and aversion of socialization and physical contact in individuals with ASD may facilitate following mandated hygiene measures such as frequent hand washing or avoiding physical contact with people or surfaces. The risk of sensory overload may be lowered as the children will be out of home less frequently due to home confinement measures. In their recent qualitative study on children with special needs, of which the majority has ASD, and their parents, Asbury et al. found that a small proportion of participants reported some positive impacts of the quarantine, such as not experiencing the challenges of daily routines as going to school or other public places or anxiety of socializing with others (20). Yet, these ASD-related strengths for dealing with Covid-19 measures are likely to be limited and not balance out the precipitated challenges.

Building on our clinical observations along with previous reports and findings, we have conducted one of the earliest studies to the best of our knowledge about the effects of the Covid-19-related life changes on individuals with ASD. We hypothesized that individuals with ASD would have a poor understanding of Covid-19 and related measures. Our second hypothesis was that their ASD symptoms and related behavioral problems, sensory sensitivity, and sleep patterns would have worsened during the pandemic. Our last hypothesis was that the anxiety levels of their caregivers would have increased during the pandemic.

METHOD

Participants

Our sample comprised 87 individuals with ASD from the patient database of the Koc University Hospital, with 72 (83%) males, mean age of the participants 13.96 ± 6.1, and an age range of 3–29 years. The inclusion criterion was having been diagnosed with ASD according to DSM-5 criteria by child psychiatrists with over 10 years of experience in ASD. These patients are regularly followed up in the child psychiatry outpatient unit every 2 months and have up-to-date medical records of their evaluations. The exclusion criterion was having a severe neurological disease or a complex genetic syndrome.

Procedure

We detected 191 patients diagnosed with ASD in our patient database. The psychologists from our department reached families via phone, introduced the study and invited them to participate. The participation rate was 46% (**Figure 1**). After parents' verbal assent for the study participation, we sent families an online survey link comprising the written informed consent, sociodemographic form, and the following questions and questionnaires. We questioned the comprehension about Covid-19, communication methods and reactions to pandemic measures of the individuals with ASD. Questions comprised whether tics, stereotypical behaviors or appetite were affected. The sensory hypo/hypersensitivity level, Aberrant Behavior Checklist (ABC), sleep parameters were questioned for before and during the Covid-19 measures. The primary caregivers' anxiety level was assessed by Beck Anxiety Inventory (BAI) for present time only. In addition to the parent-reported surveys, relevant data from medical records were collected.

Measures

Sociodemographic form. The age, gender, educational level of the participant, special education status, number of siblings were collected through a sociodemographic form.

Clinical registration data. In order to determine our sample characteristics, we collected ASD-related clinical information from the clinical registration system of our hospital. We rated autism severity according to the level of support level required as defined in DSM-5; language level as the three categorizations of "absence of language," "speech via words only," "speech via sentences"; and IQ as indicated through "no intellectual disability (ID) or borderline IQ," "mild ID," and "moderate or severe ID." We recorded other psychiatric comorbidities and assessed their severity according to the Clinical Global Impression scale with ratings ranging between 1 (Normal, not at all ill) and 7 (among the most extremely ill patients).

Pandemic-related questions. These questions probed our participants' knowledge and understanding about Covid-19, adaptation to the Covid-19-related measures, special education situation, and access to online resources were assessed through parents addressed questions such as how much their child with autism understands the pandemic, child's level of understanding of the explanations made when he/she wants to go out, reactions to the use of masks, gloves, disinfectants, if they are continuing

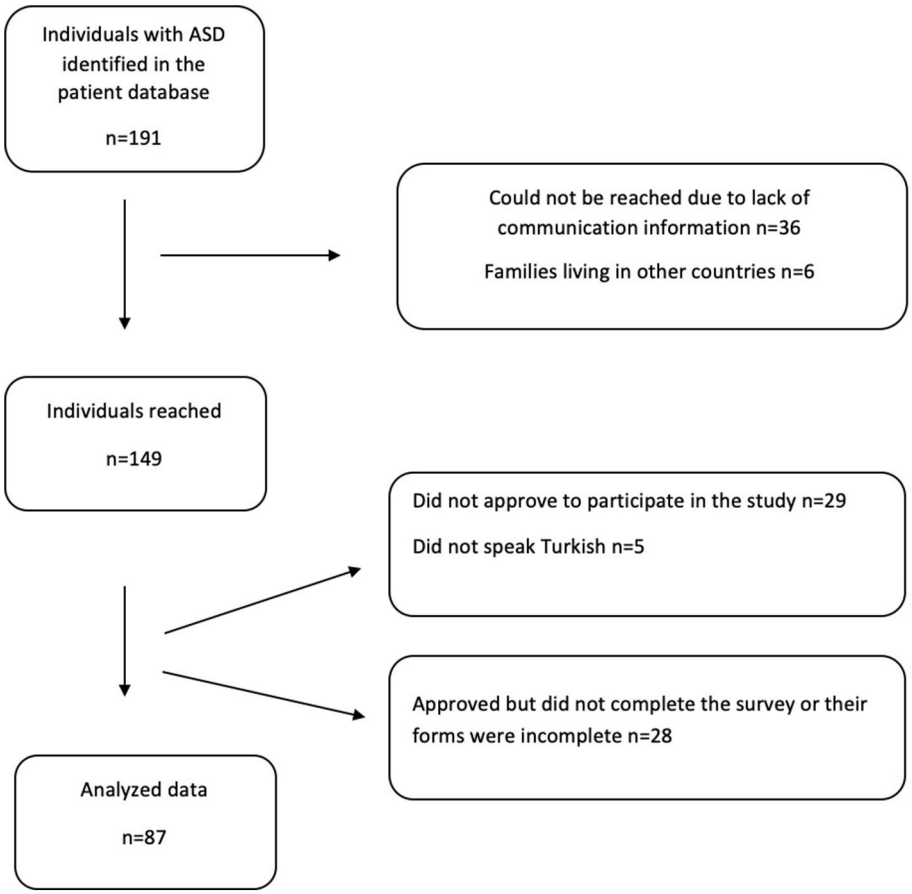

FIGURE 1 | Flow chart of patient recruitment, data collection, and participation rate.

their education, and if they are using conference or other communication applications or portals during the pandemic.

Aberrant Behavior Checklist (ABC). Changes in ASD-related symptoms and behavioral problems after one and a half months of Covid-19-related measures were assessed by a parent reported aberrant behavior checklist (ABC) for their child for the present and for before the measures for the pandemic started. This data was cross-referenced and otherwise supplemented by the participants' medical records from the hospital, to eliminate any recall bias. ABC is a four-point Likert type scale, which was developed to evaluate the behavioral problems observed in individuals with ASD and intellectual disabilities (21). It has been used to measure the effects of pharmacological, behavioral, and other treatments on these behaviors (22, 23). It contains 58 items that resolve onto five subscales. The subscales and the numbers of items are as follows: (a) irritability (15 items), (b) lethargy/social withdrawal (16 items), (c) stereotypic behavior (7 items), (d) hyperactivity/noncompliance (16 items), and (e) inappropriate speech (4 items). Score for the self-injury factor can be obtained using three items from the irritability factor. Severe self-injury is defined as a total combined score of 3 or greater (24). Turkish validity and reliability study was done by Karabekiroglu and Aman (25).

Pittsburgh Sleep Quality Index (PSQI). PSQI is a 19-item questionnaire for evaluating subjective sleep quality over the previous month (26). We used four items from PSQI to collect information about the sleep quality and disturbances of the participants before and after the pandemic measures. Single items were shown to moderately or highly correlate with PSQI total score and previous studies used single-item sleep measures (26–28). We used four items each representing one of the following components; subjective sleep quality, sleep latency, sleep disturbance and sleep duration within the 1-month during the pandemic measures and 1-month earlier than that period. Turkish validity and reliability study was done by Agargün et al. (29).

Beck Anxiety Inventory (BAI). We measured the level of primary caregivers' anxiety during the pandemic period by administering BAI. BAI is a 4-point Likert type questionnaire measuring the severity of self-reported anxiety. It comprises 21 items scored between 0 (not at all) and 3 (severely). According to the total score of BAI, anxiety level is obtained as minimal (0–7 points), mild (8–15 points), moderate (16–25 points), and severe (26–63 points) (30). The BAI has been reported to be valid and reliable (31).

Statistical Analysis

Statistical analyses were performed using the software IBM-SPSS Statistics, Version 26.0. Descriptive data were reported as numbers and percentages or as mean (M) ± standard deviation (SD) according to the nature of the data. The continuous variables about before and during the pandemic measures were compared with paired samples *t*-test and multivariate repeated measures ANOVA test. Spearman correlation analyses were made to calculate the association between continuous variables. We conducted a linear regression analysis to determine child-related predictors of parent anxiety.

RESULTS

Our participants were aged between 3 and 29, with a mean age of 13.96 ± 6.1. They included 15 girls (17%) and 72 boys (81%), paralleling the global male-to-female ratio of ASD. The sociodemographic information about the participants is depicted in **Table 1**. Our clinical ASD sample had a high rate of comorbidity, where 78% had at least one psychiatric comorbid condition. In this sample, 25% had ADHD, 30% had mood disorders, 15% had tic disorders, 5% had anxiety disorders, and 4% had other comorbidities.

Parent-reported information related to their child's Covid-19-related understanding, adaptation to the Covid-19-related requirements, special education situation, and access to online resources can be found in **Table 2**. Parent responses about behavioral, appetite, sleep, and other problems experienced by their children during the pandemic are given in **Table 3**. When asked about the changes in their child during the pandemic period, 55% of the parents said that their child got more aggressive, 26% said their child's tics increased or new tics emerged, 29% said their child's communication skills deteriorated, and 44% and 33% of the parents reported sleep and appetite changes, respectively.

Our findings show that ASD-related behaviors, sleep quality, and hypersensitivity changed significantly from before the pandemic to during the pandemic. **Table 3** presents the comparison of the total scores and subscores of the Aberrant Behavior Checklist (ABC) before and during the Covid-19 measures with paired-samples *t*-test. According to our results, participants showed increased ASD-related behaviors in total and this increase was observed in all subscales, that is, irritability, lethargy/social withdrawal, stereotypical behavior, hyperactivity, and inappropriate speech. We also conducted multivariate repeated measures ANOVA for ABC subscales as the dependent variables at two time points (before and during pandemic) as the within-subject factor. We found that all subscales of ABC differed significantly between the two time points [$F_{(1.0,83.0)} = 28.92$, $p < 0.001$, $\eta 2 = 0.26$]. The number of hours the children slept significantly decreased from before to during Covid-19 (**Table 4**). Participants' hypersensitivity level also increased significantly from before the pandemic to during the pandemic period (**Table 4**).

Beck Anxiety Index measures indicated that 25% of caregivers of individuals with ASD had minimum anxiety, 29% had mild anxiety, 21% had moderate anxiety, and 25% had severe anxiety symptoms during the Covid-19 period. BAI results of parents and the correlation of this anxiety score with their child's behavioral problems according to ABC total score before and during the Covid-19 period is given in **Table 5**. Parent anxiety did not correlate with the total ABC score of the child before the pandemic and only significantly correlated with the inappropriate subscale of ABC for the situation of the child before the pandemic. Parent anxiety significantly correlated with

TABLE 1 | Sociodemographic information.

		Mean ± SD (min–max)
Child's age		13.96 ± 6.1 (3–29) *n* = 87
Mother's age		42.32 ± 6.9 (27–60) *n* = 85
Father's age		46.80 ± 7.3 (28–65) *n* = 87
Mean severity of child psychiatric comorbidity scores according to CGI (1–7)		2.49 ± 0.1 (1–5) *n* = 87
		Frequency (%), number (*n*)
Education status	Kindergarten	9% (8)
	Elementary school	26% (23)
	Middle school	15% (13)
	High school	22% (19)
	University	2% (2)
	No school	25% (22)
Receiving special education		84% (73)
Number of siblings	Only child	20% (17)
	One sibling	53% (46)
	Two siblings	22% (19)
	Three siblings	6% (5)
Severity of autism (DSM-5 based)	Mild	48% (39)
	Moderate	27% (22)
	Severe	26% (21)
Verbal ability	Can speak with sentences	51% (44)
	Can speak with words	24% (21)
	Cannot speak at all	25% (22)
Intellectual disability	None or borderline	46% (40)
	Mild	36% (31)
	Moderate or Severe	18% (16)
Psychiatric comorbidities	None	22% (17)
	ADHD	25% (22)
	Mood disorders	30% (26)
	Anxiety disorders	5% (4)
	Tic disorders	15% (13)
	Other comorbidities	4% (3)
Medication usage	Overall	76% (66)
	Anti-psychotics	59% (51)
	Antidepressants	13% (11)
	Stimulants or Atomoxetine	17% (15)
	Mood stabilizers	14% (12)
	More than two medications	36% (27)
Medical comorbidities	All medical comorbidities	22% (19)
	Epilepsy comorbidity	14% (12)

TABLE 2 | Parent-reported information of Covid-19-related understanding and problems of individuals with ASD.

Question	Response	Frequency (%), number (*n*)
Are there any individuals in your family being treated for Covid-19?	Yes	2% (2)
	No	98% (85)
Is your child's special education continuing during the Covid-19 process?	Yes	8% (78)
	No	92% (78)
How well did your child understand what Covid-19 is?	Not much	58% (49)
	Medium	21% (19)
	Well	20% (17)
How well did your child understand Covid-19-related measures and necessities such as staying home and social distancing?	Not much	47% (40)
	Medium	28% (24)
	Well	24% (20)
Is your child able to follow Covid-19 measures (staying at home, keeping social distance etc.)?	Yes	55% (46)
	No	45% (37)
Can your child perform measures such as washing hands, wearing masks and gloves, and using disinfectants under your instruction?	Yes	80% (66)
	No	20% (17)
Is your child experiencing sensory problems while implementing these measures of wearing masks and gloves, washing hands, and using disinfectants?	Yes	37% (31)
	No	63% (52)
Do you use a resource explaining what Covid-19 is and what needs to be done?	Yes	20% (17)
	No	80% (66)
If you are not using it, would you want such a resource for children with ASD, and if it existed, would you use it?	Yes	85% (56)
	No	15% (10)
Is your child using online, remote conference media such as Zoom, Teams, etc.?	Yes	29% (24)
	No	71% (60)

TABLE 3 | Parent-reported behavioral and other problems during the pandemic.

	Frequency (%), number (*n*)
Problems related to ASD	
Communication skills deteriorated	29% (25)
Stereotypies increased	14% (12)
Hypersensitivity increased	14% (12)
Behavioral problems other than ASD	
Aggression	55% (48)
Tics (increased or new tics emerged)	26% (23)
Hyperactivity	56% (49)
Appetite	
Increased	12% (10)
Decreased	21% (18)
Sleep	
Increased	8% (7)
Decreased	36% (31)
Enuresis Nocturna	1% (1)
Masturbation	2% (2)
Other	51(44)

TABLE 4 | ASD-related behavior, sleep quality, and hypersensitivity differences before the pandemic and during the Covid-19 process.

Variable	Before the pandemic Mean ± SD	During the pandemic Mean ± SD	*t*	*P*	Cohen's *d*
ABC Total Score	48.4 ± 24.6	57.6 ± 27.7			
ABC subscales					
Irritability	12.6 ± 8.1	15.4 ± 9.4	5.3	0.000	0.57
Lethargy/social withdrawal	10.0 ± 5.9	11.8 ± 8.2	3.5	0.001	0.37
Stereotypical behavior	6.2 ± 4.1	7.3 ± 4.6	4.5	0.000	0.49
Hyperactivity	15.9 ± 9.2	18.6 ± 10.3	4.9	0.000	0.54
Inappropriate speech	3.3 ± 2.9	3.9 ± 3.4	3.8	0.000	0.41
Self-injury	1.2 ± 1.8	1.4 ± 2.0	2.0	0.054	0.22
Sleep related problems					
Sleep latency	2.3 ± 1.2	2.4 ± 1.2	0.7	0.465	0.08
Sleep disturbance	2.5 ± 1.1	2.8 ± 1.2	2.7	0.010	0.26
Sleep duration (hours)	8.2 ± 2.0	7.6 ± 2.4	−3.0	0.004	0.26
Sleep quality	2.1 ± 0.8	2.2 ± 0.8	2.1	0.040	0.27
Sensory hypersensitivity	2.7 ± 1.2	2.9 ± 1.2	2.5	0.015	0.17

ABC, aberrant behavior checklist.

the child's total ABC score during the pandemic, and with the irritability, hyperactivity, and inappropriate speech subscales. All the significant correlations are positive, indicating an increase in child behavior in the related domain or in the subscale corresponds to an increase in parent anxiety.

We also created new variables of difference scores by subtracting the previous (before pandemic) from the current (during pandemic) scores of ABC total scale and ABC subscales. Then, we conducted two different linear regression analyses to explore the predictors of current parent anxiety, where one analysis included ABC total difference score and the other ABC subscale difference scored as predictors. We found that the difference in ABC's total score (Beta = 0.21, $p < 0.05$, R2 = 0.09) and ABC's lethargy/social withdrawal subscale score predicted (Beta = 0.67, $p < 0.05$, R2 = 0.15) the total score of the parents' anxiety. Differences in other ABC subscales did not significantly predict parents' anxiety.

DISCUSSION

In this study, individuals with ASD were found to be influenced from the current Covid-19 pandemic with a significant worsening in their behavior problems, which significantly predicted their caregivers' anxiety.

Findings from typically developing samples show that during the current Covid-19 pandemic, depression and anxiety symptoms were higher in elementary school children than before the pandemic (32). The Covid-19 lockdown was reported to have

TABLE 5 | Anxiety scores of parents and their correlation with their child's behavioral problems before and during the Covid-19 period.

	BAI total score		
ABC scores	**Spearman's rho correlation coefficients**	**Sig. (2-tailed)**	***N***
Before the pandemic			
Total score	0.112	0.311	84
Irritability	0.058	0.603	84
Lethargy/social withdrawal	−0.046	−0.677	84
Stereotypical behavior	0.044	0.691	84
Hyperactivity	0.126	0.254	84
Inappropriate speech	0.295**	0.006	84
Self-injury	−0.069	0.541	84
During the pandemic			
Total	0.267*	0.014	84
Irritability	0.215*	0.049	84
Lethargy/social withdrawal	0.125	0.259	84
Stereotypical behavior	0.140	0.204	84
Hyperactivity	0.220*	0.045	84
Inappropriate speech	0.358**	0.001	84
Self-injury	0.027	0.808	84

*ABC, aberrant behavior checklist; BAI, beck anxiety index. **Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).*

a considerable negative impact on typically developing children's psychological, social, and physical wellbeing, while some children had mixed emotions as they also felt happy and relaxed spending time with their families during the lockdown (33). Upon exposure to H1N1 and SARS outbreaks, one-third of children and one-quarter of the parents who were exposed to self-isolation or quarantine manifested post-traumatic stress disorder (PTSD). These findings indicate that pandemic measures may be stressful and traumatizing for all children and also their parents (5). When we conducted this study, there were no publications investigating the reactions of individuals with ASD to a pandemic or other health-related disaster. The only relevant finding showed that after an earthquake, individuals with ASD experienced declines in adaptive functioning predominantly in the socialization domain after 6 months and also 1 year upon the traumatic event (3). After we have collected our results and submitted our manuscript, a few studies were published on this topic. In one study, for the Covid-19 period, parents reported increased anxiety and fear in families with ASD, accompanied by reports of increased distress, stress, and low mood (20). Another parent-reported survey revealed increased difficulties in managing daily activities including free time and structured activities, and less than half reported more intense and more frequent behavior problems in their children during the pandemic (34). In another survey, which has not been peer-reviewed yet, parents reported a lack of support, feeling of helplessness, and their greatest concern as the worsening of ASD symptoms due to changed routines and worsening behavior and concern for their child losing their previously acquired skills (35). Our study is the first to report the specific responses of individuals with ASD to the Covid-19-related behavioral measures and the resulting changes under three main domains: Covid-19-related understanding and reactions, behavioral changes during the pandemic, and how they relate to parent anxiety levels.

Firstly, the individuals with ASD were mostly not able to understand what Covid-19 is, to adapt to its measures of social distancing and staying home, and to perform the relevant hygiene requirements. Specific challenges of ASD, like hypersensitivity, could have an impact on the mask wearing status, and this may result in preventing them to take cautions. These findings parallel the parent reports from different countries on how their children with ASD are coping with and reacting to Covid-19 measures. BBC Scotland reporter noted from personal experience how autism makes it extra hard for affected individuals to endure lockdown mainly because of the rigidity in their thinking and a California writer on the Washington Post shared the challenges children with ASD experience when asked to wear masks due to sensory, anxiety-inducing, and smell-related issues (36, 37). Stankovic et al. found that 40% of the children with ASD had difficulties wearing protective masks or gloves (35). Our findings not only align with reported experiences from around the world, but also carry them beyond personal reports to the realm of scientific measurement. Behavioral challenges of ASD such as hyperactivity and fidgetiness may also result in a diminished adaptation to the suggested hygiene procedures due to an impatience to complete or perform them. These issues not only affect the autistic individuals' infection prevention, but also may lead to an increase in the spread of infection and disease in their family and community.

Secondly, we explored the behavioral difficulties experienced by individuals with ASD during the pandemic through the main problematic areas of core ASD symptoms, aberrant behaviors, sleep schedules, and associated problems of aggression, hypersensitivity, tics, appetite, and self-injury. Parent reports indicated deterioration in communication; increases in stereotypes, hypersensitivity, and aggression; appetite changes; and emergence of new tics or increase of existing tics during the Covid-19 period. From the scale measures, the areas that showed significant worsening through the pandemic period were irritability, social withdrawal, stereotypy, hyperactivity, inappropriate speech, self-injury, sleep disturbance, sleep duration, and sleep quality. Parallel with our results, in a recent study from Italy exploring the impact of Covid-19, parents reported more intense (in 35.5% of children) and more frequent (in 41.5% of children) behavior problems in their children with ASD compared to before (34). Similar to our findings, another study from Turkey also found increased sleep disturbances in children with ASD, such as more bedtime resistance, increased delay in falling asleep, and more night wakings compared to before the pandemic (38). Considering that pandemic life changes could be classified as a trauma-like condition, our reported clinical presentation of Covid-19 reactions in individuals with ASD is likely to have shared characteristics with PTSD. This idea is corroborated by a recent review, which showed that behavioral profiles in

individuals with ASD upon experiencing trauma are similar to our findings. Exploring specific trauma symptomatology in ASD, they concluded that PTSD symptoms like aggressive behavior, self-injury, concentration and sleep problems are common in ASD after trauma (39). In another clinical ASD sample with high comorbidity rates like ours, 67% of ASD patients fulfilled the criteria for PTSD (40). It is notable that their main findings of increased behavioral problems (e.g., aggression, self-injury), social-communication deterioration, increased stereotypes, increased hyperactivity, and changes in sleep and appetite in the traumatized individuals with ASD highly overlap with our results. These commonalities suggest that Covid-19 may produce a similar clinical presentation to PTSD in individuals with ASD. This is an important point to consider, since depression and PTSD in individuals with ASD is associated with increased risk for suicidal thought and behaviors (41).

In general, increased anxiety and depression incidence rates have been reported in caregivers of ASD patients (42, 43). In line with the current literature, we found high rates of anxiety symptoms in our ASD primary caregiver population. Twenty nine percent of them had mild, 21% had moderate, and 25% had severe anxiety symptoms during the Covid-19 period. We further evaluated the correlation between primary caregivers' BAI anxiety score (current) and ASD patient's ABC total scores (before Covid-19 and during Covid-19). This relationship was significant for during the Covid-19 period but did not reach significance before the pandemic period. Just as PTSD manifesting in parents and children exposed to quarantines during the SARS and H1N1 pandemics, the Covid-19 pandemic period seems to have influenced their parents as well as the ASD patients (5). Stankovic et al. also found that caregivers of children with ASD had negative emotions such as feeling of helplessness and need for support during the Covid-19 period (35). Our findings highlight the need for interventions targeting both individuals with ASD and their caregivers.

The lack of action plans targeted toward ASD individuals and their families is evident and must be addressed so that they can be applied effectively during collective crisis periods. Whereas measures were taken to ensure mainstream education to continue as distance education during the Covid-19 period, the majority of individuals with ASD in this sample were found not to have access to special education that is the only validated intervention for them. Intervention plans enabling children with ASD to continue special education as soon as possible and ASD-specific materials to explain Covid-19 are needed. It is also crucial that collaboration between professionals specializing in ASD and trauma is established to investigate interventions that can effectively address this trauma-related symptomology in ASD.

The main limitations of our study are its relatively small sample size and the phone interview and online survey method of data collection. Parents were asked to fill questionnaires for two time periods; for during the pandemic (during the time Covid-19 measures were implemented in our country, comprising the last 1 month) and before the pandemic (before the measures for Covid-19 started to be implemented in our country). Though we explained the timing referred to by the two assessments in a very clear way by a phone call right before filling the forms, parents' evaluation of previous behavior may have been influenced from current behavior, and such recall bias can be a limitation of the study. Though parent-report data was corroborated with the medical records in our hospital, we were not able to perform structured face-to-face clinical evaluations due to the social isolation measures of the Covid-19 period. Due to social distancing measures preventing face-to-face clinical evaluations, we were not able to make a diagnostic assessment of PTSD. As PTSD was found to be high in studies conducted after previous quarantines such as H1N1 and SARS in typically developing children, future studies can investigate PTSD in children with ASD in relation to Covid-19. Additionally, future investigations can compare the effect of Covid-19 on children with ASD with its effect on other populations, as our study sample did not involve a control or another diagnostic group to compare the findings and evaluate whether the findings are specific to ASD children and families or not. Another limitation of our study could be the high number of comorbid conditions and related medication usage. Since our sample was recruited from the clinical participant base of the hospital, their comorbidity rates and medication use were high. Future studies recruiting community-based samples can overcome this limitation.

Our study portrays how individuals with ASD were affected by the Covid-19 process shortly after the pandemic. Such an understanding is of key importance in planning psychiatric, psychosocial, and educational interventions for them. Determining these aspects will enable the development and prompt implementation of clinical, psychological, and educational service policies geared toward this population, which is of global importance given its 1 in 54 prevalence. Considering that individuals with ASD exhibit similar difficulties at the face of this pandemic internationally, investigations of ASD populations through clinical and academic expertise emerge as an utmost priority during these trying times.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Koç University 2020.168.IRB1.036. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

TM, CD, and HA were responsible for study design and contributed to data interpretation and article writing. TM and HA performed data collection. TM performed statistical analyses. CD was mainly responsible for study conceptualization and article writing. All authors personally revised and approved the final version of the manuscript.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Mitigating COVID-19 Impact on the Portuguese Population Mental Health: The Opportunity That Lies in Digital Mental Health

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COVID-19 mitigation measures present unprecedented challenges in mental healthcare delivery, posing high risk to the mental health of at-risk populations, namely patients diagnosed with COVID-19, frontline healthcare providers, and those submitted to quarantine or isolation measures, as well as the general population. Ensuring safe and equitable access to mental healthcare by these groups entails resorting to innovative psychosocial intervention strategies, such as digital mental health. In this perspective piece, we describe the impact of COVID-19 on the Portuguese population's mental health, present an overview on initiatives developed to address the challenges currently faced by the Portuguese mental healthcare system, and discuss how the timely implementation of a comprehensive digital mental health strategy, coupling research, education, implementation, and quality assessment initiatives, might buffer COVID-19's impact on the Portuguese society.

Keywords: COVID-19, public mental health, digital mental health, internet interventions, Portugal, EU, eHealth and eMental-health

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INTRODUCTION

The COVID-19 pandemic is a major public health emergency of international concern (1). As of 13th August 2020, there have been 20,439,814 confirmed cases and 744,385 deaths worldwide, with 188 countries having reported at least 1 case (2). In Portugal, the first confirmed case was diagnosed at 2nd March 2020, and since then, the spread has been fast, contaminating 53,548 people and totalizing 1,770 deaths (3). Infected patients may present a wide range of symptoms, namely fever, cough, myalgia, fatigue, sputum production, headache, hemoptysis, diarrhea, and/or dyspnea (4). Most patients seem to present with a mild disease. However, possibly as many as 20% appear to progress to severe disease, including pneumonia, respiratory failure, and, in some cases, death (5).

Due to potentially serious health outcomes of COVID-19, draconian unprecedented mitigation and suppression measures have been taken by many countries to stop the spread of the virus (6). In Portugal, the government declared an emergency state in 18th March 2020 (7), and measures, such as canceling gatherings and events, closing schools, limiting the number of people in public places (e.g., supermarkets, pharmacies, etc.), recommending social isolation, and mandating telework whenever possible have been taken to reduce contact rates in the general population and reduce

transmission. Regarding suspect and diagnosed cases, a range of measures have been adopted, such as early identification, contact tracing and monitoring, and prophylactic isolation or mandatory quarantines (8).

The implementation of such mitigation measures combined with insufficient preparedness of health authorities, high unpredictability of the outbreak itself, and uncertainty of its social-economic impact may lead to widespread fear, anxiety, and social alarm, posing high risk to the mental health of the Portuguese population (9).

COVID-19 Impact on Mental Health

Literature on the impact of COVID-19 on mental health is still scarce. However, research on the emotional consequences of the current and previous outbreaks, such as severe acute respiratory syndrome (SARS), Middle East respiratory syndrome-related coronavirus (MERS), and Ebola virus disease indicates a high burden of mental health problems among patients, suspect cases and close contacts, frontline healthcare providers (10), those submitted to isolation and quarantine measures (11, 12), informal caregivers (10), the elderly (13), and the population at large (14). Prevalent mental health problems include depression, anxiety, psychological distress (10, 15), burnout, panic attacks, post-traumatic stress disorder (16, 17), and insomnia (12). Other adverse mental health outcomes frequently reported are fear, anger, stigmatization, low self-esteem, and lack of self-control (18, 19). Severe conditions, such as psychotic symptoms (12) and suicidality (20, 21) have also been reported, although less frequently.

Epidemiological data on the prevalence of COVID-19 precipitated mental health disorders in the Portuguese population are still limited. However, previous studies reported a high burden of mental health disorders in Portugal with estimated lifetime prevalence for at least one psychiatric disorder of 42.7%. When compared to other countries participating in the *World Mental Health Surveys Initiative*, lifetime prevalence for such disorders was only exceeded by the USA (47.4%). All other Western European countries had lower prevalence values, namely Spain (19.4%) and Italy (18.1%), figures that underline the vulnerability of the Portuguese population in this domain (22).

Ongoing research (9, 23) promoted by Escola Nacional de Saúde Pública—Universidade Nova de Lisboa, inquiring 157,927 respondents, highlights the potential catastrophic impact the actual pandemic might have in citizens' mental health. In that study, around 83% of participants reported low mood, feeling agitated, anxious, or sad due to physical distance measures 1 week after such measures were enforced. More than 26% reported feeling this way daily or almost every day. The youngest (16–25 years of age) and female respondents were the most susceptible to confinement measures-induced distress. In addition, a positive association has been identified between the perception of risk to contract COVID-19 and the frequency of reported adverse mental health outcomes, such as feeling anxious, agitated, down, or sad (9).

Concerning healthcare workers, so far, only one study addressed mental health. In that study (24), 76.7% of participants reported moderate to high levels of fatigue, and 68.8% of healthcare workers reported anxiety levels above normal, with physicians reporting the highest levels of anxiety.

No data are yet available on the pandemic's impact on COVID-19 Portuguese patients. However, previous research (25) acknowledges this group as an at-risk population.

Populations at Risk

Patients diagnosed with COVID-19 and suspect cases may fear the outcomes of this possibly lethal disease experiencing anxiety, emotional distress, and insomnia (10). Potential stigmatization and social exclusion may spiral into other mental health conditions, such as adjustment disorders and depression (11). Additionally, symptoms' manifestation and treatment adverse effects may aggravate premorbid mental health disorders (10). Previous research has also found increased prevalence of post-traumatic stress disorder among survivors of infectious diseases (16).

Frontline healthcare providers are submitted to enormous pressure (24) due to a high risk of infection, potential scarcity of resources, and overwork. Such work conditions, aggravated by potential discrimination and lack of contact with support networks, make this group susceptible to complex emotional reactions and mental health problems, such as stress, anxiety, depressive symptoms, insomnia, burnout, traumatic stress, denial, anger, and fear (16, 26, 27). Reported risk factors (27–31) include being female, history of physiological chronic non-communicable diseases, family history of mental disorders, working at isolation wards, professions requiring close contact with infected patients, such as being a nurse or a medical technician, and having relatives with suspected or confirmed COVID-19. Of additional concern is the impact such conditions might have on healthcare providers' performance, potentially compromising the quality of healthcare, increasing the occurrence of medical errors and incidents, and ultimately hindering the fight against COVID-19 (31).

Special attention should also be provided to those submitted to quarantine or isolation measures. Confusion, boredom, loneliness, anxiety, anger, and guilt associated to the effects of contagion, quarantine, and stigma on family and friends are common experiences (12). Moreover, research on the psychological impact of quarantine in previous outbreaks found that being quarantined is a significant immediate and long-term risk factor to the mental health of both healthcare providers and the general population (12, 16). A study (32) targeting parents and children submitted to quarantine reported that mean post-traumatic stress scores were four times higher in children who had been quarantined than in those who were not quarantined, and almost 1/3 of quarantined parents in that study fulfilled diagnosis criteria of a trauma-related mental health disorder compared to 6% of parents who were not quarantined. Another study (33) focusing on Australian horse owners submitted to quarantine due to an equine influenza outbreak reported high psychological distress in this group when compared to the general population. Concerning healthcare providers, several studies attest the deleterious and long-term impact of quarantines on mental health outcomes (12, 16, 18).

Having been quarantined has been identified as a predictor of depression (34) and post-traumatic stress symptoms (35) up to 3 years after the event and to be positively associated with alcohol abuse or dependency symptoms in healthcare workers (36). Another study reported quarantined staff were significantly more likely to report exhaustion, detachment from others, anxiety, irritability, insomnia, sub-optimal work performance, and absenteeism (37). Previously identified stressors comprise longer quarantine duration, infection fears, frustration, inadequate supplies, inadequate information, financial loss, and stigma (12).

Still to be assessed is the impact of COVID-19 global confinement measures on mental health. Nevertheless, recent research highlights the role social capital might have in improving quality of sleep and reducing anxiety in self-isolated individuals (14).

Innovative Psychosocial Intervention Strategies

Considering the transversal and significant impact COVID-19 pandemic might have on the mental health of the general population and high-risk groups, immediate action must be taken to manage the imminent upsurge of mental health disorders associated or aggravated by coronavirus outbreak circumstances (38). Confinement measures should not enforce paralysis, and innovative psychosocial intervention strategies capable of preventing, screening, monitoring, and intervening at this level must be developed and implemented, ensuring safe and equitable access to mental healthcare (39). One such strategy is digital mental health.

Digital mental health is understood as the use of digital technologies (e.g., telephone, mobile devices, apps, videoconference and chat software, psychological assessment, support and intervention platforms, artificial intelligence, virtual reality, serious games, etc.) (40, 41) to support and improve mental health conditions and provide mental healthcare including screening, health promotion, prevention, early intervention, treatment, or relapse prevention (42). It encompasses a wide range of modalities that might be particularly suitable in this outbreak context, namely internet research (43, 44), screening and tracking tools (45, 46), videoconferencing counseling and psychotherapy (45, 46), internet interventions (38, 45, 47), and e-learning and e-supervision (48).

Facing COVID-19 mental health-imposed challenges requires a comprehensive strategy (25), where the abovementioned modalities are interlinked and prevention/intervention programs are adjuvated by high-quality training programs and research. In the following sections, we elaborate on how such modalities could be useful during the COVID-19 crisis and report on ongoing initiatives of this kind being developed in Portugal.

Internet Research

Conducting online behavioral and mental health research associated with the COVID-19 outbreak is key to gather information on the pandemic's impact on different target populations and deliver evidence-based tailored public health interventions (49).

In Portugal, important initiatives have been launched in this domain by Escola Nacional de Saúde Pública—Universidade Nova de Lisboa (9, 23), Instituto de Saúde Pública—Universidade do Porto (50), and CESOP—Universidade Católica Portuguesa (50, 51) to assess the general population and frontline healthcare providers' adaptation to the outbreak and mitigation measures.

Complementarily, the Portuguese Psychologists Association created a task force supporting the expedite assessment and dissemination of research projects aiming at identifying and monitoring the population's mental health unmet support care needs and assessing the efficacy and cost-effectiveness of prevention and intervention programs or healthcare models implemented during the COVID-19 pandemic. Seventy-six online questionnaire studies are ongoing under this umbrella initiative (52) focusing on topics ranging from the use of digital technologies by psychologists during the pandemic to the characterization of COVID-19's impact on general, specific, and clinical populations.

Surprisingly, none of these studies aims at studying the effects of COVID-19 on patients diagnosed with the disease or survivors. An immediate priority is, therefore, collecting high-quality data on COVID-19's short- and long-term impact on brain function, cognition, and mental health of patients with or recovering from COVID-19 (53).

Moreover, it is vital to perform implementation research, namely pragmatic clinical trials assessing the efficacy and cost-effectiveness of different digital mental health services implemented during this pandemic (e.g., based on videoconference, apps, chatbots, etc.), to support peri and future resource allocation decisions (54). Such initiatives should take into consideration digital health equity factors and involve people from marginalized and vulnerable groups in codesign during development and implementation (55). Tackling this challenge requires integration across disciplines and institutions, and new sources of funding (53).

In this regard, the Portuguese Foundation for Science and Technology has launched specific calls to promote research on COVID-19, namely Gender Research 4 COVID-19, Research4COVID-19, and AI 4 COVID-19 (56). Nevertheless, more funding is necessary to address digital mental health research gaps in this domain and incentivize the development or adaptation of innovative tools capable of preventing, diagnosing, and mitigating the population's distress during this outbreak.

Screening and Tracking Tools

The development or adaptation of screening and tracking tools to assess and monitor mental health outcomes in high-risk populations, such as COVID-19 patients, healthcare providers, and those in quarantine, could be particularly helpful during this crisis. Screening web platforms, apps, and chatbots are highly scalable and, if coupled with artificial intelligence, have the potential of identifying mental health pressing needs and referring or providing first-aid responses to at-risk subjects (57).

In this context, chatbots are particularly interesting due to their conversational workflow and easy and rapid deployment across email, web, social media, and text (58). During COVID-19 crisis and beyond, chatbots could be used to harness the

healthcare system not only by screening and triaging citizens and healthcare providers at risk of developing mental health disorders but also by supporting in prompt education and referral.

Another interesting application of artificial intelligence in this domain is the monitorization of social networks to model pandemic trends as well as monitoring public reactions to the pandemic over time (59), facilitating psychological crisis interventions (49). Initiatives of this kind have already saved lives in China (60), and could be helpful in responding to digital native suicidal ideation since this appears to be one of the most vulnerable groups to confinement measures-induced distress (23).

Finally, leveraging all the above-mentioned dimensions, digital phenotyping is a promising strategy to passively monitor at-risk populations during crisis, such as the COVID-19 outbreak. Encompassing the passive collection and analysis of a range of behavioral data in mobile devices, including, but not limited to, spatial trajectories (via GPS), physical mobility patterns (via an accelerometer), social networks, social dynamics (via call and text logs and Bluetooth), and voice samples (via microphone) (61), digital phenotyping has the potential of increasing accuracy and bringing timeliness to the psychological assessment process (62).

To the best of our knowledge, initiatives of these kinds are not yet ongoing in Portugal, and mentioning such approaches in a country where digital mental health is at its infancy, such as Portugal, and during a crisis, may sound as pure science fiction and a waste of time. However, in technology, the future rapidly becomes the present and dissemination occurs fast, especially in times of urgency, such as the current moment. Since such approaches may be intrusive, conflict with individual freedoms, or leave vulnerable populations behind (59), their implementation must be carefully thought out and framed to guarantee that their development and implementation comply with ethical, legal, and cultural requirements and their integration in online or hybrid-healthcare models is assured, certifying that patients are adequately signaled and referred to online or physical psychiatric and psychological counseling/psychotherapy services.

Tele and Videoconference Counseling and Psychotherapy

Telephone and online psychological counseling/psychotherapy services are instrumental in providing immediate response to acute population needs and ensuring continuation of care and adequate follow-up of patients with pre-outbreak mental conditions (39).

In this regard, various helplines have been made available by hospitals, associations, and academic agencies to provide support during this crisis (63), and on the 1st of April 2020, a partnership between the Shared Services of the Portuguese Health Ministry, Calouste Gulbenkian Foundation, and the Portuguese Psychologists Association has launched a national counseling helpline to support the population (64). As of 20th July 2020, this helpline had already received 23,590 calls from healthcare providers and the general population (65), highlighting the importance of providing such first-aid resources to contain the population's distress.

Considering psychological counseling/psychotherapy services, an abrupt shift to this treatment modality has occurred after enforcement of mitigation measures, and on the 7th April 2020, the Portuguese Psychologists Association officially published Guidelines for the Provision of Psychology Services Mediated by Information and Communication Technologies (66), recommending its use during this crisis. From 4th May 2020 onwards, the Portuguese deconfinement plan started to be implemented, and clinical activity in hospitals and private practice was progressively resumed. The real number of tele and video consultations performed by psychologists and psychiatrists during and after the confinement period is not available for consultation. Yet, an analysis of available data from the Lisbon Psychiatric Hospital Centre, assumed here as a proxy, reveals a 37% decrease in telemedicine appointments in June 2020 (post-confinement) when compared to April 2020 (during confinement) (67), suggesting that a full return to the traditional face-to-face model is unlikely, and a hybrid mental healthcare model will probably emerge from this crisis. Awareness about such treatment options, patients' preferences, potential changes in providers' attitudes (68), and digital mental health research on the effectiveness and cost-effectiveness of these modalities might facilitate ongoing integration of technology (69) in the Portuguese mental healthcare system.

Internet Interventions

With millions of citizens confined or complying with social isolation recommendations worldwide (70) and, therefore, at risk not only of developing mental health conditions but also at increased risk of inactivity (71) and malnutrition (72), wider public digital health approaches may also be necessary to deliver health promotion and intervention programs (38). In this regard, internet interventions—self-help guided or unguided interventions based on established psychotherapy models operated via secure platforms or mobile apps that aim at providing synchronous or asynchronous health and mental health–related assistance (73, 74)—may play a pivotal role in increasing the availability of self-care psychoeducational content and delivering evidence-based psychological intervention protocols (14).

Internet interventions have been found to be more effective than treatment as usual or as effective as face-to-face therapies for most COVID-19 triggered mental disorders, namely depression (75–78), generalized anxiety disorder (79–81), panic disorder (82, 83), insomnia (84), and post-traumatic stress disorder (85). Additionally, growing evidence endorses its beneficial impact in supporting patients with somatic conditions, such as chronic pain (86), tinnitus (87), irritable bowel syndrome (88), diabetes (89, 90), and cancer (91–94).

Due to its high flexibility, adaptability, dissemination potential, and low delivery costs (74), internet interventions seem to be a viable approach to effectively support the general population as well as at-risk and vulnerable groups, such as chronic patients now deprived of routine healthcare (95). The equitable implementation of self-guided, guided,

or blended approaches, possibly following a stepped care model, would facilitate psychoeducation delivery, contribute to citizens' empowerment, and ease the burden over healthcare providers, allowing them to focus on patients with severe conditions, ultimately contributing to the resilience of the healthcare system.

However, only a handful of such programs were under development or ongoing in Portugal [e.g., (96–99)] prior to the COVID-19 crisis, and, to the best of our knowledge, very few internet-delivered initiatives were developed/adapted to address COVID-19 specific constraints in the meantime (e.g., internet-delivered multimodal pre-habilitation program for confined cancer patients) (100), suggesting that well-known implementation barriers, namely clinicians' attitudes and lack of knowledge, training, and experience, persist (68). Such barriers are probably compromising the development, adaptation, and implementation of internet interventions during this crisis in Portugal.

Comprehensive e-Learning and e-Supervision Initiatives

While the COVID-19 crisis may be operating as a catalyst effect on the wide-scale acceptance and adoption of digital mental health initiatives (38), attitudinal and training barriers (68) must be expeditiously addressed in Portugal, or significant digital mental health strategies will remain unexplored, resulting in costly missed opportunities to the Portuguese mental healthcare system and its users. Overcoming such barriers implies developing and delivering adequate e-learning and e-supervision programs capable of mitigating the lag between a psychologist's instruction and unfolding practice.

In this respect, initiatives under development in Portugal, such as webinars (101) and professional guidelines (66) are important but clearly insufficient. Portuguese universities and associations must take the lead and develop comprehensive (on- and off-the-job) training initiatives capable of fulfilling clinicians' immediate education needs and practical concerns. Equipping the workforce with such cost-effective strategies will not only provide the necessary tools to handle the COVID-19 crisis but also enable facing the second mental health crisis that will loom in the following months, with economic recession (102).

Furthermore, digital mental health must become part of psychology courses' syllabus, and curricular and professional internships in this domain must be organized to train future clinicians in the development, refinement, and implementation of high-quality digital mental health tools and interventions.

Nevertheless, such reform is easier to imagine than to implement. Most Portuguese universities are not prepared to introduce such adjustment in their curriculums, and most faculty members hold classical stances and education, not being prepared to train future clinicians to work within a digital paradigm. Mapping and bringing together national clinicians and researchers working in the field and partnering with leading international organizations with expertise in delivering digital mental health programs might be an important contribution to achieve this goal.

Paving the Road Toward a Digital Mental Healthcare Paradigm Shift

Shifting to a digital mental healthcare paradigm entails more than willingness from clinicians, researchers, or academics. The involvement of other digital mental health ecosystem stakeholders—patients/citizens, charities and associations, companies, funders, and policymakers—is crucial to guarantee the alignment between digital mental health policy, regulatory and quality assurance frameworks, and citizens' interests.

In November 2019, an important step toward this unfolding digital revolution was taken with the publication of the National Strategic Telehealth Plan (103). Aggregating contributions from a wide range of stakeholders—members of central and regional healthcare administrations and professional nursing, medical, and pharmacists' associations—this plan aims at identifying the main challenges the country faces in this domain and proposing strategic measures to expedite the full integration of telehealth within the everyday sphere of healthcare.

Surprisingly, mental health is not mentioned in this document, and the misrepresentation of the Portuguese psychologists' association as an institutional stakeholder may be an important red flag suggesting that, once again, policymakers' attention might have focused on healthcare priorities other than mental health. It may also be the case that this omission reflects the void of initiatives ongoing in the country pre-outbreak, denouncing the embryonic stage that characterizes digital mental health in Portugal, and explaining the limited digital mental health resources applied so far to face the consequences of COVID-19 crisis. In fact, despite decades of significant evidence on the efficacy and cost-effectiveness of digital mental health initiatives worldwide (104–107), the National Mental Health Plan (108) fails to acknowledge the potential of digital mental health in contributing to promote the mental health of the Portuguese population and providing access to timely mental healthcare.

COVID-19 may have the potential of introducing disruption into the status quo. It may have the positive unintended effect of moving the Portuguese healthcare system forward by exposing its limitations and demanding a call for action. However, for this side effect to unfold, digital mental health must be recognized as a strategic opportunity not only to mitigate COVID-19's impact on the Portuguese population mental health but also to promote it beyond this pandemic. Chasing rainbows is not an option in this or the following mental health crisis. The solution lies on rethinking the National Mental Health Plan (108) at the light of the digital paradigm; aligning it with the National Strategic Telehealth Plan (103); delineating a comprehensive operational plan capable of leveraging duly funded training and implementation research initiatives; and ensuring the digital mental health road starts being paved today, with strategic implementation.

CONCLUSION

In summary, acknowledging digital mental health as a tactical opportunity and investing in a comprehensive digital mental health plan, coupling research, education, implementation, and

quality assessment initiatives, will buffer COVID-19's impact on the Portuguese society, particularly in high-risk groups. By promoting resilience in the population and preventing the upsurge or aggravation of mental disorders, digital mental health will also strengthen the already severely burdened Portuguese mental healthcare system (22), making it capable of facing future challenges more effectively.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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Psychological Support to the Community During the COVID-19 Pandemic: Field Experience in Reggio Emilia, Northern Italy

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We report the field experience of the psychological staff of Azienda USL-IRCCS di Reggio Emilia, a local health system conglomerate serving half a million inhabitants within a catchment area of the Emilia Romagna Region of Italy, during the coronavirus (COVID-19) pandemic. We provided free telephone-based psychological support for the community, with the specific aim of reducing stress caused by the COVID-19 pandemic and its consequences, such as quarantine and lock-down. We describe how the community used this opportunity of psychological support in terms of problems reported and interventions provided. Our field experience suggests that a service of phone psychological support is feasible and quickly implementable in the case of sudden emergencies that affect, to different extents, the whole community.

Keywords: psychological support, coronavirus pandemic, phone assistance, stress exposure, psychological trauma

INTRODUCTION

From the beginning of 2020, the COVID-19 outbreak has become a global pandemic (Zhu et al., 2020) forcing radical measures of public health such as quarantine, physical distancing and lockdowns in several countries, including Italy. Northern Italy in particular was one of the first sub-regions of western Europe hit by the COVID-19 outbreak at the beginning of March, severely stressing the health system (Grasselli et al., 2020).

During this pandemic, healthcare workers, COVID-19 patients and their family members were among those more exposed to stressful events (Duan and Zhu, 2020; Kang et al., 2020) and previous epidemics such as SARS and MERS could be helpful to rapidly identify key issues on immediate and long-term psychological risk for COVID-19 survivors (Mak et al., 2009) and healthcare professionals (Lung et al., 2009; Lee et al., 2018). Moreover, fear of being infected by COVID-19 as well as prolonged quarantine and lock-down could have potential acute and long-lasting psychological *affective* effects also on the community (Brooks et al., 2020; Holmes et al., 2020).

To reduce the potential acute and long-lasting effects of COVID-19 pandemic on mental health, many local health authorities of Northern Italy implemented stepped multilevel and multi-target services of psychological support.

CONTEXT

We report the field experience of the psychological staff of Azienda USL-IRCCS di Reggio Emilia, a local health system conglomerate serving half a million inhabitants in the catchment area of the Emilia Romagna Region of Italy.

A double-level intervention was rapidly implemented in the early weeks of the COVID-19 pandemic emergency. The first level of psychological intervention was provided by hospital-based psychologists usually involved in psycho-oncological support and was directed to healthcare workers, COVID-19 hospitalized patients and family members of patients who died after contracting COVID-19, to alleviate the symptoms and emotional distress induced by disturbing life experiences.

The second level of psychological intervention, that represents the focus of this perspective paper, was provided by psychologists of the Department of Mental Health and Pathological Addictions, that were involved in a service of free phone-based psychological support for the community, with the specific aim of reducing the stress caused by COVID-19 pandemic and its consequences, such as quarantine and lockdown.

Although the use of phone-based methods in psychological counseling and crisis intervention has a long history, especially for some targets as suicidal crisis (Lester, 1977), and its specificity has been widely examined (Lester and Rogers(eds), 2012), its potential in managing psychosocial stress following community trauma exposure has not been consistently reported or investigated (Watson and Hamblen, 2017), especially for global-scale phenomena such as the COVID-19 pandemic. Indeed, the current pandemic scenario invigorated the interest (Zulfic et al., 2020) for the more general issue of telepsychology (American Psychological Association, 2013), in which it is possible to include phone-based psychological support.

All enrolled participants in the project were licensed psychologists/psychotherapists, that underwent a specific online course taught by the head of psychological emergency staff (LT) on the management of psychological reactions induced by emergencies or mass trauma, as post-traumatic symptoms. This course also focused on possible psychological issues raised by the COVID-19 pandemic, as preliminarily reported by the earliest Chinese experiences of COVID-19 (Duan and Zhu, 2020).

Interventions were coded in three steps structuring the psychological support:

- First step: active listening focused on *containment,* i.e., a brief assessment of the stressing situations and related feelings and behaviors.
- Second step: reframing reported symptoms based on strategies of *normalization* (subjective feelings and behaviors as typical reactions to traumatic or severely stressing situations) and/or *psychoeducation* (explanations of typical and physiological reactions to abnormal and acute events, as traumatic events, including intrusive thoughts, hyperarousal, negative mood, avoidance).
- Third step: broad indications on *coping and stress reduction skills*, individualized for children, adults, and elderly people, in case of mild symptoms, or *referring* to other mental health professionals in case of need of more specific interventions. Referring involved hospital psychologists in the case of recently discharged COVID-19 hospitalized patients or family members of dead COVID-19 patients, for rapid psychological support. In other cases, such as acute manifestations of subjective psychological distress, referring involved mental health staff for adequate assessment, support and therapy.

All psychologists were provided with a sheet for each call, that was anonymously filled with basic data (given name, age, living area, stressing situation) and with psychological interventions provided. Phone calls were not recorded and were not used for training scopes or for research (in addition to this report). Supervision was available and provided in case of need by the head of psychological emergency staff (LT), while group sessions of supervisions were not implemented both for lock-down and distancing measures.

The service of psychological phone support was publicized on the local health authority website as well on social media and on local newspapers.

RESULTS

General Data

The service of free phone-based psychological support was active for a total of 11 consecutive weeks since the beginning of the COVID-19 pandemic. During this period, the service received 312 phone calls (227 from females: 72.8%; 85 from males: 27.2%), with a decreasing temporal trend after the initial peak. The mean age of callers was 56.8 ($\pm$14.8) years: age distribution of callers is reported in **Figure 1**. Within callers, 231 (74%) were from the general community, 36 (11.5%) were quarantined patients, 18 (5.8%) were family members of COVID-19 infected or dead patients, and 12 (3.8%) were patients of mental health services.

In-Depth Analysis of First 3 Weeks

We examined more in depth the first 3 weeks of activity (March 18–April 8), that temporally coincided with the hardest period of COVID-19 management by the health system in Italy. During this period, the psychological staff received 158 phone calls (first week 54, second week 60, third week 44). Phone callers were 41 males (25.9%) and 117 females (74.1%); age ranges of phone callers were <20 years (n = 2: 12.7%), 20–29 years (n = 6: 3.8%), 30–39 years (n = 14: 8.9%), 40–49 years (n = 34: 21.5%), 50–59 years (n = 34: 21.5%), 60–69 years (n = 29: 18.4%), 70–79 years (n = 31: 19.6%), $\geq$80 years (n = 8: 5.1%). 149 calls came from the province of Reggio Emilia, while others came from other provinces. The mean duration of calls was

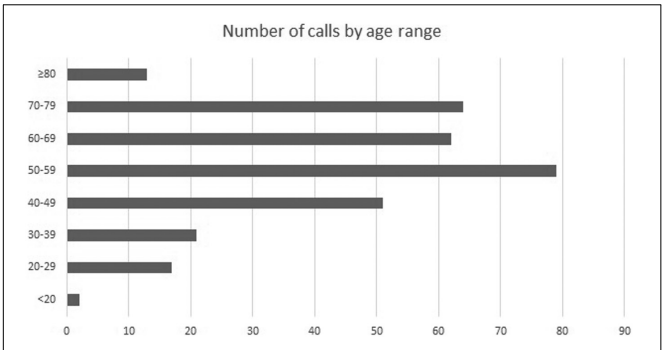

FIGURE 1 | Number of calls by age range.

32 min. Most common reasons for calling were the onset or the increase of anxious and psychosomatic symptoms related both to the fear of infection and to the quarantine (95 calls: 60.1%), physical symptoms suggestive of a possible COVID-19 infection (29 calls: 18.4%), preoccupation for other persons such as family members or friends in relation to their COVID-19 infection or isolation due to quarantine (11 calls: 7.0%). Other less prevalent reasons for calling included the possible loss of work, the online schooling of sons, worsening of the affective relationship with spouse, the availability of devices for personal protections (i.e., masks).

As regards psychological interventions, containment was provided in 147 calls (93.0%), normalization in 131 calls (82.9%), psychoeducation in 99 calls (62.7%), coping and stress reduction skills in 129 calls (81.6%) and referring in 59 calls (37.3%). Referral related to COVID-19 infection (discharged hospitalized patients or family members of infected or dead patients) was suggested in 18 calls and 16 subjects contacted hospital psychologists for a specific EMDR-based treatment. Other cases of referral regarded the presentation or the worsening of severe symptoms of psychological distress, such as anxiety, panic attacks or suicidal thoughts.

DISCUSSION

Help-seeking through phone-based psychological support was more appealing for women, as expected on the basis of empirical evidence (Addis and Mahalik, 2003) and for subjects with middle or advanced age (<40 years 13.9% of callers, ≥40 years 86.1% of callers), with the latter characteristic probably due to the different perceived risk in case of COVID-19 infection on the basis of age.

The majority of themed issues during the first 3 weeks of activity mainly involved current psychological and psychosomatic reactions related to the COVID-19 pandemic, because this period temporally coincided with the hardest moment for health systems in the management of hospitalized infected patients and the highest media coverage. In almost all phone calls, psychological support went through the three steps of intervention, from a preliminary containment based on an active listening of the situation (Lester, 1977; Lester and Rogers(eds), 2012) through a reframing of symptoms with normalization or psychoeducation, to broad indications on strategies to cope with and reduce stress. For example, during the pandemic peak, many isolated or quarantined subjects reported to spend many hours every day listening to news related to the pandemic trend, increasing feelings of anxiety; therefore, in this case it was strongly suggested to reduce exposure to the COVID-19 infodemic (The Lancet Infectious Diseases, 2020). Only in a minority of cases, referring was suggested, due to more severe stress exposure (discharged hospitalized patients or family members of infected or dead patients) or severe symptoms of distress (such as anxiety, panic attacks or suicidal thoughts). During subsequent weeks, in which the number of calls progressively decreased, the main theme of issues shifted from fear of infection and anxiety related to the pandemic to individual psychological difficulties related to quarantine and isolation, with feeling of loneliness especially in oldest subjects living alone. From the perspective of the staff involved in the psychological support, it was a common feeling among psychologists to be more able to respond efficiently to more general themes, as fear of contagion, psychosomatic symptoms or "infodemic-addiction," while preoccupations related to COVID-19 infection (such as physical symptoms suggestive of infection or delays in specific COVID-19 testing) or feelings related to objective conditions of distress such as prolonged isolation or quarantine were more difficult to manage; for example for some categories of subjects such as elderly patients living alone it was more difficult to suggest coping strategies. Moreover, despite the higher level of anonymity (Lester, 1977; Lester and Rogers(eds), 2012) and the shorter duration of phone sessions in comparison with usual face-to-face sessions (mean duration 32 min), the quality of the relationship established with callers was good in most cases, in line with a recent systematic review on phone psychological therapy (Irvine et al., 2019).

In conclusion, the field experience detailed above suggests that in the case of mass emergencies, health agencies may rapidly activate their own human resources with psychological competencies, to implement a service of phone psychological support to the community. This action is feasible and should be included in specific guidelines to support public health preparedness (Reifels et al., 2013; Watson and Hamblen, 2017).

DATA AVAILABILITY STATEMENT

All datasets generated for this study are included in the article/supplementary material.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

FG, GG, GMG, LT, and MP conceived the manuscript. MP wrote the first draft. EBe, EBo, FB, SB, FC, KC, FE, VF, RG, JL, RL, AM, GM, SP, AP, CR, MS, VV, AZ, SZ, LP, and MP participated in the project of phone-call psychological support. All authors revised the manuscript and approved the final version.

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OPINION
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COVID-19 Emergency: Social Distancing and Social Exclusion as Risks for Suicide Ideation and Attempts in Adolescents

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The world is in the middle of tackling the challenge of the coronavirus emergency. On March 11, 2020, the World Health Organization (WHO) declared a pandemic, and Italy was among the nations most affected, with more than 29,000 victims (European Centre for Disease Prevention and Control, 2020; WHO, 2020). Measures to counter the progression of the epidemic have forced a review and reformulation of the day-to-day activities of the affected populations, necessitating restrictive measures such as social distancing and quarantine.

Several studies have hypothesized that quarantine could have a negative psychological impact on the population (Brooks et al., 2020). Studies have shown that quarantine leads to a decrease in positive emotions and an increase in negative emotions, such as anger and fear (Cava et al., 2005).

The experience of quarantine tends to correlate with decreased psychological well-being and the onset of psychological symptoms and emotional disorders, such as depression, anxiety, insomnia, and post-traumatic symptoms (Brooks et al., 2020). Factors such as the quarantine duration, the uncertainty of information, and the fear of being infected or of the infection of loved ones appear to be factors that increase distress (Robertson et al., 2004; Reynolds et al., 2008; Brooks et al., 2020). In addition, the loss of routine and confinement, which causes a drastic reduction in physical and social contact with others, can increase the sense of isolation and loneliness, resulting in psychological distress (Brooks et al., 2020). The literature has focused mainly on the psychological well-being of adults and health professionals, and not on adolescent well-being, and, in particular, the risk of suicidal ideation.

Suicide is estimated to be the world's second leading cause of death among adolescents, and suicidal ideation, which contributes to the risk of committing suicide, is at its peak in adolescence (Hawton et al., 2012; Uddin et al., 2019).

Adolescence is a delicate period for future psychological adaptation, and it is at this stage of evolution that the need for group membership is strongly expressed (Badenes-Ribera et al., 2019). In agreement with self-determination theory (Deci and Ryan, 1985), adolescents seek to gratify their need to feel socially connected with others in order to satisfy their need to belong to the group, as well as to feel more popular among their peers. The need for belonging is a basic psychological need that if frustrated or not satisfied can lead to a sense of isolation and loneliness that affects adolescent psychological

well-being and can help increase the risk of suicide (Stewart et al., 2017). Thwarted belongingness, or the perception that one is alienated from others and not an integral part of a valued social group, is considered a predictive factor for suicidal ideation by suicide theories and, in particular, by the psychological interpersonal theory of suicidal behavior (Joiner et al., 2009). Quarantine seems to have all the characteristics to promote this state of isolation and loneliness. For example, in Italy, schools, as well as facilities dedicated to sports, arts, and leisure activities, have been closed throughout the country since March 10, 2020. In this way, spaces where adolescents tend to congregate have been reduced, thus reducing peer contact. In addition, the closure of schools has resulted in the use of online teaching, which could be a source of stress and disadvantage for some adolescents, and this is interesting in terms of our reflection given that school performance seems to be related to the phenomenon of adolescent suicide (Evans et al., 2004; Stewart et al., 2017). In addition, school closures could result in a lack of access to resources for adolescents with previous psychological difficulties, and this is a critical issue for the mental health of such adolescents.

Of course, young people can use social networks to keep in touch with their peers, but we must warn that the excessive use of social media can increase distress and the risk of victimization and have an impact on the psychological well-being of children (Longobardi et al., 2020a,b). We must also assume that at greater risk will still be the low-rise adolescents in social status such as popularity, rejection, and social exclusion. In fact, the literature seems to indicate that children who are rejected and excluded from their peer groups seem to experience the same dynamic even in the virtual world (Longobardi et al., 2020a). Therefore, the quarantine situation could increase the sense of exclusion and isolation and, in turn, increase suicidal risk (Morese and Longobardi, 2020).

Other factors also need to be taken into account. The quarantine period can help to increase family conflict; there is therefore often increasing distress and a sense of solitude in the families of quarantined children and adolescents. Negative experiences in the family, such as divorce and conflictive parental separation, seem to be vulnerability factors for suicide in adolescence (Hawton et al., 2012). The death of one's relatives is also recognized as a risk factor for suicide in adolescence, and daily reports tell us of mothers, fathers, and grandparents who have died following infection from coronavirus disease 2019 (COVID-19) and family members broken by the event of mourning (Jakobsen and Christiansen, 2011).

In general, this intervention aims to highlight concern for the psychological well-being of adolescents and, in particular, to address the risk of suicidal ideation and behavior. It is important, in our view, to extend knowledge about this phenomenon in relation to quarantine. We also consider it useful to inform psychologists, psychiatrists, social workers, and all the authorities involved in the protection of minors to ensure that they should not forget adolescents and the risk of suicide during this emergency.

It is important to train and inform adolescent psychological well-being facilities, start awareness campaigns, and structure dedicated services that can intercept at-risk cases. In addition, patients already being treated for suicidal behavior should be monitored for ongoing issues, and, if possible, they should conduct their psychological therapies using telematics.

AUTHOR CONTRIBUTIONS

CL, RM, and MF conceptualized the contribution. CL wrote the paper. RM reviewed the manuscript. MF provided the critical revision processes as principal investigator (PI). All authors approved the submission of the manuscript.

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Psychosocial Risks, Work Engagement, and Job Satisfaction of Nurses During COVID-19 Pandemic

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Context: COVID-19 pandemic is a serious health emergency that has affected countries all over the world. Health emergencies are a critical psychosocial risk factor for nurses. In general, psychosocial risks constitute serious problems as they impact workers' health, productivity, and efficiency. Despite their importance, few studies analyze nurses' psychosocial risks during a health emergency caused by a pandemic or analyze their perception of the emergency and its relation to such risks.

Objectives: To analyze the perception of COVID-19 by nurses, especially about measures, resources, and impact on their daily work. Also, to analyze these professionals' psychosocial risks and the relationship between perception of COVID-19 and these risks.

Methods: A descriptive correlational study was performed in a convenience sample of 92 nurses from two public hospitals in the Valencian Community (Spain), (74 women, 79.1%), aged 24–63 (M = 43.37, SD = 11.58). Data were collected via an online self-completed questionnaire during the rise of the pandemic from March 29 to April 8, when the number of infections went from 78,797 to 146,690.

Results: The measures and resources available about COVID-19 are relatively low, and the impact on their work is high. Similarly, the most prominent psychosocial risks appear to be emotional work and workload. In contrast, nurses' work engagement is medium, and their satisfaction is high. Finally, there seems to be a negative and significant relationship between the information available to nurses, the measures implemented, and resources with some of their psychosocial risks, and a positive one with job satisfaction and work engagement. There is also a positive and significant relationship only between the impact of COVID-19 and their work inequality, but not for other risks.

Conclusions: The resources, measures, and information can be a protective factor facing nurses' psychosocial risks, especially during a pandemic. Studying the relationships between psychosocial risk and perception of a health emergency would be relevant and fundamental to protecting and caring for nurses, health professionals, and society.

Keywords: COVID-19, psychosocial risks, work engagement, job insecurity, nurse, peak pandemic, job satisfaction

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INTRODUCTION

Psychosocial risks at work are aspects of work design and the social, organizational, and management contexts of work that could cause psychological or physical harm (1). Psychosocial risks and work-related stress are among the most challenging issues in occupational safety and health, impacting significantly on the health of individuals, organizations, and national economies (2, 3). They arise from inadequate work design, management, organization, and poor social context of work, resulting in adverse physical, psychological, and social outcomes such as work-related stress, depression, or burnout (4). More specifically, psychosocial risks are related to low job satisfaction (5), health problems (3), work accidents (6), work-related stress (7), burnout (8). Psychosocial risks are closely related to work-related stress, which has been associated with a reduction in social interaction and the ability to concentrate at work, increased physiological pain and cardiovascular problems, and a higher incidence of mental illness such as depression and anxiety (9, 10). Stress, and the psychosocial risks that can exacerbate it, could also affect other aspects of work such as job satisfaction and motivation (11) or work engagement (12). In this same vein, the proper management of psychosocial risk helps to prevent accidents and absenteeism (5, 13), increase productivity (5, 14, 15), and promote well-being at the workplace (16).

Among the different sectors, the health sector is the one that traditionally seems to be most affected by these types of conditions, in particular concerning physicians and nurses, who constitute a professional group that meets high responsibility, work demands, and job insecurity; and, at the same time, a great commitment to their work (17).

This data is of paramount importance, since nurses play a vital role in the health systems, constituting the largest group of health professionals (18). Nurses' contribution to global health is undisputed, and investing in improving their quality of life benefits society (19, 20). Improved working conditions and professional development affect not only the well-being or quality of life of nurses but also their performance and the functioning of the entire health care system (21). In line with this, as the WHO suggests, adequate staffing and prioritization of occupational health and safety are essential (18).

Among the different theoretical models that exist to explain the appearance of occupational stress, Karasek's model (22) is the one with the most theoretical and empirical support and the one that currently has the most influence and attention. It explains work-related stress according to the imbalance between psychology demands at work (e.g., workload, role conflicts, interpersonal conflicts, job insecurity) and the control level or resources that the employee has. According to this model, the employees' health or well-being depends on balancing their work demands and their own resources. When the demands are higher than the resources, it can feel like work-related stress by the employee. In addition, chronic work-related stress can cause burnout syndrome and several physical or psychosomatic symptomatologies. Thus, an excess of demands will produce a negative consequence in the employee, as higher burnout, however having enough resources benefit the employee decreasing the probability of having higher burnout (23).

Among the different psychosocial risks, the following stand out because of their importance:

Role conflict: This is the situation in which a worker cannot simultaneously satisfy the contradictory role expectations in which he or she is involved. There is role conflict when a worker receives contradictory demands from two or more people, or tasks without having the necessary resources to complete them. Previous research has shown that problematic distress levels were 53 percent more likely for workers reporting role conflict (24).

Lack of organizational justice: Lack of organizational justice refers to the extent to which employees perceive they are treated unfairly in their workplace and the perception of the absence of reciprocity in social exchanges (25). Low organizational justice is known to be a potential risk factor for poor physical and psychological health among employees (25).

Workload: It applies to quantitative and qualitative workload. Quantitative workload refers to the number of activities to be performed in a given time. In contrast, qualitative workload refers to the difficulty of the task and the volume of information to be processed in relation to the time available (26). A high workload has been associated with low well-being and high risks of health problems (27).

Interpersonal conflicts: It refers to the frequency with which workers perceive that conflicts are coming from the hospital management, colleagues, patients, or relatives of the patient. Interpersonal conflicts have been associated with health problems, particularly depression (28).

Emotional work: It refers to the effort, planning, and control necessary to express the organizationally desirable emotions during interpersonal transactions (29). It includes emotional demands, such as "dealing with strong feelings such as sorrow, anger, desperation, and frustration" at work (24). Previous research has shown that problematic distress levels were 38 percent more likely for workers reporting high emotional work (24).

Job insecurity: is the perceived threat of losing one's current job in the near future (30), or also that the employer did not comply with his obligations or promises (breach of psychological contract) (31), which can have equally severe consequences as actual job loss (32). Particularly, job insecurity is considered a stressor that negatively affects the employee's physical, psychological, and social health (33–35).

Among the most critical consequences of psychosocial risk factors are psychosomatic health problems and burnout syndrome.

Psychosomatic health problems: The term psychosomatic refers to alterations in which mental processes influence the organism (36). Among the most common are various types of symptoms affecting multiple organs and systems. Examples of these are back pain, tension headaches, sleep problems, chronic fatigue, heartburn, tension diarrhea, or heart palpitations (37).

Burnout syndrome: is defined as a prolonged response to chronic emotional and interpersonal stressors at work and is defined by the three dimensions of burnout, cynicism, and inefficiency (9).

Although most of the available studies on psychosocial risks tend to focus on their negative consequences or outcomes such as stress, psychosomatic problems, or burnout, psychosocial risk management also has positive outcomes. Job satisfaction and work engagement are among these positive outcomes.

Job satisfaction: It can be described as how much people like or dislike their jobs (38) or how much they perceive their needs met by work (39). There is a consensus among the several models that explain job satisfaction: it is influenced by external factors such as working conditions and internal factors such as self-efficacy beliefs (40).

Work engagement: it presents three dimensions (1) Dedication, defined by feelings of importance, inspiration, challenge, enthusiasm and pride; (2) Vigor, defined by a high level of energy and mental stamina at work, eagerness to put effort into one's work, and determination to overcome challenges; and (3) Absorption, defined by being completely focused and deeply immersed in one's work, so that time passes fast and one has difficulty letting go (41).

Work engagement can be differentiated from other types of worker well-being, such as burnout, boredom, work addiction, and job satisfaction. Work engagement has been conceived as the opposite and positive pole of burnout, characterized by mental fatigue related to work (9). As a result, burnout and work engagement relate negatively. Boredom at work, like burnout, is defined by little excitement and displeasure (42), while work engagement is defined by great excitement and pleasure. Work engagement can also be differentiated from work addiction, which applies to a strong inner compulsion to excessive work (43), defined by high excitement and displeasure. Work engagement can also be distinguished from job satisfaction (44). Although both are defined by pleasure, the degree of enthusiasm for engagement is higher than for job satisfaction (45).

Working conditions, and the consequences that arise from them, can be significantly affected by the economic and social context (46), especially when events that affect the entire population arise, such as economic crises or, in this case, health emergencies or pandemics, such as that caused by COVID-19.

The World Health Organization (WHO) recognized it as a global pandemic on March 11, 2020 (47). As of May 17, 2020, more than 4.8 million cases of the disease have been reported in more than 213 countries and territories worldwide, with nearly 316,000 deaths and more than 1.8 million recoveries (48, 49). The five countries with the highest number of infections are the United States, Russia, Brazil, the United Kingdom, and Spain (48, 49). The five countries with the highest number of deaths are the United States, the United Kingdom, Italy, France, and Spain (48, 49).

Public health emergencies affect the health, safety, and well-being of individuals. They usually generate confusion, insecurity, emotional isolation, and stigma. Public health emergencies also affect communities, leading to work and school closures, economic loss, and medical response resources scarcity. These effects may translate into a range of emotional reactions like distress or psychiatric conditions, unhealthy behaviors like substance abuse, and non-compliance with public health directives such as home confinement and vaccination (50).

The work of nurses involves several specific demands that make this group particularly vulnerable to psychosocial risks. This situation is even more dangerous in a pandemic situation such as that triggered by COVID-19, in which there is a massive increase in work demands.

Health care providers are particularly vulnerable to emotional distress in the current pandemic, given the novel nature of SARS-CoV-2 and their risk of exposure to the virus, increased workload, scarcity of personal protective equipment and other medical supplies, inadequate testing, limited treatment options, concern about infecting and caring for their loved ones, and involvement in emotionally and ethically fraught resource-allocation decisions (50).

In Spain, the alarming health situation generated by the COVID-19 pandemic has meant enormous overexertion of all health personnel at the national level, including nurses, who have had to face physical, psychological, emotional, and social demands in a situation where resources are not always available, and the uncertainty of the evolution of the pandemic has been present. Supplies of personal protective equipment in health centers have been a concern in all regions leading to re-use, despite the known risks (51). Many reports suggest that health care staff are stretched to the point of exhaustion, and the problems are being intensified by the quarantining of an increasing number of health workers (51). Insufficient measures have been taken, such as canceling holidays, bringing retired nurses, and doctors back into the health service, hiring graduates without specialization hiring final year medical and nursing students, and extending contracts of medical residents (51).

In Spain, as of May 17, 2020, there have been 231,606 confirmed cases, of which 150,376 have been discharged, 125,233 have been hospitalized, 11,437 have been admitted to Intensive Care Units (ICUs), and 27,709 have died, according to official data from the Ministry of Health (52).

In Spain, the first positive diagnosis was confirmed on January 31, 2020, on the island of La Gomera (53), while the first death occurred on February 13 in Valencia, a fact known 20 days later (54).

Given the rapid spread of the virus, on March 14, the Spanish government decreed an emergency state throughout the country for fifth teen days (55). This measure restricts citizens' free movement to some instances, such as purchasing food and medicines or visiting medical centers or the workplace. In practice, it confines the population to their place of residence. Since then, the Deputies Congress has authorized the government to extend the state of emergency on five occasions, extending this measure until June 7 (56). The Spanish government approved on April 28 (57) a plan for asymmetric de-escalation by territorial units. During this time, one of the main peaks of the pandemic in Spain occurred between late March and early April. Data on the daily evolution of the pandemic in Spain according to the level of severity of those infected during late March and early April (52) are presented in **Table 1**.

Along with the impact that a pandemic can have on its own, a key element is the pandemic's perception by those who live with it, especially frontline workers, the nurses. Their perception of the measures taken, the resources available, and the pandemic's

TABLE 1 | Daily evolution of the pandemic in Spain according to the level of severity of those infected.

	New cases	Hospital admissions	ICUs	Deceased
24-Mar	8,563	3,702	541	596
25-Mar	8,959	4,112	303	615
26-Mar	9,189	4,849	536	745
27-Mar	8,253	4,361	338	839
28-Mar	6,428	2,626	310	715
29-Mar	5,813	2,910	252	696
30-Mar	8,148	2,427	309	820
31-Mar	7,413	3,073	292	929
01-Apr	7,591	2,502	213	877
02-Apr	7,280	2,189	221	845
03-Apr	6,678	2,463	192	780
04-Apr	5,539	1,556	311	670
05-Apr	3,672	1,232	102	628
06-Apr	5,213	1,284	124	757
07-Apr	5,586	1,536	190	757
08-Apr	5,749	1,698	219	781
09-Apr	4,540	1,853	124	642

impact on their work and lives can affect and be affected by psychosocial risks and their consequences.

Despite the impact of pandemics on citizens' health and well-being, and more specifically of their workers, and its clear influence on working conditions, or more specifically on their psychosocial risks, there are hardly any studies that have addressed the effect of a pandemic on psychosocial risks. This situation is even more limited if we consider the impact on nursing professionals.

Likewise, the few studies traditionally available have been carried out retrospectively, ignoring their perception of the pandemic and the associated psychosocial risks during the times of greatest severity, or peak. Similarly, as mentioned above, studies on psychosocial risks have focused more on negative consequences such as stress or burnout while ignoring others in a positive sense, such as work engagement.

After conducting a review of the literature, we were unable to observe any studies focused on nurses that analyzed the psychosocial risks and their perception of the pandemic during its peak, considering not only negative consequences such as psychosomatic problems but also positive aspects such as job satisfaction and work engagement.

Therefore, the study presented here aims to fill this gap in the literature by offering a first approach to the perception of COVID-19 by nursing professionals and its relationship with psychosocial risks and some of its main consequences, such as psychosomatic problems, job satisfaction, and work engagement during the peak of the pandemic in Spain from March 29 to April 8, 2020.

Aims

To analyze the perception of COVID-19 by nurses, especially about measures, resources, and impact on their daily work. Also, to analyze these professionals' psychosocial risks and the relationship between perception of COVID-19 and these risks.

METHODS

Design, Procedure, and Participants

Ninety-two nurses from two public hospitals in the Valencian Community (Spain). The participants' age range was 24–63 (M = 43.37, SD = 11.58), and 79.1% of them were women.

The eligibility criteria for participants were as follows.

Inclusion criteria:

(a) To be a nurse.
(b) To be actively working during the moment of assessment.
(c) To have signed the informed consent document and confidentiality agreement within the framework of the Declaration of Helsinki principles.

Data were collected online with a self-completed questionnaire during the rise of the pandemic from March 29 to April 8, 2020, when the number of infections went from 78,797 to 146,690. This study was authorized by the Ethical Committee of Research with Medicines CEIM Code 128/19. The hospitals nursing units contacted the possible participants via email, and invited them to participate in the study. The time of completion of the entire assessment protocol was 45 min.

Outcome Measures

The study involved the following variables and measurement tools:

(a) Psychosocial risks. Different scales have been used to measure demand and consequence factors.

Within the demand factors, we find:

Role conflict: Included in the UNIPSICO battery (26). Role conflict is the situation in which a worker cannot simultaneously satisfy the contradictory role expectations in which he or she is involved. The scale comprises 5 items ("I receive incompatible demands from two or more people"). It is answered on a 4-point Likert scale (0 = Never; 4 = Very frequently: every day), with higher scores indicating higher role conflict (scores above 1.6 are considered high, whereas scores equal or below 0.81 are considered as low). The alpha de Cronbach for the sample of study is $\alpha = 0.78$.

Lack of organizational justice: Included in the UNIPSICO battery (26). Lack of organizational justice is defined as the perception of the absence of reciprocity in social exchanges. The scale is made up of 5 items ("I give up my skin at work compared to what I receive in return"). It is answered on a 4-point Likert scale (0 = Never; 4 = Very frequently: every day), with higher scores indicating a higher lack of organizational justice (scores above 2.4 are considered as high, whereas scores equal or below 1.6 are considered as low). The alpha de Cronbach for the sample of study is $\alpha = 0.88$.

Workload: Included in the UNIPSICO battery (26), it assesses quantitative and qualitative workload. Quantitative workload refers to the number of activities to be performed in a given time. In contrast, qualitative workload refers to the difficulty of the task and the volume of information to be processed in relation

to the time available. It consists of 6 items, 3 of quantitative (Is it possible for you to work at a relaxed pace?) and 3 of qualitative (When you are working, do you encounter particularly hard situations?). It is answered on a 4-point Likert scale (0 = Never; 4 = Very frequently: every day), where higher scores indicate a higher workload (scores above 2.17 are considered high, whereas scores equal or below 1.51 are considered low). The alpha de Cronbach for the sample of study is $\alpha = 0.77$.

Interpersonal conflicts: Included in the UNIPSICO battery (26), it assesses the frequency with which workers perceive conflicts coming from the hospital management, colleagues, patients, relatives of the patient. The scale consists of 6 items (how often do you have conflicts with your colleagues?). It is answered on a 4-point Likert scale (0 = Never; 4 = Very frequently: every day), with higher scores indicating higher Interpersonal conflicts (scores above 1 are considered high, whereas scores equal or below 0.6 are considered low). The alpha de Cronbach for the sample of study is $\alpha = 0.43$.

Emotional work: An adaptation of the Frankfurt Emotion Work Scales (FEWS) questionnaire (58) included in the UNIPSICO battery (26) has been used. This questionnaire defines emotional work as the effort, planning, and control necessary to express the organizationally desirable emotions during interpersonal transactions (29, 59). For the present study, 12 items were selected (Do you have to express pleasant emotions toward patients and their families? (e.g., kindness). It is answered on a 4-point Likert scale (0 = Never; 4 = Very frequently: every day). Higher scores indicate higher emotional work. The alpha de Cronbach for the sample of study is $\alpha = 0.56$.

Job insecurity: It was measured using the Job Insecurity Scale (60). It consists of five items ("I feel insecure about the future of my job") designed to measure quantitative job insecurity (i.e., insecurity to lose the job as such). Respondents were asked to rate these items on a 5-point Likert type scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree"), with higher scores indicating higher job insecurity levels. The alpha de Cronbach for the sample of study is $\alpha = 0.89$.

Within the consequence factors, we find:

Psychosomatic problems. Included in the UNIPSICO battery (26), it assesses the frequency of occurrence of psychosomatic problems related to the perception of stress sources at work. It consists of 9 items related to the organism (e.g., "Have you been worried that, without making any effort, your breathing would be cut off?"). It is answered on a 4-point Likert scale (0 = Never; 4 = Very frequently: every day), with higher scores indicating higher Psychosomatic problems (scores above 1.67 are considered as high, whereas scores equal or below 0.89 are considered as low). The alpha de Cronbach for the sample of study is $\alpha = 0.88$.

Job satisfaction. It is defined as a positive emotional state resulting from the person's work perception. This variable was measured using the job satisfaction scale of the UNIPSICO Battery (26), which contains a set of attitudes developed by the person toward specific facets of the job. It consists of 6 items (The opportunities offered by your job to do the things you like). Participants were asked to score the frequency with which they have experienced the situation described in each statement on a Likert type scale from 0 to 4 (0 = strongly unsatisfied; 4 = strongly satisfied) with higher scores indicating higher Job satisfaction. The alpha de Cronbach for the sample of study is $\alpha = 0.78$.

Work engagement. To assess this variable the Ultra-Short Measure for work Engagement UWES-3 (45) was used, a shortened version of the Utrecht Work Engagement Scale or UWES (61). This scale includes three dimensions (41): (1) vigor, characterized by "high levels of energy and mental resilience while working, the willingness to invest effort in one's work, and persistence even in the face of difficulties"; (2) dedication, characterized by "feelings of a sense of significance, enthusiasm, inspiration, pride, and challenge"; and (3) absorption, characterized by "being fully concentrated and deeply engrossed in one's work, whereby time passes quickly, and one has difficulties with detaching oneself" (41). Respondents were asked to rate these items on a 5-point Likert type scale, ranging from 1 ("strongly agree") to 5 ("strongly disagree"), with higher scores indicating higher work engagement. The alpha de Cronbach for the sample of study is $\alpha = 0.81$.

(b) COVID-19 related measures. An *ad-hoc* questionnaire was constructed to measure different aspects related to the health emergency caused by the COVID-19. The aspects considered are Available resources (provided by the health center, regional government, and national government), information (provided by the health center, regional government, and national government), measures (taken by the health center, regional government, and national government) and impact on work (workload, labor conflicts, work-related stress, and work-related concerns and fears). The *ad-hoc* questionnaire includes 13 items, where the subject scores on a Likert scale his/her level of agreement or disagreement with the statements (1 = totally disagree, 5 = totally agree). Scores range from 1 to 5, with higher levels indicating greater satisfaction with the resources available, information, and measures taken, as well as higher levels of impact on work. The alpha de Cronbach for the sample of study is as follows: available resources $\alpha = 0.92$; information $\alpha = 0.95$; measures $\alpha = 0.92$; impact on work $\alpha = 0.73$.

Data Analyses

A descriptive statistical analysis was performed for all study variables, as well as a study of correlations between them. All analyses were carried out using the IBM® SPSS® Statistics software (version 24).

RESULTS

Descriptive Analysis

Psychosocial Risks and Their Consequences

As shown in **Table 2**, during the pandemic's peak, the perception of psychosocial risks was higher for Emotional Work and Workload than for the rest of the psychosocial risks, presenting Interpersonal conflicts problems the lowest scores. Regarding the consequences of psychosocial risks, scores on psychosomatic problems are low, and Job satisfaction, as well as work engagement, obtained scores slightly above the middle of the score range.

TABLE 2 | Descriptive data of psychosocial risks and their consequences.

	Mean	SD	Range	Risk level
Role conflict	1.143	0.569	0–4	Medium
Lack of organizational justice	1.862	0.654	0–4	Medium
Workload	2.035	0.607	0–4	Medium
Interpersonal conflicts	0.692	0.462	0–4	Medium
Emotional work	3.437	0.398	0–4	–
Job insecurity	1.750	0.959	1–5	–
Psychosomatic problems	1.098	0.462	0–4	Medium
Job satisfaction	2.405	0.803	0–4	Medium
Work engagement	2.435	0.936	1–5	–

M = Mean; SD = Standard deviation; Range 0–4 (0 = Never; 4 = Very frequently: every day); 1–5 (1 = "strongly disagree"; 5 = "strongly agree"); – not applicable.

TABLE 3 | Descriptive data of COVID-19 related measures.

	Mean	SD	Range
Resources	2.256	1.045	1–5
Measures	2.444	1.073	1–5
Information	2.759	1.117	1–5
Impact on the workplace	3,873	0.862	1–5

COVID-19 Related Measures

As shown in **Table 3**, during the pandemic's peak od, participants rated the resources available and measures taken by the government and the hospital slightly below the mean value of the answer scale, which points to a tendency to consider resources and measures an insufficient. Similarly, participants rated the information available regarding the pandemic slightly above the mean value of the answer scale, which points to a tendency to consider the information available as barely enough, but not satisfactory, which would have been closer to the top score of the answer scale. Finally, the mean of the scores on the workplace's impact is the highest among the COVID-19 related measures, being close to the top of the range of scores for this measure, which points to a high impact in general of the pandemic on the workplace.

Analysis of Relations

The results of the correlation analysis among the variables are shown in **Table 4**. In regard to the psychosocial risks variables, note that job satisfaction correlates negatively with role conflict ($r = -0.547$; $p < 0.01$) and psychosomatic problems ($r = -0.380$; $p < 0.01$). Also role conflict correlates positively with interpersonal conflicts ($r = 0.271$; $p < 0.05$). Regarding the COVID-19 related variables, highlight that resources, measures and information correlate between them, in a very strong and positive way; particularly resources with measures ($r = 0.839$; $p < 0.01$) and measures with information ($r = 0.776$; $p < 0.01$). Nevertheless, none of this three variables correlated significantly with Impact of COVID-19. Finally, among the stronger correlations between variables of psychosocial risks and variables related to COVID-19, remark that resources ($r = 0.474$; $p < 0.01$), measures ($r = 0.483$; $p < 0.01$) and information ($r = 0.558$; $p < 0.01$) correlated positively with Job satisfaction. Also, resources ($r = -0.312$; $p < 0.01$), measures ($r = -0.462$; $p < 0.01$), and information ($r = -0.529$; $p < 0.01$) correlated negatively to Role conflict. In addition Workload correlates positive with Job insecurity ($r = 0.292$; $p < 0.01$), and psychosomatic problems ($r = 0.369$; $p < 0.01$), and negatively with job satisfaction ($r = -0.364$; $p < 0.01$) and COVID related resources ($r = -0.271$; $p < 0.05$), measures ($r = -0.232$; $p < 0.05$) and information ($r = -0.408$; $p < 0.01$).

DISCUSSION AND CONCLUSIONS

This article deals with an issue that is rarely addressed in the scientific literature: the interaction between the psychosocial risks faced by health professionals, specifically nurses, during a health crisis such as the pandemic generated by COVID-19. The impact that the virus has had at all levels around the world is enormous (50). It has posed and still poses a challenge in terms of health, economics, politics, and society, as well as an enormous individual and collective effort, where the emotional toll on the general population is significant and prolonged (62). It is a challenge that we are facing as humanity, as a society, and as individuals. Many professionals are working with substantial hourly loads and extreme conditions in this context of incredible demands and many uncertainties, and social and physical overload (63). Among them, the nurses' work is invaluable (47). Any information that we can provide to alleviate as much as possible the heavy physical and psychological burden to which they are being subjected, both at present and on future occasions that we hope will not be repeated for many years, will be an effort well-invested. An effort to take care of caregivers, especially in the extreme crisis of a pandemic.

This study focuses on nurses in Spain, at the peak of the pandemic in this country. The main results of the study show, on the one hand, that nurses in general feel that they have to do a lot of emotional work and that they have a heavy workload, highlighting these two psychosocial risks above all others. This result can be explained by the remarkable effort not to show their emotions. Despite the situation of being exposed to the suffering of patients together with the scarcity of resources and the large amount of worked hours represents a strong emotional strain, nurses feel that they cannot show their emotional state, and they try to offer their best face (11, 64). This situation represents a significant added effort for them and, at the same time, shows their ethical practice, respect for human dignity, human rights, and cultural diversity (65). Also, nurses are expected to provide holistic care from a cultural, environmental, social, psychological, economic, and spiritual perspective (66). On the other hand, the psychosocial risk that has received the lowest scores is psychosomatic problems. Perhaps this could be due to the pandemic's peak situation; nurses have not yet developed physical symptoms that are the product of the psychological wear to which they are subjected, and that later is when psychosomatic symptoms are likely to emerge (23).

TABLE 4 | Correlations among the variables of study.

	RC	LOJ	WL	IC	EW	JI	PP	JS	WE	R	M	INF	IMP
Role conflict	1												
Lack of organizational justice	0.338**	1											
Workload	0.385**	0.476**	1										
Interpersonal conflicts	0.271*	−0.070	0.167	1									
Emotional work	0.101	0.229	0.115	−0.113	1								
Job insecurity	0.372**	0.184	0.292*	−0.066	−0.027	1							
Psychosomatic problems	0.591**	0.371**	0.369**	0.027	0.162	0.371**	1						
Job satisfaction	−0.547**	−0.226	−0.364**	−0.092	0.071	−0.246*	−0.380**	1					
Work engagement	0.280*	0.069	0.059	0.006	−0.029	0.087	0.031	−0.183	1				
COVID-19 resources	−0.312**	−0.191	−0.273*	0.007	−0.071	−0.030	−0.218	0.474**	0.125	1			
COVID-19 measures	−0.462**	−0.056	−0.232	−0.124	−0.006	−0.062	−0.255*	0.483**	0.047	0.839**	1		
COVID-19 information	−0.529**	−0.163	−0.408**	−0.129	−0.006	−0.265*	−0.250*	0.558**	−0.011	0.639**	0.776**	1	
COVID-19 impact	0.206	0.323**	0.282*	−0.043	0.186	0.177	0.234	−0.165	0.187	−0.176	−0.192	−0.176	1

*RC, Role conflict; LOJ, Lack of organizational justice; WL, Workload; IC, Interpersonal conflicts; EW, Emotional work; JI, Job insecurity; PP, Psychosomatic Problems; JS, Job satisfaction; WE, Work engagement; R, resources; M, measures; INF, Information; IMP, impact; *p < 0.05; **p < 0.01.*

Regarding job satisfaction and work engagement, they tend to be high, which speaks to a certain resilience in the participants, perhaps due to the awareness of the enormous importance of the work to be done, especially and more than ever in these extreme circumstances. Studies have identified that nurses were able to manage their vulnerability using their strengths (personal, professional, contextual, and spiritual) by increasing their resilience. These strengths reflected a balance of personal attributes such as personal values (caring), attitudes (being optimistic), beliefs (religion) along with their professional skills (communication) in the contexts in which they worked (work environment, available support) (67). Resilient nurses are more likely to remain in the workforce (68), which is of vital concern due to the international COVID- 19 crisis. In this context, nurses consider the impact of the COVID-19 on their work to be high, although it does not obtain the maximum score. This outcome could be because the questions refer to the work in particular, and yet the COVID-19 has strongly impacted all spheres of society worldwide, affecting personal, family, and social relationships in general. This fact could lead nurses to consider the impact of COVID-19 not as a particular impact on their workplace, but as a general impact that goes far beyond (50, 62).

In relation to the perception of the measures taken by the responsible entities, as well as the resources and information available, it is considered by nurses to be of a medium level, being neither especially good nor bad. A possible explanation to this could be that they value both the positive and negative aspects, and make an average between what they perceive to be good, and what they perceive to be not so good. Nurses who received frequent and evidence-based information from hospital management expressed less anxiety about the pandemic. Concern for one's own health and the health of the family requires accurate, timely, and frequent communication from healthcare managers and experts (69). As for the relationships observed between the variables, most are those expected based on the scientific literature, such as the case of role conflict, workload, and interpersonal conflicts being positively related. The most frequently identified sources of conflict include lack of emotional intelligence, personality traits, various aspects of the job and work environment, role ambiguity, lack of support from manager and colleagues, and poor communication (70). The data suggest that job satisfaction is inversely related to these psychosocial risks (role conflict and interpersonal conflict) and to psychosomatic problems (71).

Also, in line with expectations based on previous research, the measures, resources, and information related to COVID-19 are related to each other, while the impact of COVID-19 seems to be independent of them. Interestingly, the COVID-19 measures, resources, and information relate to increased job satisfaction, which supports the theory that the more resources available to address job challenges, the greater the satisfaction and less the discomfort associated with the job (22). On the other hand, also in line with what is expected based on the scientific literature, more resources, measures, and information appear to be related to less conflict of roles, which could indicate that these measures, resources, and information facilitate the fact that nurses perceive fewer discrepancies in terms of what is expected of them, having in turn less interpersonal conflicts, greater job satisfaction, and less psychosomatic problems.

Contrary to what might be expected, the psychosocial risks and their associated consequences during the pandemic do not seem so severe, despite the pandemic's difficulties, the overload of work, and the increase in demands of all kinds, including emotional ones. These findings may reflect the nursing staff's character, who, in crises, focus on the care of patients, ignoring the problems, or difficulties of their working conditions. Probably once the crisis is over, nurses will assess somewhat more objectively and also more negatively the conditions in which they had to perform their work.

One possible limitation of the present study refers to the small number of participants, and the short period in which the data was collected. Despite these limitations, we consider

the information collected to be extremely valuable, as it collects data on nurses' perceptions of demands, and resources right during the peak of the pandemic, which gives much validity to their responses. The data has not been collected *a posteriori*, where other variables can contaminate the data at that time, such as memory, change of situation, among others. We are also aware of the limitations that this study poses in terms of its results, since it is cross-sectional and no causal relationships can be established between the variables. However, we believe that the data provided are valid and relevant. We hope that they will contribute to better help nurses and health professionals in general in future health crisis situations, especially taking into account such essential elements in the prevention of future pathologies psychosocial risks.

Nurses have played a key role as part of teams managing epidemics threat to health worldwide, (SARS) in 2003 (72), the Middle East Respiratory Coronavirus (MERS-CoV) in 2015 (73), Zika viral disease in 2016 (74, 75), Ebola viral disease in 2014 (76, 77) and the COVID-19 outbreak that began in 2019. Nurses and other health professionals are trained to support their countries' responsiveness to future disasters and emergencies (78). This fact may be particularly important for increasing the resistance of health systems made most vulnerable through disasters and conflict (79).

Finally, it is essential to highlight the significant implications that the data from this study may have for those responsible for taking measures to deal with a pandemic, and for providing the necessary resources and information to health professionals and society in general, in order to prevent the development of multiple pathologies. Our data reflect the importance of the perception of these resources and the information available to face the challenges and demands of a health crisis. These elements can be crucial in ensuring that, despite the heavy workload and the demands that it entails, nurses and health professionals, in general, can perceive satisfaction in what they do, which is a protective factor in the face of physical and psychological pathologies. We believe that studying these relationships is relevant and fundamental to protecting and caring for nurses, health professionals, and society in general.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethical Committee of Research with Medicines CEIM Code 128/19 Dr. Peset University Hospital. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MCG-E, VP-G, and AS-R made a substantial contribution to the concept and design of the work, acquisition, analysis and interpretation of data, drafted the article and revised it critically for important intellectual content, approved the version to be published, and have participated sufficiently in the work to take public responsibility for appropriate portions of the content. All authors contributed to the article and approved the submitted version.

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COVID-19 Related Knowledge and Mental Health: Case of Croatia

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Background and Aims: The COVID-19 pandemic has led to radical and unexpected changes in everyday life, and it is plausible that people's psychophysical health has been affected. This study examined the relationship between COVID-19 related knowledge and mental health in a Croatian sample of participants.

Methods: An online survey was conducted from March 18 until March 23, 2020, and a total of 1244 participant responses were collected (85.5% were women and 58.4% completed secondary education). Measures included eight questions regarding biological features of the virus, symptoms, and prevention, the Hospital Anxiety and Depression Scale, and Optimism-Pessimism Scale. According to the answers given on the questions on COVID-19 related knowledge, participants were divided in two groups: (1) informed and (2) uninformed on each question. They were then compared in the expressed levels of anxiety, depression, pessimism, and optimism. Full vs. partial mediation models with optimism/pessimism as a mediator in the relationship between anxiety/depression and the accuracy of responses for questions about handwashing and ways of transmission were estimated.

Results: Participants who responded correctly on the question about handwashing had higher levels of anxiety, depression, and pessimism than those participants whose answer was incorrect, while participants who answered correctly on the question about the percentage of patients who develop serious breathing problems had higher levels of depression than those who answered incorrectly. Lower levels of anxiety and pessimism were observed in the participants who answered correctly about ways of transmission. Higher levels of pessimism were found in participants who scored incorrectly on questions about the efficiency of antibiotics, most common symptoms, and the possibility of being infected by asymptomatic carriers. Higher levels of knowledge about handwashing were predicted by higher levels of anxiety and pessimism. Higher levels of knowledge about ways of transmission were predicted by lower levels of anxiety and lower levels of pessimism. The examined relationships between anxiety/depression and knowledge were mediated by pessimism.

Conclusion: The findings of this study suggest that knowledge about COVID-19 may be useful to reduce anxiety and depression, but it must be directed to the promotion of health behaviors and to the recognition of fake news.

Keywords: COVID-19, COVID-19 related knowledge, coronavirus, mental health, anxiety, depression, optimism, pessimism

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INTRODUCTION

Since the beginning of 2020, people's daily lives have fundamentally changed. Everyone is well aware that the cause of such a change was the spread of a novel coronavirus (SARS-CoV-2) that initially appeared in the Chinese city of Wuhan during December 2019 (Politico Magazine, 2020; World Health Organization, 2020a). Since then, the virus has spread all across the world, resulting with a declaration of a pandemic on March 11, 2020, by the World Health Organization (2020b). It is known that being infected by the novel coronavirus causes COVID-19, a respiratory disease that can ultimately lead to fatal outcomes. However, it is not currently possible to estimate the prevalence of the disease with precise certainty, given the fact that in many cases an infected person does not show any symptoms, i.e., for every COVID-19 confirmed case there are multiple undetected ones (Li R. et al., 2020). According to currently available data (John Hopkins University, 2020), mortality rates vary from one area to the other: for example, by September 2020 the mortality rate in Italy was 13.1%, in the United Kingdom 12.2%, in Belgium 11.5%, while in Kuwait the mortality rate was 0.6%, in Bahrain 0.4%, and in Vietnam 0.3% (John Hopkins University, 2020).

In an attempt to deal with the potentially fatal consequences of the pandemic, many countries have decided to implement a variety of strategies that include different forms of economic measures, along with a strong emphasis on social contacts restrictions (Bzdok and Dunbar, 2020). Although human society had been confronted with various forms of infectious diseases from the earliest days, it can be said that it has never before, on such a global level, been faced with restrictions that fundamentally change their everyday lives (Hu et al., 2020). Even though people were expected to avoid public spaces and increase indoor time, there were also favorable life changes (e.g., frequent physical exercise, increased fruit, and vegetable intake) in addition to the unfavorable ones (e.g., increased screen time) (Hu et al., 2020).

In such a situation, the importance of preserving physical health is constantly being stressed, and new challenges such as health care disparities, losing housing, limited access to food, as well as disrupted life plans (Cipolletta and Ortu, 2020; Fraenkel and Cho, 2020) need to be tackled. Having said that, governments are urged to address the impact of the pandemic on mental health (United Nations, 2020).

A large number of studies examined the impact of the lockdown on mental health (Branley-Bell and Talbot, 2020; Cellini et al., 2020; Mechili et al., 2020; Pieh et al., 2020; Verma and Mishra, 2020), as well as its relation with certain constructs such as anxiety and depression. Adams-Prassl et al. (2020) reported negative quarantine effects on the mental health of the United States population while other researchers found that lockdown affects sleep quality (Huang and Zhao, 2020; Rossi et al., 2020) and that higher levels of anxiety can be explained by the time spent reading and discussing news about COVID-19 (Rosen et al., 2020). Previous outbreaks of infectious diseases, such as SARS, have shown a significant potential for psychological contagion, which often lead to widespread fear, anxiety, and a variety of psychological problems (Liu et al., 2020). These problems may include posttraumatic stress disorder (Bo et al., 2020), a decrease in personal interest (Shi et al., 2003), stigmatization (Mak et al., 2010), and an increase in the suicide rate (Cheung et al., 2008).

The previously mentioned SARS epidemic (Leung, 2003) and the more recent Ebola virus epidemic (Ajilore et al., 2017) highlighted the importance of knowledge about the cause and symptoms of the disease for practicing precautionary measures. It is important to emphasize the role of knowledge about the latter and the treatment when studying the effect of the COVID-19 pandemic on mental health. People are exposed to a large amount of both real and fake information on a daily basis, leading to confusion that may create a panic state, which is often a greater danger than the disease risk (Depoux et al., 2020). A study (Gao et al., 2020) on the Chinese population found that those who are frequently exposed to social media are more likely to experience anxiety and depression since they have greater access to information (Qiu et al., 2020). Zhou et al. (2020) emphasize that misinformation and fabricated reports increase depression levels.

The novel coronavirus as well as the situation the world has been encountering since the declaration of the pandemic bring a great uncertainty and fear of the unknown (Cipolletta and Ortu, 2020), which lead to an increase of anxiety levels not only among those with preexisting mental health conditions but also among healthy individuals (Asmundson and Taylor, 2020; Lee et al., 2020; Shigemura et al., 2020). Furthermore, it was shown that the prevalence of negative emotions (e.g., anxiety, depression, and indignation) and sensitivity to social risks increased, while the scores on positive emotions and life satisfaction decreased (Li S. et al., 2020). Wang et al. (2020) reported that more than half of their study participants rated the psychological impact of the outbreak as moderate to severe; one quarter of the respondents reported moderate to severe anxiety symptoms. Except for the aforementioned states caused by the emergence of the novel coronavirus, stereotyping (Lima et al., 2020) and discrimination (Hahad et al., 2020) occurred as well. Some researchers suggest that panic attacks, psychosis, and suicidal thoughts may also be experienced (Salari et al., 2020). According to the literature review by Brooks et al. (2020), a lockdown period requires efficient and rapid communication, which would allow quarantined people to understand the situation by providing them all of the necessary information.

Geldsetzer (2020) reported that the general knowledge of United Kingdom and United States respondents about the novel coronavirus is good, with misconceptions such as the use of antibiotics to stay protected from the infection. Moreover, very good knowledge of Iranian medical students is reported by Taghrir et al. (2020), along with a high percentage of those who practice preventive behaviors (94.47%), which was significantly negatively correlated with the perception of disease risk. Zhong et al. (2020) report high scores among the Chinese population on a COVID-19 knowledge test, while the Indian population showed moderate levels of knowledge about the COVID-19 infection and adequate knowledge about its preventive aspects (Roy et al., 2020). Chockalingam et al. (2020) pointed out that male and

female students do not differ in the level of their COVID-19 knowledge, while Banda et al. (2020) found misconceptions about the mode of transmission and disease severity among Malawi respondents. Findings about the association between knowledge and practiced behaviors are controversial. In a study by Brug et al. (2004), there was no significant association between behavior and SARS knowledge, while Lau et al. (2007) reported that hospital avoidance was associated with misconceptions about the mode of transmission. According to Shi et al. (2003), positive and negative information about the infectious disease affect risk perception and behaviors differently: positive information (suggests positive consequences, such as new recovery cases) maintains mental health and rational coping behavior, while negative information (notifications about negative consequences, e.g., number of new cases) increases the risk perception level and leads to irrational fear and nervousness.

Results of previous studies also showed that unrealistic optimism can lead to an underestimation of risk and illness (Makridakis and Moleskis, 2015). Chang and Sivam (2004) reported that defensive pessimism had a direct positive effect on SARS related fears, which were related to immediate preventive health behaviors. Raude et al. (2020) showed that Europeans tend to be overly optimistic about the novel coronavirus, while Zhou et al. (2020) found that optimistic thoughts and attitudes toward the development of the pandemic are a protective factor against anxiety and depression. Jovančević and Milićević (2020) report that higher levels of respect toward measures taken against COVID-19 spreading are predicted by higher levels of optimism. Moreover, Arslan et al. (2020) suggested that higher levels of optimism and lower levels of pessimism may reduce the negative impact of psychological inflexibility on anxiety, depression, and somatization.

The first COVID-19 case in Croatia was registered on February 25. The lockdown started March 19 when the number of registered cases was 105 and 5 people had recovered up to that date. The lockdown, which, according to the University of Oxford (2020), was the strictest in the world among other measures, included the prohibition of all public gatherings with more than five people, and citizens were allowed to leave their city or municipality only for work obligations. The measures started to ease on April 27 when there were 873 infected cases and 1166 recovered cases. A further ease of measures was implemented in the following 2 weeks. To the best of our knowledge, there is no research up to date on the aspects of mental health considering knowledge on different types of information on COVID-19 in Croatia. Moreover, only a few studies (Du et al., 2020; Wang et al., 2020; Yıldırım and Güler, 2020) have explored the relationship between knowledge and mental health during the COVID-19 pandemic, and no study has yet explored the relationship with optimism and pessimism.

The aim of this study was to examine COVID-19 related knowledge and its relationship with anxiety, depression, optimism, and pessimism on a Croatian sample of participants. On the basis of the well-recognized protective effect of knowledge (Wang et al., 2020; Yıldırım and Güler, 2020), we hypothesized that higher levels of anxiety, depression, and pessimism would be related with minor knowledge related to COVID-19. We also expected that participants with higher levels of optimism would be less informed and less anxious and that anxiety would be positively correlated with pessimism. Our ultimate hypothesis was that optimism/pessimism could be viewed as a mediator in the relationship between anxiety/depression and knowledge related to COVID-19.

MATERIALS AND METHODS

Participants and Procedure

Participants were recruited by using the snowball method. The study survey was advertised in different Facebook groups as well as on the WhatsApp messaging application. The total number of participants was 1296. Fifty-two of them were not included in the analysis because they filled out the survey after the date chosen for closing data collection. Of the remaining 1244 respondents, 85.5% were female, 58.4% completed secondary education, and the average age was 36.49 (SD = 12.76). A description of the study sample is shown in **Table 1**.

The data was collected via Google Forms survey from March 18 until March 23, 2020. These dates were chosen because 3 weeks had passed since the first registered case in Croatia, the lockdown had been announced, and nobody had investigated the knowledge about the novel coronavirus among the general population yet. Data collection was originally thought to last for a week, but due to the earthquake in Zagreb (March 22, 2020), which was not included as a significant event among the answers to the question regarding significant life events, researchers decided to stop collecting data. In the week prior to filling out the survey, 303 participants (24.4%) had experienced a significant life event such as changes at work, death of a close person, or breaking up a close relationship. Only 5.1% of participants were under infection prevention and control measures. The study was approved by the Ethical Committee of the Department of Psychology at the University of Zadar. Before starting the survey, participants were informed about the study details. Informed consent was signed by ticking a box at the bottom of the first page in Google Forms, before the beginning of the survey. Participants were able to withdraw their data by contacting the research team via provided e-mail addresses.

Measures

The authors of the study used the information available on the WHO website to examine knowledge about COVID-19.[1] Eight questions were used to examine the participants' knowledge about the coronavirus; five of them were multiple choice questions and three questions were true/false type questions. All the questions (presented in the **Supplementary Material**) were translated from English to Croatian by using back translation. One point was given for every correct answer and 0 points were given for incorrect answers. The initial plan was to make a linear combination of answers to these eight questions as a total score that would indicate the subject's knowledge on the

[1]https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/q-a-coronaviruses

TABLE 1 | Sociodemographic and psychometric characteristics of the population.

	Overall	Anxiety			Depression		
		Normal	Border	Abnormal	Normal	Border	Abnormal
Age	36.49	36.93	35.66	36.21	36.18	36.56	38.88
Sex							
Male	180 (14.5%)	136 (75.6%)	31 (17.2%)	13 (7.2%)	149 (82.8%)	24 (13.3%)	7 (3.9%)
Female	1064 (85.5%)	558 (52.5%)	249 (23.4%)	257 (24.2%)	787 (74.0%)	168 (15.8%)	109 (10.2%)
Education							
Elementary	20 (1.6%)	4 (20%)	4 (20%)	12 (60%)	11 (55%	3 (14%)	6 (30%)
Secondary	726 (58.4%)	407 (56.1%)	160 (22.0%)	159 (21.9%)	547 (75.3%)	112 (15.4%)	67 (9.2%)
Undergraduate	180 (14.5%)	101 (56.1%)	42 (23.3%)	37 (20.6%)	134 (74.4%)	32 (17.8%)	14 (7.8%)
Graduate	282 (22.7%)	282 (56.9%)	67 (23.8%)	57 (20.2%)	216 (76.6%)	40 (14.2%)	26 (9.2%)
Postgraduate	36 (2.9%)	24 (66.7%)	7 (19.4%)	5 (13.9%)	28 (77.8%)	5 (13.9%)	3 (8.3%)
Significant life event							
Yes	303 (24.4%)	133 (43.9%)	80 (26.4%)	90 (29.7%)	205 (67.7%)	61 (20.1%)	37 (12.2%)
No	941 (75.6%)	561 (59.6%)	200 (21.3%)	180 (19.1%)	731 (77.7%)	131 (13.9%)	79 (8.4%)
Infection prevention and control measures	63 (5.1%)						
Quarantine	15 (1.2%)	7 (46.7%)	5 (33.3%)	3 (20%)	13 (86.7%)	1 (6.7%)	1 (6.7%)
Self-imposed isolation	48 (3.9%)	20 (41.7%)	14 (29.2%)	14 (29.2%)	28 (58.3%)	14 (29.2%)	6 (12.5%)
Chronic diseases	126 (10.1%)						
Heart disease	44 (3.5%)	19 (43.2%)	17 (38.6%)	8 (18.2%)	25 (56.8%)	9 (20.5%)	10 (22.7%)
Respiratory disease	51 (4.1%)	25 (49.0%)	10 (19.6%)	16 (31.4%)	35 (68.6%)	7 (13.7%)	9 (17.6%)
Diabetes	21 (1.7%)	8 (38.1%)	6 (28.6%)	7 (33.3%)	15 (71.4%)	1 (4.8%)	5 (23.8%)
More than one	10 (0.8%)						

coronavirus. Various types of factor and reliability analyses were performed to see whether a linear combination of the results could be used, but the results did not support this. It was then decided to consider each question as separate and to examine the relationship of response accuracy for each question with the research variables. Participants were divided in two groups for each of the eight questions according to their answers. More specifically, if participants scored correctly on question 2 but incorrectly on question 3, they were put in the "informed" group for question 2 and the "uninformed" group for question 3.

The Hospital Anxiety and Depression Scale (HADS; Zigmond and Snaith, 1983) is divided into the Anxiety subscale and the Depression subscale. Both subscales contain seven items. Responses were given on a 4 point Likert scale with the answer 0 meaning *not at all* and 3 meaning *most of the time*. According to Bjelland et al. (2002), this instrument performs well in the general population. In this study, the internal reliability measured by the Cronbach alpha coefficient was 0.88 for the Anxiety subscale and 0.75 for the Depression subscale. The scale was previously validated on a Croatian sample by Pokrajac-Bulian et al. (2015).

The Optimism-Pessimism Scale (OPS) was developed by Penezić (2002) to measure positive and negative expectations of future activities outcome. This scale consists of the Optimism subscale with six items and the Pessimism subscale with eight items. Responses were given on a 5 point Likert scale with the answer 1 meaning *strongly disagree* and 5 meaning *strongly agree*. The internal reliability measured by the Cronbach alpha coefficient in this study was 0.82 for the Optimism subscale and 0.86 for the Pessimism subscale.

Statistical Analysis

The first step in the data analysis was to check the descriptive statistics of the examined variables and conduct difference tests (the *t*-test and Welch's *t*-test) and correlational analyses (Pearson, Point-biserial, and Phi coefficients of correlation) using the program STATISTICA 13.5. The *t*-tests and Welch's *t*-tests were conducted to examine the differences in anxiety, depression, optimism, and pessimism between groups of respondents who provided and did not provide a correct response to a question about COVID-19. Correlational analyses were conducted to examine the relationships between sex, age, educational status, the existence of significant life events, prevention and control measures, and of chronic diseases, anxiety, depression, optimism, pessimism, and the accuracy of the responses to the COVID-19 questions.

Models proposing optimism/pessimism as a mediator in the relationship between anxiety and depression on the one side and response accuracy on the other side were tested. The models and their significance were estimated by conducting path analysis using the program Mplus 6.12 (Muthén and Muthén, 2010), with the WRMR (weighted root mean square residual) method of parameter estimation. WRMR is a badness of fit index, which

TABLE 2 | Descriptive statistics of observed variables (*N* = 1244).

	M	SD
1. Effects of rinsing nose	0.58	0.50
2. Efficacy of antibiotics in preventing COVID-19	0.98	0.14
3. The most common symptoms of COVID-19	0.70	0.46
4. Handwashing to protect from COVID-19	0.88	0.32
5. COVID-19 ways of transmission	0.52	0.50
6. The percentage of COVID patients that develop serious breathing problem	0.09	0.28
7. Persons without symptoms can transmit COVID	0.97	0.18
8. Virus time of survival on surfaces	0.94	0.24
Anxiety	7.25	4.25
Depression	5.34	3.63
Optimism	19.86	6.93
Pessimism	22.91	4.33

Means can be observed as proportions of correct answers for questions 1–8.

means that a smaller index value indicates better fit (DiStefano et al., 2017). This method of parameter estimation was used due to the categorical (dichotomous) variable included in the models, that is, the correct or incorrect answer on the given question. Therefore, the path analyses conducted were a combination of linear and probit regression. The accepted statistical significance level for this research was $p < 0.05$ to reject the research's null hypotheses, in which the researchers only accept 5% of error to reject a null hypothesis.

RESULTS

The percentage of correct answers to the questions about COVID-19, the means and standard deviations on the scales measuring anxiety, depression, optimism, and pessimism are reported in **Table 2**. The percentage of correct answers to questions 2, 4, 7, and 8 is higher than 88%, whereas for questions 1, 3, and 5 the percentage of correct answers ranges from 50–69.99% (the questions are reported in the **Supplementary Material**). The lowest percentage of correct answers was achieved on question 6; only 8.6%, so this question can be considered the most difficult of all. Mean levels of anxiety (M = 7.25, SD = 4.25) and depression (M = 5.34, SD = 3.63) can be considered as normal, with respect to the criteria of the HADS. The mean levels of optimism and pessimism were 19.86 (SD = 6.93) and 22.91 (SD = 4.33) with the possible range for optimism being 8–40 and 6–30 for pessimism, respectively.

According to the answer given on each question about COVID-19, participants were divided in two groups and compared in the expressed levels of anxiety and depression (**Table 3**) and pessimism and optimism (**Table 4**). Participants who scored correctly on question 4 (The best way to protect from COVID-19 is to wash hands regularly) had higher levels of anxiety, depression, and pessimism than participants who did not give a correct answer to this question. Participants who gave an incorrect answer on question 5 (COVID-19 is transmitted by) had higher levels of anxiety and pessimism than participants whose answers were correct. On question number 6 (What is the percentage of COVID patients that develop serious breathing problems?), participants with an incorrect answer had lower levels of depression than participants who scored correctly. Participants who scored correctly on questions 2 (Efficacy of antibiotics in preventing COVID-19), 3 (The most common symptoms of COVID-19), and 7 (Persons without symptoms can transmit COVID) had lower levels of pessimism than those who scored incorrectly.

Table 5 shows the correlation matrix between all observed variables. Age and education level were negatively correlated with pessimism and positively with optimism, whereas experiencing significant life event was positively correlated with anxiety, depression, and pessimism and negatively with optimism. Anxiety was positively correlated with pessimism and negatively with optimism. Only questions 4 and 5 satisfied the criteria for conducting the path analysis and testing mediation. Not all necessary associations between variables were significant on the remaining six questions. Therefore, the proposed mediation models were only tested for questions 4 and 5. A model proposing pessimism as a mediator in the relationship between anxiety and depression on the one side and the correct/incorrect

TABLE 3 | The results of *t*-tests (with Welch's correction) to examine differences in the observed level of anxiety and depression between those with correct and incorrect answers on each question (*N* = 1244).

	Anxiety				Depression			
	M_{True}	M_{False}	*t*	df	M_{True}	M_{False}	*t*	df
1. Effects of rinsing nose	7.30	7.18	0.48	1176.34	5.31	5.38	−0.33	1183.78
2. Efficacy of antibiotics in preventing COVID-19	7.25	7.12	0.15	25.90	5.36	4.46	1.27	26.12
3. The most common symptoms of COVID-19	7.13	7.51	−1.46	732.32	5.30	5.43	−0.57	669.97
4. Handwashing to protect from COVID-19	7.52	5.21	−7.22**	205.12	5.48	4.33	−5.01**	250.40
5. COVID-19 ways of transmission	6.83	7.70	−3.59**	1228.82	5.19	5.51	−1.57	1214.79
6. The percentage of COVID patients that develop serious breathing problem	7.99	7.18	−1.83	124.93	6.19	5.26	−2.22*	121.12
7. Persons without symptoms can transmit COVID	7.25	7.10	0.22	41.58	5.35	4.98	0.73	42.44
8. Virus time of survival on surfaces	7.27	6.95	0.63	84.97	5.38	4.76	1.56	87.26

*$p < 0.05$, **$p < 0.01$.

TABLE 4 | The results of *t*-tests (with Welch's correction) to examine differences in the observed level of optimism and pessimism between those with correct and incorrect answers on each question (N = 1244).

	Pessimism				Optimism			
	M_{True}	M_{False}	*t*	df	M_{True}	M_{False}	*t*	df
1. Effects of rinsing nose	19.97	19.70	0.68	1152.03	22.75	23.12	−1.52	1172.06
2. Efficacy of antibiotics in preventing COVID-19	19.78	23.27	−2.53*	26.07	22.92	22.42	0.44	25.61
3. The most common symptoms of COVID-19	19.43	20.86	−3.28**	675.03	22.96	22.79	0.63	657.09
4. Handwashing to protect from COVID-19	20.38	15.93	−8.10**	195.98	22.86	23.24	1.16	208.23
5. COVID-19 ways of transmission	19.21	20.56	−3.45**	1230.09	22.99	22.82	0.70	1196.67
6. The percentage of COVID patients that develop serious breathing problem	20.97	19.75	−1.72	126.16	22.51	22.95	0.88	120.81
7. Persons without symptoms can transmit COVID	19.76	22.80	−2.15**	40.56	22.94	21.85	1.18	40.41
8. Virus time of survival on surfaces	19.85	19.99	−0.17	85.12	22.87	23.46	−1.32	89.04

*$p<0.05$, **$p<0.01$.

TABLE 5 | Correlations between the observed variables.

	Sex	Age	EC	LE	IPCM	CD	q1	q2	q3	q4	q5	q6	q7	q8	A	D	P
Sex	/																
Age	0.03	/															
Education	0.01	0.13**	/														
Significant life events	0.05	0.1.11**	0.03	/													
Prevention and control measures	−0.05	−0.05	−0.07*	0.09**	/												
Chronic diseases	−0.02	0.20**	−0.03	0.03	−0.03	/											
1. Effects of rinsing nose	−0.11**	−0.10**	0.07*	0.06*	0.04	0.00	/										
2. Efficacy of antibiotics in preventing COVID-19	0.04	−0.00	0.05	0.02	−0.00	−0.03	0.01	/									
3. The most common symptoms of COVID-19	0.06	−0.04	−0.00	−0.01	−0.01	−0.02	−0.09**	0.05	/								
4. Handwashing to protect from COVID-19	−0.04	−0.04	0.10**	0.07*	0.05	0.07*	0.16**	−0.05	−0.11**	/							
5. COVID-19 ways of transmission	0.05	−0.09**	−0.06*	−0.06*	−0.03	−0.08**	−0.06*	0.02	0.12**	−0.16**	/						
6. Breathing problem	−0.02	−0.03	0.05	0.02	0.00	0.08**	−0.03	0.01	−0.02	0.09**	−0.08**	/					
7. Persons without symptoms can transmit COVID	0.04	0.03	0.05	0.02	0.01	−0.01	−0.03	0.11**	0.06*	−0.02	−0.05	−0.01	/				
8. Virus time of survival on surfaces	0.07*	0.11**	0.03	0.00	−0.08**	0.03	−0.02	0.01	0.04	−0.04	−0.06*	0.01	0.13**	/			
Anxiety	0.15**	−0.03	−0.00	0.14**	0.03	0.15**	0.00	0.00	−0.04	0.17**	−0.10**	0.05	0.01	0.01	/		
Depression	0.08**	0.04	−0.04	0.11**	0.02	0.11**	−0.02	0.03	−0.02	0.10**	−0.04	0.07*	0.02	0.04	0.73**	/	
Pessimism	0.02	−0.06*	−0.06*	0.06*	0.03	0.09**	0.02	−0.08**	−0.09**	0.21**	−0.10**	0.05	−0.06*	−0.01	0.37**	0.33**	/
Optimism	0.01	0.07*	0.06*	−0.07**	−0.02	−0.04	−0.04	0.02	0.02	−0.03	0.02	−0.02	0.05	−0.03	−0.33**	−0.37**	−0.48**

*Legend: * $p<0.05$, **$p<0.01$. EC, Education categorized; LE, Significant life events; IPCM, Infection prevention and control measures; CD, Chronic diseases; q1-q8, Questions on COVID-19 knowledge test; A, Anxiety; D, Depression; P, Pessimism; O, Optimism.*

answer on the questions on the other side (indirect path) was tested. Therefore, direct paths were included between anxiety/depression and pessimism and pessimism and correct/incorrect answer on question 4/question 5. An alternative direct path was added between depression/anxiety and the correct/incorrect answer. Optimism was not included in the models due to its non-significant relations with response accuracy.

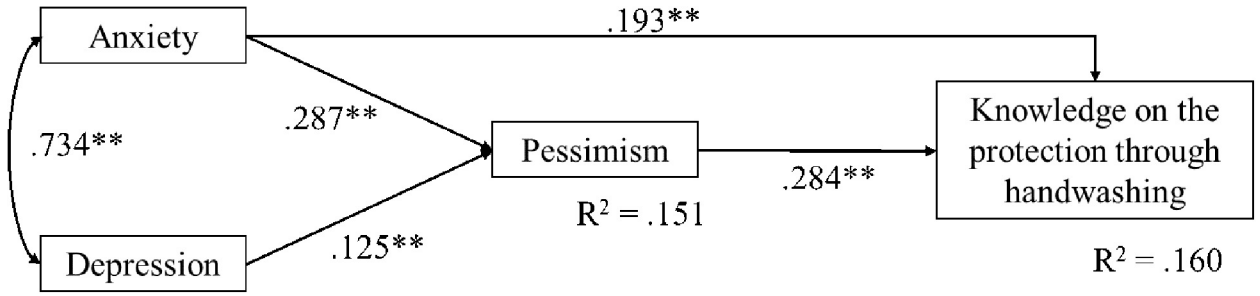

FIGURE 1 | Display of the selected model of the relationship between mental health (anxiety and depression), pessimism and knowledge on the fourth question about handwashing as a mean of protection from COVID-19.

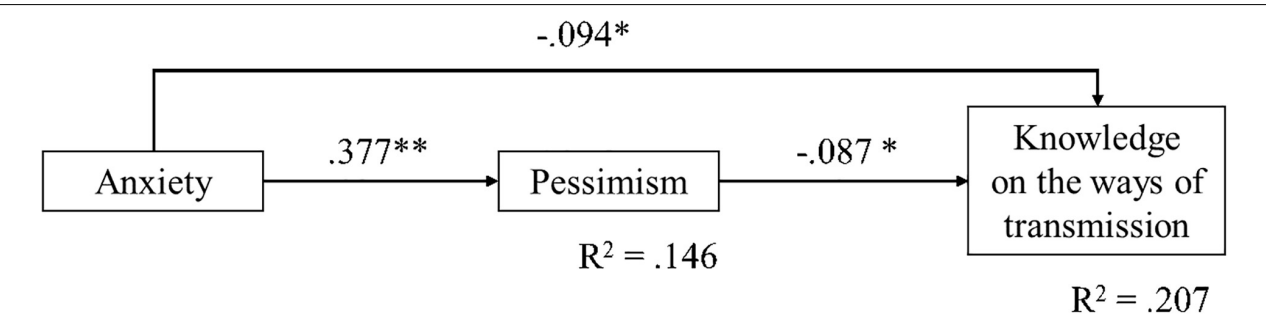

FIGURE 2 | Display of the selected model of the relationship between mental health (anxiety), pessimism and knowledge on the fifth question on the ways of transmission.

Figures 1, **2** are displays of the estimated models shown to have all significant path coefficients, along with the lower WRMR index. Considering question 4, a full mediation model was tested (WRMR = 1.05) against an alternative partial mediation model, that is, adding direct paths between depression/anxiety and the correct/incorrect answer. There was no convergence to estimate such a partial mediation model, which was likely due to the higher than 0.70 correlation between anxiety and depression. Two other models were estimated, one adding only a direct path from depression to the accuracy of the answer (WRMR = 0.57) and the other adding only a direct path between anxiety and the answer (WRMR = 0.22). The last model was accepted and is shown in **Figure 1**. For question 5, depression was not included in the models due to a non-significant bivariate correlation with the category of the answer given (correct/incorrect). The WRMR of the full mediation model was 1.003, while the partial mediation model was a just identified model (WRMR = 0). Since the path coefficient between anxiety and the correct/incorrect answer on this question was significant, this model was selected (**Figure 2**). The indirect effects were estimated using the bootstrap method (maximum number of iterations = 1000; level of significance $p < 0.05$ and 95% confidence interval) and the obtained parameters are shown in **Table 6**. The estimated indirect effects of both models were significant.

The selected model for question 4 (**Figure 1**) explained 16% of the variance of knowledge (the accuracy of the response to the question) and 15.1% of the variance of anxiety. Higher levels of knowledge were predicted with higher levels of anxiety and pessimism. A higher level of knowledge was also indirectly predicted by depression through a greater level of pessimism. The selected model for question 5 (**Figure 2**) explained 20.7% of the variance of knowledge and 14.6% of the variance of pessimism. Higher levels of knowledge were predicted by lower levels of anxiety and lower levels of pessimism and indirectly by anxiety through its relation with a higher level of pessimism.

DISCUSSION

This study aimed to examine the relationship between COVID-19 related knowledge and mental health (in terms of anxiety and depression) in a Croatian sample of participants. The results only partially confirmed our hypotheses. As expected, anxiety was positively correlated with pessimism and negatively with optimism, but optimism was not significantly associated with knowledge about COVID-19. Participants who were informed on COVID-19 symptoms, prevention through antibiotics (individuals who answered correctly on this question knew that the virus could not be prevented through antibiotics), and the mode of transmission were less pessimistic than uninformed participants. However, two questions—questions regarding handwashing as a protection from COVID-19 and serious breathing complications—yielded different results than the other questions. Namely, participants who responded correctly

TABLE 6 | Standardized estimates and levels of significance of the estimated indirect path coefficients of the observed models, and the confidence intervals obtained with the bootstrap method.

Indirect paths	Estimate	Standard error	Estimate/ standard error	*p*	95% Confidence interval
Anxiety→pessimism→ handwashing to protect from COVID-19 (**Figure 1**)	0.08**	0.02	4.38	0.000	0.05; 0.11
Depression→pessimism→ handwashing to protect from COVID-19 (**Figure 1**)	0.04**	0.01	2.90	0.004	0.02; 0.06
Anxiety→pessimism→ COVID-19 ways of transmission (**Figure 2**)	−0.03*	0.02	−2.23	0.026	−0.06; −0.01

$^{**}p < 0.01$; $^{*}p < 0.05$.

about handwashing had higher levels of anxiety, depression, and pessimism than those who responded incorrectly, whereas participants who responded correctly about the percentage of patients who develop serious respiratory problems had higher levels of depression than participants who did not know the answer to this question. Differences were not found in the rest of the questions nor at any question for the levels of optimism between participants who responded correctly and those whose answers were incorrect.

According to WHO, regularly practicing hand hygiene is the best way to be protected from the COVID-19 infection, and this information has been transmitted in mass media as well as by scientists (West et al., 2020). West et al. (2020) propose that the knowledge of effective hand hygiene provides individuals a proper level of capability, but this does not imply that people will have the opportunity to practice hand hygiene (e.g., have soap or hand sanitizer) or be motivated to do it (believe that this action is needed). Higher levels of anxiety, depression, and pessimism of participants who correctly answered the question on hand hygiene may be in line with this hypothesis. According to the participants' responses to this question, it could be claimed that the vast majority of the sample possesses an appropriate level of knowledge on this behavior. However, according to the models presented here, being anxious was associated with higher levels of knowledge, and this might be due to anxiety referring to future events (e.g., people might ask themselves: Will I have the opportunity to wash my hands when needed? and Will others be motivated to wash hands when required?). Higher levels of depression of those who responded correctly may root from the fear of previous hand hygiene practices (e.g., Did I wash my hands when I was supposed to? or Did my children have enough soap at their school when it was still opened?). These findings should be compared with the findings of other researchers who studied the practicing of hand hygiene during SARS (Leung, 2003) and the current pandemic (Harper et al., 2020; Wang et al., 2020). Leung (2003) reported that participants with moderate but not mild and high levels of anxiety regularly do hand hygiene. Wang et al. (2020) found that hand hygiene contributes to lower levels of depression, anxiety, and stress in a Chinese sample. Both findings are not in line with findings of the study conducted on the Croatian sample, but Roy et al. (2020) consider frequently washing hands as a sign of anxiety. Moreover, in a study by Harper et al. (2020), fear of COVID-19 was the only predictor of positive behavior change (e.g., improved hand hygiene). Being aware that each individual is responsible for their own acts and behaviors (e.g., properly washing hands) might have resulted in higher levels of anxiety, depression, and pessimism in the participants in our study. Finally, it could be hypothesized that higher levels of pessimism may be related to knowing that handwashing can protect you and others and also knowing that it is not a habitual practice and that the population is not aware or motivated to do it.

However, the model presented for question 5 (ways of transmission) differs from previous findings, since participants with lower levels of anxiety are less pessimistic and better informed. According to Leung et al. (2004), there is a positive association between knowledge on the transmission of SARS and adopting precautionary measures, but Lau et al. (2007) found that misconceptions about the mode of transmission of the avian flu were associated with avoidance of hospitals, while Brug et al. (2004) found no association between behavior and SARS knowledge. It could only be hypothesized that, if a higher level of anxiety allowed the study participants to be more knowledgeable on preventive behaviors such as handwashing, at the same time it prevented them from acquiring precise information about the mode of transmission.

Considering the finding of higher levels of depression in participants who correctly answered the sixth question (percentage of patients developing serious respiratory problems), which also was the most difficult question in this study according to difficulty indexes, the centrality of accurate information on COVID-19 comes to the fore (Brooks et al., 2020). All around the world people are being given loads of information, and many of these pieces of information appeared to be misinformation (Huaxia, 2020). Public health experts in Croatia had been warning citizens that the geometrical growth of infected individuals would certainly lead to huge problems in hospitals, since a sufficient number of beds in intensive care units, as well as respirators, would have already been taken by patients with complications. This kind of information, although true and accurate, may contribute to increased depression (Rubin and Wessely, 2020; Wang et al., 2020) and, in addition, people with higher levels of depression may give particular attention to this kind of information and become obsessed by the search

of the most catastrophic news that could confirm their worst expectations (Gao et al., 2020). Bearing this in mind, public health professionals have a huge responsibility when addressing citizens. Expert messages may sometimes lead to frightened citizens who may already be well informed of the worst consequences of the infection, because close people (family and friends) had suffered it. This may lead to broader knowledge, but at the same time it feeds the fear that it might happen to you or your loved ones.

Findings regarding pessimism in this study could be compared to the findings of Chang and Sivam (2004) who studied the relationship between direct pessimism and preventive health-related behaviors during the SARS epidemic in Singapore. Although the output variables in the proposed models differ, since our study measured COVID-19 related knowledge rather than practicing preventive behaviors, a few similarities occurred. In Chang and Sivam's study (2004), participants with higher levels of defensive pessimism were experiencing higher levels of SARS-related fear and eventually practiced direct preventive behaviors. In the Croatian sample, higher levels of depression and anxiety are associated with higher levels of pessimism, and participants with higher levels of pessimism are better informed about the importance of handwashing.

An important finding of the study is that the directions of the observed relationships are different in the two proposed models. This finding might have a practical implication as it suggests that different types of information should be given regarding different knowledge on COVID-19. Specifically, if more information of the mode of transmission may be useful to reduce anxiety, this does not apply to some preventive behaviors such as handwashing. Thereby, in this latter case, it might be more useful to promote a behavioral change through persuasion, training, modeling, and enablement (West et al., 2020).

The study presented here has some limitations. The sample in this study is not a representative sample of the Croatian population. Only 14.5% out of 1244 participants were men, and lower educated persons are under-represented. Moreover, the study is cross-sectional, which does not allow examining how (and if) the mental health of the Croatian population changed during the pandemic, nor does it allow making conclusions of causality in the examined relationships among the variables. Moreover, anxiety and depression were not confirmed by a clinical psychologist. Future studies should include behavioral measures and try to collect data longitudinally.

Nevertheless, this study offers the first data on mental health during the COVID-19 pandemic in Croatia and proposes new models relating anxiety and depression with knowledge, also considering pessimism as a mediator. This is a promising research line for the implementation of health promotion strategies and clinical interventions by suggesting that knowledge about COVID-19 may be useful to reduce anxiety and depression, but must be differentiated according to the type of knowledge being promoted. Knowledge on the virus must be accurate and awareness must be promoted to reduce anxiety. However, too detailed information and an excessive focus on the catastrophic consequences of the infection and on the difficulty to receive appropriate and effective care may feed depression and pessimism. Finally, the promotion of health behaviors to reduce the risk of contagion may mainly be effective through behavioral change.

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found below: https://data.mendeley.com/datasets/4c7x83hd64/1?fbclid=IwAR2UtsRKQumAznipIIukVG1LMIkP80airnKiKz-n8gzjWBHTglg0r0RXviEMendeley, doi: 10.17632/4c7x83hd64.1.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of Department of Psychology, University of Zadar. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MG, LM, and LS designed the study and collected the data. AŠ analyzed the data. SC contributed to the study design and supervised the whole process. All authors contributed to the article and approved the submitted version.

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COVID-19, an Opportunity for Developing Countries?

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The COVID-19 outbreak was declared by the World Health Organization (WHO) as global pandemic in March 2020. Considering the necessity to implement rapid response to control the pandemic and the fragility and the state of need of low income countries, it will be mandatory to develop a global approach in order to reduce the spread of infection and the creation of community viral reservoirs. So far, we could hypothesize a worst case scenario in which when the COVID-19 outbreak hits a peak in Africa and in low-income countries, the majority of such countries will be unprepared, with low resources allocated for affording the viral emergency and the consequences will be catastrophic with no lesson learnt. In the best case scenario, the COVID-19 will not affect Africa or South America on a large scale and, if the prevention measures will be implemented, we could register a lower incidence of hygiene linked diseases that still represent leading causes of death.

Keywords: COVID-19, coronavirus infections, low-and lower-middle-income countries, coronavirus, perspective

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CORRESPONDENCE

The COVID-19 outbreak was declared, by the World Health Organization (WHO), a global pandemic in March 2020. The number of confirmed cases is increasing worldwide and after Asian and European regions, a steep increase is now being observed in low-income countries (1). It is being recommended that to reduce the spread of the virus SARS-Cov-2 that leads to the disease COVID-19, a rapid implementation of public health response strategies is required including isolation, quarantine, social distancing, and community containment measures (2). Considering the necessity of implementing a rapid response to control the pandemic, as well as the fragility and state of need of low income countries, it will be mandatory to develop a general approach to reduce the infection spreading and the creation of community viral reservoirs. Importantly, the African Task Force for Coronavirus Preparedness and Response (AFTCOR) has now been established. If successful, it may provide a model for low-and-middle income countries to follow. This task force includes six main lines: risk communication; prevention and control activities in health care centers and hospitals; surveillance, including screening at the borders and customs; labs testing and sub-typing; treatment of positive patients; and supply chain management (3). Prevention measures recommended by WHO include: (I) Regular and thorough hand-washing with an alcohol-based solution; (II) Avoid touching eyes, nose and mouth; (III) Accurate respiratory hygiene: in case of a cough or sneeze it is important to cover mouth and nose with bent elbow or tissue; (IV) in case of fever, cough and difficulty breathing, it is important to consult a physician early; (V) correct information, paying attention to fake news and following health care advice; (VI) maintenance of security distance (one meter or three feet) from people coughing or sneezing (4).

The majority of these are basic good standards for hygiene and should routinely be applied worldwide. However, such standards are not common especially in low-income countries. Thus, if the COVID-19 outbreak results in the routine introduction of these measures, cross-over benefit may occur; that is, we could observe reductions in others diseases linked to poor sanitation conditions such as pneumonia, gastroenteritis, diarrhea, dysentery, hepatitis A, cholera, typhoid, polio, and skin infections.

Therefore, according to the knowledge we have so far, we could conjecture a worst- and a best-case scenario. In the worst case scenario, when the COVID-19 outbreak hits a peak in Africa and in low-income countries, the majority of such countries will be unprepared, with low resources allocated for affording the viral emergency and the consequences will be catastrophic with no lesson learnt. This would be the defeat of global health in an International Community that would show its slowness and cumbersome nature. At the beginning, in the best case scenario, it was hypothesized that COVID-19 would have not impacted so deeply sub-Saharan Africa and South America, similarly to the global outbreak of SARS-CoV in February 2003, suggesting that the spread of these viruses is more likely in the cold season and, thus, the southern hemisphere could be affected later or not at all (3). Unfortunately, South America is currently heavily affected showing substantial difference from 2003. In sub-Saharan Africa, on the contrary, although precise data are missing, it seems to have less impact, this may be due to other climate-related differences including outdoor life, the effect of hot and solar light in reducing the survival of COVID-19 on external surfaces and, different innate immunity of different ethnicities (3). In addition to this hopeful low impact, if the prevention measures are implemented, we could register a lower incidence of hygiene-linked diseases that still represent leading causes of death (5).

In conclusion, despite the difficulties and the negative effects that this virus will have worldwide, we are confident that, especially in sub-Saharan Africa, it could have some positive collateral effects owing to the relating public health messages.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary materials, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

LS and DP prepared the first draft. NV and VR made the final revision. All authors contributed to the article and approved the submitted version.

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