Health and psychological adaptations to life challenges and stressful conditions

Edited by
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Health and psychological adaptations to life challenges and stressful conditions

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Editorial: Health and psychological adaptations to life challenges and stressful conditions

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Editorial on the Research Topic
Health and psychological adaptations to life challenges and stressful conditions

Introduction

Adaptation to adversity is a multifaceted process shaped by individual resilience, social support, coping strategies, and environmental context. The capacity to adapt to life challenges is a defining feature of human resilience, encompassing psychological, social, and biological mechanisms that sustain functioning under stress. This Research Topic in *Frontiers in Psychology*, and *Frontiers in Public Health* gathers empirical evidence from diverse populations experiencing acute and chronic stressors, including armed conflict, pandemics, relocation stress, occupational trauma, and mass-casualty events.

The 11 peer-reviewed articles in this Research Topic employ cross-sectional, longitudinal, and mixed-method designs to identify patterns of distress, highlight protective factors, and inform tailored interventions. The manuscripts represent work from multiple cultural and geographical contexts including Canada, China, Israel, Portugal, Singapore, Switzerland, Ukraine, and multinational expatriate populations. Different perspectives on the mechanisms underpinning adaptation to life challenges are presented through the Research Topic. Collectively, these studies illustrate how individuals and professionals utilize coping strategies, leverage social and psychological resources, and negotiate long-term health consequences in high-adversity environments. They also underscore the variability of adaptation trajectories, calling for context-sensitive interventions and sustained monitoring to protect and enhance wellbeing. The aim of this editorial is to synthesize the key insights from the included studies, place them within the broader landscape of adaptation research, and highlight implications for clinical practice, public health, and community-based interventions.

Civilian adaptation under armed conflict

Armed conflicts exert profound and often prolonged effects on civilian mental health. The psychological toll is shaped not only by direct exposure to violence but

also by displacement, loss of livelihood, and ongoing uncertainty. Research in this area seeks to quantify mental health impacts, identify protective factors, and inform targeted interventions in affected populations.

Kurapov et al. report on a cross-sectional study of Ukrainian civilians during the Russian–Ukrainian war, assessing PTSD, depression, anxiety, sleep disturbance, prolonged grief, and resilience. The sample, drawn from regions with varying exposure to hostilities, showed high comorbidity among individuals directly affected by shelling, occupation, or displacement. Diamant and Kalfon Hakhmigari surveyed employed Israeli civilians 1 month after the onset of war, and showed associations between temporal disorientation and higher work–family conflict, emotional distress, and burnout. Despite limited direct injury exposure, many participants reported emotional strain yet also reported elements of post-traumatic growth, highlighting the dual presence of vulnerability and resilience in shared-trauma contexts. The findings underscore the need for sustained psychosocial monitoring and targeted, context-sensitive interventions.

Occupational stress and coping in prolonged crises

Workers in healthcare and other high-stress sectors face unique challenges when crises are prolonged. Beyond acute stress reactions, they may experience chronic distress, burnout, or delayed onset of mental health symptoms.

Coleman et al. conducted a longitudinal study of Canadian healthcare providers during the COVID-19 pandemic, identifying five mental health trajectories: resilient, chronically distressed, delayed onset, recovery, and mutable. Chronically distressed participants were nearly seven times more likely to meet PTSD criteria than resilient peers, pointing to the need for early identification of PTSD symptomology and intervention. Jin et al. studied Chinese clinical nurses and found that coping strategies mediated the relationship between occupational stress and mental health. Adaptive coping (e.g., problem-solving) buffered negative impacts, whereas maladaptive coping (e.g., avoidance) exacerbated them. Zhang et al. examined ICU nurses and showed that psychological capital appreciation fully mediated the resilience–burnout relationship, accounting for 79% of the total effect. Enhancing hope, optimism, self-efficacy, and resilience emerged as a promising prevention strategy. Gunasekaran et al. assessed resilience among Singapore residents during COVID-19 and found normal overall levels but significantly lower scores among individuals experiencing anxiety, depression, or job insecurity. Together, all these findings support routine trajectory monitoring, early PTSD-risk detection, and interventions that build adaptive coping and psychological capital while addressing socioeconomic stressors.

Professional resilience and secondary trauma

Professionals providing care or aid in high-trauma environments may be doubly impacted—by their own exposure

to crisis and by absorbing the trauma of those they support. Such increased exposure can lead to vicarious trauma but may also foster growth and resilience.

George-Levi et al. examined Israeli trauma therapists working in the aftermath of the October 7 attack and found that hope acted as a consistent stress buffer across all levels of secondary trauma. This reinforces the role of hope as a critical professional resilience factor in shared traumatic reality contexts, complementing the growth processes described by Diamant and Kalfon Hakhmigari. Coelho et al. extend this theme to palliative care professionals, highlighting occupational resilience challenges in end-of-life contexts. Their scoping review shows that early bereavement risk assessment, structured communication protocols, and training to detect complicated grief are not only critical for caregiver families but also serve as protective measures for staff wellbeing. By ensuring referral pathways and fostering proactive emotional support systems, organizations can mitigate secondary trauma and strengthen professional resilience. Overall, the findings favor paired person-focused (hope-building, reflective practice) and system-focused (protocolized bereavement support, supervision/peer consultation) strategies to protect helpers while preserving quality of care.

Psychological resources and social support as buffers

Psychological resources such as optimism and self-efficacy, combined with strong social support networks, can buffer individuals from the full psychological impact of severe stress. These factors can operate at individual, interpersonal, and community levels. Across the included studies, individual emotion regulation and sleep-linked affect (Chen et al.; Xiao et al.), hopeful/proactive coping and perceived support during relocation (Aegerter et al.) converge on a common pattern: resources reduce distress when they are matched to exposure and situated within supportive systems. Meaning in work protects only at low-to-moderate secondary trauma, whereas hope buffers stress across exposure levels (George-Levi et al.), and structured bereavement guidance operationalizes caregiver support (Coelho et al.). Taken together, these findings support multi-level interventions that strengthen sleep and emotion regulation, deliberately cultivate hope, and institutionalize culturally responsive support pathways calibrated to trauma severity.

Dynamic nature of adaptation

Adaptation is not a fixed state but a fluid process that evolves over time. Trajectories of recovery, stability, and decline can shift depending on ongoing exposures, resource availability, and personal circumstances.

Within the healthcare worker population, varying responses are seen, including resilience, delayed distress and recovery, but also chronic distress (Coleman et al.). Similar resilience variability is also seen among civilians in war zones (Kurapov et al.) and in palliative care environments (Coelho et al.). Together, these studies suggest that even across varying contexts, the adaptation

trajectories over time and variability in response follow patterns that can be predicted by a similar set of factors including early monitoring, early intervention, sustained social and therapeutic support, pre-loss/trauma preparation, and post-loss/trauma follow-up.

Implications and future directions

The synthesis of these studies demonstrates that adaptation to life challenges is a dynamic, context-dependent process that benefits from early detection of distress, continuous monitoring of resilience, and the promotion of psychological and social resources. This Research Topic shows the need for tailored interventions and flexible supports that adapt to changing needs. Programs that combine skill-building at the individual level with organizational and community engagement appear especially promising. The studies also emphasize the need for culturally sensitive approaches that reflect local contexts while drawing on best practices from international and clinical experience. Moving forward, longitudinal and adaptive research designs will be essential for tracking changes in resilience, understanding how protective factors evolve, and refining strategies to strengthen health and psychological adaptation in the face of ongoing or recurring adversity.

Author contributions

IP: Project administration, Methodology, Writing – review & editing, Writing – original draft, Conceptualization, Supervision, Investigation. AR: Writing – review & editing, Methodology, Conceptualization, Investigation. AS: Investigation, Writing – review & editing, Conceptualization, Methodology.

AK: Investigation, Conceptualization, Writing – review & editing, Methodology.

Conflict of interest

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Bereavement support guidelines for caregivers in palliative care: a scoping review

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Background: Palliative care teams' support practices for bereavement vary substantially. Clinical guidelines are needed to promote concerted, evidence-based intervention. The goal of the present study is to identify and synthesize the principles and clinical guidelines that ensure best practices in bereavement support for family caregivers accompanied in palliative care.

Methods: A scoping review was conducted based on a systematic search of articles in academic databases (EBSCO, PsycINFO, PubMed, Web of Science, Psychology and Behavioral Sciences Collection, Scopus) and Google (2010–2024). The review included articles focused on the principles, guidelines, and clinical recommendations for bereavement support for adult family caregivers in palliative care. Quality appraisal of guidelines was conducted using the AGREE II instrument.

Results: Of the 1,489 references identified, 20 documents were included, mostly governmental or institutional norms and clinical guidelines from gray literature. Quality appraisal revealed gaps in evidence selection, resource implications, updates and monitoring criteria. Eight fundamental principles were identified, from which several clinical guidelines were derived, organized according to the moments of assessment and intervention throughout the bereavement process, including pre and post-death period: (1) organizing support for the family caregiver; (2) assessing needs and establishing a care plan; (3) ensuring information and support for the family caregiver; (4) preparing for death; (5) support at the time of death; and (6) bereavement support post-death. In addition to universal support and information measures, regular assessment procedures should be adopted for timely referrals based on individual needs.

Discussion: These guidelines cover the temporal variation of care and the multidimensional and multiple-actor nature of palliative care. Implementing these guidelines and evaluating their impact will allow for the standardization of best practices and improve the quality of bereavement support in palliative care.

1 Introduction

Grief is a common and natural response to the loss of someone significant. It typically involves a period of mourning and adaptation to the absence, with feelings of sadness, loneliness, and longing. While most individuals adjust to the loss, some bereaved experience symptoms of Prolonged Grief Disorder (PGD), characterized by intense yearning and

disruptive emotional pain, pervasive preoccupation with the deceased, difficulty in accepting the loss, identity disruption and loss of meaning in life, often lasting for an extended period and beyond what is culturally expected (Prigerson et al., 2009). Due to its persistent and debilitating nature, this condition demands clinical intervention. According to cross-nation studies, its prevalence rates reach 10–13% of bereaved people (Comtesse et al., 2024; Lundorff et al., 2017).

Although PGD was recently recognized as an independent mental disorder in ICD11 (World Health Organization, 2018) and DSM-V-Tr (American Psychiatric Association, 2022), it often co-occurs with other mental health conditions, such as Depression, Anxiety, and Post-traumatic Stress Disorder, further complicating its diagnosis and treatment (Komischke-Konnerup et al., 2021; Rheingold et al., 2024). These overlapping disorders can exacerbate the emotional pain and distress experienced by individuals suffering from PGD. Additionally, PGD is associated with severe consequences for an individual's wellbeing, including suicidal ideation (Sekowski and Prigerson, 2022), functional impairment (Nielsen et al., 2020), and a significant reduction in overall quality of life (Maccallum and Bryant, 2020). The impact of PGD extends beyond mental health, leading to sleep disturbances (Lancel et al., 2020), cardiovascular problems (Palitsky et al., 2023) and an elevated risk of mortality, partly because of risky behaviors (Hiyoshi et al., 2022; Prigerson et al., 2009).

Family caregivers have been identified as a risk group for the development of PGD. Throughout the disorder trajectory, family caregivers experience various types of losses related to the functional decline and degradation of the patient's image (Coelho et al., 2020). These losses give rise to a process of anticipatory grief, which is often adaptive, as it functions as a preparation against the news of sudden death. However, it can also be a source of great distress, thus becoming predictive of difficulties adapting to the loss (Nielsen et al., 2016). Other situational and risk factors associated with the caregiver's poor bereavement outcomes include the family member's nervousness and stress (Liljeroos et al., 2022), less preparedness for the caregiving role, greater impact of caring on schedule, relationship strain, lack of social support, lower active coping mechanisms, greater impact on caregiver's health (Miller et al., 2018) and poor family functioning (Thomas et al., 2014). Besides that, pre-existing psychopathology (Ribera-Asensi et al., 2024), insecure attachment styles, such as anxiety and avoidance, and high dependency on the deceased also increase the risk of prolonged grief (Mason et al., 2020; Miller et al., 2018).

The prevalence of Prolonged Grief Disorder (PGD) among caregivers in Palliative Care settings is notably high, with studies indicating that up to 11.3% of caregivers experience PGD symptoms 11 months after the death of the patient (Thomas et al., 2014). Furthermore, a substantial proportion of caregivers continue to display sub-threshold symptoms of PGD even years after the loss, with one study showing that 14% of caregivers still experienced significant distress at 37 months post-bereavement (Zordan et al., 2019). These findings underscore the critical need for long-term bereavement care to address the ongoing challenges that caregivers face in adapting to the loss.

Unfortunately, bereavement support is not always effectively targeted at those who require it the most. Research suggests that many individuals who are most vulnerable to prolonged grief do not receive the necessary help (Lichtenthal et al., 2011), pointing to deficiencies in current screening methods used to identify those at greatest risk (Morris et al.,

2019). Moreover, while it is evident that intervention during complex grief situations can be highly beneficial, the application of generalized, one-size-fits-all approaches to bereavement support is counterproductive. Specialized, tailored interventions are more effective in addressing the specific needs of individuals experiencing complicated grief rather than relying on universal interventions for all bereaved individuals (Currier et al., 2008). This highlights the importance of improving screening procedures and customizing support to ensure that those at higher risk of developing PGD receive appropriate and effective care.

Considering the need to adapt resources and intervention measures to the individual needs of bereaved people, the National Institute for Health Clinical Excellence (2004) proposes the organization of bereavement care according to a three-level approach. First, universal interventions (primary prevention) are directed at all bereaved people with basic support needs (normal grief). They are carried out mainly by the community, health professionals, and senior social service professionals without specific training in bereavement. These include disseminating informative materials and literature on bereavement (at various stages of development), telephone contact and bereavement letters to acknowledge death, awareness-raising and educational actions, and memorial services. Second, selective interventions (secondary prevention) are directed at people with intermediate support needs in bereavement (with mild or moderate symptoms or at risk of developing PGD). They are carried out by mental health professionals with intermediate training in bereavement. It involves telephone support, home visits, peer group referrals, and individual support by volunteers or non-specialized professionals. Third, indicative interventions (tertiary prevention) are directed at people with complex support needs in bereavement (with symptoms of PGD). They are carried out by mental health professionals with advanced training in bereavement. It involves individual or group follow-up in bereavement counseling, which may be complemented by the intervention of trained volunteers.

Support for bereaved family members is recognized as one of the pillars of palliative care. This holistic approach provides relief from pain and other symptoms while also addressing the psychological, social, and spiritual needs of patients and their families during the illness trajectory and after the death of a loved one. By addressing grief in a compassionate and structured manner it provides a privileged context for early detection and preventive intervention for the most vulnerable individuals, allowing continuous, systematic assessment and follow-up from the phase preceding death (Neimeyer, 2020). The application of the public health model to bereavement support in palliative care emphasizes a population-based approach to addressing the needs of families and individuals coping with loss (Aoun et al., 2012). This model recognizes grief as a universal experience affecting the immediate family and the broader community. Also, it encourages the systematic collection of data to monitor trends in bereavement and identify those at higher risk for complicated grief, ensuring that appropriate interventions are provided. Ultimately, applying a public health approach to bereavement support in palliative care enhances the ability to reach a broader population, fostering a sense of collective support and resilience during times of loss.

Nevertheless, there is evidence of unmet psychosocial and spiritual needs of family members, particularly in preparing for and confronting the proximity of the death of a significant person and support in bereavement (Hashemi et al., 2018). Also, Breen et al. (2014) argues that while theoretical frameworks advocate for comprehensive support systems for families, the reality in clinical settings often falls short. Katz et al. (2023) found low rates of grief and

bereavement support pre- and post-death for families, indicating a systemic issue in providing necessary care. Additionally, Naef et al. (2020) highlight that the adoption of structured follow-up care has been notoriously low, despite an agreed-upon mandate to engage with and care for family members at the end-of-life. Together these studies highlight a significant gap between what is advocated in the literature and clinical practice. Therefore, clinical guidelines that promote concerted and evidence-based action to improve bereavement support in palliative care are needed (e.g., Morris and Sannes, 2020).

For clarification, by principles, we mean the general norms of conduct that guide good clinical practice, thus underlying the clinical guidelines. Clinical guidelines, also known as standards, consist of specific recommendations developed based on the best empirical evidence on how to proceed in clinical practice, thus supporting professionals in decision-making about diagnosis and treatment [Agency for Healthcare Research and Quality (AHRQ), 2025].

1.1 Present study

While bereavement support is a vital aspect of palliative care, there is often a gap between recommended practices and the actual support provided by palliative care services. Many services adopt a generic approach, which may not adequately address the specific needs of bereaved individuals. Barriers to effective bereavement support include insufficient resources, lack of systematic application, and inadequate assessment of bereavement risk (Aoun et al., 2017). In this study, we conduct a scoping review of the literature to identify the principles and clinical guidelines for providing bereavement support to adult family caregivers involved in palliative care, throughout the end-of-life process, death and the post-death bereavement period. The following question guided this study: According to recent literature, what are the existing principles and guidelines established for bereavement support for adult family caregivers in palliative care?

2 Methods

2.1 Design

A scoping review of the literature was conducted to map the existing guidelines on the scientific literature. This method is particularly suited when there is little evidence to provide direction and fill the gaps between research and practice (Levac et al., 2010). The review was conducted following the methodology proposed by Arksey and O'Malley (2005), which provides a flexible framework to map the evidence, involving five distinct phases: (1) Identification of the research question; (2) Identification of relevant studies; (3) Selection of studies; (4) Mapping of data; (5) Bringing together, summarizing, and presenting the results. Consultation with stakeholders or experts validated results and provided further insights. Additionally, a systematic quality assessment of guidelines was conducted to identify strengths and weaknesses in the guidelines, such as the clarity of recommendations, the transparency of evidence selection, and the involvement of stakeholders in the development process. This process not only enhances the reliability of the findings, but also supports the identification of gaps in the existing guidelines, guiding future research and informing practice more effectively.

2.2 Eligibility criteria

Documents were eligible if they met the following inclusion criteria: (1) original studies or reports of principles, guidelines, or recommendations for clinical practice in bereavement support; (2) targeted to family caregivers of adult patients in palliative care or in a situation of advanced chronic illness; (3) published in English, Portuguese, or Spanish; (4) developed by a government organization, NGO commissioned by State/Federal Government, a National Professional Association or a group of clinicians or experts on the field. As exclusion criteria, we considered: (1) guidelines targeted to other populations (e.g., neonatology, pediatrics, loss of minor children, death by suicide, sudden death); (2) studies on the prevalence of PGD, comorbidity, risk factors, or specific mechanisms of grief; (3) studies validating bereavement assessment instruments; (4) studies focused on the organization of bereavement services; (5) studies on the satisfaction and quality of end-of-life care; (6) studies on the evaluation of the quality of guidelines; (7) articles without full-text access; (8) created by a single author or as a part of a dissertation. The first author (AC) researched the databases, downloaded the articles into Mendeley to remove duplicates and initially selected the articles based on the title and abstract. Then, two authors (AC and SA) independently verify the accuracy and eligibility of the full-text articles. Disagreements in the selection process were resolved through discussion. Reasons for exclusion were registered in an Excel document.

2.3 Search strategy

The search, conducted in September–October 2024, included literature published in the last 14 years (2010–2024). This time limit was set to capture the most recent literature. The academic databases EBSCO, PsycINFO, PubMed, Web of Science, Psychology and Behavioral Sciences Collection, and Scopus were used with the following search terms: "guidelines" OR "practice guideline" OR "clinical practice guideline" OR "recommendation" OR "consensus" AND "grief" OR "griev*" OR "loss" OR "bereav*" OR "mourn*" AND "palliative care" OR "terminal care" OR "end of life care" OR "hospice care." The Google and Google Scholar search engines were also used with the same keywords to access gray literature. Finally, a manual search was conducted based on the bibliographic references from a previous literature review (Kent et al., 2020).

2.4 Data charting

Data regarding the type of document, title, authors, year of publication, location, target population, method, and results were collected and organized in tables. This resulted in creating a descriptive table of the main characteristics of the studies (title, authors, country, year, and target population).

2.5 Data analysis

This phase refers to the qualitative and quantitative analysis of the results. Regarding the qualitative analysis, the main results (principles and clinical guidelines) were thematically analysed according to the

TABLE 1 Summary of AGREE II structure and detailed list of items within each scoring domain.

Domain name	Item	Feature to be evaluated
Scope and purpose	1	The overall objective(s) of the guideline is (are) specifically described
	2	The health question(s) covered by the guideline is (are) specifically described
	3	The population to whom the guideline is meant to apply is specifically described
Stakeholder involvement	4	The guideline development group includes individuals from all the relevant professional groups
	5	The views and preferences of the target population (patients, public, etc.) have been sought
	6	The target users of the guideline are clearly defined
Rigor of development	7	Systematic methods were used to search for evidence
	8	The criteria for selecting the evidence are clearly described
	9	The strengths and limitations of the body of evidence are clearly described
	10	The methods for formulating the recommendations are clearly described
	11	The health benefits, side effects, and risks are considered in formulating the recommendations
	12	There is an explicit link between the recommendations and the supporting evidence
	13	The guideline has been externally reviewed by experts prior to its publication
	14	A procedure for updating the guideline is provided
Clarity of Presentation	15	The recommendations are specific and unambiguous
	16	The different options for management of the condition or health issue are clearly presented
	17	Key recommendations are easily identifiable
Applicability	18	The guideline describes facilitators and barriers to its application
	19	The guideline provides advice and/or tools on how the recommendations can be put into practice
	20	The potential resource implications of applying the recommendations have been considered
	21	The guideline presents monitoring and/or auditing criteria
Editorial independence	22	The views of the funding body have not influenced the content of the guideline
	23	Competing interests of guideline development group members have been recorded and addressed

method outlined by Arksey and O'Malley (2005). First, the first author (AC) coded the extracted data line-by-line to create an initial thematic framework that described the approaches and best practices in supporting family caregivers throughout the bereavement process, from the admission in palliative to the post-death bereavement period. Codes were inductively developed based on key data extraction and refined into broader concepts when overlaps occurred, generating initial themes. Then, a group of experts in grief and bereavement in palliative care was selected (five clinical psychologists and two social workers), and they were provided with materials, including the thematic framework and background information on the data extraction process. The goal was to gather feedback on the framework's accuracy and completeness. The experts reviewed and discussed the themes, offering insights and suggesting modifications. The discussion was structured to focus on refining and enhancing the identified themes. After the discussion, AC synthesized the feedback, reviewed the framework accordingly, and shared it with the panel for a final review. Then, the research team revised the coded data and the full-text articles to add detail and finalize the analytical thematic framework.

Regarding the quantitative analysis, a systematic evaluation of the quality of each guideline was conducted with the Appraisal of Guidelines, Research and Evaluation (AGREE II) checklist (Brouwers et al., 2010). A summary of the AGREE II structure and a detailed list of items within each scoring domain are displayed in Table 1. This is a widely used tool in health-related fields, which

mainly assesses the process of developing guidelines rather than their content. The AGREE II is composed of six domains: Scope and Purpose (items 1–3), Stakeholder Involvement (items 4–6), Rigor of Development (items 7–14), Clarity of Presentation (items 15–17), Applicability (items 18–21), and Editorial Independence (items 22–23). Each item is evaluated according to a 7-point scale ranging from 1 (strongly disagree, indicating no relevant information is provided) to 7 (strongly agree, indicating the quality of reporting is exceptional). The first two authors (AC and SA) independently rated each guideline across the six domains of the AGREE II checklist. Each item within the domains was rated on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree), reflecting their assessment of how well the guideline met the criteria outlined in the tool. Interrater reliability (agreement between the two reviewers' item scores) was calculated using the (two-way mixed) intraclass correlation coefficient (ICC) with SPSS software (SPSS version 29.0; IBM Corporation, 2023). Agreement was described as follows: <0.20 poor; 0.21–0.40 fair; 0.41–0.60 moderate; 0.61–0.80 good; 0.81–1.00 very good. The domain scores were determined by summing the item scores within each domain provided by both reviewers and converting the total into a percentage of the maximum possible score for that domain. Additionally, the mean and standard deviation were calculated to determine a "total domain score" for each practice guideline, resulting in an "overall quality rating," classified as good (80% or

higher), acceptable (60–79%), low (40–59%), or very low (below 40%).

3 Results

A total of 1,489 documents were identified by searching academic databases and Google. After excluding duplicate records, the first author made an initial selection based on reading the titles and abstracts ($n = 120$), resulting in the exclusion of 1,173 records that did not meet the inclusion criteria. The remaining 38 documents were read in full, with 17 being excluded for the following reasons: out of scope ($n = 11$); studies evaluating the effectiveness of intervention in bereavement ($n = 2$); other population ($n = 1$); no access to the full article ($n = 2$). A total of 20 documents were included in the review, mostly from gray literature ($n = 13$). The selection process is described in the PRISMA flowchart (Figure 1).

Seven of the 20 documents included in the review (Table 2) were published as scientific articles; the others ($n = 13$) were government or institutional norms, including palliative care and bereavement support organizations. The clinical guidelines were developed in the following countries: Australia ($n = 9$), United States of America ($n = 4$), New Zealand ($n = 2$), Canada ($n = 2$), Ireland ($n = 1$), South Korea ($n = 1$) and Singapore ($n = 1$). For a detailed list of specific guidelines per country, please refer to Table 2, where each guideline matches the corresponding country of origin. All standards included were specifically oriented toward the population of caregivers in palliative and advanced cancer care.

The results of the quality appraisal of guidelines using AGREE II are presented in Table 3. The highest scores were observed in the categories of "Scope and Purpose," "Clarity of Presentation," and "Stakeholder involvement," showing that guidelines are well-structured, with clear objectives focused on improving psychosocial and bereavement support for family caregivers of palliative care patients. They effectively identified their target audience, namely family caregivers, and were developed by a multidisciplinary team in collaboration with key stakeholders. Additionally, the guidelines offer specific and unambiguous recommendations, accompanied by practical advice and tools to facilitate the implementation of bereavement support services. In contrast, the "Rigor of Development," "Applicability," and "Editorial Independence" categories showed lower domain scores. Most guidelines lack explicit criteria for selecting evidence and fail to clearly link recommendations to supporting evidence. Furthermore, they do not outline procedures for updating the guidelines or discuss the potential resource implications of implementing the recommendations. Lastly, monitoring or auditing criteria are not explicitly addressed, leaving gaps in assessing the guidelines' effectiveness. Significant variability was evident in the scores, particularly in "Rigor of Development" and "Editorial Independence." Most guidelines obtained a low overall quality rating; only two guidelines (Shin et al., 2020; NSWACI, 2024) were considered "Good." Interrater reliability analysis showed very good agreement between the two reviewers for all guidelines (ICC range 0.84–0.99).

Given that the majority were rated as "Low" or "Acceptable," it was important to include these guidelines to ensure a comprehensive overview of the existing literature. The inclusion of lower-rated guidelines allows for a broader understanding of the current state of guidelines in the field, even though their quality may be suboptimal.

This approach aligns with the goal of scoping reviews, which aim to map the breadth of available evidence.

3.1 Principles that guide support for caregivers

The definition of bereavement support principles serves as a foundational framework for developing guidelines with specific practice recommendations. These principles provide a theoretical and ethical basis, ensuring that care strategies are aligned with the needs of those experiencing grief. By grounding guidelines in these principles, practitioners are equipped with evidence-based, compassionate, and culturally sensitive approaches that address the complexities of bereavement. This alignment ensures consistency in care delivery while allowing flexibility to adapt to individual circumstances, ultimately enhancing the effectiveness and sensitivity of bereavement support interventions. Based on a thematic analysis of the documents, we propose eight principles to guide bereavement support for caregivers of palliative care patients.

1 Recognizing and responding to bereavement according to individual needs. Bereavement support should be individualized, sensitive and flexible, acknowledging and respecting each individual's unique characteristics, needs, and preferences (MDHBPC, 2015; MHW, 2017; SGVDH, 2012). Bereavement should be understood as a normal response to the loss of a significant person, allowing individuals to adapt to a new reality. It is characterized by a range of emotional, physical, cognitive, behavioral, social, and economic reactions. Bereavement is influenced by individual, relational, social, spiritual, and cultural factors. Most individuals possess some resilience, i.e., a natural capacity to adapt and cope during periods of heightened stress and adversity. With the support of their family, friends, and established community networks, the bereaved are generally able to navigate challenges effectively and adjust to loss (MDHBPC, 2015; Keegan et al., 2021; Morris and Sannes, 2020). However, some individuals experience difficulties and may develop health problems (Keegan et al., 2021). Palliative care should advocate for policies that support bereaved individuals (Keegan et al., 2021). Family members and significant others of patients are eligible for bereavement services in palliative care settings. While the primary focus should be on the primary caregiver, support can be extended to other significant individuals (MDHBPC, 2015; SGVDH, 2012). Support should be tailored to individual needs, providing basic support to all bereaved individuals and additional care for those at risk (Keegan et al., 2021; Morris and Sannes, 2020). Healthcare professionals should be able to recognize when support needs exceed their capabilities and refer individuals to mental health specialists (Keegan et al., 2021; Morris and Sannes, 2020; NSWACI, 2024).

2 Accessible, equitable and culturally sensitive support. Bereavement support ought to be accessible, equitable and respectful of individual differences, including gender, age, socioeconomic status, cognitive abilities, sexual orientation, religion, culture and spirituality (MDHBPC, 2015; MHW, 2017; Morris and Sannes, 2020; NSWACI, 2024; SGVDH,

FIGURE 1
Flowchart PRISMA of search results.

2012; SGVDH, 2012). Bereavement services must ensure cultural safety for culturally and linguistically diverse populations, individuals identifying as LGBTIQ+, and other priority groups. Access to bereavement services should be available to all who need it, irrespective of where the person died and whether the deceased was known to a palliative care

service (MDHBPC, 2015; NSWACI, 2024). Support is expected to be readily available through phone, online, letter, domiciliary visits, or outpatient services (Ferrell et al., 2018; MDHBPC, 2015; MHW, 2017; SGVDH, 2012). Waiting times must be reasonable, ideally within five business days (MHW, 2017). Individuals should be informed about available local

TABLE 2 Guidelines and standards included in the review.

	Author, year	Title	Country	Target population
1	Hudson et al. (2010)	Clinical Practice Guidelines for the Psychosocial and Bereavement Support of Family Caregivers of Palliative Care Patients	Australia	Palliative care
2	SGVDH (2012)	Bereavement support standards for specialist palliative care services	Australia	Palliative care
3	Hudson et al. (2012)	Guidelines for the Psychosocial and Bereavement Support of Family Caregivers of Palliative Care Patients	Australia	Palliative care
4	NSPCIT (2014)	National Guidelines for Palliative Care	Singapore	Palliative care
5	NCCN (2014)	NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines)	USA	Palliative care
6	MDHBPC (2015)	Palliative Care Bereavement Support Guidelines	New Zealand	Palliative care
7	GRPCC (2016)	Bereavement Risk Screening and Management Guidelines	Australia	Palliative care
8	Philip et al. (2018)	A proposed framework of supportive and palliative care for people with high-grade glioma.	Australia	Palliative care
9	BCCPC (2017a, 2017b)	BC Inter-Professional Palliative Symptom Management Guidelines	Canada	Palliative care
10	BCCA (2017)	Palliative Care for the Patient with Incurable Cancer or Advanced Disease Part 3: Grief and Bereavement	Canada	Palliative care
11	MHW (2017)	Te Ara Whakapiri - Principles and guidance for the last days of life	New Zealand	End-of-life Care
12	Hudson et al. (2017)	Bereavement support standards and bereavement care pathway for quality palliative care.	Australia	Palliative care
13	Ferrell et al. (2018)	National Consensus Project Clinical Practice Guidelines for Quality Palliative Care	USA	Palliative care
14	PCA (2018)	National Palliative Care Standards	Australia	Palliative care
15	NHPCO (2018)	Standards of Practice for Hospice Programs	USA	Palliative care
16	Shin et al. (2020)	Clinical Practice Guideline for Care in the Last Days of Life	South Korea	Hospice and Palliative Care
17	Keegan et al. (2021)	EAPC Bereavement Task Force	Ireland	Palliative care
18	Morris and Sannes (2020)	Bereavement care for family caregivers of neuro-oncology patients	USA	Neuro-oncology
19	NSWACI (2024)	Clinical Principles for End-of-Life and Palliative Care	Australia	End-of-life Care
20	NSWACI (2024)	Clinical principles for specialist bereavement care in NSW	Australia	Palliative care

resources to make informed decisions and plan for their support needs (Keegan et al., 2021; NHPCO, 2018; PCA, 2018). Barriers to accessing specialized care should be minimized, especially considering the vulnerability and resistance often associated with addressing loss, particularly in the same physical context where end-of-life care and the death of the loved one occurred (MHW, 2017). Culturally appropriate referrals should involve coordination and collaboration with multicultural health workers. With the bereaved individual's consent, this process may include detailed handovers to specialist bereavement services to uphold cultural safety within the receiving service (NSWACI, 2024).

3 Safety, privacy, confidentiality and respectful communication. Bereavement programs must adhere to ethical principles and ensure the privacy and confidentiality of bereaved individuals in compliance with data protection laws. Informed consent is required before providing any support, data sharing, or interventions, with clear communication about processes and options to drop out. Privacy and confidentiality are upheld through secure information storage, authorized access, and a physically private and feedback-friendly environment (Morris and Sannes, 2020; NSWACI, 2024). Communication with bereaved individuals must be sensitive, transparent, and honest, with shared decision-making, both before and after death (Hudson et al., 2010, 2012; MDHBPC, 2015; MHW, 2017; Morris and Sannes, 2020; NSPCIT, 2014). Information and resources about loss and grief ought to be provided routinely to families and carers before and after the death (PCA, 2018; NSWACI, 2024). Information needs to be presented in an accessible manner, tailored to the individual's needs and at different time points. Written or audiovisual materials should be provided to enhance understanding (Hudson et al., 2010; Morris and Sannes, 2020; SGVDH, 2012). While healthcare professionals may suggest assessments and interventions, the ultimate decision-making authority rests with the bereaved individual. Sufficient time and information should be provided to enable informed choices. Before collecting information, oral consent must be obtained and documented (SGVDH, 2012).

4 Multidisciplinary assessment and ongoing emotional support. Healthcare professionals and volunteers should coordinate to ensure seamless delivery of services across different levels of support (Hudson et al., 2010; Keegan et al., 2021; MDHBPC, 2015; PCA, 2018). Ongoing assessment of the risk of complicated grief is essential, beginning at the onset of

palliative care and continuing for several months after the loss, if necessary (Ferrell et al., 2018; NHPCO, 2018; Morris and Sannes, 2020; Keegan et al., 2021; NSWACI, 2024; PCA, 2018). Bereavement support should extend from the pre-death period to several months or years after death, with no time limit (Keegan et al., 2021; MDHBPC, 2015; NSWACI, 2024). Professionals must be vigilant for signs of complicated grief and potential mental health problems, referring individuals to specialized care as needed (Keegan et al., 2021; NHPCO, 2018; SGVDH, 2012). Seeking professional help should be normalized and encouraged (GRPCC, 2016).

5 Professional and volunteer development and self-care. Healthcare professionals and volunteers involved in palliative care are supposed to receive ongoing training to equip them for their role in providing bereavement support (Hudson et al., 2010, 2012; Keegan et al., 2021; MDHBPC, 2015; MHW, 2017; Morris and Sannes, 2020; SGVDH, 2012; NSWACI, 2024; PCA, 2018). Bereavement specialists should have advanced training and mandatory access to professional supervision (Keegan et al., 2021). Volunteers working with bereaved individuals should receive guidance from a bereavement specialist and have access to professional supervision (NHPCO, 2018). Administrative staff working within or associated with the bereavement service, whether through overarching organizations or service provision networks, must receive at least basic training in the core principles of grief and bereavement support strategies (NSWACI, 2024). It is recommended that palliative care services share evidence-based recommendations with other healthcare professionals (Keegan et al., 2021). Reflective practice, such as discussions and targeted courses, must be encouraged (NHPCO, 2018). Professionals working with death and bereavement are susceptible to vicarious trauma and burnout. Self-care practices, such as peer support and individual or group therapy, are recommended (Ferrell et al., 2018; GRPCC, 2016; Keegan et al., 2021; MHW, 2017; SGVDH, 2012). Employers have a plan for bereaved professionals (MDHBPC, 2015).

6 Community awareness and involvement. Palliative care services should promote the development of basic bereavement skills among other healthcare professionals and the community (Keegan et al., 2021; PCA, 2018). The impact of bereavement should be recognized and addressed through community awareness campaigns (NSWACI, 2024; SGVDH, 2012). The entire community, including schools, universities, social services, primary care, law enforcement, mental health services, and businesses, plays a role in supporting bereaved individuals. Bereavement programs should collaborate with a network of healthcare providers (Keegan et al., 2021; MHW, 2017; NSWACI, 2024; SGVDH, 2012).

7 Planning, evaluation, and research. Each service must develop its bereavement support protocol, outlining specific recommendations and defining team members' roles (Keegan et al., 2021). A qualified professional should be appointed to coordinate bereavement support activities, i.e., tertiary qualifications in counseling, psychology or psychotherapy, social work, accreditation, membership or eligibility for membership of recognized associated professional bodies (Keegan et al., 2021; NSWACI, 2024). Services ought to

be planned based on identified needs and regularly reevaluated. Palliative care services are recommended to allocate adequate human and material resources to bereavement support programs, including funding for training and supervision (Keegan et al., 2021; SGVDH, 2012). Bereavement services must engage staff with appropriate experience to offer counseling and support to social and cultural groups. If such expertise is unavailable, they actively establish partnerships with other service providers or organizations with the necessary experience (NSWACI, 2024). The quality of services should be monitored and continuously improved (Keegan et al., 2021; MDHBPC, 2015; MHW, 2017; NHPCO, 2018; NSWACI, 2024). The roles, responsibilities, and scope of practice for staff coordinating and delivering specialist bereavement counseling are explicitly outlined and detailed in their position descriptions (NSWACI, 2024). Data collection and analysis, including satisfaction surveys and complaints, must be conducted using quantitative and qualitative methods (NSWACI, 2024). Research should be conducted to inform evidence-based interventions (MHW, 2017; SGVDH, 2012).

8 Scope of Practice and Referral Policy. All staff delivering bereavement counseling and support must recognize the boundaries of their scope of practice. Non-specialists should be aware of their limitations and refer individuals to appropriate services when necessary (SGVDH, 2012). They should also utilize internal and external referral pathways when a bereaved individual requires interventions that exceed their professional scope or that of the organization (NSWACI, 2024). All healthcare professionals need to be informed about available bereavement resources at the local and national level, as well as referral mechanisms (Keegan et al., 2021).

3.2 Clinical guidelines for bereavement support in palliative care

We derived the following clinical guidelines from the principles explained in the previous section. These were organized in chronological order, considering the various moments of assessment and intervention since the entrance into palliative care, throughout the process of dying and death and during the bereavement trajectory.

1 Organizing support for the family caregiver. Seven guidelines were proposed for this stage.

1.1 At the time of admission to palliative care, the patient should be informed that palliative care also provides support to the family (i.e., any significant person to the patient, including nuclear or extended family members, partners, friends, or neighbors) (Hudson et al., 2010, 2017; MDHBPC, 2015; NCCN, 2014).

1.2 Ask the patient to identify their primary family caregiver. If the patient identifies only one caregiver, ask if another family member or friend is available to be contacted by the team and assume the role of an additional caregiver. Discuss the patient's preferences regarding the involvement of the caregiver(s) in discussions about the care plan and document these in the patient's clinical record (Hudson et al., 2010, 2012, 2017).

TABLE 3 Summary of domain scores for guidelines using AGREE II.

		Domain 1 Scope and purpose	Domain 2 Stakeholder involvement	Domain 3 Rigor of development	Domain 4 Clarity of presentation	Domain 5 Applicability	Domain 6 Editorial independence	Total domain score Mean (SD)	Overall quality rating[a]	ICC (95% CI)
1	Hudson et al. (2010)	100	91.60	36.25	97.22	12.50	0	56.26 (45.43)	Low	0.98 (0.95–0.99)
2	SGVDH (2012)	83.3	75.00	27.08	97.22	27.08	0	51.61 (38.73)	Low	0.97 (0.93–98)
3	Hudson et al. (2012)	100.0	97.20	84.37	97.22	43.75	0	70.42 (40.44)	Acceptable	0.98 (0.95–0.99)
4	NSPCIT (2014)	100	100.00	33.33	97.22	50.00	0	63.43 (42.25)	Acceptable	0.97 (0.94–0.99)
5	NCCN (2014)	100	75.00	84.37	100	39.58	29.17	71.35 (30.37)	Acceptable	0.91 (0.81–0.96)
6	MDHBPC (2015)	86.10	80.50	51.04	77.78	50	0	57.57 (32.13)	Low	0.94 (0.86–97)
7	GRPCC (2016)	100	100.00	63.54	97.22	60.42	0	70.20 (38.92)	Acceptable	0.96 (0.88–98)
8	Philip et al. (2018)	100	88.80	27.08	72.22	31.25	0	53.23 (39.53)	Low	0.99 (0.97–0.99)
9	BCCPC (2017a, 2017b)	100	47.20	17.71	100	33.33	0	49.71 (42.02)	Low	0.98 (0.96–0.99)
10	BCCA (2017)	94	47.20	15.63	97.22	37.50	0	48.66 (40.00)	Low	0.98 (0.96–0.99)
11	MHW (2017)	100	88.80	16.67	75.00	29.17	0	51.61 (41.62)	Low	0.98 (0.95–0.99)
12	Hudson et al. (2017)	100	69.40	15.63	88.89	33.33	0	51.21 (40.84)	Low	0.97 (0.94–0.99)
13	Ferrell et al. (2018)	100	83.30	15.63	27.78	16.67	0	40.56 (40.89)	Low	0.97 (0.93–0.98)
14	PCA (2018)	100	94.40	26.04	83.33	20.83	0	54.10 (43.37)	Low	0.98 (0.95–0.99)
15	NHPCO (2018)	94.40	75.00	19.79	94.44	52.08	0	55.95 (39.44)	Low	0.87 (0.63–95)
16	Shin et al. (2020)	100	83.30	83.33	97.22	70.83	83.33	86.34 (10.70)	Good	0.84 (0.44–94)
17	Keegan et al. (2021)	100	47.20	15.63	80.56	20.83	0	44.04 (39.40)	Low	0.97 (0.93–98)
18	Morris and Sannes (2020)	100	69.40	26.04	52.78	14.58	0	43.80 (37.37)	Low	0.99 (0.98–99)
19	NSWACI (2024)	91.60	50.00	83.33	100.00	85.42	29.17	73.25 (27.52)	Acceptable	0.92 (0.82–0.96)
20	NSWACI (2024)	100	100.00	88.54	97.22	79.17	29.17	82.35 (27.28)	Good	0.95 (0.79–0.98)
	Total domain scores Mean (SD)	97.49 (5.04)	78.17 (18.32)	41.55 (28.36)	86.53 (18.61)	40.42 (21.10)	8.54 (20.57)	58.78 (12.89)		

Data for each domain are expressed as a percentage of the maximum possible score (scale 1–7). [a]Overall quality rating scores classified as good (80% or higher), acceptable (60–79%), low (40–59%), or very low (below 40%). SD, Standard Deviation; ICC, Intraclass Correlation Coefficient; CI, Confidence Interval.

1.3 Confirm with the caregiver(s) if they know the patient has designated them for this role. Explain a family caregiver's typical role and responsibilities and confirm their willingness to accept this responsibility. Document this in the patient's clinical record. Discuss any concerns the caregiver(s) may have about accepting this role, including potential conflicts with other family members (Hudson et al., 2010, 2012). Their ability and willingness to provide care should be regularly reassessed so that changes can be made to the intervention plan if necessary (Hudson et al., 2017; NHPCO, 2018).

1.4 Discuss advance care planning with the patient and family, covering any implications related to the legal responsibilities of the caregiver(s) (Hudson et al., 2010, 2012, 2017; NCCN, 2014).

1.5 Recognize the informal caregiver as an important source of information about the patient. Gather information about their experience as a support figure, including any information (when relevant) about the patient that may be considered important for the healthcare team's knowledge (Hudson et al., 2010; Hudson et al., 2012, 2017).

1.6 Explain to the caregiver(s) the services and resources the palliative care service can provide to establish realistic expectations (Hudson et al., 2010, 2012, 2017; Keegan et al., 2021; SGVDH, 2012).

1.7 Have a dedicated care coordinator who facilitates communication, linking patients and families to necessary services and ensures continuity of care (Philip et al., 2018).

2 Assessing needs and establishing a care plan. Nine guidelines were proposed for this stage.

2.1 Conduct a needs assessment with the caregiver(s), including dimensions of psychological, physical, social, spiritual, religious, cultural, financial health, and practical elements (Hudson et al., 2017; MDHBPC, 2015; NHPCO, 2018; NSWACI, 2024; SGVDH, 2012). Care and services should be aligned with patient/family caregiver needs according to the transition point in the illness. Care should continuously monitor patient/family caregiver needs (Philip et al., 2018).

2.2 The assessment of the risk of bereavement should be an ongoing process, beginning at the time of the patient's admission to palliative care and continuing for several months after the patient's death. All team members can contribute to the assessment with complementary information (Hudson et al., 2010, 2012, 2017; MDHBPC, 2015; NSPCIT, 2014; NSWACI, 2024; PCA, 2018; SGVDH, 2012).

2.3 The assessment of the risk of bereavement should be based on a conversational exploration of risk and protective factors (Keegan et al., 2021; NSWACI, 2024; SGVDH, 2012), along with data collection from the patient's medical history and the development of a family genogram (GRPCC, 2016).

2.4 The assessment can be complemented through the application of self-report instruments. In addition to general measures of psychosocial distress, it is recommended to use specific measures for assessing the risk of complicated grief, including: (a) Bereavement Risk Index (BRI; Parkes and Weiss, 1983); (b) Bereavement Risk Assessment Tool (BRAT; Rose et al., 2011); (c) Bereavement Risk Inventory and Screening Questionnaire (BRISQ; Roberts et al., 2016); (d) Family Relationships Index

(FRI; Moos and Moos, 1981); (e) Prolonged Grief Assessment Instrument, pre-death version [PG-12; BC Centre for Palliative Care (BCCPC) Prigerson et al., 2009; Hudson et al., 2010, 2012, 2017; GRPCC, 2016; MDHBPC, 2015; Morris and Sannes, 2020; PCA, 2018; SGVDH, 2012].

2.5 Based on the assessment, determine, in discussion with the informal caregiver, the current status and risk of psychological impairment or prolonged grief, and plan relevant interventions (Hudson et al., 2012, 2017; GRPCC, 2016; MDHBPC, 2015; NHPCO, 2018; NSWACI, 2024; SGVDH, 2012).

2.6 When the risk is considered moderate or high, psychological or psychiatric intervention should be suggested (Keegan et al., 2021; NCCN, 2014; NSPCIT, 2014; SGVDH, 2012; GRPCC, 2016). In case of refusal, it should be indicated that the caregiver can request this support later and ask for authorization for future contacts from the team (GRPCC, 2016; Hudson et al., 2012).

2.7 Minors affected by the patient's death should be identified, and a plan should be developed to address their needs (NHPCO, 2018).

2.8 A trauma-informed approach should form the foundation of assessments and support provided. This approach acknowledges the possibility that certain elements of end-of-life care may be perceived as traumatic or may trigger past trauma. It is crucial to ensure that counseling and cultural support are offered to priority groups in culturally sensitive ways and aligned with trauma-informed principles (NSWACI, 2024).

3 Ensuring information and support for the family caregiver. For this stage, 20 guidelines are proposed.

3.1 Arrange a family meeting or conference, including the patient (Hudson et al., 2010). Family conferences provide an opportunity to share information, plan care for the patient, ensure clear communication about caregiving roles and decisions, and understand and observe the family's functioning and relationship dynamics (Hudson et al., 2017; Morris and Sannes, 2020).

3.2 Provide caregivers with accurate information about the disease trajectory and what to expect, which is especially relevant at different time points in the illness trajectory, including at the time of diagnosis, following a recurrence and during the end-of-life period, including the dying process (Morris and Sannes, 2020).

3.3 Provide practical strategies to facilitate the provision of care in managing symptoms and emotional support for the patient (GRPCC, 2016; Hudson et al., 2012; NSPCIT, 2014; SGVDH, 2012).

3.4 Reduce barriers to communication between the family/patient by promoting the expression of needs and desires of both parties and fostering reconciliation conversations (GRPCC, 2016; NHPCO, 2018). Care should include appropriate partnership and engagement of patients and family caregivers (Philip et al., 2018).

3.5 Encourage self-care and the management of personal and social resources (GRPCC, 2016; Hudson et al., 2012, 2017; NSPCIT, 2014; Morris and Sannes, 2020; NHPCO, 2018).

3.6 Promote adaptation to the illness by encouraging people to identify and lean on their strengths and areas of wellness (BCCPC, 2017a, 2017b). Promote adaptive coping strategies and skills training (GRPCC, 2016; Hudson et al., 2012, 2017).

3.7 Promote an active role for the caregiver in recognizing and controlling symptoms (GRPCC, 2016; Hudson et al., 2012, 2017).

3.8 Facilitate the process of elaborating on the various losses inherent in the advanced disease process (GRPCC, 2016; Hudson et al., 2012, 2017).

3.9 Reinforce and validate the role played by caregivers as co-therapists at the emotional level (GRPCC, 2016; Hudson et al., 2012, 2017).

3.10 Promote the preservation of other roles distinct from caregiving (GRPCC, 2016; Hudson et al., 2012, 2017).

3.11 Intervene in the conspiracy of silence, as this can generate discomfort and conflicts within the family and with healthcare professionals (GRPCC, 2016; Hudson et al., 2017).

3.12 Resolve pending practical or emotional matters (GRPCC, 2016; Hudson et al., 2012, 2017; NHPCO, 2018).

3.13 Normalize feelings and thoughts that may provoke guilt (GRPCC, 2016; Hudson et al., 2012, 2017).

3.14 Develop relationships with the social support network to avoid extreme dependence on palliative care teams (GRPCC, 2016; Hudson et al., 2012, 2017).

3.15 Facilitate the emotional expression of family members (BCCPC, 2017a, 2017b; Hudson et al., 2012, 2017; MHW, 2017; NHPCO, 2018).

3.16 Explore fears and anticipate practical organizational aspects in case the family member may be alone at the time of death (GRPCC, 2016; Hudson et al., 2012, 2017).

3.17 Facilitate the integration of the experience and promote the search for meaning (GRPCC, 2016; Hudson et al., 2012, 2017; NHPCO, 2018).

3.18 Help to re-establish a greater sense of control over their reality (GRPCC, 2016; Hudson et al., 2012, 2017).

3.19 Explore relevant existential and spiritual questions (BCCPC, 2017a, 2017b; GRPCC, 2016; Hudson et al., 2012, 2017; MHW, 2017).

3.20 Offer caregiver support groups that create a safe place for caregivers to share their stories and seek guidance (Morris and Sannes, 2020).

4 Preparing for death. Seven guidelines are proposed for this stage.

4.1 Facilitate the decision-making process regarding the place of death and resolution of pending issues (Hudson et al., 2017; NCCN, 2014).

4.2. Help the caregiver(s) recognize the signs that death may be imminent and the potential implications for the patient's care needs (BCCPC, 2017a, 2017b; GRPCC, 2016; Hudson et al., 2010, 2017; MHW, 2017; NHPCO, 2018).

4.3. When death seems imminent, assess to what extent the caregiver(s) understand the process of dying and their degree of preparation for death (BCCPC, 2017a, 2017b; GRPCC, 2016; Hudson et al., 2010, 2012, 2017; MDHBPC, 2015; NCCN, 2014).

4.4. Encourage planning for funeral/memorial services according to their personal preferences, cultural customs and beliefs and facilitate rituals that may help the family say goodbye to the patient (Hudson et al., 2012, 2017; MDHBPC, 2015; NHPCO, 2018).

4.5. Confirm with the caregiver(s) the type of support they may desire in pre-death accompaniment (for example, last hours, days) or immediately after (GRPCC, 2016; Hudson et al., 2010, 2017; SGVDH, 2012).

4.6. The interdisciplinary team chooses a means of communication with the caregiver(s) to identify short- and long-term post-death responses. It is possible to refer for bereavement support at this point (Hudson et al., 2017).

4.7. Address practical aspects related to the will and funeral arrangements, death certification, and who should be notified (GRPCC, 2016; Hudson et al., 2017; MDHBPC, 2015; MHW, 2017; NHPCO, 2018; NSPCIT, 2014).

5 Support at the time of death. For this stage, 10 guidelines were proposed.

5.1 Interdisciplinary team members should be notified of the patient's death promptly (Hudson et al., 2010; MHW, 2017).

5.2 When the death occurs in an institutional setting (hospital, palliative care unit, nursing home) and in the absence of family members, they should be informed of the death sensitively and clearly, including other relatives (NCCN, 2014).

5.3 Sufficient time should be allowed for the family member(s) to say goodbye to the body, alone or with team members, according to their wishes (BCCPC, 2017a, 2017b; NCCN, 2014).

5.4 The family member(s) should be asked about any wishes or spiritual, religious, or cultural rituals they wish to fulfill (NHPCO, 2018; NCCN, 2014).

5.5 Ensure culturally sensitive, respectful treatment of the body (NCCN, 2014).

5.6 Post-mortem transportation and care for the body and personal belongings should be ensured with dignity and respect for the wishes and spiritual, religious, or cultural principles (MHW, 2017; NHPCO, 2018).

5.7 Normalize responses to the loss and discuss what to expect while grieving (BCCA, 2017). When appropriate, provide concise information about the grieving process (e.g., emotions and feelings that may be experienced in the acute phase of grief). The information should focus on practical and emotional support for grief, be easy to understand, and be adjusted to age, gender, and culture (BCCPC, 2017a, 2017b; NSWACI, 2024).

5.8 When death is unexpected or occurs in a particularly traumatic way, it is important to assess the degree of trauma to inform about the risk (SGVDH, 2012).

5.9 It may be necessary to postpone the first contact if the person cannot talk to the professional. In this case, it is recommended that a new contact be made 3–6 weeks after the death. This is when family and friends' support usually decreases, and the person begins to experience a feeling of loneliness (Hudson et al., 2010).

5.10 Offer opportunities for family caregivers to return to the hospital later and meet with the team to have questions answered (Morris and Sannes, 2020).

6 Post-mortem bereavement support. For this final stage, 14 guidelines were proposed.

6.1 The interdisciplinary team should discuss (at a reasonable time) the quality of care provided to the patient and caregiver(s)/family, circumstances of death, and impact on the family and team (at the individual and collective level) (BCCPC, 2017a, 2017b; Hudson et al., 2010, 2017; SGVDH, 2012).

6.2 Legitimize staff discussions about the patient's death and create a climate of safety when sharing personal issues. Provide regular opportunities for reflection and remembering through a memorial ritual for staff (e.g., brief reading, sharing stories, moments of quiet). Identify healthcare professionals at risk for complicated grief, moral distress or compassion fatigue (NCCN, 2014).

6.3 Develop a preliminary bereavement care plan based on the needs of the caregiver(s), the pre-death risk assessment, and the circumstances of death (e.g., unexpected or traumatic) (Hudson et al., 2010). When appropriate, this screening should be supplemented with a comprehensive, holistic assessment (BCCPC, 2017a, 2017b; NHPCO, 2018; SGVDH, 2012). It is recommended that the family's care plan constitute an independent process after the patient's death, and it must record the specific needs and desired frequency of contact by the bereaved (NHPCO, 2018).

6.4 Refer for psychosocial support whenever a moderate or high risk of complicated grief is identified, especially in cases where high separation anxiety and traumatic aspects related to the circumstances of death are detected (BCCPC, 2017a, 2017b; Hudson et al., 2017; NCCN, 2014; NSPCIT, 2014; SGVDH, 2012).

6.5 If the team does not offer level two or three support, refer to teams specialized in bereavement (BCCPC, 2017a, 2017b; Hall et al., 2012; Hudson et al., 2017; NHPCO, 2018).

6.6 Send a bereavement letter 2 weeks after death expressing the team's feelings/condolences. If possible, personalize the letter with specific references to the patient (Hudson et al., 2017; MDHBPC, 2015).

6.7 Attach an information bulletin with basic information about bereavement. The bulletin should focus on the following aspects: typical manifestations and available resources for bereavement support (NHPCO, 2018).

6.8 Six to 12 weeks after death, contact the caregiver(s) or other family members (as appropriate) to provide additional information (e.g., practical information, ways to cope with acute grief symptoms, the role of palliative care team professionals in bereavement support) and assess needs. According to the assessment, the bereavement care plan should be adapted. The assessment should include: (a) Symptoms related to grief that interfere with the person's physical and mental health (e.g., insomnia, anxiety, worsening of pre-existing health conditions, suicidal ideation); (b) Changes in functional and social capacity; (c) Bereavement overload (multiple losses in rapid succession, including concurrent losses); (d) Level of trauma caused by death and possible trauma factors; (e) Possible dissatisfaction with the notification

of death; (f) Possible incongruence between the wishes expressed by the patient and the death experience; (g) Satisfaction with current social support; (h) Verify follow-up by the family doctor or other consultation (BCCPC, 2017a, 2017b; Hudson et al., 2017; Philip et al., 2018; SGVDH, 2012).

6.9 After 6 months, those previously identified as having a risk of complicated grief should be subjected to a formal assessment using a standardized prolonged grief disorder (PGD) diagnostic instrument (BCCPC, 2017a, 2017b; Hudson et al., 2010, 2017; MDHBPC, 2015; SGVDH, 2012) Instruments for assessing Depression and Post-traumatic Stress Disorder can also be used (NSWACI, 2024). Another recommended tool is the Adult Attitudes to Grief Scale (Sim et al., 2014), which indicates the patient's levels of vulnerability and need for support (BCCA, 2017).

6.10 Some people may need non-specialized support. Although they do not meet PGD criteria, they may experience difficulties coping with loss, feel isolated, or need to explore their bereavement experience outside of their social context (review the circumstances of death or aspects of the relationship). In this case, it is recommended that people benefit from the support of an untrained professional or volunteer in bereavement (Morris and Sannes, 2020).

6.11 The service partners with community providers should develop strategies and referral pathways that support families and caregivers in preparing for a loved one's death and coping with grief. Bereaved individuals can access counseling and support services independently or through consented referrals to appropriate regional, government, non-government, or community-based services (NSWACI, 2024; PCA, 2018).

6.12 Specialized bereavement counseling should be suggested for a person meeting PGD criteria (BCCPC, 2017a, 2017b; NSWACI, 2024; PCA, 2018; SGVDH, 2012). Approaches may include cognitive-behavioral therapy techniques, family bereavement therapy, complicated grief treatment, acceptance and commitment therapy, trauma-focused evidence-based interventions including eye movement desensitization and reprocessing (EMDR), meaning reconstruction approaches, bereavement support groups or other evidence-based focussed psychological strategies which may include interpersonal therapy, relaxation strategies (e.g., controlled breathing, progressive muscle relaxation), skills training (e.g., problem-solving, communication), psychoeducation, narrative approaches, etc. (Morris and Sannes, 2020; NSWACI, 2024; SGVDH, 2012).

6.13 At any time when acute distress with persistent disruption of daily life, high risk of suicide, self-harm behaviors to oneself or others, or severe symptoms of depression or other mental illness is detected, immediate referral to the mental health department should be made (Hudson et al., 2017; NSWACI, 2024; SGVDH, 2012).

6.14 At 12 months, a telephone contact should be made to determine if it is necessary to maintain the assessment and support process. Alternatively, a birthday card can be sent with reinforcement of information about the bereavement counseling contacts in case people need professional support (BCCPC, 2017a, 2017b; SGVDH, 2012).

4 Discussion

Support for the family and the development of a bereavement support plan are essential indicators of quality in palliative care (Morris and Block, 2015). In this literature review, we systematized the principles and clinical guidelines that ensure best practices in bereavement support for adult family caregivers in palliative care, taking into account the different stages of assessment and intervention from the initiation of palliative care, through the dying and death process, and throughout the bereavement trajectory. The results focus mainly on primary prevention measures, including providing information and practical and emotional support throughout the bereavement journey. These clinical guidelines, considered universal, should be applied to all family members from the phase preceding the patient's death and during the period of acute grief, regardless of the degree of risk of bereavement. Simultaneously, a systematic assessment of family members should be carried out for adequate screening and referral of the most vulnerable groups in the post-mortem bereavement period. Referral to specialized levels of bereavement support can occur at any time and depends on the presence of PGD criteria and the severity of manifestations of distress. These recommendations are consistent with NICE (2004) guidelines for a more equitable and tailored response to the individual needs of bereaved people.

The application of these recommendations requires healthcare professionals to be able to offer a sensitive and appropriate response to the needs of the bereaved person. This requires adapting the practices according, for example, to the timing of entry into palliative care. In cases of late referral to palliative care, the guidelines for care organization may not apply. Furthermore, communication should be appropriate and sensitive to individual characteristics and family dynamics. In particular, preparing for death demands skills in delivering bad news, managing expectations, and responding to intense emotions. Professionals should also accurately determine the appropriate level of intervention and assess the symptoms of PGD, thereby avoiding the risk of underdiagnosing or, conversely, pathologizing normal grief. Therefore, access to training in bereavement is a consensual principle in clinical guidelines. Additionally, providing supportive conditions, such as reflective spaces and supervision for professionals, is essential to help minimize burnout caused by the emotional toll of grief. Adequate planning of bereavement support also implies articulation with spiritual and religious support services, volunteer associations, and other hospital services (e.g., psychiatry, pediatrics), health institutions, and social solidarity institutions for timely referral and collaboration in community intervention programs. The cooperation of adequately trained and supervised volunteers plays a fundamental role in intermediate-level support (including telephone contacts, one-to-one support, and management of informal support groups) and in disseminating information and sending bereavement letters. Finally, it is essential to ensure the evaluation of procedures and results (including user satisfaction) to improve the quality of services continuously.

Moreover, while structured bereavement support and professional supervision are crucial within healthcare institutions, disparities in access to these services remain a global challenge. Ensuring adequate bereavement care requires not only internal coordination among healthcare teams but also a broader commitment to equitable palliative care. The disparity in access to palliative care and bereavement support is a critical issue worldwide, particularly for patients without cancer, the oldest old, ethnic minorities and those living in rural or deprived areas are under-represented in hospice populations (Tobin et al., 2022; Kunonga et al., 2024). While hospice settings often provide structured and compassionate end-of-life care, many patients remain in acute care facilities due to the severity of their condition, resource limitations, or systemic challenges. As a result, families may not receive the same level of emotional and practical support that specialized palliative care environments offer, which can deeply impact their grieving process (Saunders et al., 2025). This highlights the need for global efforts to strengthen palliative care services and ensure that bereavement-sensitive policies extend across all healthcare settings, providing families with compassionate support regardless of where their loved one passes away.

In addition, bereavement care is often underfunded, leading to limitations in the effective application of bereavement care guidelines and, consequently, inadequate support for grieving families (Breen et al., 2014; Lichtenthal et al., 2024). Economic investments are essential for integrating bereavement services into healthcare systems to address this gap, particularly in resource-constrained settings (Lichtenthal et al., 2024). Evidence suggests that targeted funding can lead to improved outcomes. For instance, the Bupa Palliative Care Choices Program demonstrated that investments in end-of-life care enhance patient satisfaction and reduce costs by supporting care aligned with patients' preferences (Cross et al., 2020). The quality and implementation of bereavement support programs are primarily shaped by healthcare systems' financial and operational models. These models influence how resources are allocated, services are delivered, and the degree of prioritization given to bereavement care. To ensure minimum standards of bereavement support, it is recommended that healthcare teams develop realistic programs that include the following key elements: (1) providing dignified end-of-life care to reduce the risk of trauma for family members; (2) systematically assessing the risk of prolonged grief disorder (PGD); (3) conducting at least one follow-up contact after death to share information about available bereavement support resources (Lichtenthal, 2018).

The quality appraisal of guidelines, using AGREE II, corroborates previous findings (Kent et al., 2020), suggesting that bereavement care practice standards succeed in defining their scope, engaging stakeholders, and presenting clear recommendations. However, they present limitations in rigorously developing evidence-based content, addressing practical applicability, and demonstrating editorial independence. These results advocate for improved transparency, stronger connections between evidence and recommendations, and the inclusion of auditing mechanisms to ensure consistent quality.

The present work has limitations that should be taken into consideration. Firstly, although we recognize the need to adapt practices to users' preferences, the clinical recommendations from this review are still not sensitive to differences in terms of the individual's age, the nature of death, or cultural and religious diversity. The exclusion of documents based on language prevented access to a larger number of documents that would eventually reflect other cultural realities. Besides, since most guidelines are published in gray literature, it is possible that some were not included in this analysis. Gray literature, which includes reports, policy documents, and guidelines not formally published in peer-reviewed journals, often presents challenges in terms of accessibility, retrieval, and comprehensive

indexing in traditional databases. Many of these documents are scattered across institutional websites, governmental agencies, and professional organizations, making systematic identification difficult. As a result, it is possible that relevant guidelines from other countries were not captured in our search. Moreover, many recommendations referring to end-of-life care do not specifically address bereavement care or, conversely, they are directed at the general bereaved population; in both cases, they were excluded from this research. This gap highlights the need for more targeted guidelines that explicitly consider the psychological and social needs of individuals experiencing grief in palliative care settings.

Another limitation of this study is that the quality appraisal was conducted after data synthesis, meaning that the quality of the guidelines was not considered during the initial stages, such as the selection of studies. Nevertheless, including lower-rated guidelines was still necessary to comprehensively overview the available literature. Also, including the quantitative analysis added an extra layer of insight, which allowed the presentation of results with a clear understanding of the strengths and weaknesses of the guidelines included in the review. For future studies, it is recommended that quality appraisal be integrated earlier in the process, particularly during the selection and data mapping phases, so that guidelines' quality can be more effectively considered in both the inclusion of studies and the interpretation of findings.

Nevertheless, the results presented here have evident implications for clinical practice and health policies by highlighting the need to develop programs that cover different levels of bereavement support tailored to the individual needs of people. In addition to universal intervention measures of support and information, continuous assessment of symptoms of PGD and general distress should be ensured for a more appropriate and timely referral to specialized support services. On the other hand, the quality of services should be guaranteed through measures to promote training, support for professionals, and research on services. In particular, training should focus on risk assessment, diagnosis of PGD, and intervention skills appropriate to the level of intervention.

To develop evidence-based recommendations, future research should prioritize collaboration with users, including families and caregivers. This partnership is essential for adapting clinical practices in palliative care to better address their real needs, ultimately enhancing the quality of care and support. Intervention programs should focus on aspects considered helpful by the people seeking help. This calls for more inclusive, user-informed research to improve guidelines and ensure they are both evidence-based and practical (Aoun et al., 2017). More research is also needed to explore the uptake, implementation, and effectiveness of existing clinical guidelines for bereavement support in palliative care (Keegan et al., 2021). It requires a better understanding of how these guidelines are being adopted by healthcare professionals and their impact on the quality of care provided to bereaved family caregivers. Furthermore, little is known about the mechanisms of intervention that prove effective in supporting bereavement (Johannsen et al., 2019). Evidence-based guidelines should be developed directed at people with complex support needs in bereavement (with symptoms of PGD). Specifically, more robust randomized controlled trials are necessary to confirm the effectiveness of bereavement support programs, leading to evidence-based guidelines targeted at tertiary intervention.

5 Conclusion

This scoping review defines the international principles and clinical guidelines that should guide best practices in supporting adult family members through the grief process in palliative care. The implementation of these guidelines allows for the standardization of assessment and intervention procedures in bereavement support, with a view to the continuous improvement of the quality of services and greater effectiveness in responding to the needs of family members accompanied in palliative care.

Author contributions

AC: Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Validation, Writing – original draft, Writing – review & editing. SA: Conceptualization, Investigation, Methodology, Supervision, Writing – original draft, Writing – review & editing. DN: Formal analysis, Methodology, Supervision, Writing – review & editing.

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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.

Generative AI statement

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Psychological capital appreciation as a mediator between resilience and burnout among ICU nurses

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Objective: This study investigated the mediating effects of psychological capital appreciation in the relationship between psychological resilience and burnout among ICU nurses. The findings aim to provide an objective reference for hospitals to enhance the occupational health of ICU nurses.

Methods: A cross-sectional questionnaire survey was administered to 150 ICU nurses employed at 20 tertiary hospitals across Hebei Province. Stratified random sampling was employed in the sampling methodology, with strata defined by hospital size and ranking. Subsequently, ICU nurses were randomly selected within each stratum to enhance the representativeness of the sample.

Results: (i) Among the 150 nurses, the psychological resilience score was (68.701 ± 14.549), resilience was (63.547 ± 14.020), and burnout score was (65.095 ± 18.461). (ii) The analysis revealed that psychological capital appreciation mediated the relationship between psychological resilience and burnout, with a mediation effect size of 0.597, accounting for 79% of the total effect. (iii) Psychological resilience did not directly affect job burnout (direct effect = 0.148, 95% CI includes 0, $t = 0.864$, $p = 0.389$), but indirectly reduced burnout by enhancing PCA. The indirect effect was significant (indirect effect = 0.601, 95% CI excludes 0, $z = 6.073$, $p = 0.000$), with a total effect size of 0.748 (95% CI excludes 0, $z = 8.486$, $p = 0.000$).

Conclusion: (i) Psychological capital appreciation (PCA) plays a complete mediating role between resilience and job burnout of ICU nurses. (ii) The overall incidence of job burnout among nurses is high, while the levels of resilience and psychological capital appreciation are at a low to medium level, which need to be improved urgently.

KEYWORDS

burnout, intensive care unit, nurse, psychological capital appreciation, psychological resilience

1 Introduction

Psychological capital appreciation (PCA) refers to a positive psychological state exhibited by individuals during their growth and development. It serves as a fundamental psychological resource distinct from human capital and social capital, acting as a catalyst for work motivation and an important emotional asset (1). PCA is systematically evaluated through the assessment of self-efficacy, hope, resilience, and optimism (2, 3).

Psychological resilience is the ability to respond and adapt to changes in the external environment. It reflects the capacity of an individual to recover from negative states and is an

index of their flexibility in adapting to environmental changes (4, 5). In essence, psychological resilience manifests as a mental toughness that enables individuals to remain positive in the face of setbacks and difficulties (6). This ability is not entirely innate but can be developed and strengthened through challenging experiences (7).

Burnout is primarily defined as the physical and psychological harm caused when the workload of an individual exceeds a certain threshold. Originally proposed by Freudenberger in 1974, burnout is characterized by emotional exhaustion and is most common in the helping profession. It represents a suboptimal mental health state (8). Notably, medical industry research indicates that burnout varies across departments, with certain specialties exhibiting distinct patterns. For instance, medical staff in emergency departments and intensive care units (ICU) experience significantly higher levels of burnout compared to those in general internal medicine or surgical wards (9).

ICU nurses have high work intensity and pressure (10), and their mental health is closely related to nursing quality and patient safety, which has attracted much attention. Psychological resilience can help them cope with negative emotions, and psychological capital depletion reflects the depletion of psychological resources, and the two are closely related. In the existing literature, the research on psychological resilience mainly focused on the concept and general measurement (11), and the special influencing factors and mechanisms of ICU nurses were insufficient. Although the study of psychological capital consumption mentioned the influence of work stress, there was a lack of in-depth analysis of ICU nurses. Moreover, few studies have analyzed the relationship between them from the perspective of psychological capital. In the ICU environment, how psychological capital plays a mediating role between psychological resilience and psychological capital consumption is still blank.

In the past, some scholars have conducted in-depth analyses on the relationship between individual psychological traits and occupation-related states. As the key psychological adjustment ability of individuals in the face of adversity, psychological resilience has a significant impact on psychological capital. Shen et al. (12) believe that strong psychological resilience can help individuals accumulate and improve psychological capital in stressful situations, and lay a solid foundation for them to cope with work and life challenges. The relationship between psychological capital and job burnout has also attracted academic attention. Sun et al. (13) believe that individuals with a higher level of psychological capital are more proactive in work and can effectively resist the invasion of job burnout. High psychological capital can promote individuals to look at work pressure with a more optimistic attitude, enhance their ability to cope with career difficulties, and thus reduce the possibility of job burnout.

The high-stress nature of ICU nursing can have severe consequences not only for the nurses' personal wellbeing but also for the quality of patient care. If nurses experience burnout, it may lead to decreased job satisfaction, increased turnover rates, and ultimately, compromised healthcare delivery. By conducting in-depth research on this specific group, we can better understand how psychological resilience and positive coping strategies interact to mitigate burnout. This knowledge can then be translated into targeted interventions and support systems tailored to the needs of ICU nurses.

Abbreviations: ICU, Intensive Care Unit; CD—RISC, Connor-Davidson Resilience Scale; PCA, Psychological Capital Appreciation.

This study used a structural equation model to explore this mediating effect for the first time, aiming to fill the literature gap, enrich the theory of nursing psychology, provide a basis for medical institutions to formulate mental health intervention strategies for ICU nurses, and improve the mental health and occupational wellbeing of nurses.

2 Participants and methods

2.1 Research participants

An online questionnaire survey was administered to 150 ICU nurses from 20 tertiary hospitals, including the Fourth Hospital of Hebei Medical University and the Third Hospital of Hebei Medical University. The use of stratified random sampling based on hospital size and rank was based on the following considerations. Hospital scale is closely related to medical resources, the number of patients and the complexity of nursing. ICU resources in large hospitals are rich, and patients' conditions are complex, so nurses need to master more complex skills and face more challenges. Through this stratification, we can comprehensively cover different levels of ICU nursing environment, make the sample more representative, and then accurately reflect the real situation of ICU nurses, and enhance the universality and reliability of the study. The whole process of answering questions took the form of an anonymous answer sheet, and a strict privacy protection mechanism was constructed. A total of 136 valid responses were obtained, yielding an effective response rate of 91.33%. In this study, the questionnaire data were initially screened by statistical software, and the questionnaires that were not logical (such as all option A, the whole questionnaire answer less than 1 min, etc.) were marked. Then researchers manually reviewed these marked questionnaires, finally determined the list of invalid questionnaires, and deleted the invalid questionnaires. The inclusion criteria were registered nurses with at least 1 year of clinical experience in an ICU setting, who provided informed consent and voluntarily participated in the study. Exclusion criteria encompassed nurses who had resigned or transferred out of the ICU, those unable to complete the survey due to studies or further education, and nurses with a past or present history of severe physical or mental illness.

Elimination criteria involved responses with excessively long or short completion times and those with inconsistent or patterned answers showing evident logical contradictions.

2.2 Research tools

Basic demographic information, including sex, age, professional title, job title, and other related data were collected.

After data collection, a comprehensive reliability and validity test was conducted based on the data obtained. At the same time, at the end of the paragraph introducing each scale, the test results and related conditions were explained in detail to ensure the transparency and traceability of the research process and data quality.

Burnout scale: This study employed the Chinese version of the burnout scale revised by Chaoping et al. (8). The scale consists of 15 items scored on a seven-point Likert scale. The total score is calculated by summing the scores for all items with the final evaluation derived by multiplying the average score per item by 20, with 0–50 points indicating good condition; 50–75 points indicating mild burnout

state; 75–100 points indicating severe burnout state; and more than 100 points indicating extremely severe burnout state. The scale demonstrated high reliability with an α coefficient of 0.949 and excellent validity with a KMO value of 0.908 (8).

Nurse psychological capital appreciation scale: This scale was originally developed by Luthans et al. (14). The simplified Chinese version, developed by Luo and He, was employed in this study to measure the PCA level of ICU nurses (15). The scale consists of four dimensions and 12 items scored on a 7-point Likert scale. The total score is obtained by summing the factor scores, with higher total scores indicating higher PCA. In this study, the reliability and validity of the collected and collated data were tested, and the results were consistent with those tested by scholars such as Luo (15), and this scale demonstrated excellent reliability with an α coefficient of 0.976 and high validity with a KMO value of 0.946.

Connor-Davidson resilience scale (CD-RISC): The Chinese version of the scale revised by Jiao Chunhui and Qu Qingrong was employed for this investigation (5). The scale consists of 10 items and is scored on a 7-point scoring scale. The total score is calculated by summing the factor scores, with higher scores indicating higher levels of psychological resilience. The Chinese version of the CD-RISC (10 items) is reliable, valid, easy to use, and is suitable for clinical settings (16).

2.3 Statistical analysis

Data collected from the survey were statistically analyzed using SPSS 26.0.

2.3.1 Correlation analysis of resilience, PCA and job burnout

In this study, the Pearson method was used to conduct a Bayesian correlation analysis of resilience, PCA, and job burnout (see Table 1). Before analysis, normality and homogeneity of variance tests were performed. The Jarkue-Bera test was used to determine whether job burnout, psychological capital, and psychological resilience obey normal distribution. The results showed that the p values of each variable were greater than 0.05, and they obeyed normal distribution at the 0.05 significance level. At the same time, Levin's homogeneity of variance test was performed. Taking job burnout as the benchmark,

the p values of psychological capital and psychological resilience were greater than 0.05, which was consistent with the hypothesis of homogeneity of variance.

To enhance the robustness of the study, a non-parametric test (Kruskal Wallis test) was performed, and the grouping variable was burnout. The results showed that the asymptotic significance of both resilience and psychological capital was less than 0.05, indicating that there were significant differences in resilience and psychological capital among the different burnout groups.

Pearson correlation analysis showed that the confidence intervals and effect sizes of ICU nurses' burnout, resilience, and psychological capital appreciation studies were statistically significant. The 95% confidence interval of the correlation between job burnout and psychological capital appreciation was [0.535, 0.733], and the mean value was 0.645; the confidence interval of psychological resilience was [0.466, 0.687], and the mean value was 0.580; the confidence interval of psychological capital appreciation and psychological resilience was [0.823, 0.905], and the mean value was 0.867. This indicates that at the 95% confidence level, burnout is significantly positively correlated with psychological capital appreciation and resilience, and the correlation is moderate or above, and psychological capital appreciation is strongly positively correlated with resilience.

2.3.2 Analysis of mediating effect

According to Tables 1, 2, and Figure 1, resilience was positively correlated with psychological capital appreciation, the effect value was 0.842, the 95% confidence interval did not include 0, z value was 20.676, p value was 0.000; Psychological capital appreciation had a significant negative relationship with the total score of job burnout (effect value 0.713), 95% confidence interval did not include 0, z value 4.024, p value 0.000; Psychological capital appreciation played a complete mediating role between psychological resilience and job burnout score, the indirect effect value was 0.601, the 95% confidence interval did not include 0, z value was 6.073, p value was 0.000; The direct effect value of resilience on the total score of job burnout was 0.148, the 95% confidence interval included 0, t value 0.864, p value 0.389, and the total effect value was 0.748, the 95% confidence interval did not include 0, z value 8.486, p value 0.000, and was significant. The overall effect is mainly contributed by the indirect effect through psychological capital appreciation.

TABLE 1 Results of the mediating effect test.

Item	Symbol	Significance	Effect	95% CI		SE value	z value /t value	p value	Conclusion
				Lower limit	Upper limit				
Psychological resilience = > Psychological capital appreciation = > Burnout total score	a*b	Indirect effects	0.601	0.276	0.662	0.099	6.073	0.000	Full mediator
Psychological resilience = > Psychological capital appreciation	a	X= > M	0.842	0.762	0.922	0.041	20.676	0.000	
Psychological capital appreciation = > Burnout total score	b	M= > Y	0.713	0.366	1.060	0.177	4.024	0.000	
Psychological resilience = > Burnout total score	c'	Direct effects	0.148	−0.188	0.483	0.171	0.864	0.389	
Psychological resilience = > Burnout total score	c	Total effects	0.748	0.575	0.921	0.088	8.486	0.000	

It presents the various effect values, confidence intervals, statistics, and p-values of the mediating effect in a horizontal format to determine the situation of the mediating effect.

3 Results

3.1 Demographic data analysis

According to Table 3, the demographic data of 136 subjects were analyzed. There were 32 males (23.5%) and 104 females (76.5%), with the majority of females. In terms of marital status, 107 were married, accounting for 78.7%, 28 were unmarried, accounting for 20.6%, and 1 was divorced, accounting for 0.7%. In terms of educational background, 127 (93.4%) had a bachelor's degree, 1 (0.7%) had a master's degree or above, and 8 (5.9%) had junior college education. In terms of ICU working years, 1–15 years were more concentrated, with 37 workers (27.2%) for 1–5 years and 6–10 years, 41 workers (30.1%) for 11–15 years, 10 workers (7.4%) for less than 1 year, and 11 workers (8.1%) for more than 15 years.

3.2 Resilience, PCA, and burnout scale scores

According to Table 4, in the study of 136 ICU nurses, three scales were used for evaluation. The total score of the Conner-Davidson Resilience Scale was obtained by adding the scores of the factors, and the higher the score, the higher the psychological resilience. The average score of this study was 68.58 ± 14.54, which was in the middle level. The nurses' psychological capital appreciation Scale obtained the total score by adding the scores of the factors, and the higher the score, the higher the PCA value. The average PCA score was 63.46 ± 14.03, which was a moderate level. Self-efficacy (12.08 ± 3.59), hope (17.00 ± 3.92), resilience (17.19 ± 3.72), and optimism (17.19 ± 3.71); The average score of each item was multiplied by 20 to obtain the total score. The grading standard was 0–50 points for good condition, 50–75 points for mild burnout, 75–100 points for serious burnout, and more than 100 points for extremely serious burnout. The reference grading standard was between 50 and 75, indicating a high level of job burnout, and the specific dimension scores were emotional exhaustion 19.47 ± 6.98, depersonalization 21.82 ± 6.92, and invalidity 23.62 ± 7.14, respectively. In general, the resilience and PCA of ICU nurses are at a medium level, but the level of job burnout is high. According to the corresponding

relationship between the scores of the Maslach Burnout Scale and the grading standard, the data directly reflected that the subjects had experienced more significant job burnout, which may suggest that higher job burnout has an impact on the appreciation of psychological capital and then affects the level of psychological resilience. The specific relationship between the three is analyzed in the mediating effect.

3.3 Correlation analysis between psychological resilience, PCA, and burnout

Bayesian correlation analysis was performed using Pearson's method (Table 5). In this study of ICU nurses' job burnout, resilience, and psychological capital appreciation, Pearson method was used to carry out Bayesian correlation analysis.

We chose Bayesian correlation analysis for three main reasons. Bayesian analysis allows using prior knowledge from existing literature, which is beneficial, especially with small sample sizes, unlike traditional frequentist methods relying solely on current data. Also, it provides the posterior probability distribution of correlation coefficients, giving not only a point estimate but also a range of values and their probabilities, thus better understanding complex relationships like PCA's mediating

FIGURE 1
Diagram of the mediating effect model. Psychological resilience has a direct positive effect on burnout (with a coefficient of 0.158) and also has an indirect positive effect on burnout through psychological-capital appreciation (with coefficients a = 0.841 and b = 0.710).

TABLE 2 Test of the mediating effect model.

Variables	Burnout	Psychological capital appreciation	Burnout
Constant	13.593	5.697*	9.531
	(2.199)	(1.995)	(1.604)
Psychological resilience	0.748**	0.842**	0.148
	(8.486)	(20.676)	(0.864)
Psychological capital appreciation	No	No	0.713**
	No	No	(4.024)
Sample size	136	136	136
R^2	0.350	0.761	0.420
Adjusted R^2	0.345	0.760	0.411
F value	$F(1.134) = 72.017, p = 0.000$	$F(1.134) = 427.492, p = 0.000$	$F(2.133) = 48.185, p = 0.000$

This table provides the constant terms, regression coefficients, sample size, determination coefficients, etc. of the mediating effect model, evaluating the goodness of fit of the model and the significance of variables.
*$p < 0.05$, **$p < 0.001$, t-value in parentheses.

TABLE 3 Results of demographic statistics.

Variables	Categories	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Gender	Male	32	23.50%	23.50%	23.50%
Gender	Female	104	76.50%	76.50%	100.00%
Marital status	Married	107	78.70%	78.70%	78.70%
Marital status	Unmarried	28	20.60%	20.60%	99.30%
Marital status	Divorced	1	0.70%	0.70%	100.00%
Educational attainment	Junior College	8	5.90%	5.90%	5.90%
Educational attainment	Undergraduate	127	93.40%	93.40%	99.30%
Educational attainment	Master's Degree and Above	1	0.70%	0.70%	100.00%
Working years in ICU	Less than 1 year	10	7.40%	7.40%	7.40%
Working years in ICU	1–5 years	37	27.20%	27.20%	34.60%
Working years in ICU	6–10 years	37	27.20%	27.20%	61.80%
Working years in ICU	11–15 years	41	30.10%	30.10%	91.90%
Working years in ICU	More than 15 years	11	8.10%	8.10%	100.00%

TABLE 4 Scores of burnout, psychological resilience, and psychological capital appreciation (PCA) scores among ICU nurses.

Variables	N	Mean value	Standard deviation	Variance
Psychological resilience	136	68.59	14.54	211.49
PCA scores	136	63.46	14.04	197.03
Optimism	136	17.19	3.71	13.76
Resilience	136	17.19	3.73	13.904
Hope	136	17.00	3.93	15.48
Self-efficacy	136	12.08	3.59	12.89
Total burnout score	136	64.91	18.40	338.69
Emotional exhaustion	136	19.47	6.98	48.77
Depersonalization	136	21.82	6.92	47.93
Sense of personal fulfillment	136	23.63	7.14	51.02
Number of valid cases	136	None	None	None

This table lists in detail the statistical data such as the mean values, standard deviations, and variances of 136 ICU nurses on relevant psychological indicators and burnout dimensions, reflecting the central tendency and dispersion of the data.

role, while traditional methods with just a single-value estimate and *p*-value are less informative. Moreover, as our data had non-normality challenging for traditional parametric methods, the flexibility of Bayesian methods, not strictly requiring normality assumptions, enables accurate data analysis without complex transformations that could distort relationships, leading to more reliable results.

In-depth analysis of the logical relationship between the three shows that ICU nurses with higher psychological resilience can better cope with work pressure and challenges, reduce the degree of job burnout, and are more inclined to actively seek solutions in the face of difficulties and promote the appreciation of psychological capital. Nurses with increased psychological capital have strong internal psychological strength, which can cope with high-intensity work with a more positive attitude and reduce job burnout.

In summary, job burnout was significantly positively correlated with psychological capital appreciation and psychological resilience, respectively, and psychological capital appreciation was strongly positively correlated with psychological resilience. This result provides

key data support for understanding the occupational status and psychological characteristics of ICU nurses and provides key data support for formulating targeted intervention measures such as improving nurses' psychological resilience training and enhancing psychological capital construction. It has important guiding significance to alleviate job burnout and improve job satisfaction and efficiency.

3.4 Analysis of mediating effects

According to Tables 1, 2, analysis shows PCA fully mediates the link between psychological resilience and burnout in ICU nurses. The mediating effect size of PCA is 0.597, making up 79% of the total effect. Further, as a mediator, PCA has a 100% effect size in this relationship. This indicates psychological resilience has no direct impact on burnout.

Psychological resilience helps ICU nurses recognize work stressors such as long hours and emotional strain. Instead of directly influencing burnout, it activates coping mechanisms, with PCA being

TABLE 5 Correlation analysis between psychological resilience, psychological capital appreciation, and burnout in ICU nurses.

Posterior distribution characteristics of pairwise correlations[a]					
Variables 1	Variables 2	Data types	Burnout	Psychological capital appreciation	Psychological resilience
Burnout	Posterior distribution	Mode	No data	0.644	0.590
		Mean	No data	0.645	0.580
		Variance	No data	0.003	0.003
	95% confidence interval	Lower limit	No data	0.535	0.466
		Upper limit	No data	0.733	0.687
	N		136	136	136
Psychological capital appreciation	Posterior distribution	Mode	0.644	No data	0.872
		Mean	0.635	No data	0.867
		Variance	0.003	No data	0.000
	95% confidence interval	Lower limit	535	No data	0.823
		Upper limit	0.733	No data	0.905
	N		136	136	136
Psychological resilience	Posterior distribution	Mode	0.590	0.872	No data
		Mean	0.580	0.867	No data
		Variance	0.003	0.000	No data
	95% confidence interval	Lower limit	0.466	0.823	No data
		Upper limit	0.687	0.905	No data
	N		136	136	136

It presents the posterior distribution characteristics and confidence intervals of the pairwise correlations among the three, showing the degree of association between variables.
[a]Analytical hypothesis referring to prior research ($c = 0$).

key. Nurses use PCA's positive problem-solving to manage workloads and balance work-life, like making efficient routines, thus reducing burnout.

The ICU's complex, high-pressure environment means psychological resilience alone cannot fight burnout. PCA steps in as an intermediate. Through PCA's positive reappraisal, nurses see patient-care challenges as growth opportunities, lowering burnout risks.

Psychologically, psychological resilience promotes the use of PCA. When faced with potential burnout, resilient nurses are more likely to use PCA, blocking the direct path from resilience to burnout. Resilience's influence goes through PCA to determine burnout levels. In summary, PCA fully mediates this relationship, with psychological resilience having no direct effect on burnout.

4 Discussion

4.1 PCA and psychological resilience of ICU nurses

The PCA and psychological resilience levels among the surveyed ICU nurses were found to be moderate. The positive psychological state and inner psychological resilience of the ICU nurses surveyed were somewhat inhibited, which is closely related to the extremely heavy daily workload and day-and-night shifts that ICU nurses face. Currently, nurses in general ICUs deal with an increasing number of patients and diversified diseases, which places greater demands on their professional abilities and psychological resilience [17].

Previous studies have highlighted the critical role of PCA in fostering teamwork, enhancing team efficiency, and promoting effective collaboration among nurses [18]. It is also correlated with the attitude of the nurses toward patients with improvements in PCA linked to higher care quality [19].

In terms of psychological resilience, studies have suggested that low resilience is a key factor leading to higher turnover rates among nurses [20]. The turnover rate of ICU nurses is higher than that of other departments. A higher turnover rate is detrimental to the overall quality of care in nursing teams, which can negatively affect the care and treatment of critically ill patients [21]. It is worth noting that PCA is a modifiable key factor. Compared with some personal traits that are difficult to change in a short period of time, improving PCA through targeted interventions provides a practical way to improve the occupational health status of ICU nurses.

4.2 High levels of burnout among ICU nurses

Burnout levels observed among ICU nurses were notably high, indicating a critical situation that requires urgent attention. Burnout was characterized by three key dimensions: emotional exhaustion, depersonalization, and ineffectiveness. Emotional exhaustion refers to the depletion of emotional resources, resulting in physical fatigue, lack of enthusiasm, and motivation decline, often leading to frustration and emotional fatigue. Depersonalization manifests as disengagement, where nurses complete tasks passively, maintain

emotional distance from colleagues, and avoid engagement with nursing managers. A sense of ineffectiveness indicates a low sense of self-worth among nurses.

The psychological stress associated with burnout poses significant risks to physical and mental health. For instance, Sullivan V and Hughes V et al. proposed that chronic burnout stress impairs multiple systems, including immune, circulatory, neuroendocrine, and central nervous systems (22). Prolonged exposure to burnout stress exacerbates functional decline, particularly in the immune system. This can eventually lead to cellular immunity depletion and trigger inflammation in the body through cytokine release (23). A number of studies have shown that job burnout is generally associated with decreased personal wellbeing and increased turnover intention in both Chinese and international nurses (20, 24). Cohen C, Pignata et al. proposed solutions from two perspectives: (1) establishing peer support systems and integrating mental health professionals within the nursing team to provide supportive care treatment; (2) encouraging relaxation techniques such as massage, acupuncture, and yoga to help reduce stress and promote wellbeing (25).

Compared with previous studies, there are discrepancies as well as consistencies. Harwood (4) have found that there is a correlation between psychological resilience and job burnout, and psychological capital plays a certain role in it, which is consistent with the results of this study, indicating that the relationship between psychological resilience, psychological capital and job burnout has certain common characteristics in nursing groups in different regions. Wang (9) pointed out that positive psychological capital played a mediating role in the relationship between nurses' perceived organizational climate and job burnout, which was similar to the mediating role of psychological capital appreciation (PCA) between psychological resilience and job burnout in this study, indicating that psychological capital plays an important role in influencing nurses' job burnout.

4.3 PCA as a full mediator between psychological resilience and burnout

PCA was found to fully mediate the relationship between psychological resilience and burnout. The psychological resilience score of ICU nurses not only predicts their burnout status but also has a profound impact on burnout through PCA, acting as a bridge between the two (26).

Psychological resilience (27), defined as the ability of an individual to resist stress and adapt to change, directly predicts burnout status. It provides predictive insight into future burnout risk, even before employment. This influence operates through PCA, which includes the optimism of an individual, positive outlook, and level of self-efficacy. Additionally, studies have suggested that a positive working environment can improve the psychological wellbeing of nurses, enhancing psychological resilience and reducing burnout (25). This in turn helps decrease the likelihood of depression and anxiety caused by burnout, allowing nurses to focus more on patient care (28, 29). By improving psychological resilience both PCA and burnout can be improved, leading to higher team efficiency and better occupational protection for nurses (30). This reduces the psychological damage from occupational exposure and minimizes somatic dysfunction caused

by stress, ultimately improving the overall wellbeing of the nursing community (31).

Therefore, based on the results of this study, interventions in three key areas are recommended to address burnout effectively. First, enhance psychological resilience and stress resistance by cultivating higher levels of psychological resilience in ICU nurses (32). Second, incorporate psychological resilience evaluations during the recruitment process for new nurses. By selecting nurses with high levels of psychological resilience, the overall resilience and burnout levels of the ICU team can be improved. Third, create a positive and supportive atmosphere within the ICU department to improve its work environment (33). Nurse managers should prioritize mental health to boost PCA levels, helping nurses to maintain a positive and hopeful attitude. This will enable them to better engage with their ICU work and provide quality care (34).

4.4 Methods to improve nurses' psychological capital according to research design

In terms of training system construction, centralized professional training courses can be adopted. Senior experts in the field of psychology will be invited to give lectures, and the concept of psychological capital will be systematically described, covering the core components of self-efficacy, hope, optimism, and resilience, as well as the mechanism of its influence on job performance and career satisfaction in nursing work. To stimulate the internal motivation and subjective initiative of nurses to improve psychological capital, so that nurses can apply the theories and skills they have learned to practice and effectively improve their ability to cope with high-intensity work pressure.

At the level of intervention measures, a professional psychological support team for ICU nurses can be set up in the hospital. The group was led by professional psychological counseling qualified personnel and clinically experienced senior nurses and organized regular communication and sharing activities every week. It enables them to share their work stressors, psychological distress, and coping experiences. When nurses have serious psychological stress reaction, professional psychological counselors will provide personalized psychological intervention and guidance based on psychological counseling theory and technology to enhance nurses' psychological resilience.

In the process of task allocation, the professional ability, workload, and individual differences of nurses were fully considered, and the flexible scheduling system was implemented. According to the dynamic change law of ICU work intensity and the personal needs of nurses, the scheduling optimization algorithm was used to formulate a personalized scheduling scheme, which effectively reduced the work-life conflict and improved the job satisfaction of nurses.

4.5 Limitations of the study

This study relied on a literature review, questionnaire data collection, and statistical analysis to draw conclusions. However, to gain a more comprehensive and accurate analysis of psychological resilience, PCA, and burnout among ICU nurses, further research is

needed. In terms of samples, the sample size was relatively small, which may affect the reliability and representativity of the results, thus limiting the generalizability of the research conclusions to a certain extent.

From the perspective of sample and potential confounding factors, this study has some improvements. The sample size is relatively small, which may affect the reliability and representativeness of the study results to some extent, and may limit the wider applicability of the study conclusions. At the same time, potential confounding factors such as work shifts, patient care volume, and differences between different hospitals were not fully considered during the study. These factors are likely to interfere with the results of the study, thereby bringing some negative effects on the accuracy of the study conclusion.

At the data level, this study has a key improvement point, that is, the lack of longitudinal data support. Analysis based only on data at a particular time point or a short period of time limits the depth of research conclusions to a considerable extent. Longitudinal data can clearly show the changes of the subjects over a long period of time, which is of great significance for revealing the dynamic correlation between variables more accurately. The lack of longitudinal data makes it difficult to determine the key question of whether the findings are due to chance at a given time or are stable over time. Therefore, subsequent related studies may try to collect longitudinal data and follow up the changes of the subjects for a long time, so as to more accurately analyze the relationship between variables and make the research conclusions more convincing. In view of the above limitations of this study, future studies should consider expanding the sample size appropriately, actively carrying out multi-center and large-sample research, and including as many subjects with different characteristics as possible. At the same time, the potential confounding factors such as work shifts and patient care volume should be fully weighed, and the influence of differences between different hospitals on the research results should be effectively controlled, so as to promote the further development of research in this field.

5 Conclusion

PCA fully mediates the relationship between psychological resilience and burnout among ICU nurses (35). Specifically, psychological resilience not only directly influences PCA but also indirectly affects burnout. As an internal motivator, PCA profoundly impacts burnout in nurses (36). This research represents an important advancement in international research, as it explores the interaction between psychological resilience, PCA, and burnout, a relationship that has not been comprehensively investigated in existing studies. While burnout is a consequence of sustained work-related stress, it may not be immediately apparent in the early stages of a nursing career. However, psychological resilience can be assessed and addressed early, offering opportunities for timely intervention. The findings suggest that psychological resilience and burnout have an indirect impact on one another, with resilience serving as a predictive factor for burnout, enabling early identification and intervention to improve overall wellbeing and work performance. Psychological capital appreciation played a complete mediating role between psychological resilience and job burnout. Psychological resilience does not directly affect job burnout, but effectively reduces the level of job burnout by improving the key factor of psychological capital appreciation.

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

Ethical approval was not required for the studies involving humans because this study does not involve patient information, does not interfere with the patient's treatment plan, and does not require ethical approval. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

RZ: Conceptualization, Data curation, Formal analysis, Project administration, Writing – original draft, Writing – review & editing. MS: Data curation, Formal analysis, Methodology, Writing – original draft. YY: Conceptualization, Software, Supervision, Validation, Writing – review & editing. YW: Data curation, Methodology, Project administration, Resources, Writing – original draft. PG: Conceptualization, Data curation, Writing – review & editing. YX: Formal analysis, Investigation, Methodology, Supervision, Writing – review & editing. KS: Conceptualization, Data curation, Formal analysis, Validation, Writing – review & editing.

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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.

Generative AI statement

The authors declare that no Gen AI was used in the creation of this manuscript.

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A nationwide study exploring the factors associated with psychological resilience during the COVID-19 pandemic in Singapore

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Background: The COVID-19 pandemic is a global adverse event that affected many individuals' well-being. Resilience is an essential component that allows one to cope during stressful events such as the pandemic. Not many studies have longitudinally explored changes in resilience across time during the pandemic in the Southeast Asia region. The current article investigates resilience and the sociodemographic and psychological factors associated with resilience across two waves of survey of a Singapore adult population.

Methods: The study was conducted across two timepoints from May 2020 to June 2021 (T1) and October 2021 to September 2022 (T2). 1129 participants partook during T1 (response rate = 54.8%) and 858 participants partook during T2 (response rate = 76.0%). The questionnaire included sociodemographic information and measures such as the Brief Resilience Scale, Patient Health Questionnaire-9, Generalized Anxiety Disorder Scale-7, the stress component of the Depression, Anxiety and Stress Scale, and four COVID-19-related stressors. Generalized estimating equations (GEE) were utilized to investigate the relationships adjusting for timepoints.

Results: Most participants had normal levels of resilience (M = 3.61, SD = 0.62), and resilience scores did not differ much over time (p = 0.852). Males, younger adults, university-educated, employed individuals, and individuals living in private housing had higher levels of resilience. Higher levels of anxiety symptoms, depressive symptoms, stress, and one specific COVID-19-related stressor (i.e., employment concerns) were associated with lower levels of resilience. Individuals who reported having moderate to severe depression and anxiety symptoms were more likely to have low resilience.

Discussion: The findings suggest that resilience levels remained within the normal range and unchanged over time, reflective of the population's ability to cope with the pandemic. However, there is still a need for more targeted interventions for individuals who are more vulnerable to lower resilience. Continued research is also needed to understand the long-term psychological effects of the pandemic.

Introduction

The global outbreak of the novel coronavirus disease (COVID-19) was described by the World Health Organization as a public health emergency in January 2020 (1). On top of the threat to physical health, many lives had been upended by the strict pandemic measures, such as lockdowns and social distancing measures (2, 3). The widespread contagion of the coronavirus alongside pandemic measures led to income loss, loneliness, distress, and social isolation for many (4, 5). As such, there was considerable concern about the psychological consequences of the COVID-19 pandemic (6). It was evident that there was a strong need for mental health support during these times, and protective factors such as resilience could have played a key role in sustaining mental health (2, 7, 8). Various definitions of resilience have been proposed throughout the years (9). In this study, we conceptualized resilience as the ability to bounce back or recover from adversity (10). From this perspective, resilience is viewed as a dynamic process understood through patterns of responses to challenging situations or events (11). It can vary within one individual across time and circumstances and thus can be captured using within-individual response trajectories across time (11, 12). The COVID-19 pandemic presents an opportunity to explore resilience during a prominent global adverse event (13). Having insight into resilience is essential in understanding the healthy adaptation to stressors, which would be beneficial in implementation efforts to aid individuals in coping with adversities (14).

To date, a considerable number of studies have sought to explore resilience during the COVID-19 pandemic and the common factors associated with it. Some of these studies have identified that females have diminished levels of resilience (Brief Resilience Scale; BRS scores) compared to their male counterparts (15–17). During the pandemic, the dire need for interventions targeted at boosting resilience for individuals with lower socio-economic status was highlighted, given their susceptibility to stress-related psychological symptoms (18). In a cross-sectional study conducted by Riehm et al. (17) in the United States, it was revealed that adults living below the federal poverty line were more likely to have lower BRS scores as compared to adults above the poverty line. The study also revealed that adults with a graduate degree had higher odds of high resilience as compared to their counterparts with a high school education or below. Besides socioeconomic status, a longitudinal study demonstrated that individuals aged 18 to 34 had lower resilience scores on the BRS, indicating that young adults are more vulnerable to poorer resilience (19). Other studies utilizing different scales have also demonstrated that resilience and proactive coping were higher among older adults during the pandemic (20–22). Additionally, while the relationship between marital status and resilience has not been largely explored during the pandemic, some studies have suggested that married participants experience heightened anxiety levels as compared to their unmarried counterparts, and that widowed/divorced individuals experience worse anxiety as compared to their married and single counterparts (23, 24). A cross-sectional Turkish study utilizing an adapted BRS revealed that resilience did not differ

significantly across marital status, but more research is needed for conclusive associations (25).

Additionally, symptoms of anxiety, depression and self-reported stress were the most prevalent psychological reactions to the pandemic (26). This is also observed in a systematic review that reported a high prevalence of symptoms of anxiety, depression and stress across multiple countries (27). Nationwide studies such as the one conducted by Dragan et al. (28) in Poland utilizing the Patient Health Questionnaire-9 and Generalized Anxiety Disorder-7 scales reported that about 25.7 and 43.9% of the sample reported having moderate to severe levels of depressive and generalized anxiety symptoms, respectively. Additionally, a longitudinal study investigating the trajectory of anxiety during the pandemic revealed that generalized anxiety was associated with an increased risk of somatic symptoms (29). Given their prevalence and risk during the pandemic, there is importance in addressing these specific psychological distresses. The pandemic is associated with numerous stressors that might affect individual resilience. The most common stressors identified included worries about family members contracting COVID-19, infecting someone else without knowing, and financial issues following COVID-19 (13). The relationship between psychological distress and resilience has been well documented during the pandemic – a longitudinal study conducted in Australia revealed that normal levels of depression, anxiety, and stress were associated with higher scores on the BRS (30). Another two-wave longitudinal study conducted in China revealed that resilience among adolescents, measured using the Chinese Positive Youth Development Scale, was negatively associated with depression and anxiety six months later (31). Additionally, Barzilay et al. (13) also demonstrated that generalized anxiety symptoms, depressive symptoms, and concerns about COVID-19-related stressors were linked to lower BRS scores. Another study conducted in Spain identified that depressive symptoms were a predictor of poor BRS scores in clinical populations, but no associations were found for healthy controls (6).

Several studies have investigated resilience during the COVID-19 pandemic, including some longitudinal research examining the period following the outbreak (32, 33). This is particularly important, as existing literature highlights the persistence of psychological distress long after the pandemic has ended (34). However, a look into existing literature suggests a scarcity of studies examining resilience post-lockdown in Southeast Asia. There is a need for more studies in the region, considering evidence of cross-cultural differences in resilience among different countries (35). There is value in understanding the mental health trajectory in different populations as it can contribute to the informing of nationwide policies, help to determine the impact of pandemic measures on population mental well-being, and plan out the allocation of resources. Therefore, the present study looked at changes in psychological resilience in Singapore across two waves during the pandemic spanning early 2020 to late 2022.

Singapore is a Southeast Asian country with a population of approximately five million individuals. The majority of the population is ethnically Chinese (74.3%), followed by Malay (13.5%), Indian (9%) and Others (3.2%) (36). As of October 2022, there were 1.9 million reported infections and 1,620 deaths in the country due to

COVID-19 (37). Singapore went through a nationwide partial lockdown from 7th April 2020 to 4th June 2020, followed by a planned reopening. Restrictions due to the Delta and Omicron Variant started on 8th May 2021 and ended on 29th March 2022. COVID-19 restrictions were removed by 29th August 2022, except for mandatory mask-wearing in public transportation and medical settings like hospitals and clinics. The relative and inevitable uncertainty regarding the COVID-19 spread, alongside the many other consequences of the pandemic, could have been a source of psychological distress among many Singapore residents. An understanding of psychological resilience among the Singapore population would be beneficial in the preventive efforts not only for the current pandemic but for future pandemics and other events of a similar nature.

The present study utilizes an exploratory approach to understand the changes in individual resilience during the pandemic within the general population of Singapore across two waves spanning early to mid-pandemic. As we viewed resilience as a dynamic concept, we hypothesized that individual resilience levels would decline across time due to the multifaceted stressors introduced during the course of the pandemic. Secondly, we aimed to investigate the association between sociodemographic variables and perceived depression, anxiety, stress, COVID-19-related stressors, and resilience using data from both waves. We also aimed to further investigate the relationship between resilience levels and severity of depressive and generalized anxiety symptoms.

Methods

Sample

The present study was part of a larger study investigating well-being and resilience during the COVID-19 pandemic in Singapore. Ethical approval for the study was provided by the National Healthcare Group Domain Specific Review Board. Institutional Review Board protocol number: 2020/00462 and 2021/00566. A total of 1129 participants took part in the first wave of the study from May 2020 to June 2021. Participants were individuals from the general population who participated in the Singapore Mental Health Study in 2016 and had provided consent for re-contact. 50.9% of the participants were female, and 49.1% of the participants were male. The mean age was 46.70 (SD = 16.45). Most participants were Chinese (76.1%), university or pre-university educated (33.3 and 28.3% respectively), married (62.5%), and employed (71.5%). Table 1 depicts the summary statistics of the sociodemographic data of the participants at the first wave of the study. Additionally, a detailed methodology has been described in an earlier article (38). The inclusion criteria were (1) Singapore citizen or Permanent Resident (PR), (2) aged 21 years and above, (3) ability to speak in English, Bahasa Melayu or Mandarin, and (4) available for an interview via ZOOM video conferencing platform or face-to-face. The exclusion criteria included (1) severe physical or mental disorders that limited participation in the study and (2) not staying in Singapore during the survey period. Out of these 1129 participants, 858 participants took part in the second wave of the study conducted from October 2021 to September 2022. The response rate for the first timepoint and follow-up was 54.8% (after excluding those whose contact details were invalid) and 76.0%, respectively.

Materials

Sociodemographic variables

Age, gender, ethnicity, highest education level completed, employment status, monthly income, marital status, having children, and type of housing were collected as part of a structured questionnaire. Employment status was collapsed into a three-level categorical variable (i.e., economically inactive, employed, and unemployed). Marital status was collapsed into a three-level categorical variable (i.e., never married, married/cohabiting, and divorced/separated/widowed).

Brief Resilience Scale, BRS

Resilience was the main outcome variable of this study. BRS is a six-item scale measuring an individual's ability to bounce back after stressful events (39). Items were scored from 1 (Strongly Disagree) to 5 (Strongly Agree). Negatively scored items were reverse scored. Items were summed and averaged, with a higher score indicating a greater level of resilience (mean score range: 1 to 5). A mean score of 1.00 to 2.99 indicates low resilience, 3.00 to 4.30 indicates normal resilience, and 4.31 to 5.00 indicates high resilience, respectively (39). The scale was revealed to have a one-factor structure, strong internal consistency and test–retest reliability (40). This measure has been utilized in various populations in Singapore (41–43). The Cronbach's alpha was 0.80 for the current study, suggesting strong internal consistency reliability.

Patient Health Questionnaire, PHQ-9

PHQ-9 is a nine-item scale, with items scored from 0 to 3 (44). A higher score indicates higher depressive severity. The cumulative scores of all nine items were calculated (score range: 0 to 27). A total score of 10 and above suggests moderate/severe levels of depressive symptoms (45). The PHQ-9 is a valid and reliable screening instrument for depressive symptoms in the general population (46, 47). The Cronbach's alpha of the scale was 0.83, suggesting strong internal consistency reliability.

Generalized Anxiety Disorder Scale, GAD-7

GAD-7 is a seven-item scale, with items scored from 0 to 3 (48). The cumulative scores of all seven items were calculated (score range: 0–21). A higher score indicates higher anxiety severity. A total score of 10 and above suggests moderate/severe levels of anxiety symptoms (49). The scale is a valid and reliable screening tool for anxiety symptoms in the general population (50). The Cronbach's alpha score for the present sample was 0.87, suggesting strong internal consistency reliability.

Depression Anxiety Stress Scale, DASS-21

The DASS-21 comprises 21 items, with seven items for each of the three psychological distress subscales (depression, anxiety, and stress) (51). It has been demonstrated to be a valid screening tool for the general population (52). The present study only utilizes the seven items addressing stress (i.e., DASS-21 stress). The stress scale measures trouble relaxing, tenseness, being easily on edge, irritability, and over-reactivity. Each item is scored from 0 to 3. Items for stress were scored according to the original authors of the scale – the summed numbers in the subscale were multiplied by two before interpreting the scores. The cumulated scores for DASS-21 stress ranges from 0 to 42. Higher scores indicate higher levels of stress. The Cronbach alpha for the stress component was 0.86 in this study, suggesting strong internal consistency reliability.

TABLE 1 Summary statistics of sociodemographic variables in Timepoint 1 (n = 1,129).

	Weighted percentage (%)	Unweighted frequency
Age groups		
21–34	27.5	426
35–49	26.9	361
50–64	26.1	219
65+	19.5	123
Gender		
Female	50.9	527
Male	49.1	602
Ethnicity		
Chinese	76.1	398
Malay	13.0	278
Indian	9.0	324
Others	3.3	129
Highest education attained		
Below primary	13.8	51
Secondary school	24.6	151
Pre-university[1]	28.3	398
University	33.3	529
Others		
Current employment status[#]		
Unemployed	6.9	235
Economically inactive	21.6	570
Employed/Self-employed	71.5	309
Marital status		
Never married	27.4	363
Married/Cohabiting	62.5	681
Divorced/Widowed/Separated	10.2	85
Do you have any children?		
Yes	62.3	647
No	37.7	482
Monthly personal income (SGD)[#]		
Below 2,000	36.2	309
2,000 to 3,999	28.9	342
4,000 to 5,999	15.6	228
6,000 to 9,999	11.0	142
10,000 and above	6.3	93
Housing type		
HDB[2] 1/2/3 room	16.1	163
HDB[2] 4/5 room/Executive/Jumbo	67.5	747
Private housing	16.4	217
Brief Resilience Scale[*]		
Low	13.3	143
Normal	74.5	846
High	12.2	140

[#]Personal income and employment status, n = 15 missing data. Housing type, n = 2 missing data. *Cut-off scores for BRS: low (0–2.99), normal (3.00–4.30), high (4.31–5.00). [1]Pre-university includes Junior College, Vocational Institutes, Institute of Technical Education, and any form of Diploma. [2]Housing Development Board (HDB) refers to public housing in Singapore. As of 2021, about 80% of Singapore's population live in houses developed by HDB.

Sources of COVID-19-related stressors

The present study examined four sources of stress that measured whether participants felt anxious due to certain thoughts or concerns stemming from the COVID-19 outbreak (i.e., "In the past month, did you feel anxious due to some of the following thoughts or concerns related to the COVID-19 outbreak?") (38). Questions included statements relating to common COVID-19-related stressors regarding: (1) The possibility of self/family/friends being infected with COVID-19, (2) The possibility of self/family/friends dying due to COVID-19, (3) Unemployment and/or financial loss, such as losing work opportunities or having to take unpaid leave, (4) School closure. Items were dichotomously scored (no = 0, yes = 1) individually.

Procedure

Participants underwent an interview session for each wave of the study with trained research staff using structured questionnaires either via ZOOM or face-to-face. Most participants opted for ZOOM, but the latter option was provided so as not to exclude participants who may not be technologically savvy, especially older participants. Face-to-face sessions were conducted in the later stages of data collection, once pandemic restrictions permitted it, at locations convenient for each participant (e.g. their homes). Each interview session lasted for about 40–50 minutes. During T1, participants indicated if they were willing to be contacted for future studies. Participants who agreed were recontacted approximately a year after they first took part in the study. Participants were not recontacted for participation in T2 until at least a year had passed since their participation during T1 (e.g., if a participant underwent the interview session in November 2020 for T1,

they were recontacted during November 2021 for T2). The first measurement (T1) was carried out from May 2020 to June 2021 when the first wave of the pandemic was receding, and partial lockdown (i.e., circuit breaker) and other Safe Management Measures on the population were starting to be lifted (53, 54). The second measurement (T2) was carried out from October 2021 to September 2022 after the second wave of the pandemic had receded and about 82 to 93% of the population had completed two doses of the COVID-19 vaccines (53, 54). During both sessions, participants were interviewed on their sociodemographic information, psychological distress, COVID-19 stressors, and resilience, among other variables. All participants provided either electronic or physical written informed consent. A flow chart of the recruitment process is given in Figure 1.

Data analysis

Descriptive statistics of the baseline (T1) were calculated for all the variables. To account for demographic differences between each survey sample and the underlying population, we applied post-stratification weighting and inverse probability of censoring weighting to the data (55). Categorical variables were presented as weighted percentages and unweighted frequency (refer to Table 1). Continuous variables (PHQ-9, GAD-7, DASS-21 stress, BRS) were presented as weighted mean and standard deviation (SD) (refer to Table 2). Variance Inflation Factor scores were below 5 for all predictors, indicating no multicollinearity concerns. A generalized estimating equation (GEE) was performed to investigate the change in resilience across the two time points (T1 = 0, T2 = 1). In the subsequent GEE model, sociodemographic variables, PHQ-9, GAD-7, DASS-21 stress,
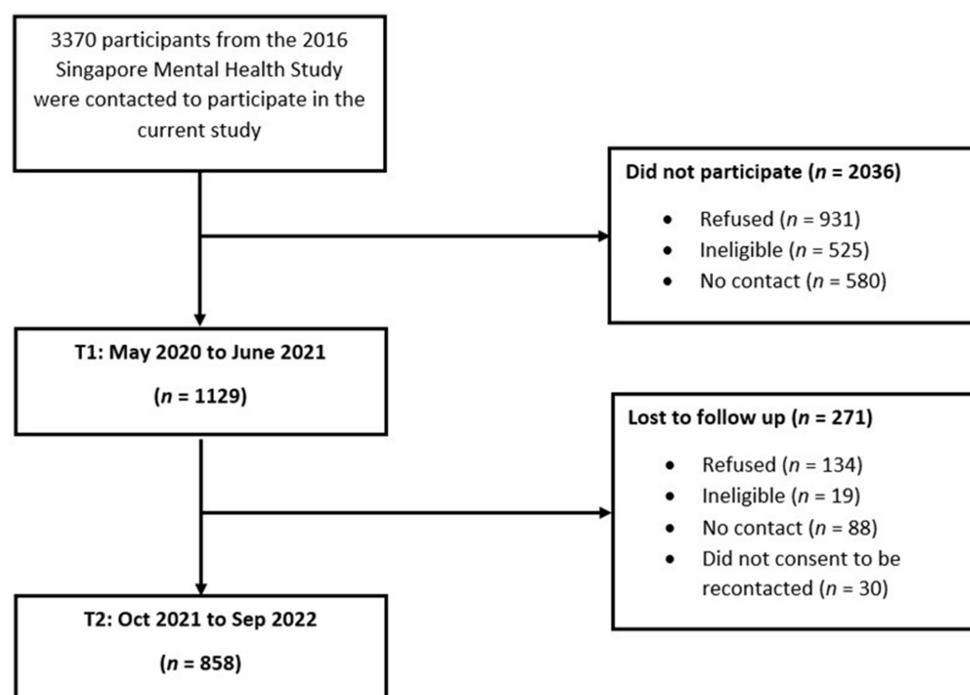

FIGURE 1
Flowchart of participants' recruitment to the study.

TABLE 2 Weighted mean and standard deviations of the study instruments.

	Overall			Timepoint 1		Timepoint 2	
	Mean	SD	p-value#	Mean	SD	Mean	SD
BRS (range 0–5)	3.61	0.62	0.180	3.61	0.63	3.61	0.60
PHQ-9 (range 0–27)	3.17	3.88	0.485	3.07	3.77	3.29	4.01
GAD-7 (range 0–21)	3.24	4.04	0.378	3.18	4.00	3.32	4.09
DASS-21 stress (range 0–42)	5.10	6.36	0.368	5.00	6.17	5.22	6.60

#p-values were derived from GEE model of the variables and timepoints.

TABLE 3 Proportion of participants who had moderate/severe scores for PHQ-9 and GAD-7.

	Overall		Timepoint 1		Timepoint 2	
	%	n	%	n	%	n
GAD-7						
No/Mild (<10)	91.70	1781	91.63	1,019	91.80	762
Moderate/Severe (≥10)	8.29	198	8.37	106	8.19	92
PHQ-9						
No/Mild (<10)	91.99	1798	92.40	1,026	91.45	772
Moderate/Severe (≥10)	8.01	179	7.59	96	8.55	83

and COVID-19-related stressors were included to identify the significant longitudinal correlates of resilience.

A sub-analysis was conducted to further investigate the relationship between self-reported symptoms of anxiety and depression and resilience. For this analysis, BRS was categorized into low, normal, and high levels of resilience using the respective cut-off scores, and PHQ-9 and GAD-7 were classified into two categories (moderate/severe and no/mild range). GEE was conducted with BRS categories as a predictor for PHQ-9 and GAD-7, while adjusting for sociodemographic variables and timepoints. Data processing and cleaning were conducted via SAS Version 9.4 for both baseline and follow-up datasets to ensure that the two variable lists were identical for merging. Survey weights were also created using SAS Version 9.4. Thereafter, survey weighted analyses such as tabulate and the mean were performed in STATA S/E Version 15 to populate the numbers for sociodemographic variables and study instruments (Tables 1–3). STATA was also used for the GEE models to investigate associations between resilience and sociodemographic variables (Table 4). Next, using STATA, we predicted for PHQ-9 and GAD-7 cut-offs and resilience categories (Table 5), while adjusting for the following sociodemographic variables in the GEE model: age, gender, ethnicity, educational level, marital status, children, employment status, monthly personal income and housing type. The statistical significance of all analyses was determined at 0.05 level (p-value <0.05) using two-sided tests.

Results

During T1, the weighted prevalence of normal levels of resilience was 74.5%. The weighted prevalence of low and high levels of resilience was 13.3% and 12.2%, respectively. During T2, the weighted prevalence of normal levels of resilience was 76.9%. The weighted prevalence of low and high levels of resilience was 12.8% and 10.3%,

respectively. The weighted means (SD) of BRS were 3.61 (0.63) for T1 and 3.61 (0.60) for T2. Mean BRS scores did not differ across timepoints. The other psychological measures (i.e., PHQ-9, GAD-7 and DASS-21 stress) also did not differ much across the two timepoints, $p > 0.05$ (Table 2). Overall, 8.3% ($N = 198$) of participants reported moderate/severe anxiety symptoms on the GAD-7, while 8.0% ($N = 179$) reported moderate/severe depressive symptoms on the PHQ-9. Refer to Table 3 for the breakdown of participants in the different score ranges across timepoints.

The GEE analysis revealed that age, gender, and housing type were associated with resilience across the two waves. Older adults (65 years old and above) had lower levels of resilience as compared to their younger counterparts ($\beta = -0.17$, 95% CI: -0.33 to -0.01). Males had a higher level of resilience compared to females ($\beta = 0.12$, 95% CI: 0.03 to 0.21). Individuals who reported staying in private housing had higher levels of resilience as compared to individuals staying in public housing ($\beta = 0.11$, 95% CI: 0.01 to 0.21). Ethnicity, educational level, marital status, having children current employment status, and monthly personal income were not significantly associated with resilience scores. Table 4 reflects the associations between sociodemographic variables and BRS for the present sample while controlling for timepoints.

Secondly, symptoms of anxiety and depression, stress levels, and a specific stressor about COVID-19 were significantly associated with resilience. Higher scores in PHQ-9 ($\beta = -0.02$, 95% CI: -0.04 to -0.01), GAD-7 ($\beta = -0.02$, 95% CI: -0.03 to 0.00) and DASS-21 stress ($\beta = -0.02$, 95% CI: -0.03 to -0.01) were associated with lower scores in BRS. Individuals who were worried about unemployment/financial loss, such as losing work opportunities or having to take unpaid leave ($\beta = -0.10$ 95% CI: -0.20 to -0.01) had significantly lower scores of resilience (see Table 4).

As compared to participants with normal BRS scores (range: 3.00–4.30), participants with low BRS scores (range: 0–2.99) were 1.43 times more likely to report moderate/severe levels of depressive

TABLE 4 Results from generalized estimating equation model to investigate the association between sociodemographic variables and BRS (*n* = 1,112).

	β coefficient	95% CI		*p*-value
Age groups				
21–34 [ref]				
35–49	−0.04	−0.14	0.07	0.48
50–64	−0.06	−0.18	0.07	0.37
65+	−0.17	−0.33	−0.01	0.045
Gender				
Female [ref]				
Male	0.13	0.04	0.22	0.00
Ethnicity				
Chinese [ref]				
Malay	0.06	−0.05	0.16	0.31
Indian	0.00	−0.08	0.09	0.97
Others	0.00	−0.11	0.11	0.98
Highest education attained				
University and above [ref]				
Below primary school	−0.15	−0.35	0.05	0.14
Secondary school	−0.03	−0.18	0.13	0.73
Pre-University[1]	−0.06	−0.16	0.04	0.25
Marital status				
Never married [ref]				
Married/Cohabiting	−0.05	−0.19	0.09	0.47
Divorced/Widowed/Separated	−0.04	−0.26	0.18	0.72
Do you have any children?				
No [ref]				
Yes	0.11	−0.03	0.26	0.13
Current employment status				
Employed/Self-Employed [ref]				
Unemployed	−0.08	−0.25	0.10	0.39
Economically inactive				
Monthly personal income (SGD)				
2,000 to 3,999 [ref]				
Below 2,000	0.07	−0.04	0.19	0.21
4,000 to 5,999	−0.09	−0.20	0.01	0.09
6,000 to 9,999	−0.07	−0.19	0.05	0.26
10,000 and above	0.05	−0.11	0.21	0.53
Housing type				
HDB[2] 4/5 room/Executive/Jumbo [ref]				
HDB[2] 1/2/3 room	0.07	−0.04	0.19	0.21
Private housing	0.11	0.01	0.21	0.03
Psychological variables				
PHQ9[#]	−0.02	−0.04	−0.01	0.00
GAD7[#]	−0.02	−0.03	0.00	0.01
DASS-21 stress[#]	−0.02	−0.03	−0.01	0.00
I/family/friends might be infected with COVID-19 (Yes)[#]	−0.05	−0.12	0.02	0.15
I/family/friends might die due to COVID-19 (Yes)[#]	−0.01	−0.09	0.06	0.72

(Continued)

TABLE 4 (Continued)

	β coefficient	95% CI		p-value
Unemployment/Financial loss, such as losing work opportunities or having to take unpaid leave (Yes)#	−0.11	−0.19	−0.02	0.01
School closure (Yes)#	0.02	−0.07	0.11	0.70

[1]Pre-university includes Junior College, Vocational Institutes, Institute of Technical Education, and any form of Diploma. [2]Housing Development Board (HDB) refers to public housing in Singapore. As of 2021, about 80% of Singapore's population live in houses developed by HDB. #Adjusted for sociodemographic variables. Bold values indicate a statistically significant p-value (< 0.05).

TABLE 5 Generalized estimating equations (GEE) model with BRS categories as a predictor for meeting clinical criteria of PHQ-9 and GAD-7.

	PHQ-9 (≥10)				GAD-7 (≥10)			
	Crude β	Adjusted β#	95% CI		p-value	Crude β	Adjusted β#	95% CI		p-value
BRS scores									
Normal (range: 3.00-4.30) [ref]									
Low (range: 0–2.99)	1.44	1.43	1.06	1.79	**<0.001**	1.61	1.63	1.28	1.98	**<0.001**
High (range: 4.31–5.00)	−1.32	−1.25	−2.22	−0.27	**0.012**	−1.11	−1.08	−1.94	−0.022	**0.013**

#Adjusted for sociodemographic variables, PHQ-9 ≥ 10 = moderate/severe levels of depressive symptoms, GAD-7 ≥ 10 = moderate/severe levels of depressive symptoms. Bold values indicate a statistically significant p-value (<0.05).

symptoms ($p < 0.001$) and 1.63 times more likely to report moderate/severe levels of anxiety symptoms ($p < 0.001$). Participants with high BRS scores (range: 4.31–5.00) were 1.25 times less likely to report moderate/severe levels of depressive symptoms ($p = 0.012$) and 1.08 times less likely to report moderate/severe levels of anxiety symptoms ($p = 0.013$) as compared to participants with normal BRS scores. The results are reported in Table 5.

Discussion

The present study investigated the population's ability to "bounce back" from the multifaceted stressors introduced by the COVID-19 pandemic. With the continued uncertainty in Singapore, coupled with the persistence of COVID-19 in the nation almost two years after its introduction, it would be reasonable to expect a dip in the resilience levels. However, resilience scores were observed to be similar throughout the two years of the pandemic, owing to the population's ability to recover from the continued and multifaceted stressors brought upon by the pandemic. A longitudinal study conducted in Australia yielded similar results and attributed the consistency in resilience to the ability of the sample to cope and adjust well to the psychosocial and economic impacts of the pandemic (30). Furthermore, a systematic review conducted in 2023 examining the trajectory of anxiety, depression and general mental health symptoms revealed that symptoms remained consistent pre- and post-pandemic across many countries, attributing it to high population resilience (56). In regard to Singapore, the government has been proactive in taking steps to preserve the population's mental well-being. Substantial efforts were focused on providing resources, raising awareness of mental health, and encouraging help-seeking behaviors such as implementing a mental health resource hub, national crisis hotlines and a 'COVID-19 Mental Wellness Taskforce' (57). As such, these initiatives may have contributed to minimizing

the impact of the pandemic to an extent, allowing the population to cope and adapt better.

While it is a positive finding that most of the population reported having normal levels of resilience, we cannot ignore vulnerable individuals who are susceptible to poorer resilience. Individuals staying in public housing as compared to private housing reported having lower levels of resilience. Housing type is often used as a proxy for family socioeconomic levels due to its relationship with income status in the nation (58). Interestingly, interconnected socioeconomic factors such as employment, education levels and income were not associated with resilience in the present study. Some possible explanations for such findings could be that, firstly, it was reported that by April 2022, during the second wave of the study, Singapore's unemployment rates bounced back to pre-pandemic levels (59), possibly suggesting that unemployment was not a contributing factor that affected most residents. The current study also had a small sample of unemployed individuals, further corroborating this. Additionally, in its earlier stages, initiatives to mitigate the economic consequences of the pandemic were introduced in the nation with the hopes of addressing issues such as employment and financial concerns. This included jobs and skills packages, monetary support grants, and COVID-19 recovery grants, especially for lower-income groups (57). These could have alleviated some of the economic consequences of the pandemic, serving as a possible explanation as to why income levels were not associated with resilience levels in the current population. Additionally, a pre-pandemic study revealed that while socioeconomic status can play a role in psychological resilience, it is more closely associated with individual characteristics and adaptive strategies (60). Nonetheless, the disparity in resilience levels among individuals in different housing groups displays some evidence that individuals with lower socioeconomic status displayed lesser resilience.

Additionally, the results revealed that females had lower resilience compared to their male counterparts, consistent with other studies conducted during the pandemic (16, 26, 61). During the pandemic,

women reported having more worries, were more susceptible to stressful situations, and elicited poorer implicit and explicit anxiety (13, 62). Women are also more likely to be frontline health workers (e.g., nurses, midwives) and essential health facility workers (e.g., cleaners) (63). Additionally, females feel more pressured to take up the unpaid labor of ensuring the emotional well-being of children, parents, and other family members (64), and mothers were more likely to take on the responsibility of childcare and home education during the closure of childcare centers and schools, adding new pressures for them (64, 65).

It was also revealed that those aged 65 and above had lower resilience scores. A similar nationwide study conducted in China revealed greater psychological distress among older adults during the pandemic (66). Specific to Singapore, another nationwide study also revealed that older adults (aged 56–78) reported having lower levels of social resilience compared to their counterparts aged 26–35 and 46–55 (67). Older adults are typically more vulnerable to the COVID-19 virus, especially those with comorbid illnesses, which further serves as a stressor (68). Furthermore, suspending community and care services and reduced face-to-face interactions with family and friends during the pandemic might have led to increased loneliness among this group who might have relied on these factors to meet their social needs (68).

In general, pandemic-related stressors negatively impacts mental health and distinguishing the specific stressors that have a greater impact on mental health would aid in the development of targeted interventions (69). Findings from the study revealed that individuals who had employment concerns (i.e., worries about unemployment/financial losses such as losing work opportunities or having to take unpaid leave) tended to have lower levels of resilience. This could be interlinked with worries about the rising cost of living reported in 2022 (70). Despite unemployment rates being relatively low in the nation, the unprecedented increase in layoffs seen worldwide during the pandemic might have caused individuals to start assessing the security of their employment (71). A study done in 2020 revealed that higher perceived job insecurity can lead to greater anxiety symptoms because of the intensified worry about one's financial situation, causing significant psychological distress (72). Lastly, individuals who scored higher on the GAD-7, PHQ-9 and DASS-21 stress measures also had lower levels of resilience. Cross-sectional and longitudinal studies during the pandemic have also yielded similar results, with higher stress, depression and anxiety levels being associated with lower levels of resilience (13, 30, 31). Psychological distress influences one's ability to cope with situations, especially during adverse events like the pandemic, and thus, these findings were not surprising (30, 73). On top of that, individuals with low resilience were more likely to have moderate to severe levels of depressive and anxiety symptoms, highlighting resilience as a potential protective factor. The capacity of resilience to prevent psychopathology and maintain mental well-being has been previously documented (74). Other similar studies have also revealed that subgroups of individuals with depression and anxiety have lower levels of resilience (75, 76). This highlights the need for nurturing resilience in mitigating depressive and anxiety symptoms. Conceptualizing resilience as "the ability to bounce back" from adverse circumstances can be beneficial in guiding the development of interventions that aim to enhance resilience when it is viewed as an ability (77). The normal levels of resilience among the adult population that remained mostly unchanged throughout the pandemic are

somewhat indicative that efforts in promoting mental well-being in the nation have been beneficial. During the partial lockdown period, downstream initiatives were developed to target specific groups, such as those at risk of developing or those with pre-existing mental health conditions. Increased funding was directed to mental healthcare, and various agencies were set up to triage and deliver initial interventions (57). There was also an increase in helplines to provide support for those with anxiety, mood, and other mental health-related struggles (57). A meta-analysis conducted in 2020 revealed that approximately one-third of the global population experienced stress, anxiety and/or depression as a result of the pandemic (78, 79). The prevalence of psychological distress, coupled with its influence on resilience, highlights a need for continuous and enhanced health promotion involving varying community and primary mental health services that screen for and target people who are at risk.

Additionally, nationwide initiatives included financial and employment support, rolled out during the early stages of the pandemic. This included jobs and skills packages, monetary support grants, and COVID-19 recovery grants (57). Providing financial support to prevent deprivation allows individuals to adopt protective behaviors and better cope with changing environments, which are salient for resilience (80). More policies and initiatives can be rolled out in support of affected individuals to help them better cope and build their resilience. Lower resilience among females and older adults also calls for more targeted gender-sensitive measures and more promotion of late-life coping during adversities like these to provide social, psychological and economic support for these groups. For example, following the COVID-19 pandemic, there has been an emphasis that public health response strategies should be inclusive of women's health and address issues such as gender norms and the need for shared responsibilities at home and work, and prioritizing female frontline healthcare workers' mental health (81, 82). Additionally, it has been suggested that accessible telehealth interventions can also be implemented to mitigate social loneliness and increase psychological resilience among older adults (80, 83).

There are some limitations to this study. Firstly, the self-reported measures are limited by their biases. Secondly, the first survey commenced in May 2020, at least 3 months after the first case of COVID-19 was reported in the nation and approximately 2 months after the World Health Organization declared COVID-19 a pandemic (1, 84). It is not unlikely that resilience levels changed from the beginning of the pandemic till T1. Notwithstanding these, the study has several strengths. This is one of the first studies in Singapore to explore psychological resilience among its adult population during the pandemic. The study collected within-individual data across months after the outbreak, which sheds some light on the trajectory of resilience and the short-term effects of the policies and steps that were put in place to mitigate the mental health impact of the pandemic. Additionally, we captured data from a large nationally representative sample, utilizing valid and reliable measures of resilience and psychological distress.

The present study gives us a better picture of the short-term impact of the pandemic on individual resilience among the Singapore adult population. The study revealed that psychological resilience remained the same 1 year after lockdown measures were lifted, with most of the population depicting normal levels of resilience. Several sociodemographic and psychological variables were influential in promoting better resilience. These findings reflect the factors that need to be targeted to better allow individuals to cope with not only the

COVID-19 pandemic but adversities of a similar nature. More empirical research is needed over the next few years to understand the long-term psychological effects of the pandemic. Continued efforts to address resilience are essential in understanding and improving individual coping and well-being in a post-pandemic world.

Data availability statement

The datasets presented in this article are not readily available because the authors' government law and institution only permits the sharing of human participant data with researchers with whom they have a Research Collaboration Agreement (RCA). However, data sharing with clear research purposes can be made available upon request. Requests to access the datasets should be directed to mythily@imh.com.sg.

Ethics statement

The studies involving humans were approved by National Healthcare Group Domain Specific Review Board (IRB protocol numbers: 2020/00462 and 2021/00566). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

SG: Conceptualization, Investigation, Project administration, Writing – original draft, Writing – review & editing. ET: Formal analysis, Investigation, Writing – review & editing. SShaf: Project administration, Supervision, Writing – review & editing. SShah: Methodology, Project administration, Writing – review & editing. PW: Project administration, Writing – review & editing. YZ: Project administration, Writing – review & editing. PS: Project administration, Writing – review & editing. ST: Project administration, Writing – review & editing. MN: Conceptualization, Methodology, Resources, Writing – review & editing. PL: Conceptualization, Methodology, Resources, Writing – review & editing. SC: Funding acquisition, Investigation, Resources, Writing – review & editing. MS: Conceptualization, Funding acquisition, Investigation, Methodology, Supervision, Writing – review & editing.

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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.

Generative AI statement

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Parallel mediating effects of anxiety and depression on the relationship between sleep quality and fear of progression in individuals recovering from COVID-19

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Background: The COVID-19 pandemic caused by the SARS-CoV-2 virus is one of the most significant public health emergencies of this century. The rapid outbreak of COVID-19 infections has instilled fear in populations. Therefore, it is essential to investigate the risk factors and mechanisms associated with fear of progression (FoP) among individuals recovering from COVID-19. This information is crucial for alleviating the physical and psychological discomfort of individuals after recovery and enhancing their long-term quality of life.

Methods: A cross-sectional study involving 861 individuals recovering from COVID-19 was conducted in China from January to February 2023. The Pittsburgh Sleep Quality Index, the Self-Rating Depression Scale, the Self-Rating Anxiety Scale, and the Fear of Progression Scale were utilized to assess mood status, sleep quality, and fear of progression. Receiver operating characteristic curves, Pearson's correlation analysis, binary logistic regression analysis, and Hayes' PROCESS Macro analysis were employed to test the model.

Results: The results showed that sleep quality, anxiety, depression, and fear of progression were positively correlated, with coefficients ranging from 0.380 to 0.814. After addressing potential bias, sleep quality, anxiety, and depression emerged as risk factors for fear of progression (FoP). In the ROC curve analysis, these three factors predicted the occurrence of FoP (AUC: 0.646, 0.703, and 0.658, respectively). Anxiety and depression played a parallel mediating role between sleep quality and FoP, accounting for 59.9 and 13.8% of the total effect, respectively.

Conclusion: The results indicate that anxiety and depression both serve a parallel mediating role in the relationship between sleep quality and fear of pain (FoP). These findings provide potential guidance for the development and implementation of group-based interventions to address the mental health challenges of the post-COVID-19 era.

KEYWORDS

sleep quality, anxiety, depression, fear of progression, post-COVID-19

Introduction

The COVID-19 pandemic caused by the SARS-CoV-2 virus is one of the defining public health emergencies of this century (Kokudo and Sugiyama, 2020). SARS-CoV-2 infection presents a range of clinical manifestations, from asymptomatic or uncomplicated upper respiratory tract infections to severe pneumonitis, multiorgan failure, and death (Herridge and Azoulay, 2022). China officially ended its zero-COVID-19 policy on 8th January 2023; this sudden shift caused the number of confirmed cases to increase rapidly (The Lancet Regional Health-Western Pacific, 2023). As of February 28, 2023, there have been a total of 758,390,564 confirmed cases worldwide, including 6,859,093 deaths (World Health Organization, 2023). The rapid outbreak of COVID-19 infection has instilled fear in populations (Reznik et al., 2021). Some studies indicate that more than 50% of individuals who have recovered from acute COVID-19 still experience symptomatic sequelae after 2 years, such as insomnia, dyspnea, muscle weakness, impaired fitness, mental fatigue, cognitive deficits, and affective symptoms (Bellan et al., 2021). Based on a systematic review that included 117 studies, about 12.2% of individuals who recover from COVID-19 become reinfected with the virus (Ren et al., 2021). Moreover, their quality of life remains reduced months after infection, as does their occupational performance (Lemhöfer et al., 2023). In addition, COVID-19 imposes a considerable economic burden on patients, families, other caregivers, and society (Álvarez-Del Río et al., 2023). Meanwhile, the prevalence of mental health problems, mainly fear of progression, anxiety, depression, insomnia, fatigue, and PTSD, has increased significantly in the general population during the COVID-19 pandemic, attracting widespread attention (Abel et al., 2021; Ding et al., 2022; Dorman-Ilan et al., 2020). The characteristics of the suddenness, severity, prevalence, and uncertainty of COVID-19 infection worldwide have further intensified fear in both infected and uninfected populations globally (Baby et al., 2022). Thus, it is crucial for healthcare professionals to examine the risk factors and underlying mechanisms related to fear of progression (FoP) in individuals recovering from COVID-19, as this information is significant for improving the physical and psychological discomfort of patients after recovery and enhancing their long-term quality of life.

Fear of progression refers to a logically understandable reaction to the genuine threat posed by a potentially life-threatening illness. It is characterized as the "fear that the illness will progress with all its biopsychosocial consequences or that it will recur" (Dankert et al., 2003). Proper fear is the body's natural stress response when confronted with disease and may actively contribute to disease management. However, excessive and prolonged fear can reduce patients' quality of life, social function, and self-reported happiness (Ban et al., 2021). Therefore, early detection and psychological intervention are necessary. Scholars have investigated the status quo and influencing factors of fear of progression (FoP) in patients with cancer, respiratory disease, Parkinson's disease, diabetes, and chronic heart failure, finding that FoP is widespread and not optimistic in these patients (Folkerts et al., 2022; Liu et al., 2021;

Wang Y. et al., 2022; Xiong et al., 2023). While FoP has been extensively studied in chronic illnesses, its relevance to COVID-19 survivors warrants distinct consideration. Unlike cancer patients, whose FoP is primarily driven by concerns about disease recurrence and treatment-related side effects, COVID-19 survivors grapple with distinct uncertainties, including the risk of reinfection, persistent symptoms—commonly known as long COVID—and the far-reaching psychological toll of the pandemic (Davis et al., 2023). Moreover, the unpredictability of viral mutations and the continued implementation of public health measures further exacerbate fear in this population (Markov et al., 2023). Given the large number of individuals affected by COVID-19 and the potential long-term health consequences, it is crucial to investigate FoP in this population to better inform psychological interventions and improve post-recovery wellbeing. To date, only one study has investigated FoP in patients with COVID-19, which found a high prevalence of FoP among participants (Ding et al., 2022). However, this study only analyzed the level of FoP in patients with COVID-19 infection and the related demographic factors, failing to conduct an in-depth analysis of the relationship between FoP and other relevant psychological variables. Therefore, exploring the factors influencing FoP in individuals recovering from COVID-19 is essential to offer guidance for reducing their FoP and promoting further adaptive growth. A multitude of domestic and international studies have investigated the effects of demographic and psychological factors on FoP in various patient groups. Through a literature review, it was found that the influencing factors of FoP were broadly categorized into demographic, disease-related, and psychosocial factors.

Previous studies revealed that there was a significant correlation between sleep quality and the development of FoP (Perndorfer et al., 2022). A study focusing on sleep disturbances in COVID-19 survivors found that the pooled prevalence of sleep disorders among these survivors was 32% (Wu et al., 2023). Poor sleep quality is associated with greater odds of having had a COVID-19 infection and significantly worsens the prognosis of the illness (Ahmet'yanov et al., 2022; Quan et al., 2023). Sleep disorders can induce delusions, metabolic disorders, hormonal disorders, immune interference, cardiovascular diseases, and respiratory diseases; these complications could compromise the overall prognosis of the survivors as well as the treatment effects (Bhat and Chokroverty, 2022). Importantly, insufficient sleep has been shown to blunt the immune response to vaccination (Rayatdoost et al., 2022) and increase the risk of developing rhinovirus infection (Prather et al., 2015). Research on neural mechanisms indicates that sleep deprivation facilitates fear acquisition by augmenting threat-specific encoding in the basolateral amygdala (Feng et al., 2023). During the COVID-19 pandemic, the FoP of patients with cancer was significantly associated with sleep dysfunction (Kim et al., 2022). Similar findings suggest that poor sleep quality is an independent risk factor for fear of falls among older people in the community (Zhang et al., 2023). While the majority of previous studies concentrated on cancer patients, the elderly, and community groups, individuals recovering from COVID-19 have not been surveyed. It is still uncertain whether poor sleep quality serves as a risk factor for FoP in individuals recovering from COVID-19. Therefore, to better understand the FoP of individuals recovering from COVID-19, the mediating mechanism through which sleep quality influences FoP requires investigation.

According to the stress responses theory (Compas et al., 2001; Meerlo et al., 2008), sleep difficulties may have an effect on an individual's voluntary responses to stress (i.e., coping). Individuals experiencing sleep loss demonstrate a marked reduction in cognitive energy resources, which are necessary for selecting appropriate emotional regulation strategies in challenging circumstances (Zohar et al., 2005). In other words, chronically restricted and disrupted sleep may excessively activate stress systems, potentially leading to mood disorders such as anxiety and depression. Studies have established a significant positive relationship between sleep quality, anxiety, and depression (Palmer et al., 2018). Compared to healthy controls, individuals with symptoms of anxiety or depression report poorer sleep quality (Brenes et al., 2009). Additionally, anxiety is associated with increased sleep onset latency, which significantly impacts individuals' subjective evaluations of sleep quality (Horváth et al., 2016). Evidence from a clinical study also supports the predictive effects of poor sleep quality on anxiety and depression (Zhu et al., 2023). Furthermore, relevant research indicates that anxiety and depression are significant predictors of fear of progression (FoP) in both Parkinson's disease and cancer patients (Folkerts et al., 2022; Yang et al., 2018). Given these perspectives, it is reasonable to consider anxiety and depression as mediators between sleep quality and FoP.

The Transactional Model of Stress and Coping (Folkman et al., 1986) posits that when individuals encounter stressors, their adaptive outcomes are shaped by two key processes: cognitive appraisal and coping mechanisms. Cognitive appraisal consists of primary appraisal (evaluating whether a stressor poses a threat to wellbeing) and secondary appraisal (assessing available coping resources and strategies). According to this model, individuals interpret stressors and adopt coping strategies that ultimately influence psychological outcomes. In this context, poor sleep quality may act as a stressor, affecting fear of progression (FoP) through psychological mechanisms such as anxiety and depression. Drawing on these findings, we suggest that anxiety and depression may serve as mediating variables in the relationship between sleep quality and FoP in individuals recovering from COVID-19. Thus, we investigate the following hypotheses: Hypothesis 1: Poor sleep quality is related to higher FoP in individuals recovering from COVID-19. Hypothesis 2: Anxiety mediates the relationship between sleep quality and FoP in individuals recovering from COVID-19. Hypothesis 3: Depression mediates the relationship between sleep quality and FoP in individuals recovering from COVID-19. Concurrently, from the perspective of individuals recovering from COVID-19, we investigate the effect of sleep quality on FoP and assess the roles of anxiety and depression to offer potential guidance for developing and implementing group-based interventions to address mental health challenges in the post-COVID-19 era.

Methods

Participants

From January to February 2023, a convenience sampling method was employed to conduct a cross-sectional survey using anonymous self-administered questionnaires from outpatients at the Second Affiliated Hospital of Zhejiang University School of Medicine. Inclusion criteria were as follows: (a) participants aged 18 or older, (b) individuals recovering from COVID-19 who did not require supplemental oxygen or hospitalization, and (c) informed consent and voluntary participation in the study. The exclusion criteria included (a) the presence of cognitive impairment and/or diagnosed mental illness, (b) severe sensory impairments, including visual or hearing deficits, and (c) speech/language disorders that would impede communication. Participants were fully informed about the purpose and significance of the research and were invited to participate voluntarily.

Procedures and measures

We used the N:q rule proposed by Jackson (2003) to calculate the sample size (Jackson, 2003). The N:q rule is appropriate for the maximum likelihood method, commonly used in structural equation modeling (Kline et al., 2011), where N represents the sample size and q refers to the number of items for the research variables. According to the guidelines, the optimal ratio of N to q should range from 10 to 20. With 68 parameters (20 for SAS, 20 for SDS, 16 for PSQI, and 12 for FoP), the ideal sample size should be between 680 (68×10) and 1,360 (68×20). To address sampling errors and invalid questionnaires, we distributed 900 questionnaires and received 866, yielding a response rate of 96.22%. After excluding five incomplete questionnaires, we obtained 861 valid responses, resulting in a valid response rate of 99.422%.

Pittsburgh sleep quality index (PSQI)

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989). Sixteen of the 18 self-rated questions in this scale were scored individually, excluding the two questions related to bedtime and wake-up time. These questions covered seven dimensions: subjective sleep quality, sleep onset, sleep duration, sleep efficiency, sleep disturbance, hypnotic medication use, and daytime dysfunction. Higher scores indicated worse sleep quality. A total PSQI score above 7 was used to distinguish poor sleepers from good sleepers. The Chinese version of the PSQI demonstrated good internal consistency, with Cronbach's α ranging from 0.82 to 0.83, and strong test–retest reliability, with a coefficient of 0.85 (Tsai et al., 2005). In this study, the Cronbach's α coefficient was 0.801. The PSQI has been widely used among Chinese populations, and previous studies have provided preliminary evidence for its validity in Chinese clinical and general samples during the COVID-19 era (Hou et al., 2022; Wang L. et al., 2022; Zhang et al., 2021).

Self-rating anxiety scale (SAS)

We measured the anxiety of patients after COVID-19 infection using the Self-Rating Anxiety Scale (SAS), which was compiled by Zung (Dunstan and Scott, 2020). The scale consists of 20 items and employs a four-point Likert scoring system, ranging from 1 (never) to 4 (always). The cut-off point for anxiety is a standard score of 50, with higher scores indicating greater levels of anxiety. The Cronbach's α coefficient for this study is 0.867. The SAS has been widely used in Chinese populations, and previous studies have provided preliminary evidence of its validity in Chinese clinical and general samples during the COVID-19 era (Du et al., 2024; Sun et al., 2022).

Self-rating depression scale (SDS)

The depression levels of patients after COVID-19 were measured using the Self-Rating Depression Scale (SDS), originally created by Zung (1965). This scale consists of 20 items and employs a four-point

Likert scoring system, ranging from 1 (never or rarely) to 4 (most or all of the time). The cut-off point for depression is a standard score of 50, with higher scores indicating greater levels of depression. The Cronbach's α coefficient for this study is 0.902. The SDS has been widely used in Chinese populations, and previous studies have provided preliminary evidence for its validity in Chinese clinical samples during the COVID-19 era (Chen L. et al., 2023).

Fear of progression questionnaire-short form (FoP-Q-SF)

The Fear of Progression Questionnaire-Short Form (FoP-Q-SF), developed by Mehnert et al. (2006) and translated by Wu et al. (2015), was used to measure the fear experienced by patients after COVID-19 infection. This scale consists of 12 items and two dimensions: physical health and social family. The items are scored on a five-point Likert scale, ranging from 1 (never) to 5 (regularly). A total score of 34 or higher indicates that the patient may have developed psychological dysfunction. The psychometric properties of the Chinese version of the FoP-Q-SF were tested by Wu et al. (2015), and the scale has been shown to be an effective tool with good reliability for measuring fear of progression in Chinese patients. The Cronbach's α coefficient for this study is 0.913. The FoP-Q-SF has been widely used in Chinese populations, and previous studies have provided preliminary evidence for its validity in Chinese clinical samples during the COVID-19 era (Ding et al., 2022).

Ethical considerations

This study received approval from the Ethics Committee of the Second Affiliated Hospital of Zhejiang University School of Medicine under approval number IR20230075.

Statistical analysis

Data analysis was conducted using SPSS 21.0 and the PROCESS Macro. The Kolmogorov–Smirnov test was performed to assess the normality of continuous variables. Descriptive statistics were used to analyze the participants' demographic characteristics and scale scores. A chi-squared test was used for binary data. The results of the univariate analysis, showing significant differences ($p < 0.05$), were entered into the regression model as independent variables for binary logistic regression analysis. Receiver operating characteristic (ROC) curves were used to assess the impact of sleep quality, anxiety, and depression on FoP. We assessed the linear relationships between continuous independent and dependent variables by examining scatter plots. Pearson's correlation analysis was used to examine the relationships among four factors: sleep quality, anxiety, depression, and FoP. The PROCESS Model 4 (Hayes, 2013) was used to examine the mediating role of anxiety and depression between sleep quality and FoP among individuals recovering from COVID-19. Furthermore, to examine the effect of sleep quality on FoP, we calculated 95% confidence intervals for bias-corrected percentile bootstrapping through a bootstrapped sample of 5,000 (Taylor et al., 2008). The p-value is two-tailed, with a threshold of 0.05 for statistical significance.

Results

Sample characteristics and factors associated with FoP level

As shown in Table 1, a total of 861 individuals recovering from COVID-19 participated in the survey, including 272 men (31.6%) and 589 women (68.4%). In addition, 77.5% of participants were under

TABLE 1 Comparison of sample characteristics between the low and high FOP groups ($N = 861$).

Variables		N (%)	Low FoP n (%)	High FoP n (%)	χ^2	p
Age (years)	<45	667 (77.5)	396 (59.4)	271 (40.6)	5.978	0.014
	≥45	194 (22.5)	134 (69.1)	60 (30.9)		
Gender	Male	272 (31.6)	175 (64.3)	97 (35.7)	1.300	0.254
	Female	589 (68.4)	355 (60.3)	234 (39.7)		
Time after infection onset	≤1 M	568 (66.0)	366 (64.4)	202 (35.6)	5.851	0.016
	>1 M	293 (34.0)	164 (56.0)	129 (44.0)		
SQ	Good	191 (22.2)	161 (84.3)	30 (15.7)	53.620	<0.001
	Poor	670 (77.8)	369 (55.1)	301 (44.9)		
Anxiety	No	425 (49.3)	349 (82.1)	76 (17.9)	204.521	<0.001
	Mild	222 (25.8)	129 (58.1)	93 (41.9)		
	Moderate	150 (17.4)	41 (27.3)	109 (72.7)		
	Severe	64 (7.4)	11 (17.2)	53 (82.8)		
Depression	No	347 (40.3)	279 (80.4)	68 (19.6)	161.208	<0.001
	Mild	220 (25.5)	150 (68.2)	70 (31.8)		
	Moderate	166 (19.3)	72 (43.4)	94 (56.6)		
	Severe	128 (14.9)	29 (22.7)	99 (77.3)		

FoP, fear of progression; M, Month; SQ, sleep quality.

45 years old, while 22.5% were 45 years of age or older. The majority of participants were infected with SARS-CoV-2 within the last month (66.0%). Of the younger participants, 396 of them (59.4%) had low FoP as defined by Short FoP scores of less than 34 points, while the remaining participants were categorized as having high FoP.

There were significant differences in FoP scores between the younger group and the older group ($p < 0.05$), with the proportion of high FoP among the younger group being significantly higher than that among the older group. Moreover, no significant gender differences were found between the two FoP groups. Regarding the time after infection onset, participants infected with SARS-CoV-2 for over 1 month in the high FoP group were significantly more numerous than those infected for less than 1 month ($p < 0.05$). In addition, the results indicated significant differences in sleep quality, anxiety, and depression between the high and low FoP groups ($p < 0.05$). Patients with poor sleep quality, severe anxiety, and severe depression had a higher incidence of FoP. Detailed information can be found in Table 1.

Based on the results of the univariate analysis, factors with $p < 0.05$ were selected for logistic regression analysis, including five variables: age, time after infection onset, sleep quality, anxiety, and depression. Binary logistic regression was then used to examine the independent effects of these factors on the fear of progression (FoP) in individuals recovering from COVID-19, with FoP as the dependent variable and the statistically significant factors as the independent variables. Retained in the model were sleep quality, anxiety, and depression (see Table 2). Figures 1a–c display the ROC curve and AUC for sleep quality, anxiety, and depression, respectively (AUC: 0.646, 0.703, 0.658, respectively). It should be noted that these three indicators are significant for predicting the incidence of FoP among the participants ($p < 0.001$).

Descriptive analysis and correlations among overall variables

Table 3 presents the means, standard deviations (SD), and Pearson correlations for each variable. The participants' PSQI scores were 9.75 ± 4.93, and 77.8% ($N = 670$) of the total participants had poor sleep quality, indicated by a global PSQI score of ≥ 5. The SAS, SDS, and FoP scores were 51.16 ± 12.06, 56.15 ± 14.84, and 30.72 ± 10.70, respectively. According to the cut-off point of each scale, 436 (50.6%), 514 (59.7%), and 331 (38.4%) participants were categorized as experiencing clinical anxiety, depression, and FoP, respectively. Pearson's correlation analysis identified statistically significant positive associations between FoP and three key variables: PSQI scores ($r = 0.380$, $p < 0.01$), SAS scores ($r = 0.578$, $p < 0.01$), and SDS scores ($r = 0.514$, $p < 0.01$). Additionally, SDS scores were positively correlated with PSQI scores ($r = 0.508$, $p < 0.01$) and SAS scores

($r = 0.814$, $p < 0.01$). Furthermore, a significant positive correlation was also observed between SAS scores and PSQI scores ($r = 0.552$, $p < 0.01$). Detailed information can be found in Table 3.

Mediating effect analysis

Logistic regression analysis revealed that age and time after infection onset had significant effects on the FoP of individuals recovering from COVID-19. Therefore, these variables were used as control variables in the mediating effect analysis.

Then, the SPSS PROCESS Macro Model 4 was employed to analyze the mediation effect, with the results presented in Table 4 and Figure 2. The results showed that, first, sleep quality significantly and positively predicted FoP ($\beta = 0.419$, $p < 0.001$, Model 1). Second, sleep quality also significantly and positively predicted anxiety ($\beta = 0.602$, $p < 0.001$, Model 2). Third, sleep quality significantly and positively predicted depression ($\beta = 0.551$, $p < 0.001$, Model 3). Fourth, when sleep quality, anxiety, depression, and FoP were entered into the regression equation concurrently (Model 4), the predictive effect of sleep quality remained significant ($\beta = 0.110$, $p < 0.001$). Both anxiety and depression significantly predicted FoP ($\beta = 0.417$, $p < 0.001$; $\beta = 0.105$, $p < 0.001$), indicating that anxiety and depression play a mediating role between sleep quality and FoP.

Finally, the bootstrap method with percentile bias correction was employed to examine the mediating effect of anxiety and depression between sleep quality and FoP. The results indicated that the mediating effect of anxiety and depression was significant, with a total indirect effect value of 0.309, representing 73.75% of the total effect (0.419). In other words, anxiety and depression mediate 73.75% of the relationship between sleep quality and FoP. Specifically, the mediating effect includes indirect effects through two pathways. The first pathway demonstrated that the indirect effect of sleep quality on FoP through anxiety had a path coefficient of 0.251 (Bootstrap 95% CI: 0.005, 0.112). Second, the path coefficient of the indirect effect of sleep quality on FoP through depression was 0.058 (Bootstrap 95% CI: 0.005, 0.111). The total effect, direct effect, and indirect effect sizes are shown in Figure 2.

Discussion

This study explored the causal association among sleep quality, anxiety, depression, and FoP. Among the participants, the sleep quality score was higher than the results reported by Kalamara et al. (2022) and Hou et al. (2022). The possible reasons are as follows: Our study was conducted from January to February 2023, shortly after the end of the zero-COVID-19 policy, when infections were widespread,

TABLE 2 Analysis of potential factors associated with FoP in individuals recovering from COVID-19.

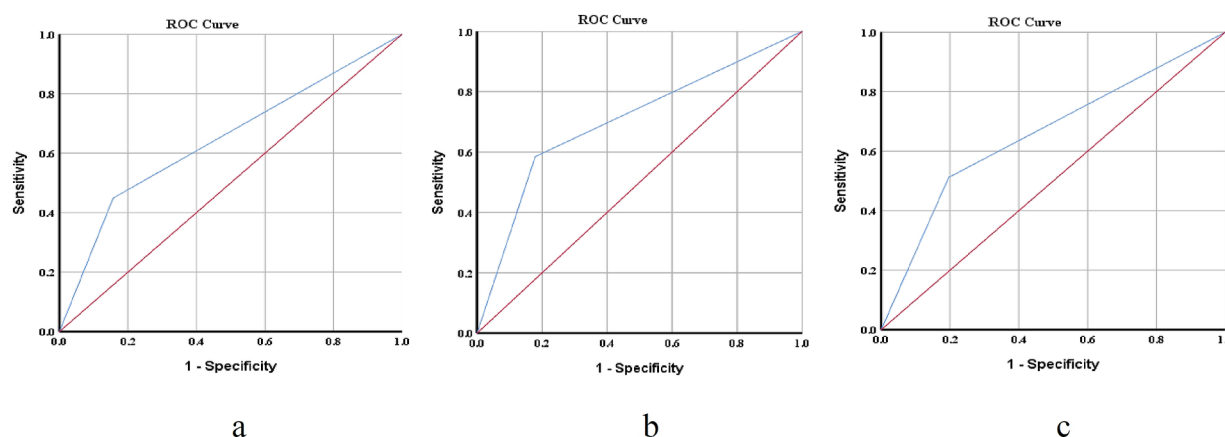| Variables	β	SE	Wald χ^2	p	OR	95% CI
Age	−0.298	0.197	2.301	0.129	0.742	0.505, 1.091
Time from infection onset	0.140	0.171	0.677	0.441	1.151	0.824, 1.608
Sleep quality	0.513	0.238	4.654	0.031	1.670	1.048, 2.663
Anxiety	0.814	0.121	45.109	<0.001	2.258	1.780, 2.863
Depression	0.319	0.103	9.672	0.002	1.376	1.125, 1.682

FIGURE 1
The ROC curves of each indicator in the prediction of FoP risk. **(a)** ROC curves of the prediction of PSQI total score to Fop, AUC = 0.646 ± 0.021, *p* < 0.001, 95%CI [0.605, 0.687]; **(b)** ROC curves of the prediction of SAS total score to Fop, AUC = 0.703 ± 0.018, *p* < 0.001, 95%CI [0.668, 0.738]; **(c)** ROC curves of the prediction of SDS total score to Fop, AUC = 0.658 ± 0.019, *p* < 0.001, 95%CI [0.621, 0.694]. ROC, receiver operating characteristic (ROC) curves; AUC, area under the curve (AUC); and FoP, fear of progression.

significantly impacting the mental health of the general population. Alternatively, it may be due to age, cultural, and other differences. By evaluating overall sleep quality with the aid of the Pittsburgh Sleep Quality Index (PSQI), our study revealed that 77.8% of participants reported sleep disturbances, which is similar to previous research indicating that 50–75% of COVID-19 patients experience sleep deterioration (Alimoradi et al., 2021; Jahrami et al., 2021; Pataka et al., 2021). While this proportion is slightly higher than that of breast cancer patients (Cho and Hwang, 2021; Weng et al., 2021). The participants' anxiety score was mild, which was lower than the findings of Sun et al. (2021); this difference may be due to their research participants being COVID-19 patients in quarantine wards. Furthermore, the participants' depression score was generally mild. The prevalence of depression, assessed using the SDS scale, revealed that approximately 59.7% of respondents exhibited symptoms of depression. Our result regarding the prevalence of depression was higher than the research by Khatun and Farhana (2023). Furthermore, the results indicated that FoP in individuals recovering from COVID-19 was at a moderate level, with 38.4% of participants showing clinically significant FoP, suggesting psychological dysfunction. This finding aligns with research by Ding et al. (2022). However, this proportion is lower than that of cancer patients (Chen R. et al., 2023; Liu et al., 2024). This difference may stem from variations in disease characteristics; the sudden infectious nature of COVID-19 and the long-term threat of cancer have distinct psychological impacts on patients. FoP can affect both short-term and long-term clinical outcomes, cause distress when reintegrating into society and family, and affect patients' quality of life, highlighting the need for increased attention from healthcare professionals.

The score of the FoP physical health dimension for COVID-19 patients in our research is slightly higher than that of the FoP social family dimension, suggesting that medical staff should implement targeted psychological nursing interventions and disease-related health education in advance to reduce participants' anxiety about disease progression. The study revealed that the proportion of individuals with high FoP was significantly higher in the under 45-year-old group compared to the group aged 45 years and older,

consistent with previous studies on cancer patients (Hinz et al., 2015; Hu et al., 2024). Younger individuals may face greater uncertainty regarding their future health, career trajectories, and social reintegration during the pandemic, which could contribute to heightened fear of progression (FoP). Additionally, their increased exposure to health-related information through social media may amplify concerns about long-term health consequences, the risk of reinfection, and potential post-viral complications. Furthermore, social and economic stressors, such as job instability and financial burdens during the recovery period, may further exacerbate FoP in this demographic. Our study found that low sleep quality, anxiety, and depression were independent risk factors for high FoP. Poor sleep quality is related to higher FoP in individuals recovering from COVID-19, which supports our Hypothesis 1 and is consistent with Yang's view (Yang et al., 2022). Individuals with sleep difficulties tend to experience excessive negative intrusive thoughts during the day, including worries about the future. In particular, poor sleep may aggravate participants' anxiety, uncertainty, and worries about their prognosis, long-term effects of treatment, or relapse (Rensen et al., 2019). Thus, individuals recovering from COVID-19 with poor sleep quality are at a higher risk of experiencing elevated levels of FoP. This finding suggests that improving sleep quality could serve as a potential approach to controlling or reducing FoP in these individuals.

Furthermore, the receiver operating characteristic (ROC) analysis demonstrated that anxiety, depression, and sleep quality demonstrate predictive ability for FoP, with AUC values of 0.646, 0.703, and 0.658, respectively. Depression (AUC = 0.703) shows acceptable predictive ability for FoP, indicating that individuals with higher depressive symptoms are significantly more likely to experience heightened fear of progression. Meanwhile, sleep quality (AUC = 0.658) and anxiety (AUC = 0.646) exhibit poor-to-fair predictive power, suggesting that while these factors contribute to FoP, their predictive ability alone is relatively limited. Given the poor-to-fair predictive ability of sleep quality and anxiety, these factors should not be overlooked but rather considered in combination with other psychological indicators when assessing individuals at risk for elevated FoP. From a clinical nursing perspective, these results highlight the need for early psychological

TABLE 3 Means, standard deviations, and correlations of the study variables ($N = 861$).

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	Mean ± SD
1. PSQI	1													9.75 ± 4.93
2. SAS	0.552**	1												51.16 ± 12.06
3. SDS	0.508**	0.814**	1											56.15 ± 14.84
4. FoP-Q-SF	0.380**	0.578**	0.514**	1										30.72 ± 10.70
5. PSQI C_1	0.786**	0.459**	0.454**	0.327**	1									1.66 ± 0.88
6. PSQI C_2	0.728**	0.453**	0.444**	0.316**	0.632**	1								1.78 ± 1.05
7. PSQI C_3	0.751**	0.324**	0.335**	0.195**	0.570**	0.417**	1							1.11 ± 1.06
8. PSQI C_4	0.680**	0.190**	0.182**	0.084*	0.412**	0.347**	0.623**	1						0.73 ± 0.26
9. PSQI C_5	0.652**	0.598**	0.483**	0.448**	0.493**	0.469**	0.378**	0.269**	1					1.41 ± 0.73
10. PSQI C_6	0.591**	0.206**	0.139**	0.136**	0.300**	0.257**	0.305**	0.329**	0.260**	1				0.80 ± 1.23
11. PSQI C_7	0.618**	0.545**	0.512**	0.426**	0.472**	0.438**	0.283**	0.150**	0.482**	0.226**	1			1.91 ± 1.05
12. Fop-PH	0.407**	0.551**	0.472**	0.947**	0.352**	0.325**	0.225**	0.119**	0.464**	0.158**	0.417**	1		16.27 ± 5.75
13. Fop-SF	0.310**	0.542**	0.500**	0.943**	0.266**	0.271**	0.142**	0.039	0.382**	0.098**	0.387**	0.786**	1	14.45 ± 5.57

PSQI, Pittsburgh Sleep Quality Index; SAS, Self-Rating Anxiety Scale; SDS, Self-Rating Depression Scale; FoP-Q-SF, Fear of progression questionnaire-short form; PSQI C_1, Subjective sleep quality; PSQI C_2, Sleep latency; PSQI C_3, Sleep duration; PSQI C_4, Habitual sleep efficiency; PSQI C_5, Sleep disturbance; PSQI C_6, Use of sleep medication; PSQI C_7, Daytime dysfunctions; FoP-PH, Fear of progression-Physiological health; and FoP-SF, Fear of progression-Social family.
*$p < 0.05$; **$p < 0.01$.

screening and intervention in post-COVID recovery programs. Since depression shows the strongest predictive power, targeted mental health support—such as psychotherapy, cognitive-behavioral interventions, and emotional support programs—may help mitigate FoP. Additionally, interventions aimed at improving sleep hygiene and anxiety management could serve as complementary strategies to enhance psychological resilience. Overall, while the AUC values indicate that anxiety, depression, and sleep quality play significant roles in FoP, their moderate effect sizes suggest that a multifactorial approach is necessary for comprehensive assessment and intervention. Future studies should explore additional factors, such as coping strategies and social support, to improve predictive accuracy and develop more effective intervention frameworks.
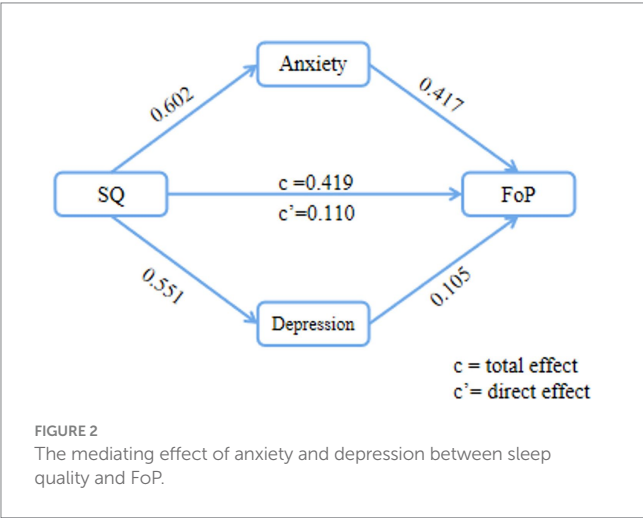
In this study, Pearson's correlation analysis revealed weak to strong positive associations among fear of progression (FoP), sleep quality, anxiety, and depression, with correlation coefficients ranging from $r = 0.380$ to $r = 0.814$. The correlation between FoP and PSQI scores ($r = 0.380$) suggests a weak association, indicating that poorer sleep quality is weakly related to higher FoP. The correlations of FoP with SAS ($r = 0.578$) and SDS ($r = 0.514$) indicate a moderate association, suggesting that anxiety and depression are moderately associated with FoP. The strong correlation between SAS and SDS scores ($r = 0.814$) indicates a high degree of association between anxiety and depression, a well-documented phenomenon in mental health research. This reinforces the notion that individuals experiencing heightened anxiety are likely to also experience depressive symptoms, further complicating their psychological recovery process. The moderate correlations between SDS and PSQI scores ($r = 0.508$) and SAS and PSQI scores ($r = 0.552$) suggest that sleep disturbances are closely linked with both anxiety and depression. The strong correlation between anxiety and depression suggests that interventions should not target these conditions in isolation but rather take a holistic approach to mental health management. Furthermore, given the weak association between sleep quality and FoP, improving sleep hygiene and addressing insomnia-related issues may serve as an indirect yet meaningful strategy for reducing FoP. From a nursing and healthcare perspective, these results highlight the necessity of integrated psychological support in post-COVID rehabilitation programs. Screening for anxiety, depression, and sleep disturbances should be incorporated into routine follow-ups, and interdisciplinary interventions involving mental health professionals, sleep specialists, and nursing care providers should be considered to enhance overall wellbeing and recovery outcomes.

This study found that anxiety and depression partially mediated the association between sleep quality and the fear of progression (FoP). These results support Hypothesis 2 and Hypothesis 3. Previous research has shown that sleep disturbance is a strong predictor of subsequent affective disorders, including anxiety, depression, and suicide (Ding et al., 2023; Um et al., 2023). Studies conducted among cancer patients have yielded similar results (Cho and Hwang, 2021). In other words, participants with poor sleep quality were more likely to experience increased anxiety and depression (Yiyue et al., 2023), which further aggravates the level of fear of disease progression, thus forming a vicious circle (Wang X. et al., 2022). On the one hand, studies have pointed out that anxiety and depression can significantly inhibit the cellular immunity of individuals (Zhou et al., 2005). As stressors, anxiety and depression can affect neurotransmitter and hormone levels, causing a decline in collective immune function and

TABLE 4 Regression analysis of the relationship between variables in the mediation effect model (N = 861).

Predictive variable	Model 1 (criterion: FoP)		Model 2 (criterion: Anxiety)		Model 3 (criterion: Depression)		Model 4 (criterion: FoP)	
	β	t	β	t	β	t	β	t
Age	−0.304	−6.824***	−0.322	−8.086***	−0.286	−6.886***	−0.139	−3.369***
Time from infection onset	0.128	2.229*	0.020	0.388	0.037	0.694	0.116	2.254*
Sleep quality	0.419	13.179***	0.602	21.143***	0.551	18.581***	0.110	3.113*
Anxiety							0.417	8.402***
Depression							0.105	2.207*
R^2	0.193		0.354		0.298		0.356	
F	68.412		156.404		121.092		94.661	

*p < 0.05; ***p < 0.001.

FIGURE 2
The mediating effect of anxiety and depression between sleep quality and FoP.

leading to increased fear about physical health among patients (Zhang et al., 2022). Furthermore, due to the characteristics of rapid transmission, multiple transmission channels, strong infectivity, and general susceptibility of the public, COVID-19 can generally cause individuals to worry about the burden it brings to their families and even to society, while anxiety and depression exacerbate this concern (Nakhaee Moghadam et al., 2022). Higher anxiety or depression may worsen prognosis by negatively impacting participants' immunity, potentially leading to significant consequences for their quality of life. Moreover, anxiety and depression can lead to reduced social participation (Kampf et al., 2016), increased cognitive impairment, and impaired quality of life (Baldiotti et al., 2023). Previous research in cancer patients suggests that higher anxiety and depression levels are key predictors of FoP, emphasizing the role of emotional distress in amplifying fears about disease progression (Jrad et al., 2024).

A novel finding of this study is that anxiety and depression partially explain the connection between sleep quality and FoP. While causal conclusions cannot be drawn from this study, the influence of anxiety and depression on the relationship between sleep quality and FoP is significant. Our findings suggest that interventions targeting sleep quality may be associated with lower FoP levels, potentially through pathways linked to anxiety and depression. However, experimental or longitudinal studies are required to confirm these relationships.

Limitations

The study has several limitations. First, as a cross-sectional study, it only examined the relationship between variables at a single point in time and could not establish their dynamic development or causal relationships. Future research should consider employing longitudinal designs to understand the dynamic changes in sleep quality, anxiety, depression, and fear of progression (FoP) over time and to establish causal relationships between these variables. Due to data constraints, we could not control for all confounding variables. Investigating potential moderating factors, such as social support and resilience, could provide deeper insights into their influence on the observed relationships. Secondly, the participants in this study were from a single hospital, which limits the generalizability of the findings. Future studies could conduct broader research across various types of hospitals in different regions to enhance the generalizability of the results. Finally, since the data were self-reported, recall bias could impact the results. Although no method bias was detected in this study, future research should employ diverse data collection methods, such as combining self-reports with reports from others, to improve the reliability of the conclusions.

Conclusion

This study investigated the sleep quality, anxiety, depression, and fear of pain (FoP) of individuals recovering from COVID-19. From the perspective of individuals recovering from COVID-19, the study developed a mediation model to examine how sleep quality influences participants' FoP. The study discovered that anxiety and depression played parallel mediating roles in the effect of sleep quality on participants' FoP. These findings provide potential guidance for the development and implementation of group-based interventions to address the mental health challenges of the post-COVID-19 era. Specifically, cognitive-behavioral therapy (CBT)-based interventions might be effective in addressing the psychological distress identified in our study. Additionally, we recommend sleep hygiene programs that focus on establishing regular sleep–wake cycles, reducing screen exposure before bedtime, and improving sleep efficiency. Given the strong interconnections among sleep, anxiety, depression, and FoP in COVID-19 survivors, integrating these approaches into post-recovery

care may help mitigate psychological distress and improve overall 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 humans were approved by the Ethics Committee of the Second Affiliated Hospital of Zhejiang University School of Medicine. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

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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.

Generative AI statement

The authors declare that no Gen AI was used in the creation of this manuscript.

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Occupational stress, coping strategies, and mental health among clinical nurses in hospitals: a mediation analysis

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Objective: This study aimed to examine the relationship between occupational stress and mental health among clinical nurses, focusing on the mediating role of coping strategies.

Methods: A cross-sectional survey was conducted among 600 clinical nurses from tertiary hospitals in Hangzhou, China. Data were collected using the Chinese Nurses' Work Pressure Source Questionnaire, the Symptom Checklist-90 (SCL-90), and the Coping Strategies Scale. Mediation analysis was performed using Bootstrap to test the hypothesized mediating effects.

Results: The results showed that occupational stress was positively associated with mental health issues ($\beta = 0.42$, $p < 0.01$), and coping strategies partially mediated this relationship (indirect effect = 0.18, 95% CI [0.11, 0.27]). Nurses in high-stress departments (e.g., surgery and ICU) reported significantly higher SCL-90 scores than the national norm ($p < 0.05$).

Conclusion: The findings suggest that positive coping strategies can mitigate the adverse effects of occupational stress on mental health. Interventions targeting coping skills training may improve nurses' well-being and reduce burnout.

1 Introduction

The global healthcare workforce faces unprecedented psychological challenges, with nurses reporting disproportionately high rates of burnout, anxiety, and depression compared to other professions (1). This crisis is exacerbated by systemic pressures in modern healthcare systems, where escalating patient demands and technological advancements often prioritize service efficiency over caregiver well-being (2). With the advancement of the new medical reform, the demand for healthcare services has steadily increased. Alongside this, medical technology and nursing practices have significantly improved, gradually establishing a "patient-centered" service model (3–5). However, despite growing recognition of occupational stress as a critical determinant of nurse well-being, existing interventions often overlook the mediating role of coping strategies in mitigating mental health risks, particularly in high-stress clinical environments (6). This shift enhances patients' access to more comfortable and satisfactory care (3–5), but it also places increased demands on clinical nurses, resulting in heightened work intensity and greater job pressure. While mild stress can enhance work efficiency and reinforce a sense of responsibility among nurses (7), sustained high levels of

stress can lead to chronic fatigue, ultimately threatening nurses' physical and mental well-being (8). Previous studies indicate that the overall mental health of nurses is significantly lower than that of the general population, with common issues including physical symptoms, depression, and anxiety (9). gradually establishingincreases, nurses' physical and mental well-being, Additionally, nurses working in high-pressure environments—such as intensive care units, emergency departments, and surgical settings—experience considerably more stress than their counterparts in general medicine, with a corresponding decline in their mental health (10–12). The Transactional Model of Stress and Coping (13) posits that stress results from an individual's cognitive appraisal of environmental demands and their perceived coping resources. This model has been widely applied in healthcare settings, demonstrating how coping strategies can buffer the negative effects of occupational stress on mental health. Previous studies have confirmed that positive coping mechanisms, such as problem-solving and seeking social support, effectively reduce work-related stress and improve mental health outcomes among nurses (14).

Prolonged exposure to high-intensity work, combined with mental health struggles, has led to a rise in professional burnout among nurses, with an increased likelihood of turnover. This negatively impacts the quality of care and affects patient satisfaction and hospital operations (15, 16). Given that clinical nurses frequently face high work demands, their mental health often remains compromised. Emotional instability or disruption to their biological rhythms increases the likelihood of nursing errors, further compounding the problem. Therefore, addressing the mental health challenges clinical nurses face is a pressing issue (17, 18). Current efforts to address these challenges in China predominantly focus on descriptive studies, typically revolving around hospital management practices. While reforming hospital regulations is essential, it is often a complex and slow process. As such, there is a growing need for practical models to alleviate stress, helping nurses actively manage their mental health. This study aims to explore such an approach by examining the experiences of 600 clinical nurses from a higher education hospital in a Chinese city. The findings are detailed in the following report. Building on the proposed model, we hypothesize that occupational stress is positively associated with mental health issues among clinical nurses, and that coping strategies partially mediate this relationship. Specifically, we suggest that effective coping mechanisms may help alleviate some of the negative effects of occupational stress on nurses' mental well-being. This hypothesis lays the theoretical groundwork for examining how improving coping strategies could enhance mental health outcomes for clinical nurses. The study's findings are presented in the following report.

2 Objects and methods

2.1 Research materials

A total of 600 clinical nurses were recruited from seven tertiary hospitals in Hangzhou through a combination of stratified and convenience sampling methods. The hospitals were selected based on their size and representation of high-stress departments (e.g., surgery, ICU, internal medicine). Within each hospital, nurses were stratified by department and years of service to ensure proportional representation. Eligible participants were full-time clinical nurses with at least 1 year of experience.

Recruitment involved collaboration with hospital nursing departments. Questionnaires were distributed during staff meetings or shift handovers, and participants were invited to complete them voluntarily. Data collection occurred over 2 weeks to accommodate varying shifts.

The sample size was calculated using GPower 3.1 with an effect size of 0.15, $\alpha = 0.05$, and power = 0.80, yielding a minimum required sample size of 500. The final sample of 589 exceeded this threshold, ensuring adequate statistical power.

2.2 Survey tools

① Basic Situation Questionnaire: A self-compiled questionnaire assessing nurses' demographic characteristics, including age, gender, education level, years of service, job title, and department. ② Chinese Nurses' Work Stress Source Survey Scale: Adapted from the American Nurses' Work Stress Source Survey Scale, this scale incorporates factors relevant to China's healthcare context. It consists of 35 items evaluating work stress in nursing care, time allocation, workload, working environment, patient care, management, and social interaction. The Cronbach's α for this scale is 0.826, indicating good reliability. ③ SCL-90 Evaluation Form: Used to assess nurses' mental health, this tool consists of 90 items across 9 factors: somatization, social sensitivity, depression, anxiety, obsessive-compulsive disorder, fear, paranoia, psychosis, and hostility. Higher scores on these items are associated with poorer mental health. ④ Coping Strategies Scale: This scale includes 62 items across 6 sub-projects: problem-solving, self-blame, seeking help, avoidance, rationalization, and fantasy. The Cronbach's α for this scale is 0.883, indicating good reliability.

2.3 Survey methods

(1) A convenience survey was conducted in several A-level tertiary hospitals in Hangzhou. Questionnaires were distributed at a uniform time and collected 2 days later. A total of 600 questionnaires were distributed, with 589 valid responses, resulting in an effective collection rate of 98.17%.

(2) Nurses were grouped based on their department and years of service, and we analyzed SCL-90-related factors for nurses in different departments.

2.4 Data processing

SPSS 22.0 and AMOS 22.0 software were used for statistical analysis. Data normality was rigorously tested using the Shapiro–Wilk test, supplemented by skewness/kurtosis values (threshold: ±2). Homogeneity of variance was assessed via Levene's test. For normally distributed variables, parametric tests (Pearson correlation, multiple linear regression) were applied; otherwise, non-parametric equivalents (Spearman's correlation, Mann–Whitney U) were used. Effect sizes (Cohen's d for group comparisons, η^2 for ANOVA, and standardized β coefficients for regression) and 95% confidence intervals (CIs) were reported for all analyses.

Hierarchical multiple regression was performed with mental health (SCL-90 total score) as the dependent variable to address potential confounders. Demographic variables (age, education, years of service) were entered in Block 1, occupational stress in Block 2, and coping strategies in Block 3. Moderation effects were tested using PROCESS Macro Model 1 (5,000 bootstraps). Mediation analysis (Process Macro Model 4) included bias-corrected CIs for indirect effects.

3 Results

3.1 Basic situation questionnaire of 600 clinical nurses in tertiary hospitals

As shown in Table 1, a total of 600 clinical nurses were selected from 7 tertiary hospitals in Hangzhou for this study. Among them, 567 were female and 33 were male. The participants' ages ranged from 22 to 44 years. The educational levels of the nurses included 34 secondary technical school graduates, 342 college graduates, and 224 bachelor's degree holders. In terms of job positions, the sample comprised 251 nurses, 183 nursing assistants, 136 head nurses, and 30 deputy head nurses. The majority of the nurses (48.50%) had less than 5 years of work experience. The sample

TABLE 1 Demographic data of 600 clinical nurses in tertiary hospitals.

Project	Number of cases	Percentage (%)
Age (Years)		
≤30	309	51.50
31 ~ 40	232	38.66
≥41	59	9.83
Gender		
Male	33	5.50
Female	567	94.50
Education level		
secondary technical school	34	5.67
College	342	57.00
bachelor's degree	224	37.33
Service years (Years)		
≤5	291	48.50
5–10	145	24.17
>10	164	27.33
Marital status		
Single	269	44.83
Married	331	55.17
Positions		
Nurses	251	41.83
Nursing assistants	183	30.50
Head nurses	136	22.67
Deputy head nurses	30	5.00

was collected from 7 hospitals in Hangzhou; however, we acknowledge the lack of detailed reporting on the number of hospitals involved and the representativeness of this sample at the city or national level. The independent variable, occupational stress, was measured using the Chinese Nurses' Work Stress Source Survey Scale, a continuous variable. The mediating variable, coping strategies, was assessed using the Simplified Coping Style Questionnaire, a continuous variable. Lastly, the dependent variable, psychological health, was evaluated using the SCL-90 Evaluation Form, which, like the others, is treated as a continuous variable.

3.2 Sources of work stress for nurses

The top stressors included low salary, nursing professions and work-related problems, time allocation and workload, working environment and medical equipment, patient care and management, and social relations. Among the 35 items assessed, high workload included low salary standards, low social status of nursing work, high task load, and limited career advancement (Table 2).

3.3 Correlation between nurses' job stressors and age, job title, education level, and psychological stress reduction patterns

The analysis revealed significant correlations between job stressors and demographic factors. Younger nurses ($\beta = 0.25$, 95% CI [0.10, 0.40], $p < 0.05$, $\eta^2 = 0.06$) and those with lower education levels ($\beta = 0.30$, 95% CI [0.15, 0.45], $p < 0.01$, $\eta^2 = 0.09$) reported higher occupational stress. Nurses in junior roles experienced significantly greater stress compared to senior staff ($\beta = 0.35$, 95% CI [0.20, 0.50], $p < 0.01$, $\eta^2 = 0.12$). Adaptive coping strategies were strongly associated with reduced psychological stress ($\beta = -0.45$, 95% CI [−0.55, −0.35], $p < 0.001$, $\eta^2 = 0.20$), indicating their protective role in mental health outcomes (Table 3).

3.4 Analysis of SCL-90 related factors of clinical nurses and comparison with Chinese norms

Clinical nurses exhibited significantly higher scores across most SCL-90 factors than Chinese norms, with large effect sizes indicating clinically meaningful differences. Specifically, somatization ($d = 0.78$, 95% CI [0.65, 0.91], $p < 0.01$), obsessive-compulsive disorder ($d = 0.69$, 95% CI [0.56, 0.82], $p < 0.01$), and anxiety ($d = 1.33$, 95% CI [1.18, 1.48], $p < 0.01$) showed the strongest disparities. Depression ($d = 1.22$, 95% CI [1.07, 1.37], $p < 0.01$) and hostility ($d = 0.62$, 95% CI [0.49, 0.75], $p < 0.01$) also demonstrated substantial effects. Only social relationship sensitivity did not differ significantly ($d = -0.09$, 95% CI [−0.20, 0.02], $p = 0.05$). Total SCL-90 scores were markedly elevated in nurses ($d = 0.88$, 95% CI [0.75, 1.01], $p < 0.01$), underscoring widespread psychological distress (Table 4).

TABLE 2 Scoring and ranking of job stress sources for clinical nurses ($\overline{x} \pm s$).

Sorting	Project	Points
1	Nursing profession and work	2.89 ± 0.58
2	Time allocation and workload	2.68 ± 0.62
3	Working environment and medical equipment	1.80 ± 0.46
4	Patient Care	2.58 ± 0.69
5	Management and social	1.62 ± 0.46

TABLE 3 Hierarchical regression analysis of demographic factors, occupational stress, and coping strategies on mental health.

Variable	β (95% CI)	SE	p	Effect Size (η²)
Age	0.25 (0.10, 0.40)	0.06	0.012	0.06
Education Level	0.30 (0.15, 0.45)	0.07	0.003	0.09
Job Title (Junior)	0.35 (0.20, 0.50)	0.05	<0.001	0.12
Coping Strategies	−0.45 (−0.55, −0.35)	0.04	<0.001	0.20

β: Standardized regression coefficient; SE: Standard error; CI: 95% confidence interval; η²: Partial eta-squared (small = 0.01, medium = 0.06, large = 0.14). Model assumptions: Normality (Shapiro–Wilk $p > 0.05$), homogeneity of variance (Levene's test $p > 0.10$). Hierarchical regression controlled for marital status and years of service.

3.5 Analysis of SCL-90 related factors of clinical nurses in different departments and comparison with Chinese norms

Nurses across high-stress departments exhibited significantly elevated SCL-90 scores compared to Chinese norms, with ICU and surgical nurses showing the most significant disparities. For example, ICU nurses reported markedly higher anxiety scores (d = 1.33, 95% CI [1.15, 1.51], $p < 0.001$), while surgical nurses demonstrated pronounced somatization (d = 0.85, 95% CI [0.68, 1.02], $p < 0.001$). Internal medicine nurses also showed elevated depression scores (d = 0.72, 95% CI [0.55, 0.89], $p < 0.001$). Notably, the "Other Departments" group (e.g., outpatient clinics) displayed lower but still significant differences in hostility (d = 0.62, 95% CI [0.45, 0.79], $p < 0.001$). Total SCL-90 scores were highest in ICU nurses (d = 1.02, 95% CI [0.85, 1.19], $p < 0.001$), reflecting cumulative psychological strain in critical care settings (Table 5).

3.6 Analysis of SCL-90 related factors of clinical nurses with different years of experience and comparison with Chinese norms

Senior nurses (≥10 years of experience) exhibited significantly higher psychological distress compared to junior nurses and Chinese norms, with medium-to-large effect sizes. For instance, senior nurses reported elevated somatization (d = 0.65, 95% CI [0.48, 0.82], $p < 0.001$) and depression (d = 0.54, 95% CI [0.37, 0.71], $p < 0.001$), while junior nurses showed milder but still significant differences in anxiety (d = 0.42, 95% CI [0.29, 0.55], $p < 0.001$). Hostility scores did not differ significantly between groups (d = 0.02, 95% CI [−0.11, 0.15], $p = 0.12$), suggesting workplace tenure exacerbates somatic and emotional symptoms but not interpersonal conflict. Total SCL-90 scores were highest among senior nurses (d = 0.72, 95% CI [0.55, 0.89], $p < 0.001$), highlighting their heightened vulnerability to chronic stress (Table 6).

3.7 Analysis of related factors affecting nurses' mental health

The regression analysis revealed that occupational stress and coping strategies significantly predicted nurses' mental health outcomes. Occupational stress had a strong positive association with psychological distress (β = 0.28, 95% CI [0.20, 0.36], $p < 0.001$, η² = 0.15), while problem-solving coping strategies demonstrated a protective effect (β = −0.56, 95% CI [−0.64, −0.48], $p < 0.001$, η² = 0.12). Avoidance coping strategies (e.g., "back off") were also linked to poorer mental health (β = 0.28, 95% CI [0.18, 0.38], $p < 0.001$, η² = 0.08). Self-blame and rationalization did not reach statistical significance ($p > 0.05$). The model explained 34% of the variance in SCL-90 scores (R² = 0.34, adjusted R² = 0.31), highlighting the critical role of adaptive coping in mitigating stress impacts (Table 7).

3.8 Multivariate regression analysis of mental health predictors

A hierarchical multiple regression model was constructed to examine the independent effects of occupational stress and coping strategies on mental health while controlling for demographic variables (Table 8). In Block 1, demographic variables explained 12% of the variance in SCL-90 scores (F = 8.21, $p < 0.001$). Younger age (β = 0.18, 95% CI [0.09, 0.27], $p = 0.002$) and lower education (β = 0.15, 95% CI [0.04, 0.26], $p = 0.011$) significantly predicted poorer mental health. Adding occupational stress in Block 2 increased the explained variance to 29% (ΔR² = 0.17, $p < 0.001$), with occupational stress showing a strong positive association (β = 0.38, 95% CI [0.30, 0.46], $p < 0.001$). Finally, coping strategies in Block 3 accounted for an additional 9% of variance (ΔR² = 0.09, $p < 0.001$), where maladaptive coping (β = 0.24, 95% CI [0.15, 0.33], $p < 0.001$) exacerbated mental health issues, while problem-solving coping (β = −0.19, 95% CI [−0.28, −0.10], $p = 0.003$) had a protective effect.

TABLE 4 Comparison of SCL-90 scores between clinical nurses and Chinese norms (Mean ± SD).

Factor	Chinese norm	Nurses	Cohen's d (95% CI)	p
Somatization	1.38 ± 0.49	1.78 ± 0.53	0.78 (0.65, 0.91)	<0.01*
Obsessive-compulsive	1.63 ± 0.59	2.07 ± 0.65	0.69 (0.56, 0.82)	<0.01*
Social sensitivity	1.66 ± 0.52	1.61 ± 0.60	−0.09 (−0.20, 0.02)	0.05
Depression	1.51 ± 0.60	2.24 ± 0.59	1.22 (1.07, 1.37)	<0.01*
Anxiety	1.40 ± 0.44	2.14 ± 0.62	1.33 (1.18, 1.48)	<0.01*
Hostility	1.47 ± 0.57	1.85 ± 0.61	0.62 (0.49, 0.75)	<0.01*
Fear	1.24 ± 0.42	1.99 ± 0.54	1.45 (1.30, 1.60)	<0.01*
Paranoia	1.44 ± 0.58	1.61 ± 0.71	0.28 (0.16, 0.40)	<0.01*
Psychoticism	1.30 ± 0.43	1.43 ± 0.44	0.29 (0.17, 0.41)	<0.01*
Total Score	1.45 ± 0.50	1.89 ± 0.52	0.88 (0.75, 1.01)	<0.01*

Cohen's d: Effect size thresholds: small (d = 0.2), medium (d = 0.5), large (d = 0.8). Independent samples t-test; Bonferroni-adjusted significance level: $p < 0.005$. Normality confirmed via Shapiro–Wilk test ($p > 0.05$); homogeneity of variance via Levene's test ($p > 0.10$). Compared with Chinese norms, *$p < 0.05$.

TABLE 5 SCL-90 scores of clinical nurses by department compared to Chinese norms ($\bar{x} \pm s$).

Factor	Chinese norm	Surgery (n = 178)	Internal Medicine (n = 136)	ICU (n = 150)	Other (n = 125)	Cohen's d (vs. Norm)
Somatization	1.38 ± 0.49	1.82 ± 0.68*	1.64 ± 0.78*	1.76 ± 0.66*	1.86 ± 0.92*	0.85 (0.68, 1.02)
Obsessive-compulsive	1.63 ± 0.59	2.01 ± 0.69*	1.94 ± 0.83*	1.97 ± 0.80*	2.05 ± 0.98*	0.69 (0.52, 0.86)
Social sensitivity	1.66 ± 0.52	1.74 ± 0.64*	1.65 ± 0.77*	1.61 ± 0.69*	1.87 ± 0.90*	0.15 (−0.02, 0.32)
Depression	1.51 ± 0.60	1.79 ± 0.70*	1.81 ± 0.74*	1.75 ± 0.76*	1.99 ± 0.98*	0.72 (0.55, 0.89)
Anxiety	1.40 ± 0.44	1.75 ± 0.66*	1.65 ± 0.80*	1.67 ± 0.70*	1.75 ± 0.91*	1.33 (1.15, 1.51)
Hostility	1.47 ± 0.57	1.81 ± 0.65*	1.64 ± 0.74*	1.84 ± 0.83*	1.94 ± 1.03*	0.62 (0.45, 0.79)
Fear	1.24 ± 0.42	1.39 ± 0.52*	1.39 ± 0.67*	1.34 ± 0.47*	1.50 ± 0.70*	0.58 (0.41, 0.75)
Paranoia	1.44 ± 0.58	1.64 ± 0.65*	1.55 ± 0.76*	1.55 ± 0.60*	1.74 ± 0.84*	0.28 (0.11, 0.45)
Psychoticism	1.30 ± 0.43	1.50 ± 0.57*	1.13 ± 0.63*	1.51 ± 0.73*	1.65 ± 0.84*	0.29 (0.12, 0.46)
Total Score	1.45 ± 0.50	1.76 ± 0.65*	1.53 ± 0.56*	1.62 ± 0.61*	1.68 ± 0.67*	1.02 (0.85, 1.19)

Cohen's d: Effect size thresholds: small (d = 0.2), medium (d = 0.5), large (d = 0.8). Independent samples t-test with Bonferroni correction for multiple comparisons (adjusted significance level: $p < 0.005$). Normality confirmed via Shapiro–Wilk test ($p > 0.05$); variance homogeneity via Levene's test ($p > 0.10$). ICU: Intensive Care Unit; "Other" includes outpatient and administrative departments. Compared with Chinese norms, *$p < 0.05$.

TABLE 6 SCL-90 scores of clinical nurses by years of experience compared to Chinese norms ($\bar{x} \pm s$).

Factor	Chinese norm	Senior Staff (n = 164)	Junior Staff (n = 425)	Cohen's d (Senior vs. Norm)	Cohen's d (Junior vs. Norm)	p
Somatization	1.38 ± 0.49	1.93 ± 0.88*	1.63 ± 0.70*	0.65 (0.48, 0.82)	0.42 (0.29, 0.55)	<0.001*
Obsessive-compulsive	1.63 ± 0.59	2.12 ± 0.96*	1.91 ± 0.74*	0.58 (0.41, 0.75)	0.35 (0.22, 0.48)	<0.001*
Social sensitivity	1.66 ± 0.52	1.77 ± 0.84*	1.64 ± 0.74*	0.18 (0.01, 0.35)	−0.03 (−0.16, 0.10)	0.02*
Depression	1.51 ± 0.60	1.93 ± 0.90*	1.74 ± 0.78*	0.54 (0.37, 0.71)	0.31 (0.18, 0.44)	<0.001*
Anxiety	1.40 ± 0.44	1.79 ± 0.90*	1.64 ± 0.70*	0.72 (0.55, 0.89)	0.42 (0.29, 0.55)	<0.001*
Hostility	1.47 ± 0.57	1.81 ± 0.79	1.80 ± 0.91	0.02 (−0.11, 0.15)	0.03 (−0.10, 0.16)	0.12
Fear	1.24 ± 0.42	1.44 ± 0.71*	1.39 ± 0.56*	0.38 (0.21, 0.55)	0.32 (0.19, 0.45)	<0.001*
Paranoia	1.44 ± 0.58	1.65 ± 0.87*	1.55 ± 0.67*	0.29 (0.12, 0.46)	0.17 (0.04, 0.30)	0.01*
Psychoticism	1.30 ± 0.43	1.54 ± 0.73*	1.48 ± 0.69*	0.34 (0.17, 0.51)	0.27 (0.14, 0.40)	<0.001*
Total Score	1.45 ± 0.50	1.65 ± 0.72*	1.61 ± 0.60*	0.72 (0.55, 0.89)	0.58 (0.45, 0.71)	<0.001*

Cohen's d: Effect size thresholds: small (d = 0.2), medium (d = 0.5), large (Independent samples t-test with Bonferroni correction (adjusted significance level: $p < 0.005$). Normality confirmed via Shapiro–Wilk test ($p > 0.05$); variance homogeneity via Levene's test (Senior staff: ≥10 years of experience; Junior staff: <10 years. Compared with senior clinical nurses, *$p < 0.05$.

TABLE 7 Hierarchical regression analysis of occupational stress and coping strategies on nurses' mental health (SCL-90 total score).

Predictors	β (95% CI)	SE	p	Effect size (η²)
Occupational Stress	0.28 (0.20, 0.36)	0.04	<0.001*	0.15
Problem-Solving	−0.56 (−0.64, −0.48)	0.04	<0.001*	0.12
Avoidance	0.28 (0.18, 0.38)	0.05	<0.001*	0.08
Self-Blame	0.13 (−0.02, 0.28)	0.06	0.095	0.02
Help-Seeking	−0.05 (−0.15, 0.05)	0.04	0.325	0.01
Fantasy	0.11 (−0.03, 0.25)	0.05	0.125	0.01
Rationalization	0.13 (−0.01, 0.27)	0.05	0.087	0.02

β: Standardized regression coefficient; SE: Standard error; CI: 95% confidence interval; η²: Partial eta-squared (small = 0.01, medium = 0.06, large = 0.14). Hierarchical regression model: Adjusted for age, education, and years of service. Model assumptions: Normality (Shapiro–Wilk $p > 0.05$), no multicollinearity (VIF < 2.0). Compared with senior clinical nurses, *$p <>0.05$.

TABLE 8 Hierarchical regression analysis of factors influencing nurses' mental health (SCL-90 total score).

Predictors	β (95% CI)	S.E	p	ΔR²	Effect size (η²)
Block 1: Demographics				0.12	0.15
Age	0.18 (0.09, 0.27)	0.04	0.002		
Education Level	0.15 (0.04, 0.26)	0.05	0.011		
Years of Service	−0.07 (−0.16, 0.02)	0.03	0.132		
Block 2: Occupational Stress				0.17	0.21
Work Stress Total	0.38 (0.30, 0.46)	0.04	<0.001		
Block 3: Coping Strategies				0.09	0.11
Problem-Solving	−0.19 (−0.28, −0.10)	0.04	0.003		
Maladaptive Coping	0.24 (0.15, 0.33)	0.04	<0.001		

β: Standardized regression coefficient; SE: Standard error; CI: Confidence interval; ΔR²: Incremental variance explained; η²: Partial eta-squared (small: 0.01, medium: 0.06, large: 0.14). Work Stress Total: Summed score from the Chinese Nurses' Work Stress Source Survey Scale. Problem-Solving and Maladaptive Coping: Subscales of the Coping Strategies Scale. Hierarchical regression steps: Block 1 (demographics), Block 2 (occupational stress), Block 3 (coping strategies). Model assumptions met (normality: Shapiro–Wilk $p > 0.05$; homogeneity: Levene's $p > 0.10$). ΔR² values indicate significant incremental contributions ($p < 0.001$).

3.9 Mediation analysis of coping strategies in the occupational stress-mental health relationship

The results revealed that occupational stress significantly predicted mental health issues (β = 0.41, $p < 0.001$). Coping strategies accounted for 42% of the total effect (indirect effect = 0.18, 95% CI [0.11, 0.27], $p < 0.01$). Specifically, occupational stress was found to significantly increase maladaptive coping (β = 0.34, $p < 0.01$), which, in turn, exacerbated mental health problems (β = 0.28, $p < 0.01$). The model demonstrated a good fit (χ^2/df = 2.1, RMSEA = 0.06, CFI = 0.95), and a path diagram with standardized coefficients is presented in Figure 1.

4 Discussions

Our survey reveals that clinical nurses experience significant stress from multiple sources, including the inherent demands of the nursing profession, work-time allocation, workload, and patient care. In A-level hospitals, systemic factors such as low wage standards, limited career advancement, high task volumes, and restricted educational opportunities contribute substantially to nurse stress [3, 19].

Global studies further indicate that insufficient financial incentives and inadequate professional recognition exacerbate psychological distress among nurses [20]. In Chinese hospitals, a pronounced shortage of nursing staff amplifies workloads and restricts opportunities for professional development, disadvantaging nurses relative to physicians [21]. Additionally, inefficient time management and redundant non-medical tasks contribute to burnout and mental fatigue [22, 23]. Recent research underscores the role of improved system management and process reengineering in alleviating these stressors [24].

The increased public awareness of healthcare quality has raised patient expectations, intensifying nurses' decision-making burdens, especially in critical care environments where errors can have severe consequences [25]. Current SCI evidence confirms that such high-pressure settings negatively affect both nurse well-being and patient care quality [20]. Finally, the positive correlation between stress, age, and professional title suggests that cumulative workload and declining physical capacity, combined with limited growth opportunities, further drive stress among senior nurses [26]. This finding is in line with global research calling for optimized work environments and fair promotion mechanisms to reduce stress and enhance professional satisfaction [12].

The concept of mental health refers to an individual's psychological state, where their emotional and cognitive responses are balanced and

FIGURE 1
Mediation analysis model. This figure illustrates the relationships between occupational stress (X), coping strategies (M), and mental health (Y). The direct effect from occupational stress to coping strategies is β = 0.34, and the effect from coping strategies to mental health is β = 0.28. The indirect effect of occupational stress on mental health through coping strategies is also depicted with an indirect effect size of β = 0.18 (95% CI [0.11, 0.27]), accounting for 42% of the total effect.

adapted to environmental demands (9). In this study, clinical nurses exhibited significantly higher scores on the SCL-90 compared to Chinese norms, indicating poorer mental health among nurses. Most clinical nurses experience varying degrees of mental health challenges, which necessitates targeted interventions. This finding aligns with previous research by Zhang et, al (27), which highlighted that Chinese nurses face high professional pressures, poor mental health, and a growing need for psychological support.

Our findings validate the Transactional Model's premise that coping strategies mediate stress-mental health relationships. The partial mediation suggests that interventions targeting adaptive coping could mitigate stress impacts. The study also found that surgical nurses scored significantly higher than both national standards and their peers in internal medicine on the SCL-90, indicating greater psychological distress. This is likely due to the nature of surgical nursing, where nurses deal with critically ill patients, high complication rates, and the rapid onset of conditions. The emotional strain of caring for patients in such dire circumstances, combined with frequent exposure to occupational hazards such as blood and bodily fluids, significantly increases the mental and physical health risks for surgical nurses (28). Similarly, nurses in intensive care units also reported elevated SCL-90 scores. ICU nurses face intensive workloads due to the high acuity of patients, the need for advanced technical skills, and the constant pressure to manage life-threatening situations. This contributes to both psychological stress and physical fatigue, which exacerbates mental health issues (29). Interestingly, the study found that senior nurses exhibited significantly higher scores across multiple dimensions of the SCL-90, including physicalization, obsessive-compulsive disorder, social sensitivity, depression, anxiety, phobia, paranoia, and general mental illness. Although senior nurses tend to have more experience and better communication skills, their inability to fully realize their career potential and the high-stress nature of their roles lead to dissatisfaction and burnout. These findings are consistent with previous studies that suggest senior nurses are often overburdened with critical care tasks and lack sufficient emotional support, leading to higher stress levels (30). Furthermore, the Pearson correlation analysis revealed that nursing profession stressors, time allocation, workload, and patient care are all positively correlated with higher SCL-90 scores, indicating a clear relationship between these factors and mental health issues. The multivariate logistic regression analysis also showed that work experience and professional titles significantly affect the mental health of nurses, particularly in high-stress areas such as surgery and intensive care. These factors should be taken into account when developing interventions to improve nurse well-being.

Occupational stress is defined as the physical and psychological strain experienced by employees due to the demands of their work and their perceived inability to meet those demands. For healthcare workers, particularly nurses, the psychological pressure is amplified due to the nature of their work, which is emotionally and physically demanding. Chronic stress can lead to serious emotional issues, negatively impacting both personal well-being and job performance (30).

Coping mechanisms play a crucial role in how nurses respond to stress. The study found significant differences in how various coping strategies affected stress levels. Nurses who employed positive psychological coping strategies were less affected by work pressure, whereas those who used negative coping mechanisms experienced higher stress levels (7). This suggests that when clinical nurses face high-intensity stress, adopting positive coping strategies—such as mindfulness, relaxation exercises, and seeking social support—can effectively mitigate negative emotions and improve overall mental health. Conversely, negative coping mechanisms, such as avoidance or emotional suppression, can lead to physical and mental exhaustion, exacerbating stress and negatively affecting both mental health and job performance (31).

Integrating modern psychological stress theory, we can view coping strategies as mediating factors between stress and mental health outcomes. Effective coping can enhance nurses' problem-solving abilities, emotional regulation, and overall psychological adaptation, thereby improving their resilience in stressful work environments (32). Nurses should be encouraged to adopt positive coping strategies, engage in continuous learning and professional development, and maintain regular self-care practices to improve their mental well-being (33). These strategies are essential for promoting a healthier work environment and reducing burnout (34).

This study has several limitations that warrant consideration. First, despite efforts to stratify sampling by department and years of service, the reliance on convenience sampling within tertiary hospitals may introduce selection bias, as nurses who voluntarily participated might systematically differ from non-participants in stress perception or coping behaviors. Second, while hierarchical regression and mediation analyses were employed to address variable complexity, the cross-sectional design precludes causal inferences, and unmeasured confounders may influence outcomes. Third, the proposed stress reduction model, though validated in high-stress departments, requires cross-cultural adaptation and testing in diverse healthcare systems to ensure generalizability. Fourth, self-reported data may be susceptible to social desirability bias; future studies should integrate objective measures to triangulate findings. Lastly, while the sample size met statistical power requirements, the single-city focus limits extrapolation to rural or non-tertiary settings. To address these limitations, we recommend: (1) multi-center longitudinal studies tracking stress trajectories and coping efficacy over time; (2) mixed-methods designs combining quantitative

surveys with qualitative interviews to contextualize coping mechanisms; (3) cross-cultural validation of the decompression model across regions with varying healthcare policies; and (4) experimental trials testing targeted interventions informed by this study's findings. Such efforts will strengthen the evidence base for nurse well-being initiatives.

5 Conclusion

Positive coping strategies, such as mindfulness and social support, were associated with lower stress levels, while negative coping mechanisms exacerbated mental health challenges. However, the study's limited sample size calls for further multi-center research to capture a more representative view. To improve nurse well-being and reduce burnout, it is essential to foster supportive work environments, promote positive coping strategies, and provide opportunities for professional development.

Our study found that clinical nurses in China experience considerable psychological distress as a result of their work, which significantly impacts their overall health and job satisfaction. The results also suggest that the use of positive psychological stress relief models can effectively alleviate stress, reduce physical and mental fatigue, and improve coping strategies. We recommend that hospitals prioritize implementing these models and invest in enhancing nurses' psychological health to improve work efficiency and the quality of care provided. Future studies should explore the development of more targeted interventions for specific departments or stressors.

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

The studies involving humans were approved by the Ethics Committee of Zhejiang Hospital. Informed consent was obtained from all the participants. All methods were carried out in accordance with Declaration of Helsinki. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

FJ: Conceptualization, Data curation, Formal analysis, Writing – original draft. SN: Data curation, Investigation, Methodology, Writing – review & editing. LW: Validation, Visualization, Writing – review & editing.

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Temporal disorientation during war: associations with work-family conflict, emotional distress, and burnout

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Introduction: Disruptions in the temporal experience—such as subjective sense of time being long, short or distant compared to "objective" time—have been found in the context of extreme emotional events. This research, conducted a month after the start of the war in Israel, aimed to identify characteristics of temporal experience among a population facing ongoing crisis conditions, and to examine their relationship to emotional distress and burnout. Based on Hobfoll's Conservation of Resources Theory it was hypothesized that temporal disorientation is essentially the loss of a vital psychological-functional resource, and its intensity would be related to emotional distress and burnout during the war period.

Methods: The study involved 374 participants, recruited using a snowball sampling technique. They completed an online survey aimed at quantifying Temporal Disorientation, Burnout, Psychological Distress and Work-Family Conflict. Principal Component Analysis (PCA) was used to validate the factor structure of the Hebrew version of Temporal Disorientation questionnaire, Pearson correlation coefficient was used to evaluated correlations among the study variables; Hierarchical linear regression was used to model the outcome variables, emotional distress and burnout.

Results: Temporal confusion and difficulties in future orientation during wartime were significantly associated with emotional distress. The findings also indicate that temporal confusion and difficulties in future orientation were related to a loss of balance in the boundaries between major life roles, work-family conflict, and the development of occupational burnout.

Discussion: This study contributes an occupational angle to the existing literature on psychological reactions to prolonged crises. Understanding the role of temporal experience during a prolonged crisis can significantly contribute to intervention and prevention measures in the context of the development of mental pathology. Practical implications and study limitations are discussed.

KEYWORDS

temporal disorientation, emotional distress, burnout, work-family conflict, war

1 Introduction

Continuity and structure in the experience of time are essential for mental health, identity cohesion, and stable functioning. A sense of time as continuous and systematic—from past to future—enables interpretation, prediction, planning, and control. "Objective" time, shared and precise, follows a steady, linear progression. In contrast, "psychological" time, the subjective internal experience, can deviate from this regular flow.

Disruptions in the temporal experience—such as a subjective sense of time being long, short, fragmented, or distant compared to "objective" time—have been found in the context

of experiencing extreme emotional events, boredom, waiting, fear, pain, and threat (Droit-Volet et al., 2020; Gil and Droit-Volet, 2012; Grommet et al., 2011; Grondin et al., 2020; Ogden et al., 2024; Zakay, 2014). Such disruptions have also been documented in relation to various psychopathological disorders, especially depression, anxiety, and post-trauma (Holman and Grisham, 2020; Kosak et al., 2022; Maiese, 2018; Thönes and Oberfeld, 2015; Treitel and Levy-Gigi, 2023). Specifically, research has shown that ongoing crisis, like the COVID-19 pandemic, was linked to temporal disorientation: confusion in time, a sense of prolonged and slow time, and difficulty in relating to the future (Ogden, 2021; Pawlak and Sahraie, 2023; Taub et al., 2022; Fernandez Velasco et al., 2022). Studies also indicated a correlation between temporal disorientation and emotional distress during and after the crisis (Droit-Volet et al., 2023). The current research was conducted about a month into the war in Israel, which began on October 7, 2023, severely disrupting routine life and existential security. The study aimed to identify characteristics of temporal experience during this crisis and examine their relationship to emotional distress and burnout.

Periods of crisis, especially wartime, are marked by heightened emotional distress and mental health decline. A meta-analysis found significantly higher rates of depression and anxiety in conflict zones compared to post-war periods (Lim et al., 2022). This pattern has also been observed in the context of the current war in Israel, with recent studies documenting elevated levels of post-traumatic stress, anxiety, and depression among various segments of the population (Bergman et al., 2025; Levi-Belz et al., 2024; Saar-Ashkenazy et al., 2024). While psychological distress during war is well-documented, workplace wellbeing, particularly burnout, is often overlooked. The WHO defines burnout as a syndrome from "chronic workplace stress that has not been successfully managed," characterized by exhaustion, mental detachment, and reduced efficacy (World Health Organization, 2019; Maslach et al., 2001). Few studies explore burnout during wartime, but examples include 67% of Libyan healthcare workers reporting high burnout, particularly emotional exhaustion, and 61% of female and 48% of male Ukrainian academic staff experiencing severe emotional fatigue and impaired academic functioning (Tsybuliak et al., 2023).

1.1 The temporal experience as a resource: a conservation of resources theory perspective

Understanding mental health during crises can be framed through the lens of the Conservation of Resources (COR) theory. The theory suggests that individuals are driven by the need to acquire, build, develop, and protect resources that they value (Hobfoll, 1989). Such resources can include a sense of security, stable livelihood, and a sense of self-efficacy. According to this approach, emotional distress, including burnout, develops as a result of a prolonged process of resources loss.

COR theory provides a foundation for understanding emotional responses to resource loss in large-scale crises like pandemics, wars, disasters, and terrorism (Hobfoll, 2001; Hobfoll et al., 2006, 2012; Ironson et al., 1997; Smith and Freedy, 2000).

Studies indicated a relationship between resources loss and emotional distress following traumatic events like hurricanes (Sattler et al., 2002), 9/11 terrorist attack in New York (Galea et al., 2002), and COVID-19 (Yu et al., 2023). Research also highlights that wartime resources loss—such as personal security, stability, economic, and social supports, trust and hope —significantly increases the risk of post-traumatic symptoms (Dekel and Hobfoll, 2007; Hobfoll et al., 2006, 2011).

Despite extensive research demonstrating the relevance of the COR theory to explaining various aspects of emotional distress during crises, the mechanisms of resources loss remain underexplored (Toker et al., 2015). The current study investigates whether temporal disorientation, as a significant loss of resources, is associated with emotional distress and burnout.

1.2 Disruptions in the temporal experience

Psychological time refers to how we perceive, experience, or evaluate time, contrasting with "objective" or "clock" time (Block and Zakay, 2000; Fraser, 1966; James, 1890). This subjective experience shapes daily life, aiding adaptation, continuity, and identity (McAdams, 2001; Prebble et al., 2013). Bergson (1946) emphasized subjective time as central to self-consciousness, describing it as "real" time—a memory-based continuity where the past persists in the present.

Disruptions occur when subjective time diverges from objective time, manifesting as altered perceptions of time passing (faster or slower) or shifts in temporal distances (e.g., feeling much or little time has passed since an event) (Fernandez Velasco et al., 2022). These disruptions reflect the interplay between environmental factors and mental processes and are linked to depression, anxiety, and trauma (Holman and Grisham, 2020; Thönes and Oberfeld, 2015). Negative emotions, in particular, are associated with a sense of time slowing down (Gil and Droit-Volet, 2012; Ishikawa and Okubo, 2016; Ogden, 2021).

During the COVID-19 pandemic, many reported a sense that time was passing either more slowly or quickly than usual (Cellini et al., 2020; Droit-Volet et al., 2023), with higher levels of depression linked to the perception that more time had passed since the pandemic began (Ogden and Piovesan, 2022). Another aspect of temporal disruption is future orientation, which is crucial for focusing on goals, fulfilling aspirations, and making plans (Baumeister et al., 2016; Zimbardo and Boyd, 1999). In times of crisis, such as war, difficulties in predicting or imagining the future, or a lack of control over it, have been shown to predict emotional distress, as well as motivational and behavioral challenges (Andre et al., 2018; Gamble et al., 2019).

Fernandez Velasco et al. (2022) developed a tool for assessing aspects of temporal disruptions and disorientation during the COVID-19 pandemic and identified six measures: *disruptions in passage of time (PT)*—a sense that time is passing more slowly or quickly than usual, *disruptions in temporal order of events (TOE)*—memory for the correct order in which events occurred, *disruptions in temporal distance (TD)*—an intuitive sense of closeness or distance in time from a certain point in time), *disruptions in future orientation (FO)*—mental reference to the future, *disruptions*

in temporal self-location (TSL)—knowledge of the current hour, day, month, and *disruption in temporal rupture (RT)*—a sense of temporal continuity being interrupted by a sudden severe event.

Fernandez Velasco et al. (2023) found that the COVID-19 pandemic was characterized by temporal disorientation, with people experiencing anomalies in time perception, temporal distance, sequence, orientation, and future reference. They also discovered correlations between these dimensions: individuals who felt time was slower also experienced confusion about event order and greater temporal distance. Slower time perception was linked to social disorientation and increased trauma responses. The authors suggested their tool could be useful for studying time perception during crises that disrupt normal temporal markers, highlighting the importance of exploring its connections to other psychological phenomena.

1.3 Work-family conflict

Work and family, as two major roles in an individual's life, form the foundation of their daily routine, shaping the rhythm of the day and their experience of time. Work-family conflict is typically defined as a form of inter-role conflict where participation in one role (work or family) is hindered by involvement in the other (Greenhaus and Beutell, 1985). This conflict can occur in both directions: when work interferes with family life (work-to-family conflict) or when family responsibilities disrupt work (family-to-work conflict) (Frone, 2003). Higher levels of work-family conflict were associated with greater psychological and physical health problems (e.g., Allen et al., 2000). Recent research emphasizes the dynamic relationship between work and family roles across temporal changes, through both life cycle stages, everyday events, and major events (Allen et al., 2023; Piszczek and Yestrepsky, 2024). Boundary theory helps to explain how individuals establish and manage boundaries between work and family roles to effectively organize their time and resources. As the dynamic relationship between these roles evolves, these natural boundaries have increasingly blurred (Ashforth et al., 2000). Despite this, there is still limited knowledge about how this conflict develops across different temporal changes (Allen et al., 2023). The blurring of boundaries may be further exacerbated by acute life events. For instance, during the COVID-19 pandemic, higher levels of work-family conflict were observed (Barriga Medina et al., 2021).

1.4 The current study

The primary aim of the current study was to examine temporal disorientation during wartime. It was hypothesized, similar to Fernandez Velasco et al. (2023), that disorientation would manifest in various dimensions, and correlations would be found between these dimensions and the level of emotional distress and burnout during the crisis. Additionally, it was hypothesized that disruptions in time would have significant correlation with a psychological phenomenon sensitive to temporal structure and order: work-family conflict. Finally, the study examined how components of

temporal disorientation and work-family conflict together relate to burnout and emotional distress.

2 Materials and methods

2.1 Participants

The study included 374 participants (261 women, 112 men, 1 unreported gender), aged 28 to 60. Of these, 271 (72.5%) were married or cohabiting, and 314 (84%) had higher education. All were employed, and none were in military service or evacuated due to the war. Conducted 1 month after the war began, participants were asked if they or their close ones had been physically injured by terror or war. Four participants (1.1%) reported personal injuries, while 37 (17.1%) reported injuries to friends or relatives.

2.2 Recruitment and procedure

The study was conducted from November 7 to November 19, 2023, 1 month after the war began. Ethical approval was obtained from the Institutional Review Board (IRB) of The Academic College of Tel-Aviv Yaffo. Participants were recruited via snowball sampling on social media and completed the survey on Qualtrics (http://www.qualtrics.com). They were invited to participate in a survey on coping with the war in Israel, with assurances of anonymity and voluntary participation. Informed consent was obtained, and participants were free to withdraw at any time. Researchers' contact information was provided.

2.3 Measures

2.3.1 Sociodemographic questionnaires

Sociodemographic questionnaires included gender, age, family status, and education level. Additionally, participants were asked about physical injuries due to war.

2.3.2 Temporal disorientation

Temporal disorientation was assessed using the Instrument for Measuring Temporal and Social Disorientation (ITSD) developed by Fernandez Velasco et al. (2022). The instrument consists of 18 items related to six components of temporal disorientation: Temporal Order of Events (TOE), Temporal Self Location (TSL), Passage of Time (PT), Future Orientation (FO), Temporal Distance (TD), and Temporal Rupture (TR). We translated the questionnaire to Hebrew, using forward-backward translation by the researchers (Brislin, 1970), and principal component analysis (PCA) was used to validate the factor structure of the Hebrew version. Parallel analysis was based on the correlation matrix with Promax oblique rotation to account for inter-component non-orthogonal relationships. The Kaiser-Meyer-Olkin (KMO = 0.70) and Bartlett's test [$\chi^2_{(153)} = 1{,}576.93$, $p < 0.001$] confirmed the suitability of the data for analysis.

The results revealed a factor structure that was similar yet somewhat different from the original. Fifteen items loaded onto

four factors. Items 3 and 4 of the original TSL factor, along with items 5, 6, and 7 from the original TOE factor, loaded onto a new factor, which we named the Temporal Confusion (TC) factor (13.7% variance). An example item: "I get confused more/less often about which day of the week it is." The three items from the original PT factor remained unchanged (12.8% variance). An example item: "At times, since the war began, time has been passing noticeably slowly." The three items from the original FO factor with the addition of item 17 (originally belonged to the TR factor, formed the third factor (FO+TR17; 11.7% variance). An example item: "I feel it is easier/harder for me to imagine the future." Finally, the original TD factor retained its factor structure perfectly as the fourth factor (9.9% variance). An example item: "At times, the beginning of the war feels noticeably far away." Together, these four factors accounted for 48.1% of the total variance. Component loadings are provided in Table 1.

The factors were transformed into new study variables by averaging their five-point Likert scores. The Cronbach's alpha reliabilities were satisfactory to good as follows: TC = 0.70, PT = 0.83, FO = 0.61, and TD = 0.66.

2.3.3 Occupational burnout

Occupational burnout was assessed using the Hebrew version of the Shirom-Melamed Burnout Measure (SMBM), a 14-item scale evaluating job burnout. Participants reported how often they experienced physical fatigue, cognitive weariness, and emotional exhaustion at work over the past month, with responses ranging from 1 (almost never) to 7 (almost always). The mean score across all items was calculated (Shirom and Melamed, 2006). The SMBM showed strong internal consistency with a Cronbach's alpha of 0.94.

2.3.4 Emotional distress

Emotional distress was assessed using the Hebrew version of the Depression, Anxiety, Stress Scales (DASS-21), a 21-item self-report questionnaire evaluating symptoms of depression, anxiety, and stress over the past week. Each subscale includes seven items, with responses rated on a 4-point Likert scale from 1 (did not apply to me at all) to 4 (applied to me very much) (Lovibond and Lovibond, 1995; Lurie-Beck et al., 2008). The DASS demonstrated strong internal consistency with a Cronbach's alpha of 0.95.

2.3.5 Work-family conflict

Work-family conflict was assessed using an eight-item measure developed for the MIDUS study by Allen et al. (2023). Four items measured work-to-family conflict and four measured family-to-work conflict. Responses were rated on a 5-point Likert scale from 1 (Never) to 5 (All of the time). The questionnaire was translated into Hebrew using forward-backward translation (Brislin, 1970). Both work-to-family and family-to-work conflict demonstrated strong internal consistency, with Cronbach's alphas of 0.82 and 0.76, respectively.

2.4 Statistical analysis

Statistical analysis included Pearson correlations among study variables and Principal Component Analysis to examine the factor structure of temporal disorientation. Hierarchical linear regression modeled emotional distress and occupational burnout. In Step 1, gender and temporal disorientation components were included; in Step 2, work-to-family and family-to-work conflicts were added. Results are presented with standardized (β) and unstandardized (B) coefficients, standard errors (SE), p-values, and adjusted explained variance (R^2). A significance level of $p < 0.05$ was used. Data analysis was performed using SPSS version 28.0.

3 Results

Table 2 shows Pearson correlations among the research variables, identifying several significant relationships. Greater temporal confusion (TO) was related to weaker future orientation (FO) and increased work-to-family and family to work conflict. Perceiving time as faster (PT) makes events feel closer (TD). Higher emotional distress was associated with increased burnout and both sides of work-family conflict. Additionally, slight gender differences emerged, with women reporting higher levels of temporal confusion and burnout.

Regression analysis (Table 3) examined how temporal disorientation and work-family conflict predict emotional distress. Gender and temporal disorientation (TC, PT, FO, TD) explained 23% of emotional distress variance ($R^2 = 0.23$, $p < 0.001$), with TC negatively and FO positively predicting emotional distress ($B = -0.24$, $p < 0.01$; $B = 0.31$, $p < 0.001$). PT and TD were not significant. Adding both sides of work-family conflict increased explained variance to 34% ($R^2 = 0.34$, $p < 0.001$), with TC, FO, work-to-family and family-to-work conflict, all being significant predictors.

Regression analysis (Table 4) examined how temporal disorientation and both sides of work-family conflict predict burnout. Gender and temporal disorientation (TC, PT, FO, TD) explained 20% of the variance in burnout ($R^2 = 0.20$, $p < 0.001$), with TC negatively and FO positively predicting burnout ($B = -0.44$, $p < 0.001$; $B = 0.50$, $p < 0.001$). PT and TD were not significant. Adding work-family conflict increased the variance explained to 33% ($R^2 = 0.33$, $p < 0.001$), with TC, FO, work-to-family and family-to-work conflict all being significant predictors.

4 Discussion

The current study examined temporal disorientation as a mental-functional mechanism related to work-family conflict, burnout, and emotional distress during an ongoing crisis. The research was conducted at an early stage of a war, characterized by widespread direct effects on the general population in Israel. For the purpose of measuring temporal disorientation, we used a tool developed by Fernandez Velasco et al. (2022), applied for the first time in Hebrew and tested in the context of war. We identified four interrelated components of temporal disorientation (similar

TABLE 1 The instrument for measuring temporal disorientation's component loadings (Hebrew version).

Item	1 TC	2 PT	3 FO	4 TD	Uniqueness
(5) At times, I feel confused about the order of events that occurred since the war began (TOE)	0.79				0.37
(4) I get confused more/less often about which month of the year it is (TSL)	0.75				0.50
(7) I feel it is easier/harder for me to recall events that have taken place since the war began (TOE)	0.64				0.60
(6) At times, I feel confused about the order of events that occurred before the war began (TOE)	0.62				0.52
(3) At times, I feel confused about the order of events that occurred before the war began (TSL)	0.49				0.61
(13) Overall, since the war began, time has been passing slowly/quickly (PT)		0.90			0.18
(12) At times, since the war began, time has been passing noticeably quickly (PT)		0.89			0.24
(11) At times, since the war began, time has been passing noticeably slowly (PT)		0.73			0.30
(14) I feel it is easier/harder for me to imagine the future (FO)			0.82		0.38
(15) I feel I'm more/less anxious about my future (FO)			0.78		0.42
(16) I feel I'm more/less in control of my future (FO)			0.57		0.63
(17) At times, the period since the war began felt unreal to me (TR)			0.45		0.66
(8) At times, the beginning of the war feels noticeably far away (TD)				0.83	0.26
(10) Overall, times before the war feel as if they are further away/closer to me than they really are (TD)				0.75	0.38
(9) At times, the beginning of the war feels noticeably close (TD)				0.43	0.61
(1) I feel I'm more/less reliant on calendars or to-do lists to keep track of what I do (ATO)					0.96
(2) I care more/less about following a routine (daily, or weekly) (ATO)					0.82
(18) The period since the pandemic began feel connected/disconnected from the months and years prior (TR)					0.88

Applied rotation method is Promax. Only loadings above 0.4 are displayed. In parenthesis next to item number is the original factor as reported by Fernandez Velasco et al. (2022). TOE, Temporal Order of Events; TSL, Temporal Self Location; PT, Passage of Time; FO, Future Orientation; TD, Temporal Distance; TR, Temporal Rupture; ATO, Assistance in Temporal Orientation.

yet slightly different from the original reported structure), with *temporal confusion* being central (e.g., confusion about the day, month, or event sequence from the start of the war or before it).

Temporal confusion reflects an unraveling of a homogeneous, continuous, stable, and chronological continuity. Participants who experienced higher levels of *temporal confusion* also experienced higher levels of *temporal distance* disorientation (feeling that the

start of the war is further away in time than it actually is) and difficulties with *future orientation* (difficulty imagining or controlling the future). In other words, individuals who are "lost in time," struggling to accurately place the "here and now," also lose a precise connection to past events (which seem distant) and to the future (which becomes inaccessible, hard to predict, and uncontrollable). These results align with Fernandez Velasco et al.

TABLE 2 Pearson correlations between the research variables.

Variable	M	SD	TC	PT	FO	TD	WFC	FWC	DASS	BO
Temporal confusion	2.99	0.69								
Passage of time	2.91	0.96	0.05							
Future orientation	3.70	0.60	−0.26**	−0.08						
Temporal distance	2.46	0.92	0.30**	0.22**	−0.13**					
Work–to–family conflict	2.87	0.83	−0.26**	−0.02	0.27**	−0.12*				
Family–to–work conflict	2.60	0.77	−0.33**	−0.07	0.34**	−0.09	0.55**			
Emotional distress (DASS)	0.92	0.59	−0.35**	−0.14**	0.39**	−0.16**	0.45**	0.42**		
Burnout	3.95	1.15	−0.33**	−0.10	0.33**	−0.18**	0.47**	0.42**	0.62**	
Gender			−0.12*	−0.12*	0.05	−0.10	0.10	0.02	0.11*	0.19**

*p < 0.05, **p < 0.01.
Male = 0, female = 1. TC, Higher scores indicate lower levels of temporal confusion.

TABLE 3 Regression model of disorientation components and work and family conflicts on emotional distress.

Variable	Step 1			Step 2		
	B	SE	β	B	SE	β
(Constant)	0.64*	0.27		−0.09	0.27	
Gender	0.06	0.06	0.05	0.04	0.06	0.04
TC	−0.24***	0.05	−0.24***	−0.15**	0.05	−0.16**
PT	−0.05	0.03	−0.09	−0.05	0.03	−0.09
FO	0.31***	0.05	0.32***	0.22**	0.05	0.22***
TD	−0.01	0.03	−0.02	−0.01	0.03	−0.02
Family–to–work conflict				0.10	0.04	0.14*
Work–to–family conflict				0.19	0.04	0.27***
R²	0.23***			0.34***		
R² change				0.11**		

*p < 0.05, **p < 0.01, ***p < 0.001.

(2023), who also found similar relationships during the COVID-19 pandemic. Similar to the social isolation and dramatic restrictions that existed during the pandemic, war situations create a severe disruption of routine, habits, and stability, contributing to the unraveling of a stable temporal fabric and temporal orientation.

4.1 Temporal disorientation, burnout, and emotional distress during war

As expected, the current study found emotional distress a month into the war. However, a key contribution of this study is the identification of emotional distress in the occupational context, including burnout signs such as exhaustion and lack of motivation related to job performance. The connection between emotional distress and burnout was strong ($r = 0.62$, $p < 0.01$). Based on Hobfoll's (1989) Conservation of Resources Theory, we hypothesized that temporal disorientation, as a loss

of mental-functional resources, would relate to emotional distress and burnout. In the current study, temporal confusion, and future orientation difficulties were found to predict both burnout and emotional distress during the war.

Our findings on temporal confusion align with literature linking disturbances in temporal experience to depression, anxiety, and trauma during prolonged crises (e.g., COVID-19) (Droit-Volet et al., 2020; Holman and Grisham, 2020; Grondin et al., 2020). The loss of predictability and control, along with the disruption of daily habits, significantly predicts maladaptive psychological reaction to crisis. Struggles to maintain routines during prolonged crises are linked to mental health decline, including depression, anxiety, and poor adaptation (Clay and Greer, 2019; Maugeri et al., 2020; Miller and Rasmussen, 2010; Sherman et al., 2020). Temporal disorientation may arise from these routine disruptions.

Participants with greater difficulty in future orientation (struggling to imagine or feel in control of the future) reported higher levels of burnout and emotional distress. Verfaellie et al. (2023) found similar difficulties among war victims with PTSD.

TABLE 4 Regression model of disorientation components and work and family conflicts on burnout.

Variable	Step 1			Step 2		
	B	SE	β	B	SE	β
(Constant)	3.50	0.54		1.93	0.53	
Gender	0.35**	0.12	0.14**	0.31**	0.11	0.13**
TC	−0.44***	0.10	−0.23***	−0.19*	0.08	−0.12*
PT	−0.05	0.06	−0.04	−0.05	0.05	−0.04
FO	0.50***	0.09	0.26***	0.30**	0.09	0.16**
TD	−0.08	0.06	−0.06	−0.08	0.06	−0.06
Family-to-work conflict				0.25**	0.08	0.17**
Work-to-family conflict				0.40***	0.07	0.29***
R^2	0.20***			0.34***		
R^2 change				0.13**		

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

Nowack (2023) suggested that in an unstable risk environment with limited accessible resources, there is more present-focused orientation, less future orientation, and a slower experience of time. He found a significant correlation between the experience of slow time and a lack of future orientation during the COVID-19 pandemic. Baumeister et al. (2016) defined pragmatic prospection as future-oriented thinking that supports practical efficiency, action orientation, promotes goals, and enables desirable outcomes in the future. Their theory of Pragmatic Prospection suggested that a basic premise that future thinking, as a basic mechanism of human existence, is based on the assumption of the ability to act on it. Another premise of the theory is that the future influences present experience by creating meaning. Based on these premises, it can be assumed that a prolonged war crisis, fundamentally characterized by a lack of control, unpredictability, and intense existential anxiety in the affected population, leads to an aversive focus on the present, which in itself loses structure and order, making it difficult to focus on the future. The absence of future orientation, in itself, makes it difficult to find meaning in the present (the present is not serving goals or desirable outcomes), a phenomenon directly related to emotional distress and the development of mental pathology.

4.2 Temporal disorientation, work–family conflict, emotional distress, and burnout

The current study highlights a significant association between work-family conflict, burnout, and emotional distress, with a new insight into this relationship during wartime. Furthermore, it identifies a connection between both sides of work-family conflict and temporal disorientation: individuals experiencing temporal confusion and difficulty in future orientation report stronger conflict. No such relationship was observed with the perceived pace of time or temporal distance.

Boundary Theory (Ashforth et al., 2000) suggests that boundary management represents a process in which individuals create, maintain, or modify boundaries in the world they operate in, including regarding their family and work roles. Time and place serve as markers that delineate different roles. For example,

the family role is usually associated with home, weekends, and evenings, while the work role is typically associated with weekdays and the workplace. Extreme prolonged crises, such as a pandemic or war, blur such markers, contributing to temporal disorientation. While slow time experience and temporal distance are significantly related in the literature to a negative effective state (depression), temporal confusion, and loss of future orientation may represent a deeper unraveling of time's continuity and coherence. This disintegration is critically related to impairment in functioning and motivation, and in our study, to work-family conflict.

4.3 Gender differences

The gender differences observed suggests that women report slightly higher temporal confusion, slower time perception, and greater burnout. These findings could reflect gender-specific challenges in balancing work and family roles, potentially leading to more strain, and burnout among women.

4.4 Limitations

This study has some limitations. First, it was conducted at a single time point, therefore limiting the ability to draw causal conclusions. A longitudinal approach could provide a deeper understanding of temporal disorientation's relationship with emotional distress and burnout. In addition, the use of snowball sampling and the focus on a population indirectly affected by the war suggest that broadening the study's scope would be helpful. The sample was also relatively homogeneous, with a high proportion of women and a generally high level of education, which may limit the generalizability of the findings. Future studies should aim to include more diverse populations in terms of gender, educational background, and other demographic factors. Regarding gender differences, is also possible that, in the context of the current war, some women experienced increased responsibilities at home due to their partners' reserve duty. Although only one participant in our sample reported such a

situation, future studies should further explore how gendered wartime roles may shape the experience of temporal disorientation and distress.

4.5 Implications and further research

The present study underscores the need for advancing theoretical and empirical understanding of the ways in which temporal disorientation relates to psychological functioning and motivation during periods of war, with particular emphasis on occupational contexts and the management of life roles. Such conceptual development holds promise not only for enriching theoretical discourse but also for informing intervention and treatment strategies aimed at sustaining daily routines and enhancing psychological resilience during extended states of crisis.

More broadly, the observed associations between temporal disorientation, emotional distress, and burnout are consistent with a growing body of literature linking disruptions in temporal experience to various forms of psychopathology, particularly depression, schizophrenia, and post-traumatic stress disorder (PTSD). Stanghellini et al. (2017), for instance, conceptualize depression as a disorder of lived time, identifying a deceleration in the subjective experience of time as a core diagnostic feature. Similarly, Blom et al. (2021) have called for further empirical work on the classification of temporal experience anomalies, proposing that temporal phenomenology may serve as a valuable diagnostic marker for specific psychopathological conditions. Future research in this domain may yield significant contributions to diagnostic frameworks.

Furthermore, the finding that diminished future orientation is associated with elevated psychological distress invites both theoretical refinement and practical application within the domain of Time Perspective research. Zimbardo and Boyd (1999) proposed a typology of individual differences in temporal orientation—toward the past, present, or future—demonstrating that these orientations are significantly associated with psychological wellbeing, adaptive functioning, and behavioral regulation. Although initially conceptualized as relatively stable dispositional traits, temporal orientations have also been shown to be modifiable through targeted interventions (Hall and Fong, 2003; Hershfield et al., 2011). Zimbardo and Boyd (2008), for example, suggest that individuals can acquire strategies to overcome maladaptive temporal biases. One intervention rooted in this framework, Time Perspective Therapy, has demonstrated efficacy in the treatment of PTSD (Sword et al., 2014). Continued empirical inquiry in this area may foster the development of additional therapeutic modalities grounded in subjective temporal experience and tailored to individuals facing psychological distress in the context of temporal disorientation.

4.6 Conclusions

The current study highlights the importance of the temporal experiential component in the development of emotional distress and burnout during prolonged crises. Szpunar and Liu (2023) discuss the connection between national temporal cognition and individual temporal cognition: the individual temporal experience of past-present-future is intertwined with collective national temporal experience. In this context, crisis events or gross disruptions of life scripts, like in war-time, may amplify such interaction when collective temporal disruption becomes significantly synchronized with individual disruption.

The findings of the current study indicate that temporal disorientation in the individual experience during wartime is significantly associated with emotional distress. The findings also indicate that temporal disruption is related to a loss of balance in the boundaries between major life roles and the development of occupational burnout; thus, this study contributes an occupational angle to the existing literature on psychological reactions to prolonged crises.

The practical implications of these findings point to the importance of maintaining, restoring, or rebuilding a "normal" temporal experience: here and now, time orientation, a continuous sense of time, and connection to the future. Preventing or rehabilitating temporal disorientation during prolonged crises could significantly contribute to the prevention of mental pathology, largely through a sense of predictability, control, influence, and competence.

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 humans were approved by the Institutional Review Board (IRB) of The Academic College of Tel-Aviv Yaffo. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

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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.

Generative AI statement

The author(s) declare that Gen AI was used in the creation of this manuscript. We utilized ChatGPT (OpenAI's GPT-4) for language improvement. The tool was employed to refine the clarity, grammar, and style of the text.

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Expatriation stressors and the well-being of accompanying partners: a commonality analysis approach

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Introduction: This cross-sectional study aims to explore the unique and shared effects of non-work expatriation stressors on the well-being of expatriate partners and spouses who relocate on a regular basis.

Methods: A cohort of 207 internationally mobile adults was recruited through international associations, foreign ministries, social media, and personal networks. Participants completed a quantitative online questionnaire that assessed various psychological factors. We employed commonality analysis to evaluate the unique and joint impact of perceived stress, perceived social support, isolation, and perceived cultural distance on partner well-being, using validated psychological scales.

Results: Perceived stress proved to be the most impactful unique contributor to partner well-being, while isolation emerged as the second strongest unique predictor. Perceived social support showed the most substantial combined effect with stress and isolation. The variance explained by perceived cultural distance was marginal, suggesting that stress and isolation are more influential factors in this population. The control variables (age, gender, duration of residence in the host country, and frequency of relocation) showed no significant contribution in combination with the stressors.

Discussion: Building on the findings of existing research, these results provide further support for the need for tailored interventions to promote the well-being of expatriate partners. Practical implications include involving partners in pre-assignment screening processes, investing in structured social support systems to reduce isolation, and developing comprehensive, culturally sensitive policies that address the range of challenges faced by expatriate partners.

Introduction

As markets have become more globalized over the past decades, modes of employment have similarly expanded across borders. Consequently, the expatriation of employees has become increasingly common, with an estimated 87.5 million employees transferring abroad for work reasons (Albien and Ruedin, 2023). In this paper, we used the term expatriation to refer to the international deployment of employees, who—in contrast to other populations on the move (e.g., long-term immigrants, refugees, asylum seekers, exchange students)— voluntarily relocate abroad for a preset amount of time (Sterle et al., 2018a) to sustain their

careers, i.e., in the private and public sectors, nongovernmental or governmental organizations, or academia (Berry et al., 2011), often accompanied by their partner and/or children (Caligiuri and Bonache, 2016). McNulty (2014) defines an expatriate family as "married, de facto, live-in, or long-term partners of the opposite or same sex, with or without children, with family members that reside in one or many locations; and legally separated or divorced (single) adults with children, with family members that resided in one or many locations" (p. 339).

Expatriation comes with both assets and drawbacks, which permeate multiple life areas, not only for expatriate employees but also for their accompanying spouses and partners. Generally, moving is perceived as stressful, resulting in a heightened baseline of stress perceptions for expatriate families (Cheung and Wong, 2022). Numerous studies have demonstrated that the levels of stress experienced by expatriates are increased (Anderzén and Arnetz, 1997; Aswegen, 2009; Berry, 2006; Brown, 2008; Doki et al., 2018; Moyle and Parkes, 1999; Riemer, 2000; Silbiger and Pines, 2014), which can adversely affect their well-being (Anderzén and Arnetz, 1997), and create spillover effects on other family members or crossover into other life areas (Sterle et al., 2018a).

Despite receiving less scholarly attention, the experience of expatriation for accompanying spouses and partners can be even more complex and multifaceted. Unlike expatriate employees, who typically enter pre-structured work environments, accompanying partners must rebuild their daily lives independently in unfamiliar settings, managing essential logistics such as housing, transportation, healthcare access, and schooling—often in a foreign language and cultural context (Andreason, 2008). This responsibility, coupled with limited initial support, can lead to significant social isolation and chronic stress (Brown, 2008; Kupka and Cathro, 2007). While expatriate employees engage daily with colleagues and benefit from organizational support, accompanying partners frequently experience loneliness, far from extended family or long-standing friendships, and with limited opportunities for meaningful social interaction (Sterle et al., 2018a). Many partners are also forced to give up their professional careers, which can severely impact their identity, sense of purpose, and self-worth (Rosenbusch and Cseh, 2012). The transition from an independent professional to a dependent homemaker or informal caregiver represents a dramatic change in self-perception and daily routine. These challenges are compounded by uncertainty about the future—employment prospects, potential career gaps, and the implications of further relocations—creating a persistent sense of instability (Rosenbusch et al., 2015; Sterle et al., 2018a).

At the same time, accompanying partners play a key role in supporting expatriate employees and thus contributing, also through crossover effects, to successful expatriation (Biswas et al., 2022; Shaffer and Wan, 2020). The inability of spouses to adjust is frequently cited as the primary reason for early abortions of an assignment (Andreason, 2008), with a premature termination leading to considerable financial costs for the employer (Aracı, 2015; Doki et al., 2018) and even greater pressure for the expatriate employee and their accompanying family. Given the systemic influence of stress on the well-being of expatriate spouses and partners, and its well-documented crossover effects on the employee and children (Sterle et al., 2018a), as well as the threat it poses to the overall success of an expatriation (Haslberger and Brewster, 2009), it is crucial to broaden our understanding of the specific stressors affecting expatriate spouses and partners.

Our study aims to identify and empirically examine key stressors that significantly contribute to psychological strain in expatriate spouses

and partners, with the goal of extending and improving existing support measures. Rather than using a formalized theoretical framework, we drew our insights from transactional stress theory (Lazarus and Folkman, 1984; Wurtz, 2022), and acculturation theory (Berry, 2006), all of which emphasize the interplay of individual perceptions and environmental stressors in shaping psychological well-being. Within this conceptual foundation and guided by the current literature on stressors in expatriate partners and spouses (Flachenecker and Gröschke, 2021; Rosenbusch et al., 2015; Sterle et al., 2018a), we chose to focus on four stressors—perceived stress, perceived social support, isolation, and perceived cultural distance. Those were selected based on both theoretical relevance and empirical evidence in the expatriation literature.

While we recognize that individual traits such as stress resilience are acknowledged mediators for mental health (Jones et al., 2023) or adjustment (Reed et al., 2023) of expatriate family members, this study focuses on situational stressors that are potentially modifiable through support interventions. These stressors often manifest through a range of physical, emotional, cognitive, or behavioral symptoms. Research indicates a raised experience of general stress among expatriates (Silbiger and Pines, 2014), which can trigger psychophysiological responses, including elevated levels of certain stress hormones, increased cardiovascular risk, and decreased mental well-being, as shown in a comparative study of expatriates and a control group (Anderzén and Arnetz, 1997). Emotional symptoms frequently manifest as anxiety, irritability, or pervasive feelings of sadness (Cangià, 2017; Kanstrén and Mäkelä, 2020; Perone et al., 2008) in expatriate partners and spouses. Cognitive symptoms may be evidenced by role or identity confusion or value-related dilemmas (Osland, 2000; Rosenbusch and Cseh, 2012). From a behavioral perspective, individuals may exhibit withdrawal, alterations in sleep or eating patterns, and an increased reliance on alcohol consumption, particularly among male expatriates (Burkholder et al., 2010; Rosenbusch et al., 2015; Takeuchi, 2010; Wurtz, 2018). The stress experienced can be acute, arising from isolated incidents related to daily living challenges, or chronic due to more enduring factors, such as a lack of close friends to confide in or the inability to spend quality time with one's partner due to increased work commitments of the expatriate employee (Brown, 2008). While the original culture shock model suggests that stress perceptions typically happen in several stages and change over time in a host country (Oberg, 1960), the linearity of stress perception has not been substantiated (Brown, 2008).

Isolation and the lack of perceived social support are interconnected. With a transition to a foreign country, the partners and spouses of the expatriate employee may feel stressed due to feelings of isolation (Brown, 2008). Isolation can result from a lack of time spent with one's partner and a lack of close friends in the host country (Sterle et al., 2018a). In particular, immediately after moving to a new country, many expatriate workers and partners experience loneliness and isolation (Bahn, 2015). However, even several months after the move, expatriate partners continue to worry about losing contact with friends and family in their home countries due to the relocation (Forster, 1997). Social support can be crucial for the adjustment of expatriate spouses (Copeland and Norell, 2002). Notably, expatriates' support from companies and families was found to be significantly related to their cross-cultural adjustment (Caligiuri et al., 1999). In reality, the expatriate community in a host country is often the only source of support for expatriate families (Kupka and Cathro, 2007). However, this network is not predetermined; it must first be established upon arrival at a new location, and its size and accessibility may vary depending on the type of posting.

Perceived cultural distance refers to the differences in specific domains between the previous host/home country and the new country of assignment. These domains include the environment, daily living, norms, language, and social contacts (Demes and Geeraert, 2014). The stronger the differences are, the lower an expatriate's sense of agency and familiarity, and the greater their psychological strain. As spouses and partners face these stress factors more frequently due to their increased exposure to everyday challenges, they may experience higher levels of stress. This vulnerability is closely related to the concept of acculturative stress, which Berry (2006) defined as "a response by individuals to life events (that are rooted in intercultural contact)" (Berry et al., 2002, p. 362), and is originally rooted in the idea of culture shock (Oberg, 1960). The reactions to cultural loss and uncertainty about the future can result in depression and anxiety (Berry, 2006). In an immigrant population, acculturation stress can contribute to negative mental (Salas-Wright et al., 2015) and physical health (Gonzalez-Guarda et al., 2021). Galchenko and van de Vijver (2007) found that exchange students who experienced a greater cultural distance between their home and host countries showed lower adjustment. For expatriate families with children, the level of cultural distance is a crucial factor in the decision to accept or reject an expatriate assignment (Dupuis et al., 2008).

Collectively, in this paper, the combined influence of these four stressors (perceived stress, perceived social support, isolation, perceived cultural distance) is referred to as expatriation stress. This provides a parsimonious yet comprehensive way to summarize the primary source of stress for expatriate partners. While previous research has identified various individual stressors such as role loss and identity disruption (Kupka and Cathro, 2007), financial strain and career disruption (Shaffer et al., 2012), our focus narrows to stressors that are widely applicable across partner demographics and can be addressed through organizational or psychosocial support. These stressors have been empirically linked to diminished partner well-being, and, through crossover effects, to the adjustment, well-being, and success of the expatriate employee and accompanying children (Haslberger and Brewster, 2009). Addressing the stressors faced by partners can lead to better preparation for expatriate assignments, potentially reducing the significant costs incurred by sending organizations due to premature terminations of an international assignment (Aracı, 2015). We also recognize that the mentioned additional stressors can intersect and exacerbate the core stressors we examine; for example, role loss may lead to feelings of perceived stress and isolation, while career disruption could intensify feelings of cultural distance or perceived social support.

By aligning our selection of stressors with both theoretical principles and empirical evidence, we aim to expand on the literature and make unique contributions to our understanding of expatriate partners' stress processes (1) by offering a measure to dissect non-work expatriation stress factors and their contribution to the well-being of the expatriate partner and (2) by quantifying the unique and common effects on the well-being of expatriate spouses/partners. Due to the exploratory nature of this study, we abdicate from presenting a predictive hypothesis and instead use commonality analysis to investigate the relative weight of each stress factor. Analyzing the potential influences of each individual stressor on the well-being of expatriate spouses and partners will contribute to an understanding of the effects of expatriation, inform the development and improvement of targeted support mechanisms, and, consequently, may prevent specific expatriation challenges and premature assignment terminations.

Materials and methods

Study procedure and sample characteristics

Data from 207 participants (see Table 1) were collected via a cross-sectional, quantitative English online questionnaire hosted on the web server of the University of Basel. As this investigation was part of a more extensive study on the well-being of expatriate families and children, to be included in the study, participants needed to (1) follow a predicted international relocation rhythm of 2 to 6 years for career reasons, (2) have at least one child between the ages of seven and 17, and (3) be proficient in English. Participants were excluded if they had no children, held the passport of their current country of residence, or were long-term immigrants, refugees, asylum seekers,

TABLE 1 Demographic variables of the study participants (N = 207).

Variables	N	%
Gender		
Female	191	92.3
Male	15	7.2
Other	1	0.5
Age		
25–34	2	1.0
35–44	87	42
45–54	105	50.7
55–64	13	6.3
Home Country Region		
Europe	131	63.3
Middle East & North Africa	2	1
Sub-Saharan Africa	2	1
Asia	11	5.3
Australia & Oceania	7	3.4
North America	48	23.2
Central America & Caribbean	4	1.9
South America	2	1
Number of International Relocations		
1–2 times	57	27.5
3–4 times	60	29
Five or more times	90	43.5
Country of Current Residency		
Europe	105	50.7
Middle East & North Africa	13	6.3
Sub-Saharan Africa	14	6.8
Asia	47	22.7
Australia & Oceania	5	2.4
North America	11	5.3
Central America & Caribbean	5	2.4
South America	7	3.4

or foreign exchange students. Participants were recruited through international partner and spouse associations, foreign ministries, social media, and personal contacts. Before completing the survey, participants were asked to confirm the inclusion criteria and consent to participate. Their anonymity was ensured because no personal information or IP addresses were collected. No monetary reimbursement was given for participation. The Ethics Committee of Basel University approved the study (Ethics Approval Number: 028–21-2).

Instruments and measures

Perceived stress

Perceived stress was assessed using the short 4-item version of the 10-item Perceived Stress Scale (PSS-Short; Cohen et al., 1983). The PSS scale questions, which primarily measure emotional and cognitive symptoms of stress, such as assessing the participant's ability to control life issues or handle personal problems, were rated on a Likert-type scale ranging from 0 (never) to 4 (very often). The results were summed to provide the total score, with higher scores indicating higher levels of stress perception. The Cronbach's alpha for the 4-item version of the PSS in this sample was 0.75.

Perceived social support

Perceived social support was assessed using the brief 6-item form of the original 14-item Perceived Social Support Questionnaire (F-SozU-K6; Kliem et al., 2015). Statements such as "*I receive a lot of understanding and security from others*" or "*If I am very depressed, I know who to turn to*" were included in the questionnaire and were rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The summarized results provided the total score, with lower scores representing lower levels and higher scores representing higher levels of perceived social support. The questionnaire was reliable for this sample, with a Cronbach's alpha of 0.88 for the 6-item version.

Isolation

Isolation was measured using the short 3-item version of the original 20-item Loneliness Scale (R-UCLA; Hughes et al., 2004). Responses were rated on a Likert-type scale ranging from 1 (hardly ever) to 3 (often), and the results were summed to provide the total score. The items included the following three questions: "*How often do you feel that you lack companionship?*," "*How often do you feel left out?*" and "*How often do you feel isolated from others?*." Higher scores indicated a greater feeling of isolation. In this sample, the Cronbach's alpha of the 3-item short version was 0.81.

Perceived cultural distance

Perceived cultural distance was assessed using the 12-item Brief Perceived Cultural Distance Scale (BPCDS; Demes and Geeraert, 2014). The items included ratings of differences on topics such as natural and social environments, living conditions, practicalities, food and eating, and family life, with responses rated from 1 (very similar) to 7 (very different). The responses were then summarized to obtain final scores. Lower total scores indicated a lower level of perceived cultural distance, and higher scores indicated a greater level of perceived cultural distance between the previous and current

countries of residence. The Cronbach's alpha for the BPCDS for this sample was 0.93.

Well-being

Well-being was measured using the 5-item WHO-5 Well-Being Index (Topp et al., 2015). The questionnaire included statements such as "*I have felt cheerful and in good spirits*" or "*I woke up feeling fresh and rested*" and was rated on a 5-point Likert scale from 0 (at no time) to 5 (all of the time). The ratings were summed to provide final scores; lower scores represented lower levels, and higher scores represented higher levels of well-being. In this sample, the Cronbach's alpha for the WHO-5 was 0.87.

Control variables

Based on the evidence in the current literature and to investigate their potential effects on the outcome, we included age, sex, duration of stay in the host country, and number of international relocations (Cieri et al., 1991; Martin, 1995; Stawski et al., 2008; Yalcin-Siedentopf et al., 2021) as covariates.

Data analysis

The data analysis was carried out in R version 4.3.2, including the R package yhat (Nimon et al., 2023). The data were analyzed using multiple linear regression to examine whether perceived stress, perceived social support, isolation, and perceived cultural distance predicted well-being after controlling for age, gender, duration of stay in the host country, and number of international relocations. In addition, commonality analysis was chosen as the most suitable extension to multiple regression analysis to decompose the multicollinearity of the four predictor variables (Gustavson et al., 2018).

Result

Preliminary analysis

The descriptive statistics of all the study variables are presented in Table 2. The assumptions of linearity, normality, multicollinearity, and homoscedasticity of residuals were met for the linear regression, and no significant outliers were detected.

The results from the correlation analysis (presented in Table 3) indicated moderate negative correlations between partner well-being

TABLE 2 Descriptive statistics of predictor variables.

Variables	N	Mean	SD	Skewness	Kurtosis
WHO5	207	14.15	4.9	−0.41	−0.3
PSS	207	5.67	2.97	0.32	−0.53
FSozU-K6	207	22.01	5.32	−0.63	−0.15
RUCLA	207	5.44	1.68	0.3	−0.54
BPCDSD	207	49.79	17.19	−0.14	−0.98

WHO5, World Health Organization Well-Being Index; PSS, Perceived Stress Scale; FSozU-K6, Perceived Social Support Questionnaire (short version); RUCLA, Loneliness Scale (short version); BPCDSD, Brief Perceived Cultural Distance Scale.

and perceived stress ($r = -0.63$, $p < 0.001$) and between partner well-being and sense of isolation ($r = -0.54$, $p < 0.001$). A moderate positive correlation was detected between perceived social support ($r = 0.44$, $p < 0.001$) and partner well-being. A weak negative correlation existed between perceived cultural distance and partner well-being ($r = -0.22$, $p < 0.01$). A moderate negative correlation was found between perceived stress and perceived social support ($r = -0.40$, $p < 0.001$) and between perceived social support and isolation ($r = -0.55$, $p < 0.001$). Perceived stress and isolation were moderately positively correlated ($r = 0.4$, $p < 0.001$).

Relationships among perceived stress, perceived social support, isolation, perceived cultural distance, and well-being

Multiple regression analysis revealed that higher levels of perceived stress, perceived social support, isolation, and perceived cultural distance predict lower partner well-being (see Table 4). All predictors accounted for a total of 53.28% (R^2) of the variance in partner well-being, $F(9, 197) = 24.96$, $p < 0.001$. Perceived stress ($B = -0.76$, $p < 0.001$) and isolation ($B = -0.84$, $p < 0.001$) explained the most variance in partner well-being. Perceived cultural distance ($B = -0.04$, $p < 0.01$) explained a minor amount of the variance in partner well-being, while perceived social support had a statistically insignificant relationship with well-being. None of the covariates contributed significantly to the variance in partner well-being. The estimated regression coefficients (B), standard errors (SE), standardized regression coefficients (β), and significance levels are reported in Table 4.

The results from the commonality analysis are presented in Table 5. Perceived stress accounted for the strongest variance in partner well-being, with a unique effect of U = 0.16, a common effect of C = 0.24, and a total contribution T (= U + C) of 0.40, translating into %R^2 = 30.04% of the total variance in partner well-being explained by perceived stress. Isolation was the second strongest unique predictor of partner well-being, with a unique effect of U = 0.05, a common effect of C = 0.24, and a total contribution of T = 0.30, translating into %R^2 = 9.88% of the total variance explained by isolation. Sense of social support (U = 0.0040; C = 0.19) and perceived cultural distance (U = 0.02; C = 0.03) explained only a minor amount of the total variance in partner well-being. In addition, the most substantial contributions for shared effects were calculated for the combination of perceived stress and isolation (%R^2 = 8.44%) and the combination of perceived stress, perceived social support, and isolation (%R^2 = 20.91%). The combination of perceived stress and social support accounted for only 5.07%, and perceived social support and isolation accounted for 6.52% of the total variance in partner well-being. None of the control variables, including age, gender, duration of residence in the host country, and frequency of relocation, demonstrated statistical significance when applied in combination with the stressors.

Discussion

To our knowledge, this is the first study to investigate the unique and shared effects of different non-work expatriation stressors on the well-being of expatriate spouses/partners. Our findings indicate that

TABLE 3 Correlations between variables.

Variables	WHO5	PSS	FSoz-U-K6	RUCLA	BPCDSD
WHO5	–				
PSS	−0.63***	–			
FSozU-K6	0.44***	−0.40***	–		
RUCLA	−0.54***	0.4***	−0.55***	–	
BPCDSD	−0.22**	0.08	−0.03	0.17*	–

WHO5, World Health Organization Well-Being Index; PSS, Perceived Stress Scale; FSozU-K6, Perceived Social Support Questionnaire (short version); RUCLA, Loneliness Scale (short version); BPCDSD, Brief Perceived Cultural Distance Scale. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TABLE 4 Hierarchical multiple regression with perceived stress, perceived social support, isolation, and perceived cultural distance predicting well-being.

Predictor	B	SE	β	p
PSS	−0.76	0.09	−0.46	0.001***
FSozU-K6	0.07	0.06	0.08	0.19
RUCLA	−0.84	0.18	−0.29	0.001***
BPCDSD	−0.04	0.01	−0.14	0.006**

PSS, Perceived Stress Scale; FSozU-K6, Perceived Social Support Questionnaire (short version); RUCLA, Loneliness Scale (short version); BPCDSD, Brief Perceived Cultural Distance Scale. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TABLE 5 Commonality analysis representing the variance in well-being explained by perceived stress, perceived social support, loneliness, and perceived cultural distance.

Effects	Predictors	Commonality coefficient (R^2)	β	p
Unique effects (U)	PSS	0.16	−0.46	0.001***
	FSozU-K6	0.00	0.08	0.19
	RUCLA	0.05	−0.29	0.001***
	BPCDSD	0.02	−0.14	0.006**
Common effects (C)	PSS, FSozU-K6	0.03	–	–
	PSS, RUCLA	0.05	–	–
	PSS, FSozU-K6, RUCLA	0.11	–	–

PSS, Perceived Stress Scale; FSozU-K6, Perceived Social Support Questionnaire (short version); RUCLA, Loneliness Scale (short version); BPCDSD, Brief Perceived Cultural Distance Scale. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

perceived stress, perceived social support, isolation, and perceived cultural distance each contribute uniquely and jointly to the well-being of expatriate spouses and partners.

Consistent with existing research on the link between stress and well-being (Anderzén and Arnetz, 1997) and the adjustment process (Rosenbusch and Cseh, 2012), our findings revealed that perceived stress has the most significant unique impact on the well-being of expatriate partners, accounting for around 30% of the variance. This finding underscores the profound impact of stress on expatriate spouses and partners during a posting abroad, highlighting the critical need for targeted stress reduction interventions for accompanying partners.

In line with previous research on the dominant stressors of expatriation (Brown, 2008; Doki et al., 2018; Rosenbusch et al., 2015), isolation emerged as the second most significant predictor, accounting for 9.88% of the variance in partner well-being. Expatriates face isolation in several ways: leaving a well-connected environment, with proximity to family, a familiar language, and local knowledge, to relocate to a new location where these factors are absent. Additionally, the new professional role of expatriate employees may leave partners or spouses without contacts, careers, and support, thereby increasing the perception of isolation, especially among newly arrived expatriates.

In contrast to expectations, a lack of perceived social support had a low unique impact on the well-being of expatriate partners (0.0040). Nevertheless, some significance of this variable is conveyed through its interconnections with the other variables. When combined with perceived stress and isolation, the lack of perceived social support accounted for 20.91% of the total variance in partner well-being. This suggests that the social support received by expatriate partners can mitigate the adverse effects of stress and isolation, thereby improving their well-being.

When combined, perceived stress and isolation jointly contributed 8.44% to the variance in partner well-being, reinforcing the intertwined nature of the examined factors. The joint effect of perceived stress, perceived social support, and isolation (20.91%) highlights the complex interaction of these factors, suggesting a holistic approach that addresses multiple facets simultaneously for the most effective support interventions for expatriate partners and spouses.

Perceived cultural distance accounted for a marginal amount of variance in partner well-being (U = 0.02; C = 0.03), indicating that stress and isolation may play a more significant role in this population than cultural factors. This limited contribution could also be influenced by the sample composition, which predominantly comprised participants who relocated between culturally similar Western countries. Such transitions typically involve fewer cultural adjustments, leading to a diminished perception of cultural distance. Furthermore, while participants experienced considerable changes in their geographical surroundings, the effects on their immediate personal environment are likely more nuanced and intrinsic, resulting in minimal impact on their overall well-being. Nonetheless, as societies become increasingly culturally diverse, it is essential to consider the implications of cultural contexts and their potential effects on partners' experiences and well-being.

In conclusion, our study aligns with the current literature on expatriation stress, emphasizing the roles of perceived stress, perceived social support, isolation, and perceived cultural differences. While previous investigations have consistently identified occupational stress as having a strong relationship with well-being and adjustment (Rosenbusch et al., 2015), our focus on non-work-related expatriation stressors enriches the understanding of this field and offers valuable insights into the overall adjustment process of expatriate partners.

Implications of study findings

The findings of our study reinforce and extend the existing empirical evidence on the effects of expatriation stressors on spouses and partners, highlighting their significant impact on overall well-being (Brown, 2008; Foyle et al., 1998; Rosenbusch et al., 2015). While support interventions have been shown to effectively improve

adjustment and mitigate expatriation risks (Ali et al., 2003; Cole, 2011; Lazarova et al., 2015), the lack thereof has been identified as a primary and underreported reason for assignment failure (Cole and Nesbeth, 2014). Therefore, the results of this research underscore the urgent need to complement, customize, and strengthen existing interventions to address the specific challenges faced by accompanying spouses and partners. Drawing on our findings and previous studies, we outline the following suggestions to enhance the effectiveness and sustainability of existing interventions.

Improving the selection process for expatriate candidates and partners

One of the most significant predictors of early termination of expatriate assignments is the difficulty that the accompanying spouse or partner experiences in adjusting to life abroad (Andreason, 2008). Therefore, the selection process should extend beyond the employee to include a comprehensive assessment of the partner's potential stressors and adjustment capacity. Relevant factors may include the existence of a meaningful career in the home country and the feasibility of continuing or resuming it in the host country, as well as ongoing family obligations in the home country, such as caregiving responsibilities for elderly relatives. Identifying such challenges early enables organizations to make more informed decisions and tailor their preparatory support accordingly. Including the spouse or partner in the screening process ensures better alignment between the family system and the demands of international relocation, ultimately reducing the risk of failed assignments and premature returns (Andreason, 2008).

Designing specific interventions to target perceived stress

Our study underlines the crucial need to consolidate a discussion around stress as a risk factor and stress management as an essential topic for the entire expatriate family. Given that perceived stress accounts for the largest proportion of variance in partner well-being, it is essential to proactively increase awareness among these families about stress-related risks. The inclusion of stress management skills training should be treated as a non-negotiable component of pre-departure training, emphasizing techniques such as mindfulness-based stress reduction, cognitive-behavioral therapy, and relaxation methods. Wellness programs tailored to the specific needs and circumstances of the posting (Rosenbusch et al., 2015), and access to counseling services and support groups can offer ongoing assistance throughout the assignment, improving adjustment and decreasing stress (Platanitis, 2017). These efforts may also reduce reciprocal effects on family members through spill-over and crossover effects.

Addressing social isolation and promoting social support systems

With isolation emerging as the second most significant predictor of partner well-being, it is vital to support expatriate partners and spouses in fostering social connectivity to mitigate feelings of isolation (Brown, 2008). Although perceived social support contributed marginally to an individual's well-being, its significance in combination with other variables underscores its importance. Implementing community-building programs, introducing new families to existing networks, arranging partner contacts even before relocation, or providing online support groups for expatriate partners and spouses of the same employer or organization can help alleviate

feelings of isolation and establish social connections (Rosenbusch et al., 2015).

Empirical studies support the effectiveness of these interventions. Participation in online support groups has been linked to reductions in social isolation and loneliness over time, particularly when participants engage actively with the community (Trail et al., 2020). Canhilal et al. (2022) further found that virtual support platforms function as meaningful complementary resources. The availability of socioemotional support has been positively associated with better interaction and work adjustment among expatriates, highlighting the importance of emotional and informational resources in facilitating adaptation (Sterle et al., 2018b). Through sustained funding from policymakers, the impact of these support systems can be maximized. Funding for community programs, online support options, and training in networking skills can create opportunities for partners to connect and build relationships (Brown, 2008).

Employers also play a crucial role by offering flexible work schedules to employees who have recently transferred abroad with their families, thereby providing the best possible support for partners while minimizing additional stress through crossover impacts. Introducing both virtual and physical support mechanisms to accompanying partners and minimizing potential stressors before, during, and after a transition can be a powerful way to alleviate some of the burden of the expatriate employee.

Considering cultural contexts

While perceived cultural distance made a minor, yet unique, contribution to well-being in this sample, likely due to the predominance of relocations between culturally similar Western countries, cultural context remains a crucial consideration. As organizations expand their financial investments into new and profitable markets in Africa, Asia, and Latin America (UNCTAD, 2005), the likelihood of more parent country national expatriates relocating to culturally distant countries from their countries of origin will grow (Colakoglu and Caligiuri, 2008). Here, it needs to be kept in mind that the perceived degree of similarity between home and host countries has consistently been an important and decisive factor in an employee's willingness to accept an international assignment, particularly when relocating with a partner or children (Wagner and Westaby, 2009).

While many companies and organizations already offer intercultural training, language courses, and host-country education/orientation programs as part of their expatriation strategy, our findings suggest that the effectiveness of these measures may depend on how well they address the specific stressors faced by accompanying partners. By deepening cultural knowledge and increasing situational familiarity, such programs have the potential to build confidence in expatriate partners, which in turn may reduce uncertainty and perceived stress. Tailored interventions that acknowledge the family's unique composition and specific destination context can thus serve not only to ease cultural adjustment but also to strengthen psychological resilience and overall well-being during the assignment.

Supporting partner well-being through holistic approaches

Given the complex interplay of various predictors of the well-being of expatriate spouses and partners, a holistic and systemic approach is essential to support accompanying partners effectively.

Integrating the measures outlined above into a coordinated support framework can significantly improve partner adjustment, satisfaction, and resilience throughout the expatriation. Existing programs should be complemented and designed to address both individual and family-level needs, combining practical guidance with psychological support. A well-rounded approach might include the following elements:

1) Involving spouses and partners in pre-assignment screenings to evaluate their suitability, motivation, and individual circumstances, while adapting preparatory measures accordingly.
2) Pre-assignment preparatory measures, including language and intercultural training, career transition planning, and professional orientation. These measures not only increase knowledge and familiarity with the host environment but also foster a sense of competence and reduce anticipatory stress. Additionally, training in networking strategies can strengthen social self-efficacy and help partners build meaningful connections abroad.
3) Ongoing in-country support, such as access to counseling services, peer support groups, and financial or logistical support for community engagement initiatives. These interventions help mitigate social isolation, sustain emotional well-being, and create opportunities for integration and empowerment.
4) Post-assignment debriefings, which allow partners to reflect on their experiences, consolidate gains, and foster motivation and psychological readiness for future expatriate deployments.

By addressing emotional, social, cultural, and logistical needs across all phases of the expatriation journey, such holistic programs not only enhance individual well-being but also strengthen the overall success and sustainability of international assignments.

Policy implications

Last, but not least, policymakers and organizational decision-makers should recognize the key role of expatriate partners in the success of the expatriation process. The interaction of multiple stressors shapes the well-being of accompanying partners, and failure to address these adequately can jeopardize both family adjustment and assignment outcomes. Continued investment in policies that promote mental well-being and social integration, particularly through the holistic, preventive measures outlined above, should be considered strategic priorities. Such investments not only enhance the overall expatriate experience for families but also contribute to greater employee satisfaction, improved retention rates, and reduced assignment failure costs for the sending organization. By acknowledging and addressing the systemic nature of expatriation challenges, policymakers can help create a more sustainable and supportive framework for internationally mobile families.

Limitations

Demographically and contextually, this study presented several limitations: more than 90% of survey responses were completed by females. While this distribution accurately mirrors the current real-world situation in which expatriate spouses and partners are

predominantly female, it limits our ability to explore the stress experiences of male expatriates. Furthermore, the sample was relatively homogenous when considering participants' relationship status, with almost 100% in a marriage or long-term relationship. This restriction bereaves us of the opportunity to delve more deeply into the circumstances and perceptions of more contemporary family models, such as single-parent households and same-sex families. Additionally, almost 90% of participants were of Western origin, specifically from Europe or North America, while around 10% represented other world regions. Nearly half of the participants (50.7%) indicated that Europe was their current host country, which may impact their stress perception and well-being, given the comparatively high standards of living in host countries, particularly in terms of safety, healthcare, and education. Furthermore, this study did not differentiate between different types of relocation, which may significantly impact the levels, nature, and dimensions of stress. For example, investigating differences in stress factors between self-initiated expatriates and those assigned by employers, as well as dual-career couples versus single-career arrangements, and families experiencing long-term separation due to frequent business travel, would offer critical insights.

Future directions

Future research should expand on our findings by investigating and incorporating additional stress variables, such as the stress caused by losing employment due to relocation in the case of spouses or partners. Establishing the construct of expatriation stress by further exploring the most impactful stressors and the most potent combinations, and then conceptualizing the construct, would be an interesting and helpful step in supporting accompanying spouses/partners and expatriate families. Designing a targeted scale to measure the stress levels of expatriates before, during, and after relocation could provide a simple yet powerful tool to support families in need of mitigation.

Furthermore, since our population was relatively homogeneous in terms of gender and area of origin, it would be worthwhile to diversify the population to determine whether stress perception and its impact on well-being differ across various cultural and demographic groups. In particular, the experience of male accompanying partners warrants deeper investigation. Although still a minority, their numbers are gradually increasing (Haslberger and Brewster, 2008). Male partners may be more severely affected by certain stressors, such as role reversal and career discontinuity, which can challenge their identity and increase vulnerability to stress (Cole, 2011). Social norms and persistent stereotypes in some countries can limit societal acceptance of male stay-at-home spouses, and support networks remain scarce, due to their small number or gender exclusivity. As a result, male spouses may be more isolated and under-supported (Selmer and Leung, 2003), placing them at greater risk of elevated stress and relationship strain.

Conclusion

The present study highlights the influential role of the examined stressors – perceived stress, perceived social support, isolation, and perceived cultural distance – on the well-being of expatriated accompanying spouses and partners, providing valuable insights into their relative importance. Understanding the differing weights of stressors enables employers and sending organizations to make informed decisions regarding the design and offer of training and preparation interventions. Tailored support strategies addressing the most critical stressors may have a profound impact on the well-being and adjustment of expatriate partners and their families, and, considering its vital role in the relocation process, on the success of expatriation.

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 humans were approved by the Ethics Committee of Basel University (Ethics approval number: 028–21-2). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

KA: Formal analysis, Conceptualization, Project administration, Writing – review & editing, Data curation, Methodology, Writing – original draft. AM: Writing – review & editing, Formal analysis. JG: Writing – review & editing. YO: Methodology, Investigation, Conceptualization, Writing – review & editing.

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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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Beyond meaning: hope and secondary trauma in Israeli therapists after the October 7th massacre

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The massacre on October 7th, 2023 in southern Israel had a profound impact on mental health therapists in the region. Such collective trauma can lead to heightened stress and secondary trauma among therapists. Identifying resilience and risk factors is, therefore, essential for mitigating these effects. This preliminary study involved 60 therapists (75% women; M = 48.3 years, SD = 10.7) from the Sderot Resilience Center, located near the Gaza border, who completed questionnaires about demographic, professional, and war-related factors, as well as secondary trauma symptoms, finding meaning in work, sense of hope, and stress levels during the war, 1 year after the attack. Loss of a loved one during the war was associated with higher stress levels. Secondary trauma symptoms were linked with increased stress, and higher levels of hope were associated with reduced stress. Moderation models indicated that finding meaning in work was associated with lower stress only when secondary trauma symptoms were low or moderate, but not when they were high. Higher hope levels were linked to reduced stress regardless of secondary trauma severity. Although preliminary and cross-sectional, these findings suggest that whereas finding meaning in work may motivate therapists, it may not fully protect them against stress during extreme trauma. Hope, however, appears to offer a stronger protective buffer. Interventions to mitigate risk factors, reduce secondary trauma, and foster hopeful thinking are essential.

KEYWORDS

hope, meaning, secondary trauma, therapists, war

Introduction

The Hamas massacre in Israel on October 7th, 2023 significantly amplified the challenges faced by trauma therapists, particularly those working near the Gaza border (Taubman Ben Ari et al., 2024). Residents in this area endured direct threats to their lives, relentless rocket attacks, the destruction of their homes, and the heartbreaking loss or abduction of loved ones. In the aftermath of the massacre, many residents were evacuated from their homes and were compelled to grapple with profound trauma, uncertainty, and fear (Levi-Belz et al., 2024).

In the year following the massacre, trauma therapists working near the Gaza border confronted the dual burden of supporting clients deeply affected by the massacre and the war, while simultaneously enduring the same collective trauma themselves (Saar-Ashkenazy et al., 2024; Stahnke and Firestone, 2024). This phenomenon, known as "shared traumatic reality," highlights the unique difficulty of being both personally impacted by a catastrophic event and professionally responsible for helping others cope with it (Baum, 2010).

A study conducted a month after the massacre found alarmingly high rates of post-traumatic stress disorder (PTSD) symptoms, depression, and anxiety among Israeli residents, reflecting the immense psychological impact of the October 7th atrocities on the population and the corresponding strain on mental health providers (Levi-Belz et al., 2024). Several studies (Ben-Kimhy et al., 2025; Erel-Brodsky et al., 2024; Taubman Ben Ari et al., 2024) revealed that therapists, like their clients, experienced intense feelings of helplessness, fear, sorrow, and a sense of a collapsing world. Yet many therapists sought to sustain their sense of meaning through their work as a way to cope. Mental health workers who experienced trauma prior to October 7th reported increased stress and secondary trauma shortly after the massacre, whereas personal resilience was associated with reduced stress among this cohort (Dahan et al., 2024).

According to conservation of resources (COR) theory (Hobfoll and Hou, 2025), under traumatic conditions, individuals strive to preserve resources essential for self-protection as a way to mitigate stress. Extreme events, such as the October 7th events in Israel, underscore the urgent need to identify risk and resilience factors that can effectively mitigate stress levels for therapists working in contexts of collective trauma, particularly in high-intensity war zones. Previous studies have shown that "finding meaning in work" and "sense of hope" act as resilience resources, helping to reduce stress among trauma therapists (Passmore et al., 2019). Although numerous resilience factors have been identified, recent research that was conducted after the attacks underscored the notion that these two factors are particularly crucial in fostering the well-being of trauma therapists (Lev et al., 2023; Taubman Ben Ari et al., 2024).

Guided by COR theory, in this exploratory study we explored how different resources such as demographic factors, professional factors, war-related factors, and personal resilience factors (i.e., finding meaning in work and sense of hope) were related to the stress levels of therapists working in a war zone (i.e., near the Gaza border in Israel), 1 year after the massacre. We also examined how personal resilience factors interacted with the risk factor of secondary trauma symptoms to mitigate therapists' stress levels.

Stress among trauma therapists

Trauma therapists are particularly vulnerable to stress and tension due to the emotionally demanding nature of their work (Molnar et al., 2017). Constant exposure to clients' traumatic experiences can lead to greater stress, as therapists are highly engaged in the emotional distress of those they treat (Figley, 2002; Leung et al., 2023). The unpredictability of trauma work, ethical dilemmas, and the pressure to provide effective interventions contribute to this heightened stress, which can become chronic (Bride, 2004).

Recent studies have identified several key factors associated with trauma therapists' stress. Demographic factors such as younger age, less clinical experience, and being female have been associated with their higher levels of stress (Cieslak et al., 2014). Therapists' negative personal perspectives on treatment also influence stress outcomes (Miller Itay and Turliuc, 2023). Additionally, lack of resilience and inadequate self-care practices increase vulnerability to stress and burnout among therapists, particularly during crises (Cook and Fye, 2023; Litam et al., 2021). Active engagement in providing assistance has, for its part, been

identified as a moderating factor in the relation between traumatic stress and resilience among first responders (Saar-Ashkenazy et al., 2024). Furthermore, personal and job-related factors (gender, resilience, social support, frequency of moral dilemma, and exposure to client violence), rather than years of experience, have also been found to influence stress among trauma therapists (Lev et al., 2022).

Secondary trauma

Studies suggest that a major factor in trauma therapists' stress is continuous exposure to clients' traumatic experiences, which can lead to secondary trauma symptoms and emotional exhaustion (Leung et al., 2023). Secondary trauma symptoms include symptoms such as intrusive thoughts, flashbacks, and nightmares (Gentry, 2002), which may lead to distress indicators such as sleep disturbances, emotional withdrawal, irritability, and difficulty concentrating (Finzi-Dottan and Berckovitch Kormosh, 2016; Hamama-Raz and Minerbi, 2019; Quinn et al., 2019). Such symptoms may also lead to neglect or minimization of client needs (Finzi-Dottan and Berckovitch Kormosh, 2016).

Some therapists may even develop secondary traumatic stress (STS), a condition that closely resembles PTSD, due to repeated exposure to clients' traumatic experiences (Leung et al., 2023). When left unaddressed, STS can escalate, increasing the risk of developing a PTSD diagnosis and impairing therapists' emotional well-being, professional functioning, and overall quality of life (Hensel et al., 2015).

Meaning in work

Meaning in work is defined as individuals' subjective perception of significance and value in their work (Allan et al., 2015). Martela and Pessi (2018) defined meaningful work as consisting of the intrinsic value of the work itself, self-realization, and the contribution one feels one is making to a larger purpose. Meaningful work is strongly associated with work engagement, commitment, and job satisfaction, as well as with overall well-being and reduced stress (Allan et al., 2019). The more therapists find meaning in their work, the lower their levels of burnout are likely to be, even when their work involves heavy workloads and is performed under challenging conditions (Pardes et al., 2014).

Taubman Ben Ari et al. (2024) found that therapists responding to the aftermath of October 7th in Israel balanced the stress of working with clients by deriving meaning from their work. They reported positive outcomes such as pride, accomplishment, personal and spiritual growth, and renewed purpose. Levkovich and Labes (2024) indicated that counselors working in Israeli communities along the Gaza border experienced a deep sense of fulfillment and positive psychological growth, which they attributed to the meaningful nature of their work with evacuees (i.e., from the communities that, after the October 7th attack, were at further risk of war or had been destroyed). Accordingly, one of the recommendations of the National Council for Post-Trauma following the events of October 7th was to cultivate a sense of meaning in work as a protective factor for first responder therapists (Lev et al., 2023), which provided the rationale for focusing on meaning in work in our study.

Hope

According to Snyder (2002), hope represents the ability to identify pathways toward desired goals and to motivate oneself to pursue those paths. Hope is considered to be a significant predictor of individual psychological adjustment in challenging life situations (Deniz et al., 2023; Gallagher et al., 2020). Studies have indicated that hopeful individuals are also more skilled at identifying effective strategies to achieve their goals and navigate challenges, making it easier for them to cope with and manage stress (Shorey et al., 2007).

Lev et al. (2023) emphasized the crucial role of hope in enhancing resilience among therapists. Consistently, hope has been identified as a key protective factor for professionals working in high-stress environments (Passmore et al., 2019; Pharris et al., 2022; Usta and Bekircan, 2024). Sustaining hope not only supports therapists' well-being and reinforces their sense of purpose and commitment to their work, but also benefits clients by fostering their post-traumatic growth (Levi, 2013). Given the demonstrated importance of hope in therapeutic resilience, we chose to focus on this variable in the current study to explore its contribution to therapists' reduced stress levels.

The current study

Trauma therapists' demanding role during a collective trauma has been shown to heighten their vulnerability to stress. In this exploratory study we focused on therapists working at the Sderot Resilience Center in Israel 1 year after the October 7th massacre. Sderot is the largest city near the Gaza border, which has long faced ongoing exposure to traumatic events. On October 7th Sderot suffered a brutal attack, forcing all residents to evacuate from their homes for months. The Sderot Resilience Center, which has provided emotional support to the Sderot community for over 15 years, intensified its efforts after the attacks, with both new and experienced therapists joining forces to address the increased demand for care.

In accordance with COR theory, we explored the connection between the therapists' demographic and professional aspects, war-related factors, and resilience factors, and the degree to which the therapists felt stress. Specifically, we hypothesized that finding meaning in work as well as sense of hope would serve as resilience factors, and that therapists who experienced high levels of meaning and hope would report lower levels of stress. However, given that these therapists worked in a high-intensity war and traumatic zone, we proposed that the protective effect of these resilience factors might depend on the severity of their secondary trauma symptoms. In other words, we assumed that varying levels of secondary trauma symptoms might moderate the extent to which meaning and hope would mitigate therapists' stress.

Materials and methods

Participants

Eligible participants consisted of 258 trauma therapists affiliated with the Sderot Resilience Center, located near the Gaza border, 1 year following the October 7th attack. All eligible individuals were invited to participate via a targeted outreach in professional online groups. Of those approached, 72 therapists provided informed consent to participate, and 60 completed all study questionnaires in full. Of the therapists, 75% were women. Therapists' average age was 48.2 years (SD = 10.7) and ranged from 30 to 74 years. The majority (77.8%) were married or in a relationship, and had an average of 2.93 children (SD = 1.5). Regarding religious affiliation, 58.3% identified as secular, 8.3% as traditional, 20% as religious, and 3.3% as other. Participants had an average of 17.7 years of education (SD = 3.5).

Therapists' average professional experience was 15 years in duration (SD = 8.8). Concerning their professional tenure at the Sderot Resilience Center, 50% had been working there for 1 year, 24.1% for 1–4 years, 14.8% for 5–10 years, and 11.1% for more than 10 years. On average, study participants treated 12.07 clients per week (SD = 6.5). Geographically, 18.5% resided in the Gaza Envelope (i.e., the populated areas in the Southern District of Israel that are within seven kilometers of the Gaza Strip border and are therefore within range of mortar shells and Qassam rockets launched from the Gaza Strip); 33.3% lived within a 40-kilometer range of the Gaza border; and 48.1% lived more than 40 kilometers away. Additionally, 20.4% of the participants were evacuated from their homes during the Swords of Iron War – namely, the Israel-Hamas war that began following the October 7th Hamas attack on Israel—and 24.1% reported experiencing the loss of a loved one during the war.

Instruments

The work and meaning inventory (WAMI)

Developed by Steger et al. (2012), the WAMI consists of 10 items divided into three subscales: positive meaning, meaning through work, and motivation for the common good. For this study, the "motivation-for-the-common-good" subscale was used to assess participants' sense of finding meaning in their work. Respondents rated each item on a 7-point Likert scale. In this study, we adjusted the questionnaire to address participants' work at the Resilience Center. An example item was: "I know that my work at the Resilience Center makes a positive change in the world." The Hebrew version of the scale has been used in previous studies (e.g., Yakobi et al., 2023). Cronbach's alpha coefficient was 0.65.

Compassion fatigue scale-revised

This 13-item self-report questionnaire, developed by Adams et al. (2006), includes two subscales: (1) a five-item secondary trauma subscale, and (2) an eight-item work burnout subscale. Respondents rate each item on a 10-point Likert scale, from 1 (*never or rarely*) to 10 (*very often*). In the current study, we focused on the secondary trauma subscale. An example item from the secondary trauma subscale was: "I experienced disturbing dreams similar to those of my clients." The ratings for all items from the secondary trauma subscale are summed, and the average of these sums represents the final score. Cronbach's alpha coefficient was 0.75.

The Hope Scale

The Hebrew version of the Hope Scale (Lackaye and Margalit, 2006), originally developed by Snyder (2002), is a self-report measure for adults that assesses hope levels. It consists of six statements, answered on a 6-point scale, with the hope score calculated as the average of the responses. The items are divided into two subscales: goal-oriented thinking (e.g., "I feel that I am achieving the goals I have set for myself")

and process-oriented thinking (e.g., "If I encounter a problem, I can think of many ways to resolve it"). Cronbach's alpha coefficient was 0.86.

Stress

Participants' stress levels were assessed using one question: "In the past few weeks how much stress/tension did you experience?" Responses ranged from 1 (*rarely*) to 7 (*very often*). The use of one question to assess stress, in order to reduce the burden on participants, has been validated in former studies (Elo et al., 2003; Littman et al., 2006).

Sociodemographic data

Participants were asked to complete a short demographic questionnaire regarding gender, age, years of education, marital status, religiosity, area of residence, length of time working at the Resilience Center, how qualified they felt to work with trauma (1 = *not at all* to 7 = *very much*), number of clients, and the impact of the Swords of Iron War. This last aspect included questions regarding participants' evacuation from their homes and any loss of a loved one they experienced during the war (i.e., personal loss).

Procedure

After receiving approval from the authors' college's ethics committee and the Sderot Resilience Center, the questionnaires were presented as an electronic link to therapists working at the Sderot Resilience Center by the research team. Missing data accounted for ~3.3% of the sample and were handled using available-case analysis, whereby cases with missing values on variables relevant to a given analysis were excluded. The preliminary analysis consisted of t-tests, analyses of variance (ANOVAs), and Pearson correlations using SPSS 29 in order to examine associations among the demographic and research measures. Based on theorized methods in which secondary trauma symptoms may moderate the relation between finding meaning in work and stress, and between sense of hope and stress, a moderation model was examined, using Preacher and Hayes' (2008) bootstrapping method with 5,000 resamples with replacement. Bootstrapping was used as it provides a more reliable estimate of indirect effects and does not assume normality (Preacher and Hayes, 2008).

Sample size calculation

A power analysis was conducted using GPower 3.1 to determine the required sample size for a multiple regression analysis with four predictors, including the interaction term for moderation. The analysis was based on an alpha level of 0.05, a power of 0.80, and effect size estimates following Cohen's (1988) guidelines: small ($f^2 = 0.02$), medium ($f^2 = 0.15$), and large ($f^2 = 0.35$). The required sample size for a medium effect was 77, and for a large effect it was 36.

Results

Associations between the study variables

Therapists' stress levels did not differ in terms of gender [$t_{(58)} = 1.52$, $p = 0.07$], evacuation status [$t_{(58)} = -1.39$, $p = 0.73$], geographic residence [$F_{(2,57)} = 1.57$, $p = 0.21$, $\eta2 = 0.05$], or religion [$F_{(3,56)} = 1.25$, $p = 0.30$, $\eta2 = 0.07$]. Therapists who experienced personal loss during the war reported higher stress levels than those who had not experienced such a loss [$t_{(58)} = -2.55$, $p = 0.00$]. The effect size, as measured by Cohen's d, was large, $d = -0.81$.

Pearson correlations did not indicate a significant correlation between stress and age ($r = -0.07$, $p = 0.58$), experience in trauma therapy ($r = -0.17$, $p = 0.22$), number of clients ($r = -0.13$, $p = 0.31$), or length of time working at the Resilience Center ($r = 0.22$, $p = 0.10$).

Means and standard deviations (*SD*s) and Pearson correlations among the research measures are presented in Table 1. As can be seen in Table 1, stress was significantly and positively correlated with secondary trauma symptoms and negatively correlated with sense of hope. No significant correlation was found between the variables and finding meaning in work. A moderation analysis was performed to further examine the interactions between the predictors.

Moderation analyses

To assess the robustness of these findings and determine whether the relation between finding meaning in work and stress varied across different levels of secondary trauma symptoms (at the 16th, 50th, and 84th percentiles), a moderation model (Command Model 1) was tested using SPSS PROCESS macro (Hayes, 2018). Interaction terms were calculated using mean-centering, and personal loss during the war was included as a covariate in the analysis.

The model was significant, $F_{(4,55)} = 4.77$, $p = 0.00$, explaining 28.03% of the variance in stress (Cohen's $f^2 = 0.39$), indicating a large effect. The model indicated that finding meaning in work was significantly related to stress, $b = -1.90$, $SE = 0.72$, $t = -2.61$, $p = 0.01$, 95% CI = [-3.3657, -0.4410]. Secondary trauma symptoms were

TABLE 1 Means, *SD*s, and Pearson correlations among the variables.

Variables	1	2	3	4
1. Stress	--			
2. Secondary trauma	0.36**	--		
3. Hope	−0.31*	−0.19	--	
4. Meaning	−0.02	−0.11	0.07	--
M	4.21	12.08	4.31	5.55
SD	1.51	4.85	0.62	0.88

*$p < 0.05$; **$p < 0.01$. The variables in the table are numbered as follows: 1 = Stress, 2 = Secondary trauma, 3 = Hope, 4 = Meaning.

significantly related to stress, $b = -3.13$, $SE = 1.33$, $t = -2.35$, $p = 0.02$, 95% CI = $[-5.8102, -0.4634]$. Furthermore, secondary trauma symptoms significantly moderated the relation between finding meaning and stress, $b = 0.63$, $SE = 0.23$, $t = 2.67$, $p = 0.01$, 95% CI = $[0.1560, 1.1052]$. Analysis of the moderation effect indicated that the relation between finding meaning and stress was significant for low levels of secondary trauma symptoms (16th percentile), $b = -1.02$, $SE = 0.42$, $t = -2.41$, $p = 0.01$, 95% CI = $[-1.8686, -0.1724]$, but not for medium (50th percentile), $b0$- $0=.51$, $SE = 0.27$, t = -1.87, $p = 0.06$, 95% CI = $[-1.0681, 0.0361]$, or high (84th percentile) levels of secondary trauma, $b = 0.36$, $SE = 0.26$, $t = 1.41$, $p = 0.16$, 95% CI = $[-0.1558, 0.8895]$. In other words, finding meaning in work was negatively related to stress only when secondary trauma symptoms were low. The implication of this moderation is that stress was lower for therapists who found a lot of meaning in their work only when they experienced low levels of secondary trauma symptoms. When they experienced medium or high levels of secondary trauma symptoms, the protective effect of finding meaning in their work on stress was non-significant, as depicted in Figure 1.

A second moderation model was conducted in order to investigate whether secondary trauma symptoms moderated the relation between hope and stress, controlling for personal loss. The model was significant $F_{(4,55)} = 7.07$, $p = 0.00$, explaining 36.60% of the variance in stress (Cohen's $f^2 = 0.57$), indicating a large effect. The model indicated that hope was significantly related to stress, $b = -1.59$, $SE = 0.72$, $t = -2.21$, $p = 0.03$, 95% CI = $[-3.0500, -0.1454]$. Secondary trauma symptoms were not significantly related to stress, $b = -0.66$, $SE = 1.37$, $t = -0.48$, $p = 0.63$, 95% CI = $[-3.4211, 2.1018]$. Furthermore, secondary trauma symptoms did not significantly moderate the relation between hope and stress, $b = 0.27$, $SE = 0.31$, $t = 0.86$, $p = 0.39$, 95% CI = $[-0.3600, 0.9021]$. In other words, hope was negatively related to stress regardless of secondary trauma symptoms. The implication of this finding is that stress was lower for therapists with high levels of hope regardless of their secondary trauma levels.

Discussion

The aim of this study was to investigate factors related to stress levels among trauma therapists working at the Sderot Resilience Center near the Gaza border 1 year after the Hamas massacre in Israel on October 7th, 2023, under the unique conditions of a collective trauma. No significant relations were found between therapists' stress levels and their demographic or professional characteristics; the importance of war-related factors and psychological aspects was thus emphasized.
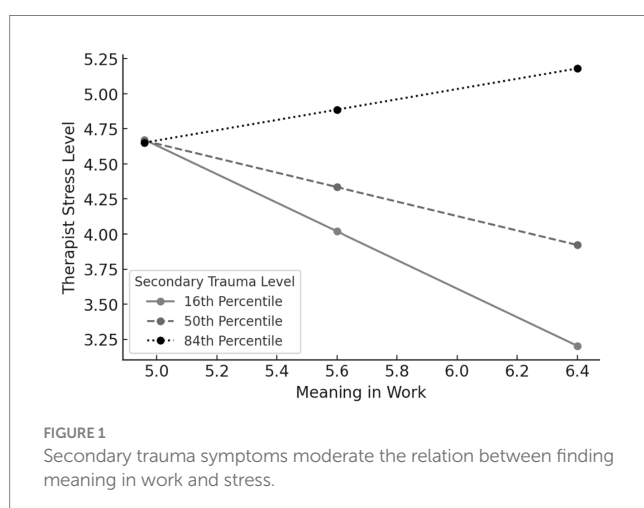
Overall, therapists reported relatively high levels of finding meaning in their work. These results align with prior research suggesting that mental health professionals often derive significant meaning from their work (Taubman Ben Ari et al., 2024). However, the results also indicated that only when secondary trauma symptoms were low was finding meaning in work linked to reduced stress. When secondary trauma symptoms were high, the beneficial effect of finding meaning in work diminished.

These results accord with COR theory (Hobfoll and Hou, 2025), which posits that stress arises when individuals perceive a threat to their valued resources. In this context, secondary trauma symptoms may deplete therapists' psychological resources (Singh et al., 2020), reducing their ability to utilize meaning in work as a protective factor. Under certain conditions, the positive effects of finding meaning in work may be diminished by the excessive emotional demands placed on therapists (Soren and Ryff, 2023). Moreover, individuals who experience their work as meaningful but are unable to fully utilize their skills and abilities may face a heightened risk of poorer well-being (Allan et al., 2020).

In contrast, sense of hope was associated with lower stress levels, irrespective of secondary trauma symptoms. Hope has been recognized as a significant predictor of psychological adjustment in challenging life situations (Deniz et al., 2023) and serves as an independent protective factor for resilience (Pharris et al., 2022). Current empirical evidence also highlights hope's strong association with positive psychological functioning and a reduced prevalence of mental health symptoms, including PTSD (Long, 2022). By fostering a sense of agency and goal-directed thinking, hope may help therapists manage stress, even in the presence of secondary trauma symptoms (Passmore et al., 2019).

In addition, in line with COR theory, the current study revealed that therapists who experienced a loss of a loved one during the war exhibited higher levels of stress than did those who did not experience this kind of loss. An association has been found in the literature between therapists who have a history of trauma and their poorer mental health as well as negative changes in their self-perception (Leung et al., 2023). The findings of the present study, similar to findings in the existing literature, highlight the need for further research into the lasting effects of personal loss and trauma among therapists in the context of a collective trauma.

We did not find a significant association between the following factors – therapists' demographics (age, geographic residence, religion), professional characteristics (experience in trauma therapy, caseload, tenure at the Resilience Center), and other war-related characteristics (being evacuated from one's home)— and reported stress levels in this study. Although this finding suggests that psychological resources and the loss of a loved one may be particularly salient under extreme circumstances (Hobfoll and Hou, 2025), future research in diverse settings is needed to confirm these results and explore potential contextual influences on therapists' stress levels.

FIGURE 1
Secondary trauma symptoms moderate the relation between finding meaning in work and stress.

Limitations and future directions

This study had several limitations. First, the cross-sectional design restricts the ability to establish causal relations between finding meaning in work, sense of hope, secondary trauma symptoms, and stress, particularly given the ongoing trauma and war. Second, the study relied on self-reported data, which may have been influenced by social desirability biases and retrospective inaccuracies. Future research could benefit from incorporating multi-informant reports and in-depth interviews to enhance validity. Third, the sample size was relatively small, which may have limited the ability to detect significant results. However, the sample did consist of a unique population—therapists working in a high-trauma environment—and the effect sizes were large, offering valuable insights that should be explored further in larger, more diverse samples.

Given that the sample was drawn from a single resilience center in close proximity to Gaza, with a predominantly female therapist population (75%), readers should be mindful when generalizing these findings to other geographical regions or to male therapists. An important limitation of this study was the relatively low response rate, which may limit the generalizability of the findings. Although all eligible therapists at the Center were invited to participate, it is possible that those who chose to respond differ systematically from those who did not, potentially introducing a self-selection bias.

The study's measurement tools had limitations. Although the single-item stress measure has been validated (Elo et al., 2003; Littman et al., 2006), it provides only a coarse assessment (Benuto et al., 2021), potentially resulting in reduced precision. This choice minimized participant burden, but the findings should be interpreted cautiously. Additionally, there was a significant correlation between the stress and secondary trauma symptom measure, raising concerns about conceptual overlap. Although not statistically redundant (e.g., $r < 0.85$; Bagozzi et al., 1991), this overlap may reflect limitations of the single-item measure. Future studies should consider multi-item stress assessments or alternative outcomes, such as behavioral or interpersonal functioning, to better distinguish the constructs.

Finding meaning in work was assessed through the "motivation-for-the-common-good" subscale. However, other dimensions of finding meaning in work may have a different impact on therapists. Moreover, another limitation of this study was the relatively low Cronbach's alpha ($\alpha = 0.65$) for the "meaning in work" subscale. Although expected, given the subscale's limited number of items and minor adaptations for context, the results related to "finding meaning in work" should be interpreted with caution due to the measure's limited internal consistency. Finally, although we examined key resilience and risk factors, other potential moderating or mediating variables, such as prior trauma exposure, coping strategies, organizational support, and other personal resources, were not included and warrant further investigation.

Future research should confirm the findings and examine the mechanisms through which secondary trauma symptoms may weaken the protective effect of finding meaning in work and explore whether specific coping strategies can mitigate this impact. Longitudinal studies could clarify the temporal relations among these variables and assess whether prolonged exposure to a collective trauma interacts with how finding meaning in work and sense of hope function as resilience factors. Additionally, tracking the development of secondary trauma and stress among therapists in highly traumatic areas would provide deeper insights into the long-term effects of working in such environments. Comparing these therapists with those exposed to a collective trauma but not working directly with trauma survivors—or with those practicing in lower-risk settings—could help delineate the unique roles of hope, meaning, and trauma exposure. Finally, future studies should explore broader expressions of distress among therapists, as well as potential pathways for growth and resilience.

Although resilience is shaped by various factors such as social support, self-efficacy, and emotion regulation (Lev et al., 2022), our study focused specifically on "finding meaning in work" and "sense of hope" due to their strong association with personal growth and sustained motivation. These factors have been shown to be especially important for mental health professionals in trauma-related fields (Passmore et al., 2019; Taubman Ben Ari et al., 2024), making them central to our investigation.

The findings of the current study, although exploratory, have important implications for interventions aimed at supporting trauma therapists. Therapists that experience personal loss (i.e., the loss of a loved one) emerged as a significant factor in predicting their levels of stress during a collective trauma. This finding underscores the need to direct focused attention toward therapists who are personally affected by such events. Moreover, secondary trauma symptoms were found to be highly related to stress. These findings underscore the critical importance of early identification of therapists who may be at elevated risk—particularly those coping with personal loss or exhibiting symptoms of secondary trauma. Utilizing tools such as targeted screening, self-report measures, and attentive supervisory observation can help flag individuals who are at risk before the escalation of their stress levels. Early recognition of those at risk is an essential precursor to effective support or intervention, allowing for timely, tailored responses that safeguard therapists' well-being and professional functioning.

Recently, meaning-centered psychotherapy (MCP)—a brief, evidence-based intervention—has garnered growing interest for its potential to enhance the well-being of healthcare professionals (Rosa et al., 2025). That said, although fostering meaning in work is beneficial, it may not be sufficient to mitigate stress for those experiencing high secondary trauma symptoms. Instead, targeted strategies to reduce secondary trauma, such as supervision, peer support, and trauma-informed self-care practices, should be prioritized (Elwood et al., 2011; Kim et al., 2022). Additionally, promoting hope through resilience-building interventions may provide a stress-buffering effect (Chmitorz et al., 2018). Brief hope interventions (BHIs) have shown promise not only in enhancing hope and reducing distress, but also in supporting overall psychological resilience and well-being across various high-stress professional contexts (Chan et al., 2019; Kwon et al., 2015).

Data availability statement

The datasets presented in this study can be found in online repositories. This data can be found here: https://osf.io/q3vuh/?view_only=cbc9860ccddc4055aaa4f95f6165cc6b.

Ethics statement

The studies involving humans were approved by Achva Academic College review board. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

SG-L: Writing – original draft, Writing – review & editing, Formal analysis. LF: Writing – original draft. YG-L: Writing – original draft. AB-GD: Writing – original draft. RF-L: Writing – original draft.

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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.

Generative AI statement

The authors declare that no Gen AI was used in the creation of this manuscript.

Correction note

A correction has been made to this article. Details can be found at: 10.3389/fpsyg.2025.1649364.

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Emotion regulation strategies and mental wellbeing among Chinese college students during COVID-19: the moderating roles of confinement and attentional bias

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Background: During COVID-19, confinement measures were implemented to curb the epidemic spread. While effective in reducing infections, these measures likely deteriorated the psychological wellbeing of students due to school closures and isolation.

Methods: This study analyzed 13,109 valid questionnaires from individuals aged 18−24 years (mean 20.28 ± 1.518) to explore how emotion regulation strategies (cognitive reappraisal and expression suppression) impact mental wellbeing through attentional biases (positive and negative), with confinement as three moderators.

Results: Cognitive reappraisal was positively associated with mental wellbeing, whereas expression suppression showed a negative association. Positive attentional bias was associated with higher wellbeing, whereas negative bias was linked to lower levels of it. Negative attentional bias was linked to a stronger positive association between cognitive reappraisal and mental wellbeing, as well as a more pronounced negative association? with expression suppression. Confinement was associated with a stronger positive relation between cognitive reappraisal and mental wellbeing, while corresponding to a more negative relation with expression suppression.

Conclusion: Our findings highlight the complex interplay between emotion regulation strategies and mental wellbeing during confinement. Cognitive reappraisal and positive attentional bias are associated with protective effects, while expression suppression and negative bias are linked to detrimental effects. Confinement measures, despite their positive impact on physical health, significantly modulate these effects. Tailored interventions considering individual differences and contexts are needed to support mental wellbeing in similar crises.

KEYWORDS

confinement situation, emotion regulation strategies, mental wellbeing, attentional bias, COVID-19

Introduction

COVID-19, marked by its rapid transmissibility and widespread reach, coupled with a notable fatality rate, imposed a formidable public health challenge. In the face of this ongoing threat, individuals have increasingly grappled with a deluge of negative emotions, including anxiety and fear, which, amidst uncertainty, pose a grave risk to mental wellbeing. Empirical evidence underscores a plethora of exacerbated mental wellbeing symptoms, notably depression, anxiety, and stress, that have surfaced during the pandemic (Cao et al., 2020; Fullana et al., 2020). College students, as a special and crucial group in society, are in a critical stage of psychological development. They highly rely on social interaction and campus environment to achieve self-growth and development (Chavira et al., 2022; Liu et al., 2024; Yang et al., 2021). During pandemic prevention and control, measures such as campus closure, interruption of offline teaching, and social confinement disrupted their regular study and life rhythms, becoming associated with a series of psychological problems (Lansford et al., 2023; Wang et al., 2022; C. Zhang et al., 2020).

Mental health of college students in the pandemic

During the pandemic, people's mental health was affected to varying degrees (Davico et al., 2024; Özlü-Erkilic et al., 2021). Martin et al. (2025) conducted a systematic review of 36 studies from multiple countries (involving Africa, Asia, Europe, South America, and North America) between 2020 and 2022 to explore the impact of adult self-confinement on mental health. They found inconsistent effects of self-confinement on mental health, but qualitative research showed negative impacts, with individuals with pre-existing physical and mental illnesses and those lacking support being more vulnerable (Martin et al., 2025). Pietrzak and Hanke (2024) conducted a literature review integrating 35 studies and found that mental health problems were more prevalent among young people and women during the pandemic, while changes in suicide attempts showed different trends across countries Pietrzak and Hanke (2024). For example, Kauhanen et al. (2023) conducted a systematic review of 21 articles from 11 countries including China, the UK, and the US, covering 2009–2020, and found that most studies showed a longitudinal deterioration in the mental health of adolescents and young people during the pandemic, including increased symptoms of depression and anxiety (Kauhanen et al., 2023). Hall et al. (2023) found that during the 2022 lockdown in Shanghai, China, the prevalence of depression, anxiety, and suicidal ideation among residents significantly increased, especially the anxiety symptoms in the 18–29-year-old youth group, highlighting the vulnerability of young adults such as college students.

A study narratively reviewed the psychological impact of the pandemic on global children and adolescents and found that the pandemic led to a decline in their mental health (Boonroungrut et al., 2022). Lopez-Serrano et al. (2023) showed that pandemic lockdowns significantly increased externalizing symptoms and behaviors in Spanish children and adolescents (especially those with autism spectrum disorder and conduct disorder), which corroborates the findings of Rider et al. (2021). In a cross-regional comparison within the same country, Kurz et al. (2022) studied different regions in Germany and found that among first-grade primary school students during the pandemic, girls experienced a decline in health-related quality of life and increased emotional and behavioral difficulties, while boys significantly increased their screen time. Salmi et al. (2022) analyzed chat data from the Dutch suicide prevention hotline and found significant differences in suicide-related issues among callers of different genders, ages, and residential statuses during the pandemic, which is consistent with the conclusions of Chadi et al. (2022) and Cooper et al. (2021). Cross-national studies have specifically identified adolescents and young adults as a vulnerable subgroup, whose developmental stage—marked by high social dependency and identity formation—amplifies their susceptibility to pandemic-related disruptions (Lansford et al., 2023; Skinner et al., 2023a,b). For example, a nine-country investigation (Skinner et al., 2022) revealed that young adults who reported higher pre-pandemic positivity and future orientation exhibited significantly weaker associations between COVID-19-related disruption and perceived increases in internalizing symptoms, such as anxiety and depression, underscoring the protective role of cognitive-affective resources.

Mental health of college students under confinement

Confinement measures, implemented as a crucial tool in disease prevention and control, emerged as an additional predictive factor for psychological deterioration (Rajkumar et al., 2022). Schools, as congregational hubs, were temporarily shuttered to mitigate the spread of COVID-19 and safeguard students from infection. However, this measure inadvertently exposed confined populations, particularly those within academic settings, to heightened vulnerability and predisposition to anxiety, sorrow, and other detrimental emotional states, as corroborated by recent studies (Tepeli Temiz and Elsharnouby, 2022). People in COVID-19 lockdown often experience insomnia (Yang et al., 2023) and exhibit signs of psychiatric subclinical manifestations, characterized by compromised acute stress coping abilities, manifesting as depressive and anxious symptoms (Moreno et al., 2020; Sprang and Silman, 2013). Notably, age demographics such as young adults and the elderly have been disproportionately affected by these adverse psychological sequelae (Amanzio et al., 2023; Muñoz-Navarro et al., 2021), emphasizing the urgency for tailored interventions to address these specific mental health challenges.

The dual effects of quarantine measures arise from their inherently contradictory roles. While confinement measures reduced infection risks, prolonged academic disruptions (e.g., campus closures, online learning challenges) and social isolation amplified uncertainty, particularly among students dependent on structured educational environments (Tasso et al., 2021). Liu et al. (2024) found Chinese college freshmen faced dual challenges of identity transition and university adaptation during prolonged

lockdowns, with anxiety and poor sleep significantly affecting mental health. Wu et al. (2025) reported a 28.0% prevalence of post-traumatic stress symptoms among Chinese students, highlighting the pandemic's severe mental health impact. Patrono et al. (2024) linked COVID-19 fear to poor sleep and emotional instability in Chilean students during lockdowns, reflecting youth psychological adaptation challenges.

Role of confinement

Although existing research has yielded fruitful results, there are still certain limitations. On the one hand, research results are significantly affected by regional differences, including economic development levels, social and political environments, population characteristics, resident mobility, medical resources, and COVID-19 transmission situations (Kwilinski et al., 2022; Rule et al., 2025), while differences in restriction measures implemented by different countries and regions also interfere with research results (World Health Statistics, 2020). In general, the strictness of lockdown measures varies across countries, leading to inconsistent mental health research results (Davico et al., 2024; Nash, 2023; Özlü-Erkilic et al., 2021). On the other hand, epidemiological surveys minimize regional differences through sampling, but to some extent, they overlook potential impacts such as residential density and medical standards.

This study conducts a cross-sectional analysis of two universities in the same city with differing management policies, using a homogeneous regional setting to precisely examine the relationship between college students' emotion regulation strategies and mental health under campus confinement (Solmi et al., 2025). Narrowing the scope to within-city university types reduces interference from regional variables like social culture and economic levels, making findings more targeted compared to broader studies (Jackson et al., 2021). For instance, cross-country or large-region research often faces confounding effects from significant social, cultural, or developmental disparities (Davico et al., 2024; Özlü-Erkilic et al., 2021). By focusing on intra-city universities, this study controls such macro-factors to accurately explore links between confinement measures, emotion regulation, and mental health.

Choosing Chinese college students as the research population holds significant value. In their critical transition from adolescence to adulthood, they face academic, social, and career planning pressures, with sensitive and unstable mental states highly susceptible to external environmental changes (Chavira et al., 2022; Pandya and Lodha, 2022). The pandemic's economic downturn has amplified their employment stress, while the outbreak disrupted their life and study routines, obstructed goals, and increased psychological burdens (Liu et al., 2024; Zarowski et al., 2024). Chinese university residences, characterized by high-density centralized living (Zhang et al., 2022), elevate pandemic transmission risks and cluster outbreak likelihood. Strict campus confinement measures under unified management—implemented to ensure safety—significantly impact students' emotional regulation and mental health (Chavira et al., 2022; Gao et al., 2020; Ocampo et al., 2024).

This special residential environment and confinement methods provide a unique context for the study, helping to deeply explore college students' emotion regulation strategies and their impact on mental health under strict control. Research on Chinese college students under pandemic confinement measures can not only provide a scientific basis for Chinese universities to develop targeted mental health interventions but also offer valuable experience and references for other countries and regions worldwide on how to protect the mental health of youth groups during similar public health events (Chavira et al., 2022; Liu et al., 2024; Wang et al., 2022).

Role of emotion regulation strategies

Stress associated with confinement has been linked to exacerbated negative cognitive biases, potentially impeding the cultivation of positive emotions (Somma et al., 2021). Psychological resources provide a strong buffering effect when individuals encounter stress events (Hu et al., 2025). Based on Gross's (1998) process model of emotion regulation, antecedent-oriented strategies like cognitive reappraisal enhance an individual's wellbeing. They achieve this by reinterpreting emotional stimuli prior to the full onset of emotional arousal. In contrast, response-oriented strategies such as emotional suppression are believed to interfere with the process of emotional processing. Moreover, they have the potential to intensify physiological stress (Gross and John, 2003; Webb et al., 2012). Emotion regulation, a well-studied coping strategy, is associated with blunted emotional response (Gross and John, 2003). Cognitive reappraisal and expressive suppression are two main strategies involved in cognitively interpreting the cause and consequence of emotional events (Gross, 2002).

During pandemic confinement, college students frequently encounter academic interruptions, social restrictions, and impacts of the pandemic itself (Pandya and Lodha, 2022). Cognitive reappraisal is expected to alleviate negative emotions through positive reinterpretation of stressors, while expressive suppression is associated with emotional exhaustion due to long-term suppression (Webb et al., 2012). Patrono et al. (2024)'s study on Chilean college students also showed that individuals with high emotion regulation ability had significantly lower somatization symptoms under strict confinement than those with low regulation ability, and the difference widened, reflecting the dynamic association between individual psychological resources and environmental restrictions. Individuals in long-term stressful environments exhibit obvious negative attentional bias, which may gradually deteriorate in confined environments; however, no current research has explained the underlying mechanism.

Moderating role of attentional bias

Individuals also rely on trait-like mechanisms like attentional control ability and emotion regulation strategies when responding to stressful events (Olatunji et al., 2010). Skinner et al. (2023a) found that parental support and adolescents' own emotion regulation strategies, such as cognitive reappraisal, were crucial in

buffering the impact of pandemic-related stress on internalizing symptoms in young adults across nine countries. Chronic stressors, exemplified by COVID-19 lockdown measures, deplete cognitive resources according to Folkman and Lazarus (2013) transactional theory of stress. This depletion can reshape the efficacy of emotion regulation strategies, notably increasing expressive suppression and self-compassion under prolonged stress (Liu et al., 2024). These findings highlight the importance of both individual and contextual factors in shaping mental wellbeing during the pandemic. Given its hypothesized interaction with emotion regulation strategies and key role in untangling pandemic—era mental health complexities, this study adopts attentional bias as the moderating variable.

Current study

While numerous studies have investigated the pandemic's impact on mental health, gaps remain, particularly concerning the moderating role of confinement strategies and individual factors. Epidemiological surveys, while minimizing sampling bias, often overlook the influence of varying medical resources and residential density. To address this, our study focuses on universities of comparable level within the same city, employing different confinement strategies to examine their specific association with college students' mental wellbeing, as well as associated risk and protective factors. Specifically, we investigate the role of emotion regulation strategies (cognitive reappraisal and expressive suppression) and attentional bias (positive and negative) in mental wellbeing under varying confinement measurement. Furthermore, we aim to explore how the confinement state itself moderates the relation between these emotion regulation strategies and mental wellbeing. This research is grounded in Gross's (1998) process model of emotion regulation, Folkman and Lazarus (2013) transactional theory of stress, and Hobfoll's (1989) resource conservation theory, which collectively suggest that confinement, as a chronic stressor leading to resource depletion, may differentially influence the effectiveness of emotion regulation strategies, potentially making reappraisal a more adaptive strategy than suppression under such conditions (Wang et al., 2014). Given the mental wellbeing vulnerabilities of young adults during the pandemic, this study specifically examines Chinese college students' mental wellbeing during the COVID-19 pandemic.

Among Chinese college students, the confinement measures during the COVID-19 pandemic, as significant stressors, can influence the relation between emotion regulation strategies and mental wellbeing. Meanwhile, attentional bias, as an individual's tendency to process emotional information, can interact with emotion regulation strategies and further relate to mental wellbeing. Thus, we have selected emotion regulation strategies, mental wellbeing, confinement measures, and attentional bias as key variables to explore the relations among them, aiming to provide theoretical bases and practical guidance for improving the mental health of college students. Guided by the theoretical underpinnings discussed above and considering the unique context of Chinese college students during the pandemic, we propose the following hypotheses to systematically investigate the intricate relations among the key variables.

H1: Cognitive reappraisal positively promotes psychological wellbeing, whereas emotional expression suppression negatively impacts it. Cognitive reappraisal is associated with psychological wellbeing by altering individuals' cognitive evaluations of events. In contrast, emotional expression suppression is associated with the accumulation and repression of negative emotions, which are linked to adverse relations with mental wellbeing.

H2: Attentional biases moderate the impact of emotional regulation strategies on psychological wellbeing. Positive attentional bias may potentiate the positive influence of cognitive reappraisal, whereas negative attentional bias may exacerbate the negative impact of emotional expression suppression.

H3: Confinement measures moderate the impact of emotional regulation strategies on psychological wellbeing. Confinement measures may augment the positive influence of cognitive reappraisal while intensifying the negative impact of emotional expression suppression.

Participants and procedure

This study was undertaken in Guangzhou, encompassing two universities to examine the differences between confined and unconfined situation during COVID-19 (April 15 to April 30, 2022). Among the two selected universities, one entered a confinement phase following the detection of a confirmed COVID-19 case near the campus in mid-April. Measurements were conducted approximately 10 days into this confinement period. Under this regime, students were restricted to the campus premises and prohibited from participating in indoor gatherings of more than ten people, while being allowed to engage in on-campus activities while strictly maintaining social distancing. In contrast, the other university remained unconfined throughout the study period, enabling students to live and study as usual. They could dine at on-campus cafeterias, attend classes in person, and leave the campus upon obtaining proper approval when necessary.

Thirteen thousand one hundred and nine valid questionnaires were collected in this study, and the age range of the subjects was 18–24 years old (20.28 ± 1.518 years). Among them, 5,513 (42.1%) were male subjects and 7,596 (57.9%) were female subjects. Five thousand two hundred and forty six subjects (40%) were from the confined situation and 7,863 subjects (60%) were from the unconfined situation.

All participants were screened to ensure they had no visual impairments, no history of neurological or psychiatric disorders, and were not currently using medication or recreational drugs, as self-reported through the online survey. Informed consent, tailored for both confined and unconfined settings, was meticulously obtained via the online survey platform, with each questionnaire initiated only after the participant's signature signified their understanding and agreement. Notably, while participants residing in the confined situation were not directly notified by the principal investigators about the specifics of confinement measures, electronic versions of the informed consent forms were widely disseminated through the online channel. This ensured that all participants had ample opportunity to thoroughly review and comprehend the content before submitting their

data. Furthermore, the principal investigators remained accessible via telephone to address any queries or provide clarifications regarding the study's details, fostering a transparent and supportive research environment.

To ensure broad participation, researchers prepared an online invitation message containing their contact information and the link to an online questionnaire on the platform Wenjuanxing (www.wjx.com) indicating that completing the questionnaire would take approximately 10 to 30 min. This invitation was forwarded by university counselors to class monitors, who then shared it in class WeChat groups for college students. Participation was voluntary, and no remuneration was provided. Any questionnaire that was not fully completed due to premature withdrawal was deemed invalid and excluded from the database. Participants, after providing their informed consent, completed the questionnaire online, adhering to rigorous ethical protocols approved by the local ethics committee in alignment with the Helsinki Declaration's standards.

Measures

The emotion regulation questionnaire

The emotion regulation strategy scale used in this study was the Emotion Regulation Questionnaire (ERQ) developed by Gross and John (2003), translated and revised by Wang et al. (2007). The questionnaire consists of 10 items divided into two subscales: cognitive reappraisal (e.g., I control my emotions by changing the way I think about the situation I'm in) and expressive suppression (e.g., I keep my emotions to myself). A 7-point scale was used (1 = "strongly disagree" to 7 = "strongly agree"), with higher scores on a subscale indicating more use of the emotion regulation strategy by the subject. In this study, both the cognitive reappraisal subscale (Cronbach's α = 0.951) and the expressive suppression subscale (Cronbach's α = 0.854) had high reliability.

The attention to positive and negative information scale

In this study, the Attention to Positive and Negative Information Scale (APNI) developed by Noguchi et al. (2006), revised and translated by Lv et al. (2016) was used to assess the extent to which individuals pay attention to positive and negative information in their. The scale consists of 30 items divided into two subscales: positive attentional bias (e.g., I mostly remember times when I was happy) and negative attentional bias (e.g., I can't forget the times I have performed poorly at something). A 5-point scale was used (1 = "strongly disagree" to 5 = "strongly agree"), with higher scores on the subscales implying that the subject's attentional bias was more toward that dimension. In the present study, both the positive attentional bias subscale (Cronbach's α = 0.972) and the negative attentional bias subscale (Cronbach's α = 0.972) had high reliability.

The short Warwick Edinburgh Mental Well-Being Scale

In this study, the short Warwick Edinburgh Mental Well-Being Scale (SWEMWBS) was used to assess the mental wellbeing of individuals (Stewart-Brown et al., 2009). The scale consists of 7 items (e.g., I've been feeling optimistic about the future) and is scored on a 5-point scale (1 = "never" to 5 = "always"), with higher scores on the scale indicating better mental wellbeing. In the present study, Cronbach's α for the SWEMWBS was 0.960.

Statistical analysis

The study used IBM SPSS 27.0 for data analysis. First, the common method bias was tested; second, the study used independent samples non-parametric tests to determine the mental wellbeing scores in areas with different confinement; again, to test the correlation between the variables, the study used Pearson correlation test to verify the significance of the correlation between variables; finally, to test whether negative/positive attentional bias moderate the relationships among variables, the study used PROCESS (model 1) to perform a moderating effect test. Any incomplete data was excluded from the database and not included in the subsequent analysis.

Ethics approval statement

All procedures performed in studies that involved human participants were in accordance with the ethical standards of the institutional research committee (Ethics Commission of Tsinghua University, 2022 Ethics Review No. 19) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Results

Common method bias control and testing

To assess the presence of common method bias (CMB), Harman's single-factor test was employed. Notably, the first factor accounted for 44.320% of the total variance, which is considerably lower than the commonly accepted threshold of 50%. This finding indicates that common method bias is not a significant issue in the current study.

Correlation analysis

The correlation analysis among the variables is presented in Table 1. Cognitive reappraisal was strongly correlated with expression suppression and positive attentional bias and moderately correlated with negative attentional bias and mental wellbeing. Expression suppression was moderately correlated with positive attentional bias, negative attentional bias, and

mental wellbeing. Positive attentional bias was correlated with negative attentional bias. Negative attentional bias was weak but significantly correlated with mental wellbeing. These findings indicate interrelated patterns among emotion regulation strategies, attentional biases, and mental wellbeing.

Normality test

In the normality test, when the p-value (i.e., significance) of the Kolmogorov-Smirnov (K-S) test is extremely small, such as 0.000, it indicates that there is sufficient evidence to suggest a significant difference between the data and the normal distribution, leading to the conclusion that the data does not follow a normal distribution. As shown in Table 2, the significance levels of Cognitive Reappraisal, Expression Suppression, Positive Attentional Bias, Negative Attentional Bias, and Mental Wellbeing are all 0.000, suggesting that none of them follow a normal distribution. Therefore, the Mann-Whitney U test was selected to analyze the differences in X_1, X_2, M_1, M_2, and Y between the confined and unconfined areas.

Differences in emotion regulation strategies, attentional biases, and mental wellbeing among college students between confined and unconfined areas

We employed non-parametric tests, specifically the Mann–Whitney U test and the Wilcoxon rank-sum test. The differential analysis revealed significant differences in cognitive reappraisal, expression suppression, positive and negative attentional biases, and mental wellbeing between confined and unconfined regions. Specifically, cognitive reappraisal, expression suppression, positive attentional bias, negative attentional bias, and mental wellbeing all showed substantial variations, indicating that confinement significantly impacts these psychological variables, see Supplementary Table S1.

To further investigate the association between confinement and cognitive reappraisal, expression suppression, attentional bias, and mental wellbeing, boxplots were generated for positive attentional bias, negative attentional bias variable across the two conditions.

The results revealed that, in confinement, levels of cognitive reappraisal and expression suppression were higher compared to the general condition, with more dispersed data distributions and significant individual differences (see Figure 1). In contrast, in the unconfined condition, data distributions were more concentrated, and individual differences were relatively smaller.

Overall, both positive and negative attentional biases were higher under confinement compared to the general condition. In the confined situation, the data distribution was more dispersed, with greater individual differences dispersed data distributions and significant individual differences (see Figure 2). In contrast, in the non-confined situation, individual differences were relatively smaller, and the data distribution was more concentrated. The middle 50% of the data for negative attentional bias was distributed at a higher level, but with a large degree of dispersion and significant individual differences.

Mental wellbeing levels were generally higher under confinement, with the middle 50% of the data distributed at

TABLE 1 Correlation analysis of variables.

Variable	1	2	3	4	5
1. Positive attentional bias	–				
2. Negative attentional bias	0.532**	–			
3. Cognitive reappraisal	0.743**	0.383**	–		
4. Expression suppression	0.508**	0.513**	0.730**	–	
5. Mental wellbeing	0.447**	0.112**	0.456**	0.316**	–

**$p < 0.01$.

TABLE 2 Normality test table.

Variable	Situation	Kolmogorov-Smirnova[a]		
		Statistic	df	Significance
Cognitive reappraisal	Unconfined situations	0.230	7,863	0.000
	Confined situations	0.207	5,246	0.000
Expression suppression	Unconfined situations	0.223	7,863	0.000
	Confined situations	0.234	5,246	0.000
Positive attentional bias	Unconfined situations	0.163	7,863	0.000
	Confined situations	0.129	5,246	0.000
Negative attentional bias	Unconfined situations	0.139	7,863	0.000
	Confined situations	0.132	5,246	0.000
Mental wellbeing	Unconfined situations	0.147	7,863	0.000
	Confined situations	0.171	5,246	0.000

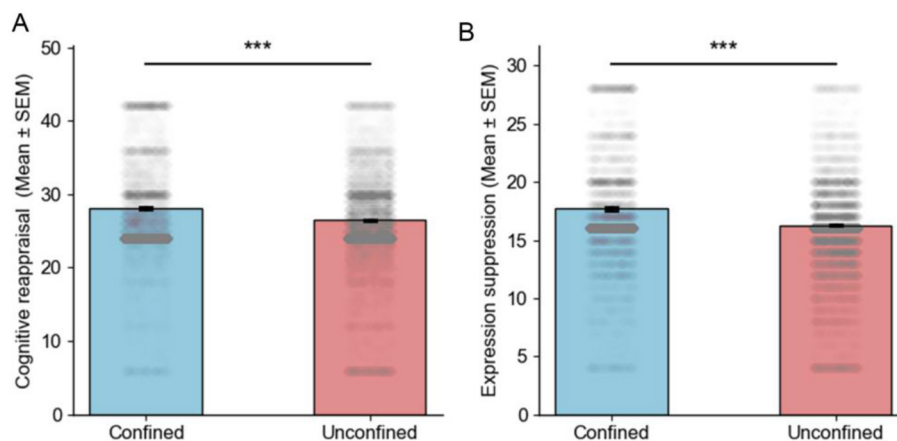[a] Lilliefors significance correction.

FIGURE 1
Bar graphs of Cognitive Reappraisal and Expressive Suppression in Confined and Unconfined Situation. **(A, B)** Bar graphs depict the mean values of cognitive reappraisal scores and expression suppression scores in confined and unconfined situations with enhanced emotion regulation strategies in confined situations (*** $P < 0.001$).
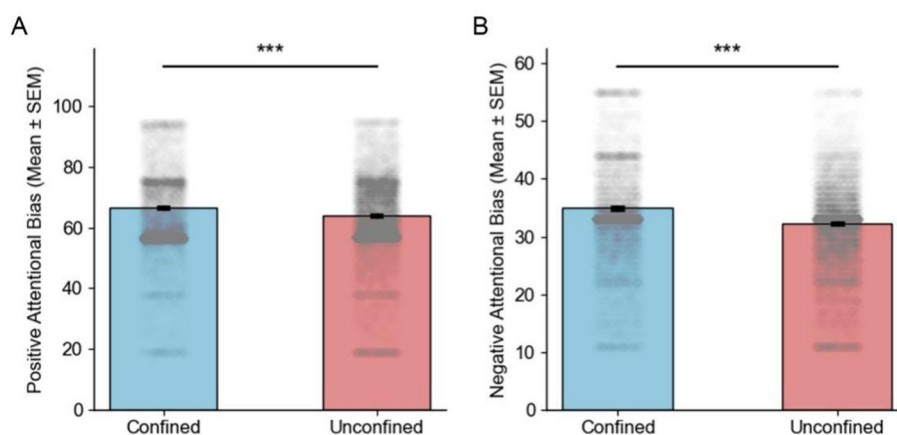

FIGURE 2
Bar graphs of attentional bias in confined and unconfined situation. **(A, B)** Bar graphs depict the mean values of positive attentional bias scores and negative attentional bias scores in confined and unconfined situations with enhanced both attentional bias in confined situations (*** $p < 0.001$).

a higher-level distributions and significant individual differences (see Figure 3). However, the data dispersion was greater, indicating significant individual differences. In contrast, mental wellbeing data were more concentrated in the non-confined situation, with less dispersion, but overall levels were relatively lower compared to the confined condition. Additionally, more individuals exhibited lower levels of mental wellbeing in the non-confined situation relative to those under confinement.
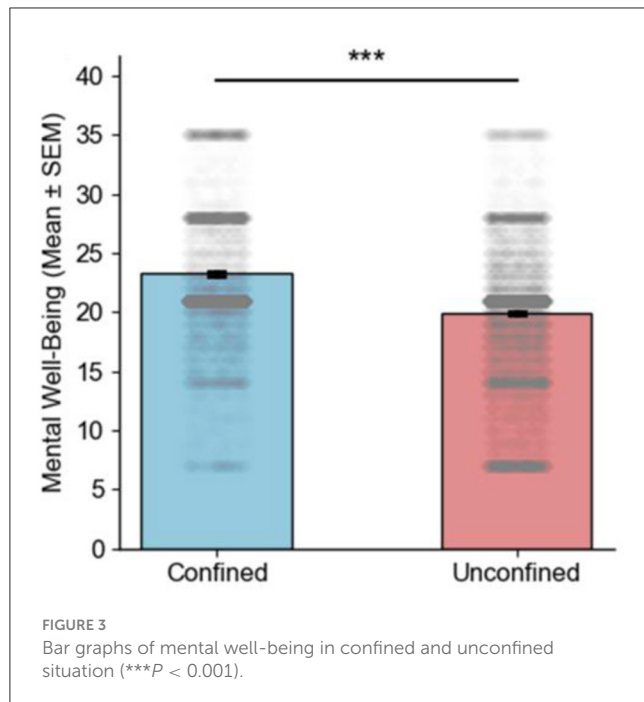
Moderation model with three independent variables

In this study, we examine the moderation model with two independent variables, where two independent variables, cognitive reappraisal and expression suppression, are moderated by three moderator variables, positive attentional bias, negative attentional

bias and confined situation. Model 1 examined the direct effects of emotion regulation strategies (cognitive reappraisal and expressive suppression) on mental wellbeing. Model 2 incorporated positive/negative attentional bias as moderators, while Model 3 further included confinement status as a contextual moderator.

Initial models with single moderators

In the initial analysis, we examined the effects of cognitive reappraisal (X_1) and expressive suppression (X_2) on mental wellbeing, with positive attentional bias (W_1), negative attentional bias (W_2), and regional differences (W_3) each considered as moderators. Positive attentional bias had a significant positive effect on mental wellbeing (Beta = 0.114, $p < 0.001$) and enhanced the positive impact of expressive suppression (X_2W_1: Beta = 0.173, $p=0.042$), suggesting its role as a protective factor against psychological distress. Negative attentional bias had a significant

FIGURE 3
Bar graphs of mental well-being in confined and unconfined situation (***$P < 0.001$).

negative effect on mental wellbeing (Beta = -0.186, $p < 0.001$), amplifying the negative impact of expressive suppression (X_2W_2: Beta = 0.519, $p < 0.001$) while attenuating the positive effect of cognitive reappraisal (X_1W_2: Beta = -0.286, $p < 0.001$). Regional differences also had a significant positive effect on mental wellbeing (Beta = 0.228, $p < 0.001$) and interacted significantly with both cognitive reappraisal (X_1M: Beta = -0.170, $p=0.001$) and expressive suppression (X_2M: Beta = 0.148, $p=0.004$), indicating that regional factors may influence the effectiveness of cognitive and emotional regulation strategies on mental wellbeing (see Figure 4). These findings provide context for subsequent model selection.

Based on the model presented in Table 3, the following regression equation can be formulated:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3W_1 + b_4W_2 + b_5W_3 \quad (1)$$
$$+ b_6X_1W_1 + b_7X_1W_2 + b_8X_1W_3 + b_9X_2W_1$$
$$+ b_{10}X_2W_2 + b_{11}X_2W_3 + \epsilon$$

Where:

b_0 is the constant term.

b_1 and b_2 represent the direct effects of X_1 and X_2 on Y, respectively.

b_3, b_4 and b_5 represent the direct effects of W_1, W_2, and W_3 on Y, respectively.

b_6 to b_{11} represent the moderating effects of the interaction terms on the relation between X_1, X_2, and Y.

ϵ is the error term.

When W_2 and W_3 are held constant, an increase of one unit in W_1 results in a decrease of 0.157 units in the effect of X_1 on Y and a decrease of 0.045 units in the effect of X_2 on Y. These effects are not statistically significant.

When W_1 and W_3 are held constant, an increase in W_2 enhances the positive effects of both X_1 and X_2 on Y by 0.184 and 0.255 units, respectively.

When W_1 and W_2 are held constant, an increase in W_3 (confinement) weakens the positive effect of X_1 on Y by 0.211 units but strengthens the positive effect of X_2 on Y by 0.162 units.

Cognitive reappraisal (X_1) was significantly positively associated with mental wellbeing in both Model 1 (Beta = 0.481, $t = 42.337$, $p < 0.001$) and Model 2 (Beta = 0.189, $t = 13.064$, $p < 0.001$). The moderation between cognitive reappraisal and positive attentional bias (X_1W_1) was not significant (Beta = -0.157, $t = -1.773$, $p=0.076$). The interaction between cognitive reappraisal and positive attentional bias was not significant (Beta = -0.157, $t = -1.773$, $p = 0.076$), but the interaction with negative attentional bias was significant (Beta = 0.184, $t = 2.650$, $p = 0.008$), suggesting that the relation between cognitive reappraisal and mental health is stronger at higher levels of negative attentional bias. Additionally, the moderation between cognitive reappraisal and regional coding (X_1W_3) was significant (Beta = -0.211, $t = -4.156$, $p < 0.001$), suggesting that the positive association between cognitive reappraisal and mental wellbeing was weaker in confinement compared to general zone.

Expression suppression (X_2) was significantly negatively associated with mental wellbeing in Model 1 (Beta = -0.035, $t = -3.095$, $p = 0.002$) and significantly positively associated in Model 2 (Beta = 0.069, $t = 5.836$, $p < 0.001$). The moderation between expression suppression and negative attentional bias (X_2W_2) was significant (Beta = 0.255, $t = 3.653$, $p < 0.001$), indicating that higher levels of negative attentional bias were linked to a stronger negative association between expression suppression and mental wellbeing. The interaction between expression suppression and positive attentional bias (X_2W_1) was not significant (Beta = -0.045, $t = -0.486$, $p=0.627$), suggesting that positive attentional bias did not significantly moderate the relation between expression suppression and mental wellbeing. Additionally, the moderation between expression suppression and regional coding (X_2W_3) was significant (Beta = 0.162, $t= 3.224$, $p=0.001$), indicating that the association between expression suppression and mental wellbeing was stronger in confinement compared to general zone.

Positive attentional bias had a significant positive effect on mental wellbeing (Beta = 0.373, $t= 30.314$, $p < 0.001$), while negative attentional bias had a significant negative effect (Beta = -0.229, $t= -23.888$, $p < 0.001$). Regional coding (0–1) also had a significant effect on mental wellbeing (Beta = 0.220, $t= 29.645$, $p < 0.001$), with individuals in confinement showing higher levels of mental wellbeing compared to those in general zone.

The R-squared values indicated that Model 3 explained 31.1% of the variance in mental wellbeing (F = 536.847, $p < 0.001$), suggesting that the models provided a good fit to the data.

Building on the aforementioned models, we attempted to incorporate second-order interaction terms (W_1W_2, W_1W_3, and W_2W_3) and third-order interaction terms ($X_1W_1W_2$, $X_1W_1W_3$, $X_1W_2W_3$, $X_2W_1W_2$, $X_2W_1W_3$, and $X_2W_2W_3$) to further explore the moderating effects. However, these additional terms did not yield significant results and did not significantly improve the $R2$ value thus these higher-order interaction terms were excluded from the model (Blumer
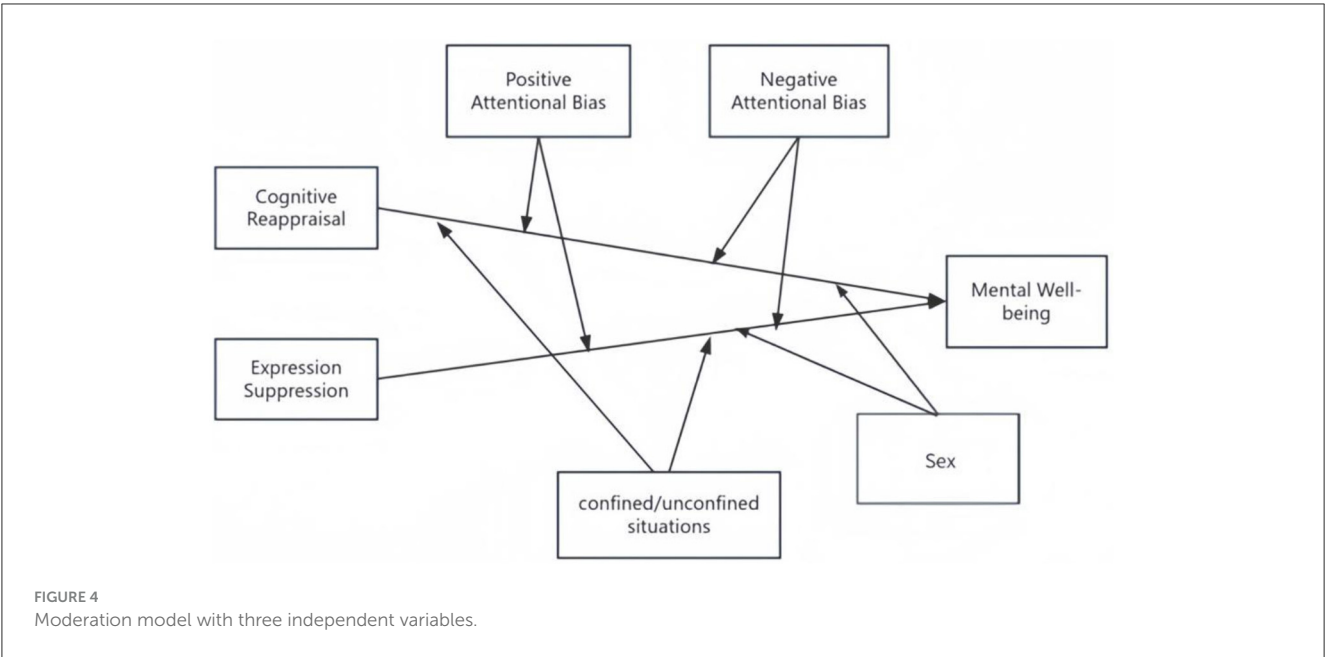
FIGURE 4
Moderation model with three independent variables.

TABLE 3 Moderation model with three independent variables.

Variable	Model1			Model2			Model3		
	Beta	t	p	Beta	t	p	Beta	t	p
Constant		39.733	0.000		33.074	0.000		21.590	0.000
Cognitive reappraisal (X_1)	0.481	42.337	0.000	0.189	13.064	0.000	0.209	2.910	0.004
Expression suppression (X_2)	−0.035	−3.095	0.002	0.069	5.836	0.000	−0.075	−1.049	0.294
Positive attentional bias (W_1)				0.373	30.314	0.000	0.490	13.745	0.000
Negative attentional bias (W_2)				−0.229	−23.888	0.000	−0.497	−13.020	0.000
Confinement (W_3)				0.220	29.645	0.000	0.264	7.437	0.000
X_1W_1							−0.157	−1.773	0.076
X_1W_2							0.184	2.650	0.008
X_1W_3							−0.211	−4.156	0.000
X_2W_1							−0.045	−0.486	0.627
X_2W_2							0.255	3.653	0.000
X_2W_3							0.162	3.224	0.001
R_2	0.208			0.305			0.311		
F	1,723.156			1,149.891			536.847		

Dependent variable: mental wellbeing.

et al., 1987). Consequently, we retained the original model as the most parsimonious and effective representation of the data.

Negative attentional bias moderation effect

We constructed the three-dimensional moderation effect plot of negative attention using SPSS 27.0 (see Figure 5). For negative attention, the minimum value (11), the rounded mean value (33), and the maximum value (55) were selected as the representative values for the low, moderate, and high levels, respectively.

The red dots are primarily concentrated in the regions characterized by low cognitive reappraisal (0–30) and low expressive suppression (0–15). Within this region, mental wellbeing values are relatively low and widely dispersed. This suggests that when negative attention is at a low level, low cognitive reappraisal and low expressive suppression are often associated with poorer mental wellbeing, with significant individual differences.

The green dots are evenly distributed throughout the three-dimensional space, covering the entire range of cognitive reappraisal and expressive suppression values. In the regions with low cognitive reappraisal (0–20) and low expressive suppression
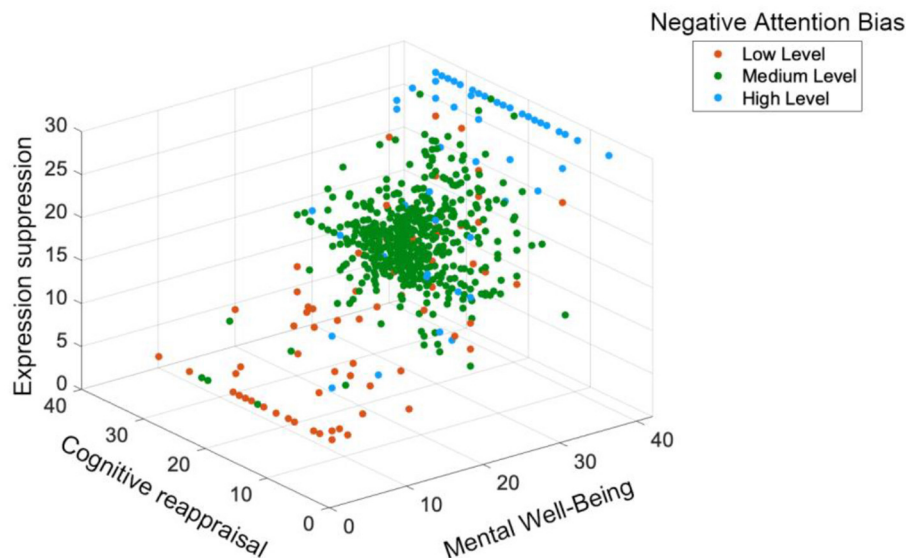
FIGURE 5
Three-Dimensional scatter plot of the moderating effect of negative attentional bias.

(0–10), there is some overlap between green and red dots. However, the mental wellbeing values of green dots are relatively higher and more concentrated, indicating that when negative attention is at a moderate level, individuals may have better mental wellbeing even with low cognitive reappraisal and expressive suppression. As cognitive reappraisal and expressive suppression increase, green dots become more densely distributed in regions with higher mental wellbeing values, particularly in the regions with high cognitive reappraisal (30–50) and moderate expressive suppression (10–20). The increase in green dots in these regions suggests that under moderate levels of negative attention, higher cognitive reappraisal and moderate expressive suppression are more conducive to mental wellbeing, with a more pronounced positive effect.

The blue dots are mainly concentrated in the regions with high cognitive reappraisal (30–50) and high expressive suppression (20–30), where mental wellbeing values are relatively high and concentrated. This indicates that when negative attention is at a high level, high cognitive reappraisal and high expressive suppression are closely associated with better mental wellbeing.

Overall, the plot reveals that the moderator variable, negative attention, plays a significant role in modulating the relation between cognitive reappraisal, expressive suppression, and mental wellbeing. When negative attention is low, low cognitive reappraisal and expressive suppression are associated with poorer mental wellbeing, and improvements in these variables have limited effects on enhancing mental wellbeing. When negative attention is moderate, individuals tend to have relatively better mental wellbeing across various levels of cognitive reappraisal and expressive suppression, with higher cognitive reappraisal and moderate expressive suppression being particularly beneficial for mental wellbeing improvement. When negative attention is high, high cognitive reappraisal and high expressive suppression are closely linked to higher levels of mental wellbeing.

Confinement moderation effect

We constructed the three-dimensional moderation effect plot of confinement using SPSS 27.0 (see Figure 6). The plot indicates that the situational variable (i.e., confined vs. unconfined situations) significantly influences the relation between cognitive reappraisal, expressive suppression, and mental wellbeing. Individuals in unconfined situations exhibit more diverse patterns across these variables, lacking distinct regional characteristics or regularities. In contrast, individuals in confined situations appear to have higher levels of mental wellbeing when engaging in higher cognitive reappraisal and moderate expressive suppression.

The green dots are widely distributed throughout the three-dimensional space, covering the entire range of cognitive reappraisal and expressive suppression values, with relatively uniform density across different regions. This suggests that individuals in unconfined situations display greater variability in cognitive reappraisal, expressive suppression, and mental wellbeing, without a clear concentration trend or specific pattern.

The distribution of blue dots overlaps with the green dots to some extent but also shows distinct differences. In regions with low cognitive reappraisal (0–20) and low expressive suppression (0–10), blue dots are relatively sparse. Conversely, in regions with high cognitive reappraisal (30–50) and moderate expressive suppression (10–20), blue dots are more densely concentrated. Moreover, mental wellbeing values in these regions are relatively higher and more concentrated. This pattern suggests that individuals in confined situations are more likely to achieve higher levels of mental wellbeing when they engage in higher cognitive reappraisal and moderate expressive suppression.

Discussion

The current findings are largely consistent with the theoretical framework and hypotheses proposed in our study. The results
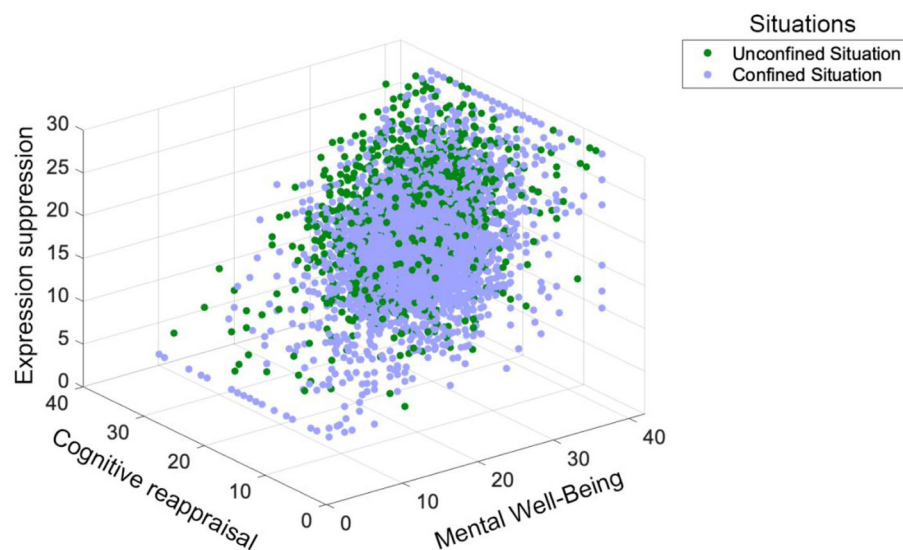
FIGURE 6
Three-dimensional scatter plot of the moderating effect of confinement.

confirmed that cognitive reappraisal exerts a positive influence on mental wellbeing, while expressive suppression demonstrates a negative association, which aligns with Gross's emotion regulation theory (Gross and John, 2003) and the assumptions of our H1. Similarly, the moderating roles of attentional biases and confinement measures in shaping the relation between emotion regulation strategies and mental wellbeing provide strong support for our H2 and H3, shedding light on the complex interplay between individual differences and contextual factors during the pandemic (Folkman, 2013; Hobfoll, 1989). Specifically, negative attentional bias was found to be associated with a stronger positive association between cognitive reappraisal and also strengthen the negative association between expressive suppression and mental wellbeing. Additionally, contextual differences, particularly confinement, play a crucial regulatory role. Specifically, confinement further enhances the positive impact of cognitive reappraisal while intensifying the negative association of expressive suppression with mental wellbeing.

The current study elucidated the impact of emotion regulation strategies on mental wellbeing, as well as their underlying moderating mechanisms. Cognitive reappraisal exerts a positive influence on mental wellbeing, yet this association is attenuated by confinement, and is enhanced by negative attentional bias. The impact of expression suppression on mental wellbeing is more complex, showing a shift from negative to positive effects across different models and is significantly moderated by negative attentional bias and confinement. Overall, the study underscores the significant role of attentional biases and confinement in shaping the relation between emotion regulation strategies and mental wellbeing, highlighting the necessity of considering the interplay between individual differences and situational contexts when promoting mental wellbeing.

The impact of cognitive reappraisal and emotional expression suppression on psychological wellbeing

Cognitive reappraisal exerts a significant positive impact on psychological wellbeing, indicating that individuals who effectively engage in cognitive reappraisal tend to have better mental wellbeing. This association is consistent across different models, highlighting cognitive reappraisal as a robust protective factor for psychological wellbeing. As an antecedent strategy that occurs before emotions are fully activated, cognitive reappraisal efficiently guides emotional trajectories (Gross and John, 2003; Wang et al., 2021). The role of cognitive reappraisal in enhancing psychological wellbeing has been confirmed (Garnefski et al., 2001; Riepenhausen et al., 2022), and our results are in line with these previous findings, further validating this positive association in the context of our study on Chinese college students during COVID-19. Previous research (Fino et al., 2021a; Xu et al., 2020) has highlighted the effectiveness of cognitive reappraisal in buffering anxiety and promoting psychological growth under conditions of extreme stress. In addition, other evidence further supports that the habitual use of cognitive reappraisal contributes to better mental health and greater psychological resilience in the face of stressful situations (Cardi et al., 2021). Complementary evidence from medical students further corroborates this mechanism of cognitive reappraisal, showing that emotion regulation partially mediates the anxiety-depression link (Colonnello et al., 2022). Cross-cultural data reveal gender disparities: females reported heightened distress but concurrently demonstrated stronger social support and growth potential in both Italian (Fino et al., 2021b) and Albanian samples (Fino et al., 2022). Age-related vulnerabilities emerged particularly among young adults (18–24) and older adults

(55–65), who exhibited elevated anxiety and avoidance coping during confinement (Fino et al., 2022).

Emotional expression suppression typically has a negative impact on psychological wellbeing, although this association is moderated by other variables such as attentional bias and contextual differences. Previous studies have found that expression suppression can exacerbate negative emotions and inhibit positive emotions, posing a threat to long-term wellbeing (Dryman and Heimberg, 2018; Kaplan et al., 2024). Its negative correlation with indicators of psychological wellbeing and positive correlation with adverse psychological states highlight the detrimental effects of expression suppression on wellbeing, life satisfaction, and depressive symptoms (Haga et al., 2009). However, findings from some researchers suggest that in collectivist settings, expressive suppression, a reactive regulation strategy, reduces emotional expression and is associated with better mental wellbeing (Tamir et al., 2024). Consistent findings from Tyra et al. (2021) indicate that there are no significant differences in the impact of expression suppression on mental wellbeing.

The impact of attentional bias on mental wellbeing

Individuals with higher levels of negative attentional bias—a tendency to disproportionately focus on negative information—may restructure their concepts of negative stimuli, further promote seeking social support, reduce stress, and transform negative emotions into positive experiences, thereby enhancing mental wellbeing (Cardi et al., 2021). In contrast, positive attentional bias promotes the processing of positive information, leading to improved emotional states (Noguchi et al., 2006), life satisfaction (Riepenhausen et al., 2022), and overall mental wellbeing (Yeung et al., 2015). These findings are consistent with our observations in the current study.

Conversely, negative attentional bias can impair mental wellbeing by contributing to anxiety and depression (Liu et al., 2021), which is also reflected in our research results, showing that higher levels of negative attentional bias are associated with lower mental wellbeing scores in our sample. Emotional balance is crucial, as extreme biases can be detrimental (Grant and Schwartz, 2011). The Behavioral Immune System theory posits that humans have evolved defense mechanisms against pandemic threats, suggesting that heightened reactions to negative information are adaptive (Ackerman et al., 2018). Specifically, when individuals encounter aversive stimuli that may pose a disease threat, it elicits feelings of disgust as a protective mechanism (Makhanova and Shepherd, 2020). This mechanism may be related to the complex effects of negative attentional bias on mental wellbeing we found in our study, potentially influencing how individuals respond to the stressors during the COVID-19 pandemic.

Moderating role of attentional bias

Negative attentional bias significantly influences the relation between cognitive reappraisal, emotional expression suppression, and psychological wellbeing. Negative attentional bias amplifies the negative impact of emotional expression suppression on psychological wellbeing and strengthens the positive effect of cognitive reappraisal. In contrast, positive attentional bias does not significantly modulate these relations.

Consistent with researchers (Aldao, 2013), cognitive reappraisal benefits individuals with negative biases by redirecting attention away from negative stimuli and toward positive/neutral stimuli. The link between expression suppression and negative attentional bias may stem from enhanced attentional control, redistribution of cognitive resources, and potentially heightened internal regulatory effort, thereby facilitating the processing of negative information. Processing negative and threatening information typically consumes more cognitive resources, and the psychological consequences of focusing on negative information are far greater than those of focusing on positive information. This is because negative information is evolutionarily more significant for our survival (Cianfanelli et al., 2023), prompting our attentional system to be inherently more inclined to focus on it.

Impact of confinement on mental wellbeing

Reviews show the COVID-19 pandemic was associated with negative mental health effects across all ages. Pietrzak and Hanke (2024) analyzed 35 studies (2020–2023) in Poland, Spain, and the U.S., finding the pandemic was significantly associated with higher anxiety and depression levels globally, with stronger associations observed in younger individuals and females. Filindassi et al. (2022) reviewed 294 articles (2019–2020) and reported the first wave was linked to increased anxiety, stress, depression, and reduced wellbeing, with these associations being more pronounced among young people. As young adults, college students demonstrated significant mental health associations with the pandemic: Pandya and Lodha (2022) noted the pandemic was broadly correlated with anxiety, depression, and stress in college students, with some showing associations between pre-existing mental illnesses and symptom exacerbation.

Studies on adults highlight pandemic-related long-term psychological associations. Sharma and Sharma (2024) analyzed 13 UK studies (2020) on adults aged ≥65, finding the pandemic was associated with higher anxiety and depression symptoms. Wondmeneh and Solomon (2024) reviewed 20 Ethiopian studies (2020–2024), linking the pandemic to increased post-pandemic comorbid mental disorder prevalence, with stronger associations in females, unemployed individuals, and those with low social support. Wickens et al. (2023) scoped 66 global studies (up to 2021), showing pre-existing depression/anxiety/stress disorders were associated with symptom exacerbation and higher psychological distress. Kumar and Bhatia (2023) noted school closures during confinement were linked to deprivation of safe peer support and teacher support in children and adolescents, correlated with loneliness, irritability, and future uncertainty.

Confinement measures show complex associations with mental health across ages. Boonroungrut et al. (2022) reviewed 2,055 global studies (2020–2021), linking confinement to disrupted

social support and altered learning environments, which were associated with mental health impacts on students from K12 to university levels. Kumar and Bhatia (2023) noted global school closures and confinement (2020–2022) were correlated with anxiety, depression, loneliness, sleep issues, and future uncertainty in children and adolescents, with stronger associations in low/middle-income regions like India, Africa, Asia, and Latin America. Kauhanen et al. (2023) identified school closures and social isolation as key factors linked to deteriorated mental health in children/adolescents, e.g., German 7–17-year-olds showed lower quality of life, increased hyperactivity, and peer problems, with more significant impacts on low-income/immigrant families. Wickens et al. (2023) emphasized isolation measures might be associated with disrupted treatment for pre-existing mental disorders or loss of social support, correlated with exacerbated depression/anxiety, particularly affecting specific populations.

College students have been particularly prone to mental health issues during confinement. Lei et al. (2020) found that the prevalence of anxiety symptoms among college students rose to 41.7% during isolation, with depression symptoms reaching 34.5%, significantly higher than in non-confined groups. Pietrzak and Hanke (2024) pointed out that college students experienced significant increases in anxiety, depression, and loneliness during confinement, especially with prolonged isolation and lack of social support. Studies on Chinese college students (Cao et al., 2020) showed that students in strictly locked-down areas had depression scores 15% higher than those in loosely controlled areas. Boonroungrut et al. (2022) cited research indicating that isolation exacerbated depression, anxiety, and loneliness in adolescents and children, along with increased behavioral problems.

The mechanisms through which confinement affects mental health are diverse. A US review of K12 students from March–July 2020 (Oosterhoff et al., 2020) revealed that confinement led to the loss of emotional support networks at school, increasing loneliness and decreasing a sense of belonging. Study by Schaefer et al. (2020) found that the shift in learning methods during isolation (e.g., stress from autonomous learning) exacerbated the psychological burden on students. A systematic review by Adjepong et al.'s (2022) systematic review of 25 studies across sub-Saharan Africa (2000–2023) found that isolation exacerbated disruption of social and emotional support, separated students from campus resources, and increased loneliness and academic pressure. The uncertainty of exam postponements and evaluations triggered anxiety, while scarce local mental health service resources limited students' access to professional help, making psychological issues prone to accumulation (Chadi et al., 2022; Gureje and Alem, 2000). Although some students alleviated stress through family support or self-regulation, the overall impact remained predominantly negative (Admin, 2023; Julius et al., 2024).

The impact of isolation on individual mental health varies with individual differences and environmental factors. Individuals with stronger psychological resilience, adequate social support, or effective stress-coping strategies experienced fewer negative effects from isolation (Martin et al., 2025). Environmental differences also played a significant role, with studies showing that home isolation had significantly less negative impact on mental health than centralized isolation (e.g., hotel quarantine) (Mohamed

and Yousef, 2021). Some student groups experienced enhanced psychological security during isolation due to increased family time and reduced campus social pressure (Rogers et al., 2021). Changes in family interaction patterns indirectly influenced adolescents' mental health: harmonious family relationships and increased parent-child time spent together could have positive effects; remote work allowed parents more opportunities to accompany their children, potentially reducing parent-child conflicts and benefiting adolescents' mental health (Gencer et al., 2024, p. 26).

During the pandemic, some individuals gained psychological benefits from isolation through proactive coping measures. For example, regular exercise, cultivating new hobbies, self-reflection, organizing affairs, helping others, and fulfilling social obligations all contributed to enhancing psychological resilience and emotional health (Sharma and Sharma, 2024). Some individuals reported positive isolation experiences, such as "having more family time and relaxation, being able to refocus on and cherish existing things," even viewing isolation as a "relaxation period," which promoted mental health (Martin et al., 2025). By adopting coping strategies like planning, maintaining a regular lifestyle, and self-care, some individuals effectively maintained their mental health (Martin et al., 2025). Additionally, the "sense of control over flexibility" from autonomous learning brought short-term positive psychological effects to some students (Huck and Zhang, 2021; Schaefer et al., 2020; Youth Truth, 2020).

Research has revealed temporal effects in the impact of isolation on mental health: depression and anxiety symptoms might increase initially but significantly decrease over time (e.g., at the end of isolation) (Martin et al., 2025). Some regions or groups exhibited short-term positive effects at the beginning of isolation, such as the "honeymoon effect"—altruism and social support from collective crisis response led to a short-term decline in suicide rates (Goto et al., 2022). Reduced social pressure and increased family time brought short-term psychological improvements, but long-term isolation generally had negative impacts on mental health, especially for young groups (Pietrzak and Hanke, 2024). An observational study of 70–80-year-old elderly individuals showed that those who maintained physical activity through family activities did not experience significant worsening of depression symptoms despite increased sedentary time at the beginning of isolation (Sharma and Sharma, 2024). Rothenberg et al. (2024) conducted a longitudinal study on adolescents from multiple countries, observing that the impact of COVID-19 on their wellbeing varied over time and across cultures. These findings align with our study's focus on Chinese college students during the pandemic, highlighting the importance of considering the dynamic nature of the pandemic's influence on mental health.

According to the box plot and moderation model, the direct effect of confinement on mental wellbeing is significant, revealing that the mental wellbeing level in confinement areas is higher than that in general areas. Major public health events bring significant uncertainty to individuals. Previous studies have shown that, in the context of public health emergencies, the psychological states of individuals in different regions may exhibit a "ripple effect," whereby individuals closer to the epicenter of the event perceive higher risks and experience more intense negative emotions

(Kasperson et al., 1988; Wen et al., 2020). However, some studies also indicate that individuals near the epicenter of an epidemic or disaster often show lower levels of anxiety (Wang et al., 2021; Xie et al., 2011). This finding contradicts the "ripple effect." Based on the "psychological eye of the storm effect" (Stewart-Brown et al., 2009), we speculate that this observed phenomenon may be related to risk stimulus adaptation in confinement areas. Combining Bandura's social learning theory (Wiegman et al., 1991; Wiegman and Gutteling, 1995), we hypothesize that individuals in central areas alleviate information-induced panic through direct experience (Wen et al., 2020). This adaptation and direct experience results in better mental wellbeing among people in confinement areas, due to their awareness of risks and prevention and confinement, compared to individuals not involved in confinement within the same city.

Moderating role of confinement

The main effect of confinement situations on psychological wellbeing is positive, potentially reflecting an enhancement of psychological wellbeing among individuals through self-reflection, solitude, and other means in confinement situations. Our results further contribute to the growing body of evidence highlighting distinct gender and age patterns in pandemic-related psychological outcomes, consistent with studies showing younger adults are vulnerable to negative mental health effects during the pandemic lockdown (Lansford et al., 2023; Skinner et al., 2021). This finding aligns with Wen et al. (2020), who observed higher resilience in regions directly affected by COVID-19 due to adaptive coping strategies. However, confinement situations affect the impacts of cognitive reappraisal and expression suppression on psychological wellbeing through their moderating effects. Specifically, confinement situations limit the external support for cognitive reappraisal, thereby weakening its positive influence on psychological wellbeing; simultaneously, confinement situations exacerbate individuals' feelings of loneliness and stress, intensifying the negative impact of expression suppression on psychological wellbeing. This moderation effect may be explained by Bandura's social learning theory (Wiegman et al., 1991), where direct exposure to risk enhances adaptive regulation strategies but amplifies maladaptive strategies under prolonged stress.

Implications and limitations

Despite its contributions, this study also acknowledges several limitations. Firstly, although the validated model is grounded in existing research and theoretical frameworks, the use of questionnaire-based and cross-sectional methods inherently precludes causal inferences. Future research may employ longitudinal designs to examine the causal effects of emotion regulation strategies on mental wellbeing. However, Wen (2017) has noted that questionnaire-based methods can still validate causal relations if the proposed causal sequence is logically, conceptually, and theoretically reasonable, and key confounding variables are controlled. Secondly, the study focused solely on

the moderating effects of positive and negative attentional biases; future research should incorporate variables closely related to mental wellbeing, such as personality traits, social support, and psychological resilience, to comprehensively unravel the relation model between emotion regulation strategies and mental wellbeing. Lastly, the self-report method used to assess participants' behaviors may be prone to response biases, including social desirability effects (Paulhus, 1984). To mitigate measurement errors, future studies could incorporate behavioral experiments in conjunction with self-report measures. As noted by Rothenberg et al. (2024), gender and age can significantly impact how adolescents experience the disruptions caused by COVID-19. Their research showed that different genders and age groups may have varying levels of exposure to pandemic-related stressors and different coping mechanisms. In our study of Chinese college students, although we focused on the 18–24 age group, future research could delve deeper into how gender—specific factors interact with emotion regulation strategies and mental wellbeing, similar to how Skinner et al. (2021) found gender-related differences in the adjustment of young adults and their mothers during the pandemic.

Conclusion

The results indicate that cognitive reappraisal and expression suppression have significant effects on mental wellbeing, with notable interactions involving attentional biases and regional differences. Specifically, negative attentional bias strengthens the positive effect of cognitive reappraisal and the negative effect of expression suppression on mental wellbeing. Regional coding also moderates these relations, highlighting the importance of contextual factors in understanding the dynamics of cognitive and emotional processes on mental wellbeing.

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 humans were approved by the Ethics Commission of Tsinghua University (2022 Ethics Review No. 19). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

MX: Writing – original draft, Writing – review & editing. YW: Conceptualization, Writing – original draft. YZ: Investigation, Writing – original draft. YLu: Data curation, Writing – original draft. LL: Formal analysis, Writing – original draft. YLi: Formal analysis, Writing – original draft. DG: Writing – review &

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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.

Generative AI statement

The author(s) declare that no Gen AI was used in the creation of this manuscript.

Publisher's note

Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2025.1571275/full#supplementary-material

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| Frontiers in **Psychology**

Psychological wellbeing of Ukrainian civilians: a data report on the impact of traumatic events on mental health

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Introduction

The Russian-Ukrainian war has profoundly impacted the lives of Ukrainians, bringing both direct and indirect psychological challenges. Armed conflicts, such as this one, are associated with enduring effects on mental health, including post-traumatic stress disorder (PTSD), anxiety, depression, and psychological distress, which affect all demographic groups irrespective of their financial status, marital status, education, or gender (Chudzicka-Czupała et al., 2023; Garry and Checchi, 2020). However, the degree of vulnerability varies, with those exposed to war-related events being at the highest risk.

Direct exposure to war, including constant shelling, loss of homes, displacement, and violence, has left a significant mark on mental wellbeing. Many civilians face daily threats to their lives and are dealing with injuries, deaths of loved ones, and destruction of infrastructure. The closer to the frontline regions where people often lack access to necessities such as food, water, electricity, heating, and shelter, the higher the level of stress and anxiety is reported because people are facing the following difficulties more often (Pypenko et al., 2023). These daily stressors, worsened by the armed conflict, compound existing challenges, making mental recovery and resilience harder to achieve (Miller and Rasmussen, 2010; Palace et al., 2024). Another threat for young adults in Ukraine is a substantial risk of screening positive for depression, anxiety, insomnia, and PTSD symptoms due to their exposure to violent events like shellings, explosions, occupation, violence, assault, and witnessing or experiencing the death of loved ones (Polyvianaia et al., 2025). The stated above symptoms often co-occur simultaneously.

The economic ramifications of the war further exacerbate mental health struggles. Rising energy and commodity prices, along with rise in food prices, have increased the economic burden on civilians already affected by war (Balbaa et al., 2022). This has contributed to financial hardship for a lot of Ukrainians. Along with financial difficulties, factors such as social marginalization, isolation, inadequate housing conditions, and changes in family structure and functioning can trigger or intensify a range of severe stressors (Miller and Rasmussen, 2010). Thus, the socio-economic consequences of the war are also likely to worsen the psychological wellbeing of Ukrainians.

According to the research, only 23.5–26% of civilians exposed to traumatic events were diagnosed with PTSD (Ahmed et al., 2024; Lim et al., 2022; Morina et al., 2018). However, traumatic events can still significantly impact the mental health of the broad population of civilians. Despite the generally high levels of resilience observed in populations, those directly exposed to military actions, violence, or severe human suffering continue to experience significantly elevated levels of stress, anxiety, and trauma-related symptoms (Kurapov et al., 2023). The report follows an initial screening conducted by our research team (Kurapov et al., 2023) and represents one of a planned series of assessments. This study serves as a checkpoint for monitoring the mental health of Ukrainians during the ongoing war, providing a valuable tool for tracking changes and dynamics over time. It offers a screening of mental health among Ukrainian civilians, an overview of key dimensions such as sleep quality, anxiety, emotional wellbeing, PTSD symptoms, alcohol consumption, and the long-term effects of traumatic events. The findings aim to present an overview of trends in the psychological state of Ukrainians. This report may be used to guide the development of evidence-based programs for Ukrainian civilians and inform mental healthcare systems, psychologists, and international partners addressing the consequences of this war in one of today's most challenging humanitarian contexts.

Methods

Procedure

The data report employed a cross-sectional quantitative design, focusing on individual participants as the unit of analysis. Eligibility criteria required participants to be 18 years of age or older. A self-selected sampling approach was adopted to the Google Forms platform. Simultaneously, we applied a convenience sampling method by engaging participants via various social media platforms (including Telegram FZ-LLC) and the official Facebook page of the Faculty of Psychology of Taras Shevchenko National University of Kyiv, aiming to reach a diverse demographic and regional representation across Ukraine. Data collection occurred in a single phase, spanning from December 10 to December 29, 2024. In total, 241 respondents met the inclusion criteria. Informed consent was collected from all participants. All data were processed in accordance with applicable data privacy regulations and ethical guidelines. All questions were presented in the Ukrainian language. As no Ukrainian adaptation was available for BRS, PCL-5, ISI, PSQI, PG-13, we used an author-translated version that underwent standard questionnaire translation procedures. During the data collection process, participants completed a series of validated psychological questionnaires, which are described below.

Measurements

The Brief Resilience Scale (BRS) is a concise self-report measure designed to assess an individual's ability to recover or "bounce back" from stress. It includes six items scored on a Five-point Likert scale,

ranging from 1 ("strongly disagree") to 5 ("strongly agree"). The total score is calculated as the mean of all item responses, with reverse scoring applied to three negatively worded items. Higher scores indicate greater resilience (Smith et al., 2008).

The PHQ-9 is a short self-report questionnaire designed to screen for depression and assess its severity over the past 2 weeks. It consists of nine items corresponding to DSM-IV criteria for major depressive disorder. Each item is rated on a Four-point Likert scale from 0 ("not at all") to 3 ("nearly every day"), with total scores ranging from 0 to 27. Scores are categorized as minimal (1–4), mild (5–9), moderate (10–14), moderately severe (15–19), or severe (20–27) depression (Kroenke et al., 2001). The PHQ-9 has been adapted for use in Ukrainian (Institute of Cognitive Behavioral Therapy, 2012).

The Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5) is a 20-item self-report questionnaire designed to evaluate PTSD symptoms based on DSM-5 criteria. Respondents rate each item on a Five-point Likert scale, ranging from 0 ("not at all") to 4 ("extremely"), reflecting how much they have been bothered by PTSD symptoms over the past month. The PCL captures a broad range of posttraumatic symptoms that may emerge in response to stressors, even in the absence of a strong emotional identification with a specific traumatic experience. The total score ranges from 0 to 80, with higher scores indicating greater symptom severity (Karachevskii, 2016).

The GAD-7 is a brief self-report questionnaire that screens for generalized anxiety disorder (GAD) and measures its severity over the past 2 weeks. It contains seven items based on DSM-IV criteria for GAD, scored on a Four-point Likert scale from 0 ("not at all") to 3 ("nearly every day"). Total scores range from 0 to 21, with thresholds of 5, 10, and 15 indicating mild, moderate, and severe anxiety, respectively. The GAD-7 is validated for use in both clinical and research settings (Aleksina et al., 2024). A cut-off score of 10 is commonly used to identify probable GAD cases, providing high sensitivity (89%) and specificity (82%). According to Williams (2014), a score of 10 or higher is also recommended as a threshold for referring individuals for further evaluation of anxiety disorders. This threshold was also applied in a similar sample by Lushchak et al. (2023).

The Insomnia Severity Index (ISI) is a self-report measure designed to assess the nature, severity, and impact of insomnia. It includes seven items evaluating sleep onset difficulties, sleep maintenance issues, early awakening, satisfaction with sleep patterns, interference with daily functioning, noticeability of sleep problems, and distress caused by sleep issues. Each item is scored on a Five-point Likert scale from 0 ("no problem") to 4 ("very severe problem"), resulting in a total score ranging from 0 to 28. Scores are categorized as absence of insomnia (0–7), subthreshold insomnia (8–14), moderate insomnia (15–21), or severe insomnia (22–28). The ISI is widely validated for assessing both clinical severity and treatment outcomes (Bastien et al., 2001).

The Pittsburgh Sleep Quality Index (PSQI) is a self-report questionnaire designed to measure sleep quality and disturbances over the past month. It consists of 19 self-rated items that generate seven component scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. These components

are summed to produce a global score ranging from 0 to 21, with higher scores indicating poorer sleep quality. A global score above 5 suggests poor sleep quality (Buysse et al., 1989).

The WHO-5 Wellbeing Index is a short self-report questionnaire that measures subjective wellbeing. It consists of five items rated on a Six-point Likert scale from 0 ("never") to 5 ("all the time"), reflecting the respondent's feelings over the past 2 weeks. The total score ranges from 0 to 25 and is converted into a percentage (0–100%) to represent overall wellbeing. Scores below 50 indicate poor wellbeing and warrant further evaluation for depression using ICD-10 criteria. The WHO-5 is widely used to monitor changes in wellbeing, with a 10% score change considered clinically significant. This tool has been adapted for use in Ukrainian (Karamushka et al., 2023; Topp et al., 2015).

The Continuous Traumatic Stress Response (CTSR) scale is a 15-item self-report questionnaire designed to measure symptoms of traumatic stress due to ongoing exposure to threats. Respondents rate their symptoms over the past month on a Four-point Likert scale from "not at all" to "to a very large extent." The scale also evaluates distress and functional impairment using additional severity subscales. It includes items addressing prior trauma exposure and previous mental health diagnoses. The CTSR primarily assesses the subjective emotional experience and perceived severity of a traumatic event, focusing on the individual's internal sense of trauma. The CTSR was developed and validated to assess continuous traumatic stress in individuals facing ongoing security threats. This questionnaire has been adapted for use in Ukrainian (Frankova et al., 2025; Goral et al., 2021).

The Prolonged Grief Disorder (PG-13) scale is a diagnostic tool consisting of 13 items that evaluate symptoms of prolonged grief, including separation distress, cognitive and emotional symptoms, and functional impairment. Responses are scored using a Likert scale, ranging from "not at all" to "several times a day" or "overwhelmingly." Specific diagnostic thresholds across five domains must be met to identify prolonged grief disorder (PGD). According to Prigerson et al. (2009), a diagnosis requires the presence of at least five out of nine specific symptoms, occurring either daily or to a disabling extent. These include emotional numbness, a sense of being stunned or feeling that life lacks meaning, mistrust, persistent bitterness about the loss, difficulty accepting the death, confusion about one's identity, avoidance of reminders of the loss, and an inability to move forward. These symptoms must persist for a minimum of 6 months following the death and must significantly impair daily functioning. The PG-13 was developed following evidence-based guidelines for diagnosing PGD (Prigerson et al., 2009).

The Alcohol Dependence Scale (ADS) includes 25 items designed to measure the severity of alcohol dependence. The questionnaire evaluates various aspects, including the quantity and frequency of alcohol use, physical and psychological symptoms, behavioral patterns, adverse effects, and attempts to control drinking. Responses are scored using frequency- and severity-based options, with some items employing a Likert-like format. The total score, calculated by summing item scores, provides an overall measure of dependence severity (Skinner and Horn, 1984).

Data characteristics

The dataset comprises responses from 241 participants and includes demographic variables such as gender, age, marital status, education level (highest completed), monthly income (in UAH), and region of residence. The study presents findings on respondent distributions based on available cutoff scores (using either internationally established or previously published thresholds), along with descriptive statistics such as means and standard deviations. These are reported alongside reliability and validity indices for each questionnaire. Data preprocessing included scaling adjustments, such as multiplying WHO-5 scores by 4 (Topp et al., 2015) and dividing BRS-6 scores by 6 (Smith et al., 2008), to align with scoring conventions, ensuring accurate analysis and interpretation.

Data cleaning

Responses from respondents under the age of 18 were excluded from the data collected. Respondents were required to answer all questions, thus yielding no missing values.

Data description

In Table 1, we show gender, age, marital status, education, monthly income, and region of residence as the main demographic variables. Each category in a variable is analyzed using frequency and percentage.

In Table 2, we have presented Cronbach's alpha, composite reliability (CR), average variance extracted (AVE), tolerance, and variance inflation factor (VIF) as tools to assess the reliability and validity of the measures. All calculations were performed in R. Cronbach's alpha was computed using the psych package, and values above 0.7 were considered acceptable (Howard, 2021; Nasution et al., 2020). Composite reliability and average variance extracted were calculated using standardized item loadings from item correlation matrices, following standard psychometric formulas. Composite reliability should be at least 0.7 (Nasution et al., 2020). As for the AVE, it is a key indicator of convergent validity, which assesses whether a set of items truly reflects the underlying construct they are intended to measure. The generally accepted threshold for AVE is 0.50, meaning that the construct should explain at least 50% of the variance in its indicators (Shrestha, 2021). Ensuring AVE meets this level strengthens the evidence that the questionnaire reliably captures the intended theoretical concept. Tolerance and variance inflation factor (VIF) are important metrics for diagnosing multicollinearity among predictors in a regression model. Tolerance and VIF were calculated based on the AVE to screen for multicollinearity in the predictors. Tolerance, computed as $1-R^2$, indicates the proportion of variance in a predictor not explained by other predictors. Typically, a tolerance value below 0.10 signals problematic multicollinearity. VIF, the reciprocal of tolerance, quantifies the degree to which a predictor's variance is inflated due to

TABLE 1 Overview of sociodemographic data.

Variable	Category	N	%
Gender	Female	191	79.3
	Male	47	19.5
	Other	3	1.2
Age	18–25 years	88	36.5
	26–35 years	69	28.6
	36–60 years	79	32.8
	61–75 years	5	2.1
Marital status	Widower/widow	2	0.8
	Civil marriage	29	12
	Single	119	49.4
	Married	70	29
	Divorced	17	7.1
	Other	4	1.7
Education	Bachelor's degree	63	26.1
	Master's degree	105	43.6
	I have a scientific degree	10	4.1
	Complete general secondary education (11 grades)	36	14.9
	Professional junior bachelor/junior specialist	18	7.6
	Other	9	3.8
Monthly income (UAH)	10,000–15,000	30	12.6
	15,000–20,000	33	13.9
	25,000–30,000	27	11.2
	5,000–10,000	21	8.7
	More than 30,000	73	30.7
	Less than 5,000	33	13.7
	I do not wish to answer	24	10
Region of residence	Ivano-Frankivsk	4	1.7
	Volyn	2	0.8
	Vinnytsia	3	1.2
	Dnipropetrovska	16	6.6
	Donetsk	1	0.4
	Zhytomyr	6	2.5
	Transcarpathian	1	0.4
	Zaporizhzhya	1	0.4
	Kyiv (together with the city of Kyiv)	115	47.7
	Kirovograd	5	2.1
	Lviv	16	6.6
	Mykolaiv	4	1.7
	Odesa	9	3.7
	Poltava	3	1.3

(Continued)

TABLE 1 (Continued)

Variable	Category	N	%
	I do not live in Ukraine (abroad)	27	11.2
	Rivne	3	1.2
	Ternopil	1	0.4
	Kharkiv	9	3.7
	Kherson	1	0.4
	Khmelnytsky	4	1.7
	Cherkasy	4	1.7
	Chernivtsi	2	0.8
	Chernihiv	4	1.7

N, frequency; %, percentage.

TABLE 2 Reliability and validity.

Construct	Number of items	α	CR	AVE	Tolerance	VIF
WHO-5	5	0.896	0.504	0.504	0.495	2.018
CTSR-15	15	0.907	0.194	0.194	0.806	1.241
PG-13	13	0.941	0.361	0.361	0.639	1.564
ADS	25	0.845	0.045	0.045	0.955	1.047
ISI-7	7	0.873	0.325	0.325	0.675	1.482
GAD-7	7	0.87	0.317	0.317	0.683	1.465
PCL-5	20	0.937	0.209	0.209	0.791	1.264
PHQ-9	9	0.88	0.262	0.262	0.738	1.355
BRS-6	6	0.879	0.388	0.388	0.612	1.634
PSQI	7	0.585	0.092	0.092	0.908	1.102

α, Cronbach's alpha; CR, composite reliability; AVE, average variance extracted; VIF, variance inflation factor; WHO-5, World Health Organization Wellbeing Index (5-item version); CTSR-15, Continuous Traumatic Stress Response scale (15-item version); PG-13, Prolonged Grief Disorder scale (13-item version); ADS, Alcohol Dependence scale; ISI-7, Insomnia Severity Index (7-item version); GAD-7, Generalized Anxiety Disorder scale (7-item version); PCL-5, posttraumatic stress disorder checklist for DSM-5 (20-item version); PHQ-9, patient health questionnaire (9-item version); BRS-6, Brief Resilience scale (6-item version); PSQI, Pittsburgh Sleep Quality Index.

multicollinearity. VIF helps detect if predictors are too highly correlated, which could distort regression coefficients and lead to unreliable conclusions. By monitoring VIF values, we can ensure that their models accurately reflect the distinct effects of different psychological constructs, and thus improve the validity and interpretability of their findings. Monitoring tolerance and VIF helps ensure reliable regression estimates (Kim, 2019). To ensure that multicollinearity did not bias the regression estimates, a threshold of VIF < 5 was adopted, consistent with established guidelines suggesting that VIF values above 5 warrant concern (Menard, 2001).

Some constructs, including CTSR-15, ADS, and PSQI, showed low Average Variance Extracted (AVE) values (below the recommended threshold of 0.50), suggesting weak convergent validity. This indicates that these scales may not capture sufficient

TABLE 3 Confirmatory factor analysis.

Questionnaire	CFI	TLI	RMSEA
ADS-25	0.421	0.368	0.144
BRS-6	0.991	0.985	0.052
CTSR-15	0.776	0.739	0.134
GAD-7	0.924	0.886	0.127
ISI-7	0.914	0.914	0.143
PCL-20	0.802	0.779	0.113
PG-13	0.804	0.765	0.178
PHQ-9	0.899	0.866	0.118
PSQI-7	0.924	0.886	0.059
WHO-5	0.968	0.935	0.139

CFI, Comparative Fit Index; TLI, Tucker-Lewis Index; RMSEA, Root mean square error of approximation.

variance in their indicators within our sample, which could affect the reliability of related results. Consequently, caution is warranted when interpreting findings based on these measures, and future studies should further examine and refine these instruments to improve their validity and applicability.

To evaluate the structural validity of the questionnaires in our sample, we conducted a confirmatory factor analysis using the component scores, that is, the scores for each item, as observed variables. The CFA was performed using the "lavaan" package in R (version 4.4.1), employing the robust maximum likelihood (MLR) estimator. The results are presented in Table 3.

As for the ADS-25, both indices (CFI and TLI) are low, and the RMSEA is higher than accepted, which indicates a poor model fit, suggesting that the one-factor model may not adequately capture the underlying structure of this questionnaire. In contrast, the BRS-6 demonstrated an accurate model fit, with CFI (0.991) and TLI (0.985) well above the conventional threshold of 0.95, and a low RMSEA (0.052), indicating a close fit to the data. The CTSR-15 showed a marginal fit, with CFI (0.776) and TLI (0.739) below the ideal cutoffs, and an RMSEA of 0.134, suggesting potential model misspecification. The GAD-7 and PSQI-7 both demonstrated acceptable model fit, with CFI values of 0.924 and RMSEA values close to or below 0.06. ISI-7 also showed a good fit, with CFI and TLI at 0.914 and an RMSEA slightly above 0.14, which may indicate a minor deviation from a perfect fit. The PCL-20 and PG-13 both exhibited suboptimal model fit, with CFI values just above 0.80 and TLI values below 0.78, along with relatively high RMSEA values (0.113 and 0.178, respectively). The PHQ-9 demonstrated a reasonable fit, with CFI (0.899) approaching acceptable levels and RMSEA (0.118) within a moderate range. Lastly, the WHO-5 showed a strong model fit, with a high CFI (0.968), TLI (0.935), and an SRMR below 0.03, although the RMSEA (0.139) was slightly elevated, suggesting room for improvement.

A potential explanation for the poor model fit in some scales is that the latent factor structure of a questionnaire may vary depending on the characteristics of the sample, such as cultural background, age, or psychological state. While minor

modifications such as rewording items or recalibrating scoring could potentially improve model fit, such changes were not implemented in this study to preserve the original validated structure of the instruments and maintain comparability with previous research. Moreover, given the theoretical grounding and extensive prior use of these scales in trauma-related and cross-cultural contexts, they remain valuable tools for assessing psychological wellbeing.

Further research aimed at testing the measurement invariance of these instruments across different populations and contexts are needed for reliability and validity, as well as exploring alternative factor structures that may better reflect the specific features of the sample under investigation.

In Table 4, responses to each questionnaire are summarized. For Pittsburgh Sleep Quality Index (PSQI), we chose 5 as a cutoff value, based on previous studies (Buysse et al., 1989). Specifically, participants who scored >5 are considered to have poor sleep quality, and participants who scored 5 or less are considered to have good sleep quality. For ISI-7, differentiative thresholds are no insomnia, subthreshold insomnia, insomnia, moderate insomnia, and severe insomnia (Bastien et al., 2001). Concerning GAD-7, traditional levels are differentiated with scores 5, 10, and 15, creating mild, moderate, moderately severe, and severe anxiety cutoffs (Aleksina et al., 2024). For PCL-5, 41 was chosen as a cutoff score, meaning that respondents who scored more than 41 have symptoms of PTSD (Morrison et al., 2021). For PHQ-9, Concerning WHO-5, the cutoff score for the Ukrainian population is 50 (same as for Western Europe), so participants who scored 50 or lower are considered to have poor life quality, and those who scored more than 50—high life quality (Asanov et al., 2023). The BRS-6 questionnaire cutoffs are 3 and 4, meaning that scores below 3 indicate low resilience, and scores above 4.3 elicit high resilience (Smith et al., 2013). As for CTSR, the questionnaire consists of 15 items rated on a Four-point Likert scale ranging from 0 ("Not at all") to 3 ("Often"). Total scores are obtained by summing the item scores, with higher scores indicating more severe symptoms of continuous traumatic stress. In line with previous research (Goral et al., 2021), a median score of 3 was used as a cutoff to distinguish between probable presence or absence of traumatic stress symptoms. For the PG-13 (Prolonged Grief Disorder) questionnaire, participants responded to 13 items rated on a Five-point Likert scale, assessing the frequency and intensity of grief-related symptoms. Total scores were calculated by summing relevant item responses. Participants were categorized into two groups—"No prolonged grief" and "Probable prolonged grief"—based on the diagnostic criteria outlined by Prigerson and Maciejewski (2006), which include symptom duration, functional impairment, and symptom severity.

For the Alcohol Dependence Scale (ADS), participants completed 25 items measuring aspects of alcohol dependence. Scores were summed to produce a total score ranging from 0 to 47, with higher scores indicating greater alcohol dependence. Consistent with Murphy and MacKillop (2011), we used the following interpretation thresholds: 0–13 = low dependence, 14–21 = moderate dependence, 22–29 = substantial dependence, 30+ = severe dependence.

TABLE 4 Summary of the results.

Questionnaire	Symptom	Gender	Mean	SD	Cutoff	Count	Percentage
PSQI	Sleep quality	Other	9	3.46	Poor sleep quality	3	100
		Female	6.48	2.93	Good sleep quality	57	29.84
					Poor sleep quality	134	70.16
		Male	6.26	2.65	Good sleep quality	15	31.91
					Poor sleep quality	32	68.09
ISI-7	Insomnia severity	Other	14	7	No insomnia	1	33.33
					Moderate insomnia	2	66.67
		Female	10.48	6.16	No insomnia	56	29.32
					Subthreshold insomnia	84	43.98
					Moderate insomnia	40	20.94
					Severe insomnia	11	5.76
		Male	9.94	5.92	No insomnia	18	38.3
					Subthreshold insomnia	16	34.04
					Moderate insomnia	10	21.28
					Severe insomnia	3	6.38
GAD-7	Anxiety	Other	13.67	5.13	Moderate anxiety	1	33.33
					Severe anxiety	2	66.67
		Female	9.21	4.95	Mild anxiety	39	20.42
					Moderate anxiety	68	35.6
					Moderately severe anxiety	52	27.23
					Severe anxiety	32	16.75
		Male	8.26	5.2	Mild anxiety	13	27.66
					Moderate anxiety	17	36.17
					Moderately severe anxiety	13	27.66
					Severe anxiety	4	8.51
PCL-5	PTSD	Other	47.67	24.09	No PTSD	1	33.33
					Probable PTSD	2	66.67
		Female	29.31	16.32	No PTSD	145	75.92
					Probable PTSD	46	24.08
		Male	29.3	17.33	No PTSD	36	76.6
					Probable PTSD	11	23.4
PHQ-9	Depression	Other	17.33	8.96	Mild depression	1	33.33
					Severe depression	2	66.67
		Female	11.24	5.9	Minimal depression	14	7.33
					Mild depression	59	30.89
					Moderate depression	53	27.75
					Moderately severe depression	38	19.9
					Severe depression	27	14.14
		Male	11.19	5.9	Minimal depression	5	10.64
					Mild depression	11	23.4
					Moderate depression	14	29.79

(Continued)

TABLE 4 (Continued)

Questionnaire	Symptom	Gender	Mean	SD	Cutoff	Count	Percentage
					Moderately severe depression	10	21.28
					Severe depression	7	14.89
WHO-5	Wellbeing	Other	25.33	26.63	Good wellbeing	2	66.67
					Poor wellbeing	1	33.33
		Female	41.88	20.89	Good wellbeing	126	65.97
					Poor wellbeing	65	34.03
		Male	44.77	25.4	Good wellbeing	27	57.45
					Poor wellbeing	20	42.55
BRS-6	Resilience	Other	1.61	0.59	Low resilience	3	100
		Female	2.84	0.84	Low resilience	102	53.4
					Normal resilience	80	41.88
					High resilience	9	4.71
		Male	3.04	0.93	Low resilience	19	40.43
					Normal resilience	23	48.94
					High resilience	5	10.64
CTSR-15	Trauma symptoms	Other	2.33	1.15	No significant trauma	1	33.33
					Probable trauma	2	66.67
		Female	0.99	0.86	No significant trauma	179	93.72
					Probable trauma	12	6.28
		Male	1.11	0.84	No significant trauma	44	93.62
					Probable trauma	3	6.38
PG-13	Prolonged grief	Other	31	16.5	No prolonged grief	3	100
		Female	18.9	9.5	No prolonged grief	186	97.38
			42.6	4.2	Prolonged grief	5	2.62
		Male	20.9	10.4	No prolonged grief	46	97.87
			46	NA	Prolonged grief	1	2.13
ADS	Alcohol dependence	Other	11.33	13.05	Low dependence	2	66.67
					Substantial dependence	1	33.33
		Female	3.03	3.4	Low dependence	188	98.43
					Intermediate dependence	3	1.57
		Male	4.89	5.73	Low dependence	43	91.49
					Intermediate dependence	3	6.38
					Substantial dependence	1	2.13

Limitations

One limitation of the present study is the lack of a screening question to distinguish between civilian and military respondents. As a result, we cannot reliably separate civilian participants from those who may have been actively involved in military operations or affiliated with the armed forces.

Another limitation is related to the sampling strategy. Although the survey was distributed online to reach a diverse demographic and regional representation, recruitment was conducted mainly through a Telegram channel and the official Facebook page of the Faculty of Psychology at Taras Shevchenko National University of Kyiv. This approach may have limited the diversity of the sample in terms of age groups, socio-economic statuses, and regional backgrounds.

Moreover, not all cutoff scores used for the psychological questionnaires have been validated specifically for the Ukrainian population. In such cases, we relied on internationally established or widely accepted thresholds from prior research. While this

allowed us to classify symptom severity and facilitate comparison with other studies, the cultural and contextual appropriateness of some cutoffs may be limited.

Some scales, such as the Alcohol Dependence Scale (ADS) and Pittsburgh Sleep Quality Index (PSQI), showed unexpectedly low composite reliability values in our sample. This suggests potential measurement limitations that should be addressed in future research. Certain questionnaires, such as CTSR-15, ADS, and PSQI, exhibited low AVE values, indicating weak convergent validity in our sample. This suggests that these instruments may not adequately capture the underlying constructs, potentially limiting the robustness of findings based on these measures. Future research should aim to further validate and possibly refine these scales within the Ukrainian population to enhance their psychometric properties and interpretability.

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://osf.io/smhnr/.

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 participants provided their written informed consent to participate in this study.

Author contributions

AK: Conceptualization, Data curation, Methodology, Project administration, Validation, Writing – review & editing. OB: Data curation, Writing – original draft. YB: Data curation, Validation, Writing – original draft. YV: Data curation, Formal analysis, Validation, Writing – original draft. AB: Data curation, Writing – original draft. ID: Data curation, Writing – review & editing.

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 distress is associated with symptoms of post-traumatic stress disorder among healthcare providers during the COVID-19 pandemic: 2021–2023

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Background: During the COVID-19 pandemic, approximately 25% of healthcare providers (HCP) worldwide were reported to have experienced symptoms associated with post-traumatic stress disorder (PTSD). While longitudinal studies have identified factors associated with PTSD in this group of essential workers, associations with psychological distress trajectories have not been studied.

Methods: Healthcare providers who participated in the prospective Canadian COVID-19 Cohort Study were eligible. Baseline data were collected at enrolment with time-varying measures updated by participants every 12 months. Kessler Psychological Distress Scale (K10) questionnaires were completed in March 2021 or upon their recruitment (whichever came first) and every 6 months thereafter. Impact of Event Scale-Revised (IES-R) questionnaires were completed within two weeks of their withdrawal from the study or study termination date (December 2023). Modified Poisson regression was used to assess the association between PTSD symptoms (i.e., IES-R scores of < 24 vs. ≥ 24) and score trajectories of the first four K10 questionnaires that were completed 180 ($\pm$ 60) days apart.

Results: Of 441 participants, 105 (24.0%) had IES-R scores indicative of concern for PTSD (i.e., ≥ 24). Five trajectories of K10 scores were identified including: resilient (n = 111, 25.2%), chronically distressed (131, 29.7%), delayed onset of distress (43, 9.8%), recovery (83, 18.8%), and mutable (73, 16.6%). HCP whose K10 score trajectories were classified as chronically distressed (i.e., all ≥ 16) had rates of IES-R scores indicative of PTSD that were 6.9 times [95% confidence interval (CI) 3.7, 13.0] higher than HCP with resilient score trajectories (i.e., all < 16). Participants with scores in the other three K10 trajectories also had higher rates of IES-R scores of ≥ 24 when compared to those with resilient scores, with adjusted incident rate ratios of 2.6 (delayed onset; CI 1.3, 5.1), 3.1 (recovery; CI 1.4, 7.2), and 4.0 (mutable; CI 2.2, 7.3).

Conclusion: Early and repeated assessment of HCP distress levels will help identify those who are distressed so that evidence-based mitigation strategies can be provided.

1 Introduction

Despite the World Health Organization's declaration of the end of the public health emergency on 11 May 2023 (World Health Organization, 2024), people around the globe continue to get sick and die from severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). As of 21 September 2024, 60,871 coronavirus disease 2019 (COVID-19)-related deaths had been reported across Canada (Government of Canada, 2022) with another 1,886 deaths reported in the intervening 7 months (Government of Canada, 2025).

Healthcare providers (HCP) continue to provide care to patients with COVID-19, but can come with a long-term emotional toll. Previous literature has shown that public health crises, such as the COVID-19 pandemic, can lead to symptoms of psychological distress (e.g., depression and anxiety) as well as post-traumatic stress disorder (PTSD) in HCP (Naushad et al., 2019). Meta-analyses have estimated that 22%–33% of HCP across the globe experienced depression, 35%–41% reported anxiety, and 21%–32% had symptoms of PTSD during the COVID-19 pandemic (Krishnamoorthy et al., 2020; Boucher et al., 2023). One study found that 20%–23% of Canadian HCP felt anxious, irritable, isolated, or depressed to a "great extent" between April 2020 and February 2022, with the highest estimates for each outcome occurring in March through June 2021 in that study (Boucher et al., 2023).

The 10-item Kessler Psychological Distress Scale (K10) is a 10-question scale to screen for psychological distress that has been shown to discriminate well between cases and non-cases of serious mental illness as defined by the United States Substance Abuse and Mental Health Service Administration (Kessler et al., 2002). It has also been used to assess stress in HCP. Two studies conducted with HCP in Canada during the SARS-CoV-2 pandemic reported rates of distress, as measured by the K10, of 74% in 2020 (Voth et al., 2022) and 70% in 2021 (Gutmanis et al., 2024a).

Post-traumatic stress disorder is a mental health disorder that may occur after someone is exposed to what they perceive as traumatic stress that can lead to chronic impairment and increased risk of co-occurring psychiatric conditions (Mann et al., 2024). PTSD is defined as the presence of symptoms for one or more months; however, symptoms may last for varying lengths of time and may not even become apparent for 6 months or longer (Canadian Psychological Association, 2024). A meta-analysis of HCP with PTSD symptoms following infectious disease outbreaks found that 18.6%–28.4% still had PTSD symptoms after 30 days, 17.7% after 6 months, and 10%–40% after 1–3 years (Preti et al., 2020). A second meta-analysis, focusing on the SARS-CoV-1 pandemic, determined that 16% of HCP reported PTSD symptoms during the pandemic, 19% at 6 months, and 8% more than 12 months afterward (Alberque et al., 2022). A Canadian study that was part of that meta-analysis found that 13–26 months after the SARS-CoV-1 outbreak, HCP who had provided care to patients infected with the virus reported significantly higher levels of post-traumatic stress, as measured with the 15-item Impact of Event Scale (Horowitz et al., 1979), and psychological distress, as measured by the K10, than HCP who did not (Maunder et al., 2006).

Not all HCP respond to the added physical and emotional demands of crises in the same manner. According to Wang et al. (2023), the impact of a traumatic event differs depending on the event itself (intensity and duration) as well as the individual's perception of the event, personal psychological defense mechanism(s), and support system(s). One systematic review reported that 18%–80% of HCP reported psychological distress during outbreaks caused by caused by SARS-CoV-1, Middle East respiratory syndrome coronavirus, influenza A (H1N1pdm or H7N9), SARS-CoV-2, or the Ebola virus (Preti et al., 2020). A second review assessed responses to potentially traumatic events over time. These authors reported that the most frequently reported trajectories of change in symptoms of PTSD, anxiety, depression, subjective well-being, life satisfaction, psychological functioning, and distress were: (1) resilient, indicating consistently normal scores; (2) chronic, signifying persistently elevated scores; (3) recovery, representing an elevated score immediately following the experience with a return to normal score(s); (4) delayed-onset, indicating initially normal scores followed by elevated score(s); and eight other trajectories that were observed with much lower frequency (Galatzer-Levy et al., 2018). As reported in the review, the same four trajectories were identified among people who had been hospitalized for SARS-CoV-1 in 2003, as measured by the Medical Outcome Study short form health survey (SF-12) (Bonanno et al., 2008). The same four trajectories were reported amongst a representative sample of the Irish adult population during the COVID-19 pandemic (April–December 2020), using a composite score of depression, anxiety, and post-traumatic stress (Hyland et al., 2021).

Canadian HCP participating in the COVID-19 Cohort Study during the pandemic had a rate of distress, as measured by the K10, of 70% in 2021 that dropped to 49% in 2023 (Gutmanis et al., 2024b). In this same study, it was noted that among patient-facing HCP, 48% and 45% of participants had symptoms at levels of concern for PTSD in 2021 and 2022, respectively, with a drop in the rate to 22% in 2023 (Gutmanis et al., 2024a). Although these studies provided rates over time, they failed to describe whether the trajectories of distress were experienced differently within an individual over time. The goal of this explanatory study was to establish the association between psychological distress trajectories as measured by the K10 (Kessler et al., 2002) and PTSD

symptoms as measured by the IES-R (Weiss and Marmar, 1997) among Canadian HCP participating in the COVID-19 Cohort Study between March 2021 and December 2023.

2 Materials and methods

This analysis is a sub-study of the prospective COVID-19 Cohort Study, a 42 months pan-Canadian (provinces of Ontario, Quebec, Nova Scotia, and Alberta) prospective study to determine the incidence and risk factors for infection with SARS-CoV-2 (Coleman et al., 2024). In short, enrolment occurred from June 2020 to June 2023 with data collection ending upon participant withdrawal or study termination (1 December 2023), whichever occurred first. Prior to recruitment, ethical approval was obtained from each of the 14 participating acute care centers. HCP were eligible for the parent study if they were 18–75 years old at enrolment, provided written consent, were hospital employees who worked $\geq$ 20 h per week, or were a physician, nurse practitioner, or midwife with hospital privileges or a private practice in Toronto. Participation was voluntary.

For this sub-study, inclusion criteria were COVID-19 Cohort Study participants who submitted their first K10 between 29 March 2021 and 28 March 2022, submitted four K10 surveys with 180 ($\pm$ 60) days between subsequent submissions, and submitted an IES-R at study withdrawal/completion. Individual observations with incomplete K10 or IES-R scales were excluded from the analysis.

All data were collected anonymously using a bespoke, secure online platform. Baseline data were collected at enrolment with time-varying measures updated by participants every 12 months. All HCP participants were asked to complete a K10 survey in March or April 2021 or upon their recruitment (whichever came first) and every 6 months thereafter. Participants were asked to complete the IES-R within 2 weeks of their withdrawal from the study or at study termination date (1 December 2023).

2.1 Explanatory variable (K10 score)

The K10 is a widely-used screening tool of psychological distress (Stolk et al., 2014) that has been used to measure the frequency of symptoms of psychological distress during the COVID-19 pandemic (Gutmanis et al., 2024a). Previous research has established the reliability and validity of the K10 (Andrews and Slade, 2001; Kessler et al., 2003; Brooks et al., 2006; Sampasa-Kanyinga et al., 2018). Items were scored from 1 (none of the time) to 5 (all of the time) with possible scores of 10–50, with higher scores indicating greater distress. These analyses used a score of $\geq$ 16 to identify those most likely to be experiencing distress (Maunder et al., 2006).

2.2 Outcome measure (IES-R score)

The IES-R is a psychometrically sound and widely-used measure of PTSD symptoms (Elhai et al., 2005) that asks participants to indicate how distressing each of 22 difficulties was during the past 7 days on a scale from 0 (not at all) to 4 (extremely) (Weiss and Marmar, 1997). For this study, the IES-R was introduced with "You have been working throughout the COVID-19 pandemic...". The IES-R cut off scores for this analysis were 0–23 (no concern for PTSD/normal) and $\geq$ 24 (indicative of concern for PTSD) (Weiss and Marmar, 1997), with three categories of concern including 24–32 (mild), 33–36 (moderate), and $\geq$ 37 (severe). Subscale scores (avoidance, intrusion, hyperarousal) are the mean of the subscale item scores (range 0–4).

2.3 Model covariates

Participant age, gender, and the use of prescription medications for anxiety, depression, or insomnia were collected from the baseline survey completed at enrolment. Other demographic (any children < 19 years of age in the household) and occupational (occupation, working on a high-risk unit, level of patient contact) factors that could vary over time were taken from the baseline survey completed closest, but prior to, the date the fourth K10 was completed. Individuals who indicated that they worked in the emergency department, an adult intensive care unit, or an adult inpatient medical unit were identified as working on a high-risk unit; other work locations were identified as lower risk. The level of contact participants had with each of: inpatients, outpatients, and/or emergency department patients were categorized into the highest level of contact for any of the three settings as (1) no patient care, (2) in patient room, but no patient contact, or (3) physical care/contact. Since nurses have been identified as being more likely to report symptoms of PTSD (Fattori et al., 2023), occupation was dichotomized to nurse (nurse practitioner, midwife, registered nurse/registered practical nurse) or non-nurse (physician, respiratory therapist, laboratory technician, physical therapist, occupational therapist, imaging technician/technologist, pharmacist, pharmacy technician, psychologist, social worker, infection prevention and control practitioner, food service, ward clerk, administration, healthcare aid, housekeeper, porter, researcher, other clinical support).

2.4 Data analysis

Change patterns of the dichotomized K10 scores (< 16 vs. $\geq$ 16) were explored to determine distinct emotional responses using the four previously described trajectories (Galatzer-Levy et al., 2018) as a starting point; they included (1) resilient: all four K10 scores < 16, (2) chronically distressed: all four scores $\geq$ 16, (3) delayed onset: first score(s) < 16 followed by score(s) always $\geq$ 16, and (4) recovery: first score(s) $\geq$ 16 followed by score(s) of < 16. All other trajectories were categorized as mutable since they fit none of the four patterns.

Chi-square, Fisher's exact tests, or median tests, as appropriate, were used to compare the demographic and occupational characteristics associated with each of the categories. Modified Poisson regression (Zou, 2004) was then used to assess the relationship between the K10 trajectories and IES-R scores (0–23 vs. $\geq$ 24). Possible demographic and occupational confounding

variables were eliminated from a saturated model retaining covariates associated at p-values of ≤ 0.2. Covariates that were removed were added back in, one at a time, being retained if the variable changed the adjusted estimate between the trajectory and the IES-R score by $\geq 10\%$. All variance estimates were adjusted for clustering within province and all models were adjusted for the time between the completion of the fourth K10 survey and the IES-R (per 30 days). Negative binomial models of each of the IES-R subscales that included the variables identified in the previous analysis were then generated using the same procedures as described above. All analyses were done in Stat v.18.1 (StatCorp LLC, 2024).
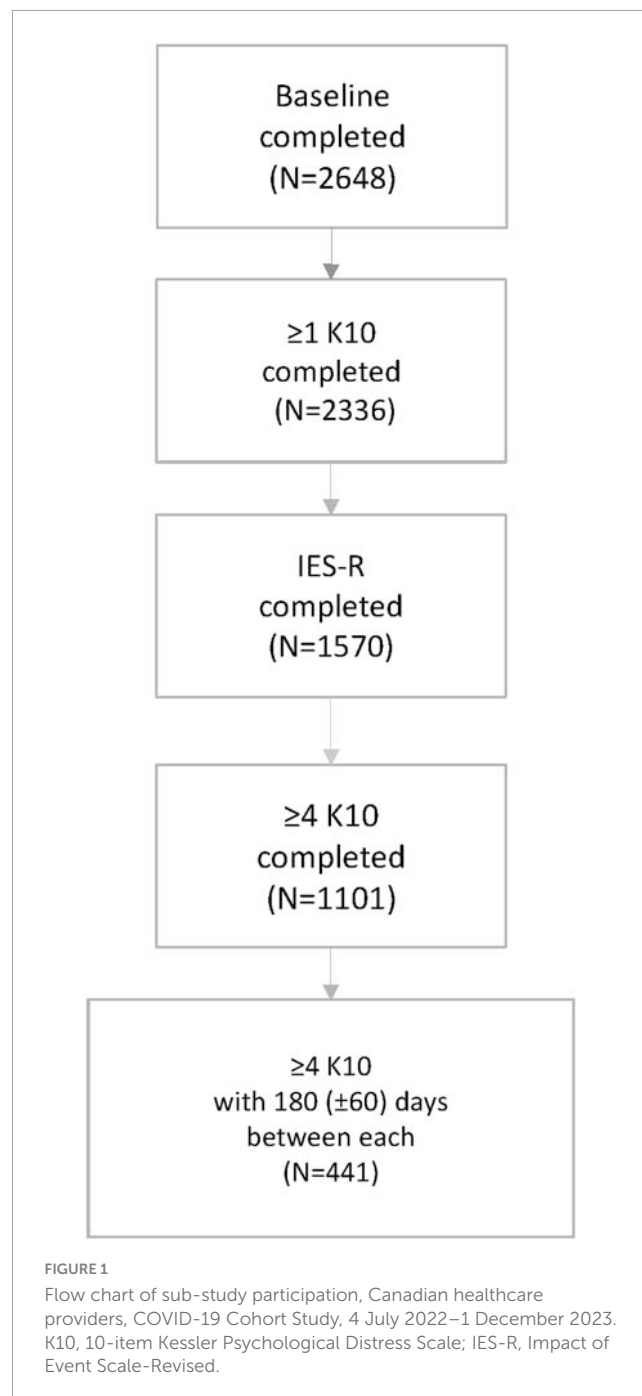
3 Results

Of the 2,648 HCP who participated in the parent study, 441 (16.7%) met the sub-study inclusion criteria (see Figure 1). The first K10s were completed between 29 March 2021 and 7 March 2022 while the fourth K10s were completed between 4 July 2022 and 6 November 2023; minimum study participation was 545 days. Most ($n = 384$, 87.1%) IES-R scales were completed in 2023; there was an average of 179 ($\pm$ 18) days between submission of the fourth K10 and the IES-R. The majority ($n = 385$, 87.3%) of sub-study participants were female, 138 (31.3%) were nurses, 316 (71.1%) reported very good or excellent health, 116 (26.3%) worked on a high-risk unit, and 88 (20.0%) reported using medication to treat anxiety, depression, or insomnia at study enrolment (Table 1).

The participants in this sub-study are similar to those in the full study. Most were female (85.1%), 33% were nurses, 75.0% reported very good or excellent health, 31.1% worked on a high-risk unit, and 18.1% used medication to treat anxiety, depression, or insomnia. Also, 43.5% [95% confidence interval (CI) 38.5, 48.5] of participants in this sub-study had an average K10 score of ≥ 16 in 2023, which is similar to the rate (49%; CI 44.4, 54.0) reported in a study of the overall K10 scores (Gutmanis et al., 2024a). Similarly, 21.9% (CI 18.0, 26.2) of participants in this sub-study had IES-R scores-of-concern in 2023; this is similar with the 22.5% (CI 18.1, 27.5) reported in 2023 in our study of HCP engaged in patient care (Gutmanis et al., 2024b).

Five K10 trajectories of psychological response to working during the COVID-19 pandemic were identified including resilient ($n = 111$, 25.2%), chronically distressed ($n = 131$, 29.7%), delayed onset ($n = 43$, 9.8%), recovery ($n = 83$, 18.8%), and mutable ($n = 73$, 16.6%). As shown in Table 1, the median K10 score varied significantly by trajectory from 11.8 (resilient) to 23.8 (chronically distressed). Figure 2 depicts the mean K10 scores by submission (first, second, etc.) for each trajectory.

3.1 Concern for PTSD

The percentage of participants whose IES-R score was > 24 (of concern for PTSD) was significantly higher (22/57 or 38.6%) if submitted between July and December 2022 than if submitted in 2023 (84/384 or 21.9%; $p = 0.006$). The percent of participants with scores > 24 also varied significantly across K10 trajectories, ranging from 6.3% for HCP in the resilient trajectory group to 42.7% in the chronically distressed group (see Table 2).

3.2 Psychological distress and concern for PTSD

Healthcare providers whose K10 score trajectories were classified as chronically distressed (i.e., all ≥ 16) had rates of IES-R scores indicative of PTSD (i.e., ≥ 24) that were 6.9 times (CI 3.7, 13.0) higher than HCP with resilient score trajectories (i.e., all < 16) after adjusting for occupation and number of days between the submission of the fourth K10 and the IES-R and with variance estimates adjusted for clustering within province (see Table 3). Participants with scores in the other three K10 trajectories also had higher rates of IES-R scores-of-concern for PTSD as compared

TABLE 1 Characteristics of Canadian healthcare providers who participated in sub-study by K10 trajectory, COVID-19 Cohort Study, 4 July 2022–1 December 2023; number (%) unless otherwise specified.

Characteristic	Study population (n = 441)	Resilient[1] (n = 111)	Chronically distressed[2] (n = 131)	Delayed onset[3] (n = 43)	Recovery[4] (n = 83)	Mutable[5] (n = 73)	P-value between groups
Age, in yearrs median (IQR)	43 (35, 53)	50 (41, 57)	40 (35, 49)	45 (35, 55)	41 (36, 48)	40 (32, 52)	< 0.001
Gender: female	385 (87.3)	93 (83.8)	122 (93.1)	34 (79.1)	74 (89.2)	62 (84.9)	–
Male	56 (12.7)	18 (16.2)	9 (6.9)	9 (20.9)	9 (10.8)	11 (15.1)	0.07
Subjective health							
Poor/fair/good	125 (28.3)	19 (17.1)	65 (49.6)	9 (20.9)	12 (14.5)	20 (27.4)	–
Very good/excellent	316 (71.7)	92 (82.9)	66 (50.4)	34 (79.1)	71 (85.5)	53 (72.6)	< 0.001
Medicated for anxiety, depression, insomnia	88 (20.0)	11 (9.9)	36 (27.5)	6 (14.0)	18 (21.7)	17 (23.3)	–
Not medicated	353 (80.1)	100 (90.1)	95 (72.5)	37 (86.1)	65 (78.3)	56 (76.7)	0.01
Child in home	144 (32.7)	41 (36.9)	41 (31.3)	9 (20.9)	28 (33.7)	25 (34.3)	–
No child < 18 years	297 (67.4)	70 (63.1)	90 (68.7)	34 (79.1)	55 (66.3)	48 (65.8)	0.43
Household size, median (IQR)	3 (2, 4)	3 (2, 4)	2 (2, 4)	3 (2, 4)	3 (2, 4)	3 (2, 4)	0.62
High-risk unit[6]	116 (26.3)	31 (27.9)	36 (27.5)	9 (20.9)	21 (25.3)	19 (26.0)	–
Lower risk	325 (73.7)	80 (72.1)	95 (72.5)	34 (79.1)	62 (74.7)	54 (74.0)	0.92
Occupation							
Nurse[7]	138 (31.3)	35 (31.5)	32 (24.4)	15 (34.9)	26 (31.3)	30 (41.1)	–
Non-nurse	303 (68.7)	76 (68.5)	99 (75.6)	28 (65.1)	57 (68.7)	43 (58.9)	0.17
Patient contact level							
No patient contact	158 (35.8)	43 (38.7)	46 (35.1)	14 (32.6)	29 (34.9)	26 (35.6)	–
In room, no contact	83 (18.8)	19 (17.1)	26 (19.9)	8 (18.6)	15 (18.1)	15 (20.6)	–
Physical care/contact	200 (45.4)	49 (44.1)	59 (45.0)	21 (48.8)	39 (47.0)	32 (43.8)	1.00
Hours of work, median (IQR)	37.5 (35, 40)	37.5 (32, 40)	37.5 (35, 40)	37.5 (35, 40)	37.5 (35, 40)	37.5 (35, 40)	0.21
K10 scores, median (IQR)	NA[8]	11.8 (10.8, 12.8)	23.8 (20.5, 28.8)	15.3 (14.0, 17.3)	15.8 (14.3, 18.0)	16.0 (15.0, 17.5)	< 0.001
IES-R scores							
0–23 (normal)	335 (76.0)	104 (93.7)	75 (57.2)	36 (83.7)	66 (79.5)	54 (74.0)	–
≥ 24 (of concern)	106 (24.0)	7 (6.3)	56 (42.8)	7 (16.3)	17 (20.5)	19 (26.0)	< 0.001
Year IES-R completed							
2022	57 (12.9)	11 (9.9)	17 (13.0)	5 (11.6)	14 (16.9)	10 (13.7)	–
2023	384 (87.1)	100 (90.1)	114 (87.0)	38 (88.4)	69 (83.1)	63 (86.3)	0.71

[1]Resilient: all four K10 scores were < 16. [2]Chronically distressed: all four K10 scores were ≥ 16. [3]Delayed onset: first/first few K10 scores < 16 with all subsequent scores ≥ 16. [4]Recovery: first/first few K10 scores ≥ 16 with all subsequent scores < 16. [5]Mutable: K10 scores fell both above and below 16. [6]High risk units: includes adult intensive care units, emergency departments, and adult inpatient medical units. [7]Nurse: includes midwives, nurse practitioners, registered nurses, registered practical nurses; Non-nurse HPC: includes administration, food service, healthcare aid, housekeeper, imaging technician/technologist, infection prevention and control practitioner, laboratory technician, occupational therapist, pharmacist, pharmacy technician, physical therapist, physician, porter, psychologist, researcher, respiratory therapist, social worker, ward clerk, other clinical support. [8]Not applicable because K10 scores changed over time. IES-R, Impact of Event Scale-Revised; IQR, interquartile range; Max, maximum; Min, minimum; NA, not applicable.

to those with resilient scores, with adjusted incidence rate ratios (aIRRs) of 2.6 (delayed onset; CI 1.3, 5.1), 3.1 (recovery; CI 1.4, 7.2), and 4.0 (mutable; CI 2.2, 7.3).

3.3 Subscale (hyperarousal, intrusion, avoidance) models

Subscale Kendel's tau correlations varied from 0.69 (hyperarousal: intrusion) to 0.61 (hyperarousal: avoidance). As

shown in Table 3, the largest difference in the rates of hyperarousal, intrusion, and avoidance were between the resilient group (the referent) and HCPs with scores in the chronically distressed group.

4 Discussion

In this longitudinal cohort study of Canadian HCP, five trajectories of psychological responses to working during the COVID-19 pandemic were detected as measured using the K10.
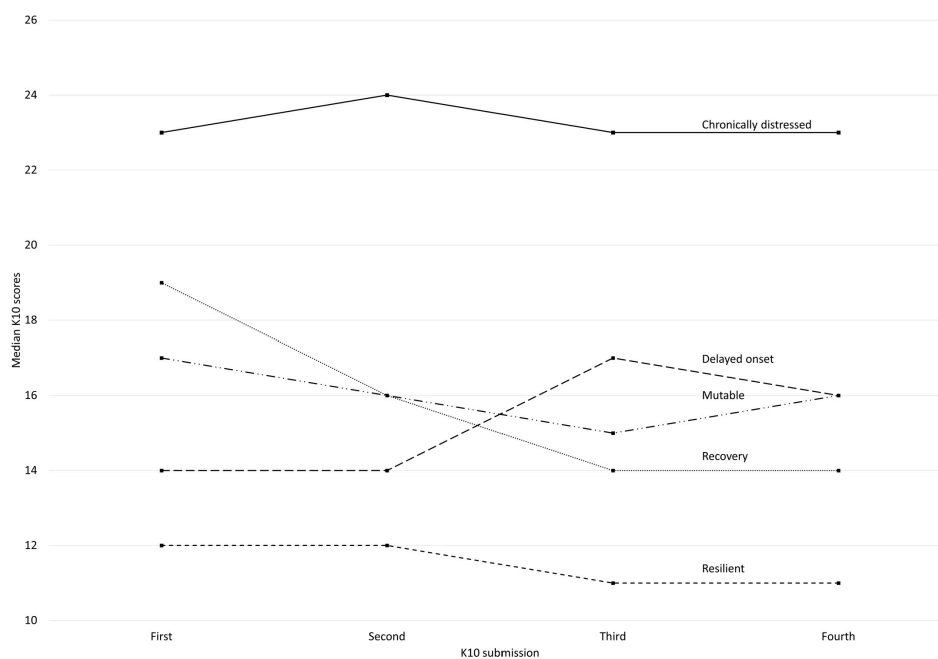
FIGURE 2
Kessler 10 Psychological Distress Scale median scores by submission (first through fourth) and by response trajectory, Canadian healthcare providers who participated in the COVID-19 Cohort Study, 28 March 2021–1 December 2023. K10, 10-item Kessler Psychological Distress Scale; K10, minimum score is 10; maximum score is 50; scores ≥ 16 indicate possible distress; Trajectories: Resilient: all four scores < 16; Chronically distressed: all four ≥ 16; Delayed onset: first/first few < 16 with all subsequent ≥ 16; Recovery: first/first few ≥ 16 with all subsequent < 16; Mutable: scores were both above and below 16 over time.

TABLE 2   Median scores for Impact of Event Scale-Revised (overall and subscale) for Canadian healthcare providers, COVID-19 Cohort Study, 4 July 2022–1 December 2023.

Survey scale	Median (IQR)
Total IES-R	10 (2, 23)
Avoidance	0.5 (0, 1.2)
Intrusion	0.5 (0.1, 1.1)
Hyperarousal	0.3 (0, 1.0)

IES-R, Impact of Event Scale-Revised; IQR, interquartile range.

These trajectories were associated with higher rates of scores indicative of concern for PTSD (i.e., ≥ 24 as measured with the IES-R). The rate HCPs scoring in the of-concern category of the IES-R was seven times higher for the 30% of HCP whose K10 scores were consistently ≥ 16 (i.e., chronically distressed) than for those who scores were consistently below that cut-off. HCP with K10 scores in other non-resilient trajectories also had higher rates of participants in the of-concern categories. Twenty-four percent of HCP who participated in this study had symptoms at a level indicative of concern for PTSD; 13% had severe symptoms as assessed by the IES-R, demonstrating the considerable long-term emotional health impact of the pandemic among HCP. Given that there are an estimated 2.0 million people working in healthcare in Canada (Government of Canada, 2023), these findings suggest that up to 260,000 Canadian HCP may be in need of psychological assistance following the pandemic.

A temporal relationship between psychological distress and symptoms of PTSD was reported during the first peak of the pandemic in France (Laurent et al., 2022). They found that the odds of having symptoms of PTSD (IES-R scores > 33) were 1.4 times higher for intensive care unit staff who had scores indicative of distress than those with lower scores, as measured 3 months earlier using the General Health Questionnaire. Although the odds of having symptoms of PTSD were lower in the French study than in the current one, there were significant differences in study design including the period and duration of data collection, the measure of distress, and the threshold used for the IES-R.

Authors of a Canadian study of HCP reported that IES-R scores peaked in the spring of 2021 and then decreased through to the spring of 2023 (Maunder et al., 2024). These results are similar to results of our study of Canadian HCP in which 47.8%, 44.8%, and 22.5% had IES-R scores of concern (≥ 24) in 2021, 2022, and 2023, respectively (Gutmanis et al., 2024b). In the current study, participants whose K10 scores indicated a chronically distressed trajectory had the highest rates of IES-R scores indicative of concern for PTSD - and for each of the IES-R's subscale scores. Authors of a study that followed Canadian HCP ho had survived an infection with SARS-CoV-1 in 2003 reported that levels of depression, anxiety, and PTSD symptoms did not significantly change 1, 4, and 7 years later, demonstrating the long-term impact of pandemics (Moallef et al., 2021). In that study, higher hyperarousal and avoidance scores in 2004 were associated with reductions in functional outcomes. These findings suggest the need to focus prevention and treatment efforts on those in need.

A single assessment can identify HCP who are (or are not) distressed at the time of the measurement. However, as our study highlights, individual levels of distress during a prolonged

TABLE 3 Associations between patterns of Kessler 10 scale response trajectories and Impact of Event-Revised scale response groups (< 24 vs. ≥ 24) or sub-scale mean scores, Canadian healthcare providers, COVID-19 Cohort Study, 28 March 2021–1 December 2023; adjusted incident rate ratios[1] (95% CI).

Scale[1]	Resilient[2] ($n = 111$)	Chronically distressed[3] ($n = 131$)	Delayed onset[4] ($n = 43$)	Recovery[5] ($n = 83$)	Mutable[6] ($n = 73$)
Total IES-R (aIRR)	Referent group	6.9 (3.7, 13.0)	2.6 (1.3, 5.1)	3.1 (1.4, 7.2)	4.0 (2.2, 7.3)
Hyperarousal	Referent group	7 (3.4, 6.4)	2.7 (2.0, 3.7)	2.0 (1.1, 3.4)	2.7 (1.9, 3.8)
Intrusion	Referent group	3.2 (2.5, 4.2)	2.1 (1.8, 2.6)	1.9 (1.3, 2.7)	2.2 (1.9, 2.7)
Avoidance	Referent group	2.7 (2.3, 3.3)	1.8 (1.6, 2.1)	1.5 (1.2, 2.0)	1.7 (1.4, 2.1)

[1] Adjusted for months between last K10 and IES-R submission and occupation; variance estimates adjusted for clustering within province. [2] All four K10 scores < 16. [3] All four K10 scores ≥ 16. [4] First/first few K10 scores < 16 with all subsequent scores ≥ 16. [5] First/first few K10 scores ≥ 16 with all subsequent scores < 16. [6] K10 scores were both above and below 16 over time. K10, Kessler 10-item scale; IES-R, Impact of Event Scale-Revised.

traumatic event may not be static. In a separate analysis of the K10 data from all HCP in the COVID-19 Cohort Study, we reported that the scores increased during periods of high SARS-CoV-2 transmission but generally decreased between 2021 and 2023 (Gutmanis et al., 2024a). Authors of a second Canadian study of HCP reported that Kessler-6 scores generally mirrored infection rates but failed to decrease in the final year, spring 2022 to spring 2023 (Maunder et al., 2024). In the current study, 25% of participants had K10 score trajectories that represented resiliency while 30% denoted chronic distress. Another 29% had score trajectories that did not remain constant: 10% had delayed onset distress while 19% improved/recovered. In another Canadian study, 53% of HCP who were surveyed for eight consecutive weeks between May 2020 and January 2021 were deemed resilient while 34% exhibited short-term (< 4 weeks) and 13% had longer-term (≥ 4 weeks) distress (Rapisarda et al., 2023). In another study conducted among Canadian intensive care unit staff, of the participants who reported distress at the onset of the pandemic, 45% were persistently distressed while 55% had improved by the end of the first wave of the pandemic (Pestana et al., 2024). Likewise, among Italian HCP with scores above the cut-off for concern in July 2020, 14% were considered chronically distressed, 9% had a delayed onset of symptoms, and 34% had scores suggesting they had recovered by March 2022 (Fattori et al., 2023). The findings are consistent in that levels of distress within many individuals changed over time. As such, it is important to monitor people at regular intervals during a protracted event such as the COVID-19 pandemic.

Assessment should also continue after the end of a prolonged traumatic event since they can have long-lasting impacts on some HCP (Maunder et al., 2006). In that study, more than 40% of HCP who had worked at a hospital that provided care to people hospitalized with SARS-CoV-1 experienced adverse outcomes including burnout, psychological distress, post-traumatic stress, and work-related impacts such as missed work shifts due to stress or illness for more than 18 months after the pandemic had ended. A systematic review and meta-analysis similarly reported that the prevalence of PTSD among HCP was 16% during the 2003 SARS-CoV-1 pandemic and 8% more than one year later (Alberque et al., 2022).

We recognize that there are limitations to this study. Although the questionnaires were completed anonymously, the findings are based on self-reported data that may be subject to over- or under-reporting of symptoms. The data for the K10 and IES-R were

collected between February 2021 and December 2023, so results cannot be generalized beyond those dates. The IES-R was only collected once, at the end of the participant's tenure with the study, so the temporal relationship between PTSD symptoms and trajectories of psychological distress cannot be determined (i.e., the association was not causal). This analysis identifies important vulnerable groups, those with non-resilient K10 trajectories and high PTSD scores long into the pandemic; it does not clarify the relationship between those variables. Also, although participants were from four of the 13 provinces/territories in Canada, the hospitals were located in larger urban centers and participation was voluntary. This limits the generalizability of findings to smaller sub-urban or rural settings, or to HCP at large. Further to this, participation in this sub-study was limited to participants who completed at least four K10 questionnaires. As such, representation of HCP is further limited to those who were able to manage the added workload of participating in the study during the pandemic (i.e., may have been less likely to feel overwhelmed by the added physical and/or emotional burden caused by the pandemic than non-participants) and may not represent all HCP. It is important to keep these limitations in mind when interpreting this study's results.

This study is one of few that assesses the temporal relationship between symptoms of distress and PTSD and despite the above-mentioned limitations, the study is unique in the duration of data collection (March 2021 to December 2023) and the scope of participation with HCP from 19 hospitals across four Canadian provinces and a variety of occupations. Also, the scales used to measure symptoms of distress and PTSD were validated and are used across the globe.

5 Conclusion

Although the majority of HCP did not experience chronic distress during the COVID-19 pandemic, about 40% had chronic or delayed distress as measured over time. This highlights the need to monitor people more than once during a protracted event. Among those with chronic distress, the rate of PTSD symptoms was seven times higher than for HCP who had no symptoms of distress. These people need to be identified and supported. HCP with levels of distress of clinical concern during the COVID-19 pandemic need to be followed over a longer period to understand the multi-year impacts of working during the 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 below: https://www.maelstrom-research.org/study/cccs.

Ethics statement

The studies involving humans were approved by the Research Ethics Boards of Sinai Health System (20-0080-E, 2020-04-17), Sunnybrook Health Sciences Centre (1644, 2020-04-13), Michael Garron Hospital (807-2004-Inf-055, 2020-04-29), North York General Hospital (20-0017, 2020-05-06), University Health Network (20-5368, 2020-05-21), Unity Health Toronto (20-109, 2020-06-01), Oak Valley Health (121-2010, 2020-11-04), William Osler Health System (2020-12-18), Hamilton Health Sciences Centre (12809, 2020-12-31), St. Joseph's Healthcare Hamilton (13044, 2020-12-31), University of Alberta (Pro00106776, 2021-01-13), Nova Scotia Health (1026317, 2021-02-02), The Ottawa Hospital (20210024-01H, 2021-02-05), and Centre Hospitalier Universitaire de Sherbrooke (MP-31-2021-4104, 2021-06-09). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

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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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