ONLINE SOCIAL COMMUNICATION: ESTABLISHING, MAINTAINING, AND ENDING ONLINE RELATIONSHIPS

EDITED BY: Graham G. Scott, Gordon Patrick Dunstan Ingram, Christopher James Hand and Heyla A. Selim

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Editorial: Online Social Communication: Establishing, Maintaining, and Ending Online Relationships

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Editorial on the Research Topic

Online Social Communication: Establishing, Maintaining, and Ending Online Relationships

Online communication has evolved rapidly over the past two decades, especially since the implementation of web 2.0 technology. As social media and direct messaging platforms become more widespread, and technology becomes more mobile, the way we communicate with friends, family, colleagues, and romantic partners becomes more diverse. The distinction between the on- and off-line worlds is more ambiguous. Relationships are now not solely on- or off-line, but technology allows us to communicate with members of our social network using a selection of digital tools. With an increasing range of communication platforms offering different affordances, it is important to understand how users utilize the communication mediums available to them, and what impact this can have not only on their relationships, but on them as individuals. To further explore this topic in more detail we launched our Research Topic *Online Social Communication: Establishing, maintaining, and ending online relationships*.

We received nine insightful manuscripts from 31 authors in nine countries covering the distinct specialized sections of Human-Media Interaction and Personality and Social Psychology. The research falls into three areas: (1) online self-presentation, including false self-presentation; (2) online impression formation based on online communications; and (3) online communication and wellbeing.

A first line of research focuses on how users self-present online. Bong and Kim investigated motivations for deceptive self-presentation on Instagram, and the mental and behavioral outcomes associated with it. They demonstrated that users who scored highly in "need for approval" reported lying more often when self-presenting online, and that such behavior increased depression, perceived popularity, and deleting behaviors. While deceptive self-presentation increased depression, perceived popularity acted as a buffer against depression. Zhang et al. examined online self-presentation by looking into the option users have to hide or delete content they post on WeChat after a designated amount of time. Users who utilized the time-limit settings were found to post more frequently, use privacy settings more often, and had smaller audiences. Users who both utilized the settings and scored higher on measures of life changes, self-monitoring, posting frequency, and audience size, but lower on perceived stress were more likely to select a relatively short time limit for the content they posted. Finally, in a review of online identity reconstruction, Huang et al. summarized the theoretical and methodological approaches

to research around online identity reconstruction, including examining the predictors and effects of the phenomenon, and provided an overview of the thematic patterns of recent research.

A second line of research takes a different perspective, investigating how we form impressions of others online. Qin et al. investigated how online self-disclosure influenced first impression formation. Specifically, they examined how the valence of self-disclosure (mostly negative, balanced, mostly positive) in WeChat profiles influenced first impressions of an unknown potential collaborator. Their findings showed that dominantly positive self-disclosures were associated with greatest likability; predominantly negative self-disclosures were associated with the lowest levels of likability. Perceived trustworthiness mediated the effect of self-disclosure type on likability. Kong et al. examined the relationship between styles of social media use and vulnerable narcissism. They demonstrated that active and passive use of social media platforms are linked to upwards and downwards social comparison, and that both types of use indirectly predict vulnerable narcissism. Sullivan's study explored the link between attachment jealousy and online jealousy in response to ambiguous hypothetical online scenarios. Participants were all in relationships, and it was found that the link between attachment anxiety and jealousy increased as participants' attitudes to online communication became more negative.

A third line of research looks at how individuals interact with social media and what impact this has on their wellbeing. Ostic et al. recruited 940 social media users from Mexico, gathering data on participants' social media use, social capital, social isolation, smartphone use, phubbing, and psychological wellbeing. Through Structural Equation Modeling, they found that there was an overall positive (but indirect) effect of social media usage on psychological wellbeing—mainly due to effects of bonding and bridging social capital. In a mixed-methods study, He and Liu used semi-structured interviews to identify eight factors that could produce social media fatigue in young people. In a subsequent regression analysis of the results of an online questionnaire, they found that negative social comparison, dysfunctional interactions, informational and social overload, impression management (the most important factor in the model), and poor intergenerational communication were all significant predictors of social media fatigue. Self-efficacy turned out to be a positive factor, rather than a negative one as predicted, while privacy anxiety had no effect. Negative social comparisons were also studied by Lim et al. Noting that studies of the relationship between social comparison and self-esteem have typically shown only weak and unreliable effects, they proposed

a novel, "evolutionary mismatch" hypothesis to account for this. According to this hypothesis, negative social comparison with the unrealistic, idealized depictions of other people's lives portrayed on social media only impacts self-esteem when an individual's social network is small enough to correspond to the sort of size it would have had in our evolutionary past. They found a relationship between social media use and low self-esteem in people with social networks of around 150 connections. Yet with many of their participants reporting networks numbering over 1,000 online "friends," it seems that in these individuals social comparison was not perceived as taking place with real social connections, and thus social media use did not adversely affect self-esteem.

Taken together these findings highlight how different ways of interacting with social media and online communication platforms can impact on users. Both actively self-presenting online, and passively consuming content, can lead to wellbeing-related outcomes. As a limitation we highlight the fact that most studies in the Research Topic utilize cross sectional designs, and thus it is difficult to establish any truly causal relationships between the variables investigated. However, we are confident the studies selected for this Research Topic offer valuable contributions to the area of online communication and offer an insight into the impact interactions with such technologies can have on individual users.

AUTHOR CONTRIBUTIONS

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Influence of False Self-Presentation on Mental Health and Deleting Behavior on Instagram: The Mediating Role of Perceived Popularity

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The present study explored motivations (need for approval, impression management) for lying self-presentation on Instagram as well as the mental and behavioral outcomes (depression, perceived popularity, deleting behavior on Instagram) of this presentation. We also examined the differential mediational roles of perceived popularity in accounting for the association between lying self-presentation and depression. Our results showed that individuals with a strong need for approval reported higher levels of lying self-presentation. The results also revealed that lying self-presentation positively influenced depression, perceived popularity and deleting behaviors. Furthermore, we found that even if lying self-presentation increased depression, perceived popularity served as a psychological buffer against depression.

Keywords: lying self-presentation, perceived popularity, depression, deletion, social media

INTRODUCTION

In online environments, people use lying as a way to present themselves. They usually lie to appeal to others regarding physical attraction, age, background and interests (Utz, 2005). In the case of the SNS (Social network service) environment, people have been known to lie about age, gender, job, and relationships status (Wright et al., 2018).

SNSs can accelerate lying self-presentation because users have control over the activities with which they present themselves (Kim and Tussyadiah, 2013). Individuals have relatively no difficulty lying on SNSs, which are characterized by availability, ease of use and anonymity (Kim et al., 2009). Also, in the online environment, people are less likely to detect non-verbal cues related to lies, unlike in the real world (Stanton et al., 2016). The technical tools of social networking services support individuals in creating deceiving self-presentational elements, such as picking and editing images of themselves (Gibbs et al., 2006).

One previous research study found that significant numbers of users believed that their Facebook self was different from their real self, and they exaggerated their positive aspects while minimizing their faults (Gil-Or et al., 2015). Another research study examined false self-presentation on Facebook and classified it into categories of false self-deception, self-comparison and self-exploration. The study confirmed that false self-exploration was the most frequent type of false self-presentation (Michikyan et al., 2015). Given the fact

that activities involving visual self-expression, such as photographs or sharing short films, commonly occur on Instagram, it will be necessary to look at the motivations and outcomes of these ways of expressing oneself with lying.

Humans have a basic desire to be approved of by others or groups, an intrinsic desire to be recognized for their value and ability (Rudolph et al., 2005), and this is an important motive to influence individuals' behavior (Homans, 1974). One of these behaviors is self-presentation, which people engage in to gain recognition from others (Hewitt et al., 2003). Particularly, one way to obtain approval is to express one's self deceitfully (McLeod and Genereux, 2008). Lying behavior, like self-expression, is caused by the motivation to win others' approval (Snyder, 1987). Indeed, people either act with selective honesty in order to meet their need for approval, or they properly distort and express themselves by lying (Skinstad, 2008). People with a high level of need for approval paint themselves in a positive light (Schneider and Turkat, 1975), and regardless of their beliefs, either agree with others' values or present themselves with a particular emphasis on similarities (McLeod and Genereux, 2008).

Impression management is not only about controlling and manipulating information about oneself disclosed to others (Schneider, 1981), but also the process of managing one's own impressions of what others perceive (Leary and Kowalski, 1990). An important part of the nature of self-promotion is that it sometimes includes lying in order to sway individuals to agree with one's opinion, which is different from others', in order to win others' goodwill (Feldman et al., 2002). In addition, individuals sometimes can select information about an image strategically and then positively describe their own image (Toma et al., 2008). Although lying behavior for impression management causes moral issues or a confusion in crucial choices (Kupfer, 1982), picking images carefully and editing oneself to display a favorable impression to others have been regarded as universal and essential elements for social interaction (Goffman, 1959). One previous study predicted that respondents who had a high level of impression on others were more likely to lie in their self-presentation (Kashy and DePaulo, 1996). In a study on dating, it was found that people are likely to engage in lying behaviors to appear competent or desirable when first meeting a likable partner (Feldman et al., 2002). Also, in online dating environments, lying behaviors to partners convince individuals that they are getting into a more positive situation than they actually are (Hancock, 2007). Hence, lying is a representative strategy of impression management, and it is a meaningful resource for building an attractive self-presentation.

Popularity acts as a central factor in SNSs (Utz et al., 2012). SNSs also provide an environment or opportunities to produce exaggerated and fabricated information that enables users to easily gain popularity (Zywica and Danowski, 2008). In order to increase popularity on SNSs, some users even purchase SNS accounts to inflate their number of followers (Lagerspetz et al., 2014). To sum it up, lying self-presentation is motivated by gaining popularity from others,41 and lying leads to describing oneself more positively than reality (Hancock, 2007).

Psychological risks have the possibility of affecting deletion behavior. Lying has been regarded as a serious moral violation

for many years because it infringes upon the recipient's right to information and freedom of choice (Kupfer, 1982). The lying distributor may suffer from psychological risks such as regret or apologetic feelings due to moral violations, and they may conduct countersteps such as deleting posts or comments to overcome these risks on SNSs (Wang et al., 2011). Individuals are likely to decide whether to delete posts or comments by considering the risks and benefits. Concretely, when uploading a post that is psychologically uncomfortable to another person, owners may recognize the risk and then delete it (Wang et al., 2011). In sum, individuals are likely to be aware of the psychological crisis of both oneself and others that comes with lying behavior, and these risks may soon affect deletion behavior.

Lying may be associated with indicators of emotional adjustment, such as depression, stress, and loneliness (Engels et al., 2006). Likewise, it was suggested that true self-expression reduces depression by reducing emotional labor on Facebook (Grieve and Watkinson, 2016). This result indirectly implies that lying self-presentation requires more emotional labor, which can have a significant effect on depression. Facebook research also identified the effects of lying behavior, which is positively related to psychological factors such as anxiety (Wright et al., 2018). Thus, lying self-presentation is expected to have an impact on depression.

Meanwhile, perceived popularity is likely to affect mental health. Individuals may spend considerable energy in the condition worrying about receiving a negative evaluation of themselves, and people who need to receive support from others may be likely to experience anxiety or depression (Wu and Wei, 2008). In fact, popularity plays a role in predicting loneliness, which is a factor in mental health (Nangle et al., 2003). Research regarding adolescents on social media found that when teenagers perceive a lower level of popularity, they are likely to experience a higher level of depression (Nesi and Prinstein, 2015).

Given these discussions and literatures, the present study is to investigate, in the Instagram environment, how "need for approval" (H1) and "impression management" (H2) affect lying self-presentation, how lying self-presentation affects depression (H3) as well as perceived popularity (H4) and deletion (H5), and the mediating effect of perceived popularity between lying self-presentation and depression (H6).

METHODS

Participants

Data in this study were collected through an online survey using a quota sampling method to represent in the sample targeting Instagram users. Since the Korea Internet & Security Agency (2019) revealed that Instagram was the second most popular platform in 2019, and Instagram used rate was highest among young adults aged 20–39 years in Korea, the target participants of this study were Instagram users between the ages of 20 and 39 years. The participants were recruited from the EMBRAIN (www.embrain.com) online pool in Korea, a leading online survey company in Korea managing national samples of Korean Internet users. The company maintains over one million internet users whose demographics are similar with those of Korean

Internet users. The online survey was conducted from September 18 to October 5, 2019. A total of 1,045 were selected for this study and sent an email with the survey link. We excluded 703 participants who did not meet eligibility criteria or did not complete this survey. The final sample included 315 participants (about 30.1% response rate). About half of them were female (50.2%, $n = 158$), and the mean age of the participants was 29.44 (SD = 5.40). When asked about the amount of time spent on Instagram per day, 40.0% of the participants reported "1–30 min," 36.7% reported "30 min−1 h," 15.0% reported "1–2 h," and 8.3% reported "2 h or more." The participants also reported uploading an average of 7.7 pictures, videos or other contents (SD = 9.7, range = 0–90), had an average of 132.1 followers (SD = 227.3,

range = 1–3,000 followers) and 32.2 followings (SD = 232.6, range = 1–3,000 followings).

Measures

Need for Approval on Instagram was modified to specifically reflect this study's context from the need for approval questionnaire (Rudolph et al., 2005). In this study, the scale was designed to assess the extent to which participants presented themselves to others in positive terms to obtain the others' approval on Instagram. The subscale consisted of four items which measured on a 7-point Likert scale with anchors of 1 (strongly disagree) and 7 (strongly agree).

TABLE 1 | Sample items, means, and Cronbach's alpha scores for each construct.

Constructs	Sample items	Item means	Factor loadings	Composite reliability	AVE	Cronbach's alpha
Need for Approval	Being liked by users on Instagram makes me feel better about myself.	5.22	0.792	0.88	0.64	0.917
	I feel like a good person when users on Instagram like me.	4.64	0.859			
	When users on Instagram like me, I feel happier about myself.	4.89	0.91			
	I feel proud of myself when users on Instagram like me.	4.60	0.87			
Impression Management	I think my profile is a representation of myself.	5.09	0.788	0.85	0.54	0.770
	I like to create an impact with Instagram posts so that people see me in a certain way.	5.06	0.761			
	I have others' reactions in mind when I post updates to Instagram.	4.67	0.717			
	I'm mindful of how others may perceive me on Instagram.	4.18	0.442			
	I believe that people read a lot about me into the posts that I make on Instagram.	4.68	0.546			
Lying self-presentation	Lying about your relationship status	2.87	0.817	0.90	0.64	0.961
	Lying about your achievements	2.69	0.929			
	Posting or talking about doing something that you didn't actually do on Instagram	2.65	0.928			
	Lying about your hobbies	2.86	0.939			
	Lying about your interests	2.80	0.945			
Depression	I couldn't seem to experience any positive feeling at all.	3.43	0.827	0.89	0.57	0.953
	I found it difficult to work up the initiative to do things.	3.62	0.865			
	I felt that I had nothing to look forward to.	3.43	0.902			
	I was unable to become enthusiastic about anything.	3.55	0.937			
	I felt I wasn't worth much as a person.	3.43	0.883			
Deletion	I often deleted posts that represented myself on Instagram.	3.72	0.848	0.73	0.57	0.871
	I switched posts that represented myself on Instagram so only I could see them ("Save Post").	3.69	0.914			
Perceived Popularity	Compared to other Instagram users, I am more popular on Instagram.	3.07	0.928	0.85	0.74	0.932
	Other people consider me to be very popular on Instagram.	3.09	0.94			

Impression Management was developed based on previous studies (Wilson et al., 2014; Keep and Attrill-Smith, 2017). The questionnaire had five questions that probed into a person's attempt to portray him- or herself in a favorable light on Instagram. The items were measured on a 7-point Likert scale with anchors of 1 (strongly disagree) and 7 (strongly agree).

Lying self-presentation was adapted from the Facebook False Self-Presentation Behaviors Inventory (Wright et al., 2018). In this study, LSP was measured using a five-item instrument designed to assess the extent to which participants falsely presented themselves through Instagram. The items were measured on a 7-point Likert scale with anchors of 1 (strongly disagree) and 7 (strongly agree).

Depression was measured with the Depression Scale (Lovibond and Lovibond, 1995), which assesses the symptom severity of depression. In this study, depression consisted of 6 self-report items. Responses were made on a 7-point Likert-type scale, anchored by 1(strongly disagree) and 7 (strongly agree).

Deleting was assessed by a newly created index of two items designed to remove or hide a self-presenting post on Instagram. The items were measured on a 7-point Likert scale with anchors of 1 (strongly disagree) and 7 (strongly agree).

Perceived Popularity was adapted from a previous study (Zywica and Danowski, 2008) that assessed the perception of popularity on SNS. In this study, it was measured using a two-item instrument measured with 7-point Likert scale with anchors of 1 (strongly disagree) and 7 (strongly agree).

The reliability tests of measurements indicated acceptable scores as those with Cronbach's alpha coefficients of more than 0.7 (**Table 1**).

Statistical Analyses

All statistical analyses were conducted with path analysis using SEM in Amos 20. To test for the mediating role of popularity in the link between lying self-presentation and depression, we used bootstrapping method (Cheung and Lau, 2008) and the Sobel test was applied (Sobel, 1982). In line with recommendation by Preacher and Hayes (2008), this study generated 5,000 bootstrap samples to estimate a 95% confidence interval (CI) for the indirect effects.

RESULTS

We performed a confirmatory factor analysis (CFA) to verify factor structure, as well as factorial validity and reliability. A minimum cut off criterion for item deletion is factor loading below 0.50 (Karatepe et al., 2005) and item loadings above 0.50 (Anderson and Gerbing, 1988), composite reliability (CR) values above 0.70 (Molina et al., 2007), Cronbach's alpha above 0.70 (DeVellis, 2003), and average variances extracted (AVE) above 0.50 (Fornell and Larcker, 1981). Factor loadings, Cronbach's alpha values, composite reliability, and AVE were considered acceptable (**Table 1**) and all squared correlations were less than the AVE.

The results also indicated the fit indices of the research model. The model fits in both models were considered acceptable (**Table 2**). H1 and H2 stated that the need for approval (H1)

TABLE 2 | Fit indices of measurement and structural models.

Fit index	Recommended value	CFA	Hypothesized model analysis	Mediation analysis
χ2 (df)		663.33 (237)***2.79	735.59 (246)***2.99	622.74 (203)***
CFI	≥0.90	0.937	0.928	0.934
IFI	≥0.90	0.938	0.928	0.934
TLI	≥0.90	0.927	0.919	0.925
RMSEA	≤0.08	0.076	0.079	0.079
PCLOSE	≤0.05	0.000	0.000	0.000
PGFI	≥0.50	0.669	0.683	0.675

***$p < 0.001$.

and impression management (H2) would influence lying self-presentation. The results showed that need for approval ($\beta = 0.33$, CR $= 3.74$, $p < 0.001$) positively predicted false self-presentation. However, impression management ($\beta = -0.13$, $p = 0.142$) was not significant in predicting lying self-presentation. The results demonstrated that only NFA had a positive direct impact on LSP. Hence, H1 and H2 were partially supported.

H3, H4, and H5 stated that lying self-presentation would influence depression (H3), perceived popularity (H4), and deletion of posts (H5). As expected, the significance testing results showed that lying self-presentation had a positive effect on depression ($\beta = 0.44$, CR $= 7.81$, $p < 0.001$), perceived popularity ($\beta = 0.70$, CR $= 14.02$, $p < 0.001$), and deletion of posts ($\beta = 0.58$, CR $= 9.48$, $p < 0.001$), respectively (**Figure 1**). Thus, H3, H4, and H5 were supported.

In the mediation analyses, the SEM was revealed to be an acceptable fit for the data (**Table 3**). H6 stated that perceived popularity would mediate the relationships between lying self-presentation and depression. As shown in **Table 3**, the direct effect was 0.60 (CR $= 7.40$, $p < 0.001$), and the indirect effect was -0.16 ($p < 0.01$). The Sobel test indicated that the mediated effect was significant (z $= -2.53$, SE $= 0.006$, $p < 0.01$). Thus, when lying self-presentation predicted depression, popularity partially mediated the significance of both the direct and indirect effects. Lying self-presentation had a significant effect on depression and decreased when perceived popularity was added as the mediating factor.

DISCUSSION

This study aimed to examine (a) psychological predictors of lying self-presentation, (b) the influence of lying self-presentation on psychological and behavioral outcomes on Instagram and (c) the mediating effects of perceived popularity.

The results showed that need for approval had an important role to play in engaging behaviors related to lying self-presentation. These results show that self-presentation is a principal means of acquiring approval. The results also identified that lying self-presentation might be a way of being approved by other users on Instagram. This finding is inconsistent with

FIGURE 1 | SEM results of the hypothesized path model. Path values are unstandardized coefficients. ***$p < 0.001$.
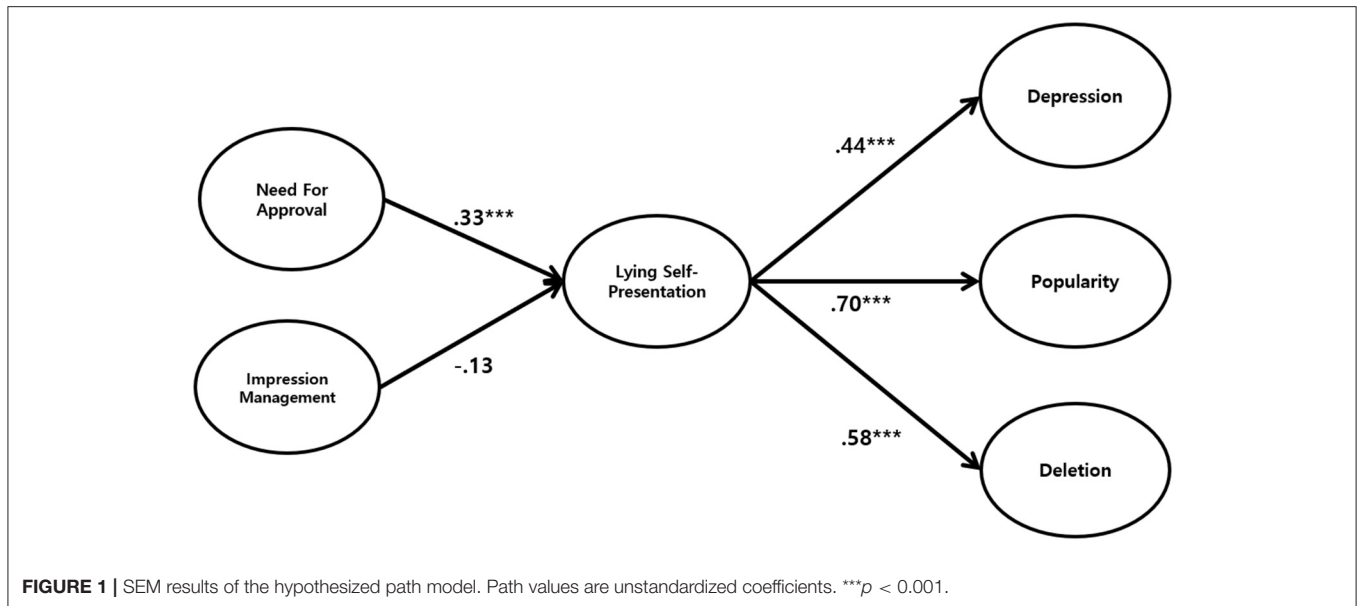
TABLE 3 | Bootstrap analyses of the magnitude and statistical significance of indirect effects.

Model pathways	Total Effect		Direct effect		Indirect effect	
	β(SE)	95% CI	β(SE)	95% CI	β(SE)	95% CI
LSP→ PO→ Dp						
LSP→ Dp	0.44 (0.05)**	0.54 to 34	0.60 (0.08)**	0.75 to 0.46	−0.16 (0.06)**	−0.06 to −0.29
LSP→ PO	0.70 (0.04)**	0.77 to 0.62	0.70 (0.04)**	0.77 to 0.62	–	–
PO→ Dp	−0.23 (0.09)**	−0.08 to −0.40	−0.23 (0.09)**	−0.08 to −0.40	–	–

LSP, False self-presentation; PO, Perceived Popularity; Dp, Depression. These values are based on unstandardized path coefficients. **$p < 0.01$.

previous findings that people attempt to engage in selective honesty to meet their need for recognition (Skinstad, 2008) and that self-popularity positively affects lying behaviors. People with a high approval motivation tend to use social media improperly (Takao et al., 2009), and this tendency has also been confirmed in the self-presentation context. Considering that the need for approval positively affects emotional well-being, those with a need for approval may acquire psychological well-being and be less conscious of others' negative perception due to lying behaviors.

In contrast, the relationship between impression management and lying self-presentation was not significant. Unlike previous results that say that lying behavior is one of the important strategies for impression management (Hancock, 2007), the relationship was not supported in SNS situations. This might be caused by the environmental factors of Instagram. The rate of communicating with strangers on Instagram is 58%, which is higher than Facebook (38%), while the probability of communicating with acquaintances on Instagram is only 22% (Yang and Lee, 2020). Instagram users may perceive lying to strangers as a higher risk behavior. In fact, SNS users may engage in lying behavior involving impression management in order to

establish a social relationship (Underwood et al., 2011), but they may be less interested in establishing impression management on Instagram with strangers because they perceive the risk involved. Also, given the fact that impression management with lying has a negative effect on future relationship goals, it is expected that individuals engage in lying self-presentation for long-term impression management rather than short-term. Previous research has also suggested that the magnitude of lying behavior should be controlled by considering future interactions with others (Toma et al., 2008).

Next, our study showed that lying self-presentation online was positively associated with psychological and behavioral outcomes. Supporting the study's predictions, lying self-presentation significantly increased depression, deleting posts and popularity. On Facebook, honesty-based activities were part of predictors to increase subjective well-being (Kim and Lee, 2011), and also there have been significant correlations found between mental health, such as anxiety, and lying self-presentation behavior (Wright et al., 2018). Similar to these studies, our findings show that lying self-presentation positively affects mental health such as depression.

Third, lying self-presentation had a direct or indirect effect on depression when mediated by popularity. The results imply that even if behaviors of lying self-presentation increase the users' level of depression, the depression of these people can be reduced by popularity. The results suggest that when people engage in behaviors of lying self-presentation, they may become popular on Instagram and accordingly feel decreased levels of depression. These results provide that perceiving oneself in a popularity state may serve as a psychological buffer against negative health outcomes.

Fourth, lying self-presentation was identified as a factor affecting deletion behavior. This study found the meaningful mechanism that lying self-presentation leads to actual behavior related to a SNS as well as psychological outcomes. Psychological risks caused by lying behavior are likely to affect deletion on a SNS. Specifically, the psychological risk related to lying behavior can be divided into risks perceived by oneself and others (Wang et al., 2011). If the false expression is for social interactions, individuals may possibly delete their own content, taking into account the psychological risks to others. Tufekci (2008), for example, suggested that individuals who focus on strong ties in an online environment are less likely to engage in lying acts such as aliasing. Based on this finding, future research could address the level of ties as a predictor between lying self-expression and deletion behavior.

Finally, in a comparison of lying-self presentation (Wright et al., 2018), individuals were more likely to engage in lying behaviors on Instagram (M = 2.77, Likert scale = 7) than Facebook (M = 1.14, Likert scale = 6). In addition, while the relationship between lying self-presentation and depression was not significant on Facebook (Wright et al., 2018), lying self-presentation on Instagram increased depression. Our study showed that lying self-presentation on Instagram might be different from that on Facebook.

The limitations of this study should be noted. It is important to understand why and what functions, such as profile, posting, liking, and comments, are used for lying self-presentation on SNSs because providers can selectively put more technical resources into situations where lying self-presentation stands out. Therefore, it is proposed that future research should check functions' specific effect on lying self-presentation.

CONCLUSION

In this study, we explored how false self-presentation was associated with unhealthy online communication behaviors such as deleting self-presenting posts on Instagram as well as with negative mental health attributes. For future studies, this research provides a greater understanding of the effects of false self-presentation on actual use behavior in the SNS context. Also, our findings expand the available database regarding psychosocial correlates of false self-presentation in that lying behavior may negatively impact mental outcome but can also reduce negative mental health when mediating perceived popularity. Future research should consider all the positive and negative aspects of self-presentation on social media. The most meaningful finding of this study is that popularity can buffer the relationship between false self-presentation and depression. In particular, the relevance of perceived popularity and buffering effects in online environments is meaningful because it expands the scope of research from that of previous studies, which confirmed only the buffering effects of social support (Cummins, 1990) and religiosity (Wills et al., 2003).

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

IM and HK designed the research, conducted the literature searches, and wrote the manuscript. IM collected the research data and performed statistical analysis. HK reviewed and revised the final manuscript. All authors contributed to the article and approved the submitted version.

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First Impression Formation Based on Valenced Self-Disclosure in Social Media Profiles

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This study aims to understand how the valence of self-disclosure (operationalized as the dominantly positive vs. balanced vs. dominantly negative social media posts of a future collaborator) influences first impression formation on social media. We also focus on trustworthiness as a mediator and perceived homophily as a moderator to specify the underlying mechanisms through which self-disclosure valence affects first impression formation. The results from an online experiment ($N = 204$) suggest that self-disclosure valence has a significant effect on perceived trustworthiness and likability when individuals evaluate an unknown future collaborator using the social media profile. Trustworthiness mediates the effect of self-disclosure valence on likability when the individuals feel that they are dissimilar or even slightly similar to strangers. At that time, individuals tend to seek cues from both self-disclosure valence and perceived homophily to form the trustworthiness perception, and the influence of self-disclosure depends on the level of perceived homophily.

Keywords: online self-disclosure valence, first impression, perceived homophily, trustworthiness, likability

INTRODUCTION

Impression formation is "a process by which an organized overall impression emerges in which single traits receive specific meanings" (Bierhoff and Klein, 1989, p. 2). First impression is a salient topic in the domain of impression information because the first impression can lead to biased judgments of subsequent information in offline contexts (Asch, 1946) and online environments (Walther, 1993). Social media actively reconfigures the ways in which individuals socialize with other individuals (Orben and Dunbar, 2017) because users can passively consume information provided by other social media users, which is quite different from directed and reciprocated offline interaction. A common example of passive consumption in our daily life is viewing the posts of other social media users without interacting with them (Orben and Dunbar, 2017). In online settings, individuals frequently encounter strangers, and they make inferences based on the profiles of these strangers without any prior interaction (Bacev-Giles and Haji, 2017). Moreover, it is clear that individuals search for strangers or build initial contacts with strangers *via* social media platforms, such as LinkedIn or Facebook. As a result, it is crucial to understand how individuals make initial impression judgments, especially considering that it is becoming more widespread and convenient to get acquainted with a stranger based on their self-disclosure information on their social media profiles.

An important dimension of personal self-disclosure is valence (Gilbert and Horenstein, 1975). In terms of self-disclosure, valence refers to the extent to which "the information shared is

positive, neutral, or negative" (Orben and Dunbar, 2017, p. 490). The positivity or negativity of the information disclosed has a significant influence on impression formation. Usually, positive (vs. negative) self-disclosure has a favorable (vs. negative) effect on impression formation, while in some cases, negative self-disclosure is preferred and leads to unexpected positive influence (Runge and Archer, 1981). For example, individuals who disclose negative information may be perceived as honest, which may allow them to obtain further favorable impression judgments (Robinson et al., 1995). On the contrary, individuals who disclose too much positive information may be considered dishonest, which will in turn influence the evaluation of their impressions. As such, the mixed findings of the influence of information valence on impression formation (e.g., Robinson et al., 1995; Orben and Dunbar, 2017) have led to a demand for further exploration.

Previous studies have suggested that the level of trustworthiness of disclosure information plays a crucial role in the effect of valence on interpersonal perception (Runge and Archer, 1981; Robinson et al., 1995). Moreover, the role of trustworthiness could be more significant in passive online consumption. In this social context, the only reference available for a perceiver is the stranger's self-disclosure information on their online profile. However, online profiles tend to be overly curated and managed by users for self-promotion, self-enhancement, and impression management (Toma and Hancock, 2011), making the trustworthiness of the disclosed information (e.g., valence) questionable.

Furthermore, the context of this study indicates a high level of uncertainty because the target is a stranger, and the only reference is their questionable self-disclosure information. With higher levels of uncertainty, individuals tend to look for more signals to "fill the gaps" when making interpersonal judgments (Spence, 1974). Quick interpersonal judgments are likely to be based on trust, and individuals tend to use social categories (e.g., homophily) when there are no other reliable social contextual cues (Robert et al., 2009). Therefore, this study focuses on two additional factors—perceived trustworthiness as a mediator and perceived homophily as a moderator—both of which are crucial variables that influence uncertainty reduction in initial encounters (Prisbell and Andersen, 1980; Robinson et al., 1995; Wout and Sanfey, 2007).

In sum, this study aims to test a research model that specifies the underlying mechanisms through which self-disclosure valence influences a perceiver's first impression formation by focusing on the mediating role of trustworthiness and the moderating role of perceived homophily. We tested our research model in the context of WeChat, which is a popular social media platform in China that is similar to Facebook and has more than one billion monthly active users (Tencent, 2018). Compared to Facebook, where strangers can view both self-generated information and other-generated information, WeChat provides an ideal platform to test self-disclosure valence on user profiles because strangers can only see self-generated information. Given that most online profile studies are limited to Facebook (Shu et al., 2017), conducting a study with WeChat could provide insights into self-presentation and impression formation on social media in different contexts.

This study aims to make a theoretical contribution by exploring the first impression formation of different forms of valenced self-disclosure in online profiles. It could provide robust evidence for further exploration of the effect that self-disclosure valence has on interpersonal perceptions. Previous studies have had mixed findings in this regard. Moreover, this study may contribute to a revelation regarding the underlying mechanism of valence effect because it is not restricted to testing the direct effect of self-disclosure valence. We also specify the mediation effect of perceived trustworthiness and investigate the moderation effect of perceived homophily.

LITERATURE REVIEW

Self-Disclosure Valence and Interpersonal Perception

Self-disclosure is defined as "any message about the self that a person communicates to another" (Wheeless and Grotz, 1976, p. 338). Kim and Dindia (2011) demonstrated the powerful influence that computer-mediated communication (CMC) has on self-disclosure and extended the definition of online self-disclosure by considering the traditional verbally revealing self as well as self-related pictures and links that are posted online. Considering the rapid changes in the affordances of online settings, we operationalized self-disclosure on social media as any self-generated information (conveyed verbally or nonverbally) that provides cues that allow receivers to learn more about the profile owner. Valence is a key element of self-disclosure that varies in its degree of positive vs. negative information (Wheeless and Grotz, 1976). Thus, in this study, we categorized self-disclosure valence into positive, neutral (balance of positive and negative), and negative conditions. To reflect self-disclosure in real life, we also tried a more refined look into self-disclosure valence by further splitting the positive self-disclosure condition into all positive self-disclosure and mostly positive self-disclosure (similar in the negative self-disclosure condition).

Previous literature has shown that valence (positive vs. negative) has a significant effect on individual perceptions of others. Generally, disclosing positive information is more likely to form a favorable impression (Gilbert and Horenstein, 1975; Goodmon et al., 2015; Rains and Brunner, 2015). According to social exchange theory, it may be rewarding to build a relationship with a discloser who conveys positive information in an initial interaction (Gilbert and Horenstein, 1975). Goodmon et al. (2015) also found that participants had a lower likability judgment for those who disclosed negative information about themselves (e.g., being responsible for a negative incident). Consistent with these studies, Rains and Brunner (2015) argued that individuals with positive personal information achieve more interpersonal liking, especially when the relationship is not close. The findings are in line with social penetration theory (Altman and Taylor, 1973), which suggests that people are motivated to disclose positive personal information and conceal negative aspects of themselves to make others perceive them as rewarding

partners. Hence, we predicted that users with dominantly positive self-disclosure in their WeChat profiles would gain the highest level of likability.

> H1: Dominantly positive online self-disclosure attains a higher level of likability compared to neutral self-disclosure, followed by negative self-disclosure.

The Mediating Role of Perceived Trustworthiness

While it is intuitively logical to assume that positive self-disclosure leads to higher likability levels (e.g., Goodmon et al., 2015; Rains and Brunner, 2015), it is also possible that the relationship could be changed when the effect is mediated by perceived trustworthiness. Trustworthiness perception is an essential antecedent of interpersonal trust (Lau et al., 2008), and it comprises information that is used to judge whether others are trustful or distrustful and whether they are worthy of being approached or should be avoided (Wout and Sanfey, 2007).

In online settings, an interesting phenomenon involving the hyperpersonal model is online deceptive self-presentation (Walther et al., 2015). Text-based CMC allows users to selectively present their ideal selves; they can convey only those cues that they desire to share. This is a prominent trend because editable profiles allow users to rewrite and revise their disclosure information to continually make themselves more appealing (Toma and Hancock, 2011). However, perceivers may consider these positive cues unreliable and untrustworthy due to the ease of editing. Thus, the perceived trustworthiness of online self-disclosure is crucial for the influence of disclosure cues, especially with online profiles.

Previous results regarding the effect of valence on trustworthiness have varied (e.g., Runge and Archer, 1981; Robinson et al., 1995; Miller et al., 2013). Runge and Archer (1981) found that a confederate who disclosed positive personal information attained greater positive judgments of trustworthiness compared to one who disclosed negative personal information. Similarly, Miller et al. (2013) argued that negative self-disclosure is negatively associated with perceived trustworthiness, possibly because this type of personal information reveals character weaknesses and personal failures. However, Robinson et al. (1995) notably discovered the following: individuals who presented themselves in a balanced way were rated the most honest; individuals who presented themselves in a negative way were rated less honest, and individuals who presented themselves in an extremely positive way were rated the least honest. Self-disclosure that is too positive is regarded as a form of extreme self-enhancement, which seems to run counter to an individual's expectations during initial interactions, and it further urges them to consider a thoughtful attribution process. Thus, too positive self-disclosure is more likely to be viewed as a form of disingenuous self-presentation that has ulterior motives. However, negative self-disclosure that is too extreme is also abnormal, considering that individuals tend to present themselves positively during initial interactions (Robinson et al., 1995).

In sum, previous studies have reported mixed and inconclusive findings. In this study, which we based on future cooperation, we adopted Miller et al. (2013) proposition that negative personal information is harmful to perceived trustworthiness because such information may reflect personal weakness. Moreover, disclosing dominantly positive information is normative on social media (Toma and Hancock, 2011); therefore, it may not be perceived that extremely positive information is an abnormal social cue. Thus, we proposed the following:

> H2: Dominantly positive online self-disclosure attains a higher level of trustworthiness compared to neutral self-disclosure, followed by negative self-disclosure.

Trust is also considered an important component of interpersonal liking, and a higher level of trustworthiness perception leads to a higher level of interpersonal liking (Hawke and Heffernan, 2006). Trust plays a particularly important role when interacting with uncertain individuals, such as outgroup members or online strangers. Montoya and Pittinsky (2011) found that outgroup trust is positively associated with outgroup favoritism. Trust is key to the effect that group identification and relations have on outgroup liking, and it is difficult to form a "liking" between groups without trust, even if the groups highly identify with one another and are cooperative. Therefore, we predicted the following:

> H3: A higher level of trustworthiness perception increases the level of perceived likability.

Perceived Homophily as a Moderator

Perceived homophily is defined as "the degree to which pairs of individuals who interact are similar with respect to certain attributes, such as beliefs, values, education, social status, and the like" (Rogers and Bhowmik, 1970, p. 526). The similarity–trust/dissimilarity–distrust paradigm has been explained by social identity theory: individuals categorize others into "us" vs. "them" based on social categories, and they have a favorable perception (e.g., the trustworthiness perception) of members of the "us" group (Lau et al., 2008). Prisbell and Andersen (1980) advocated that perceived homophily could reduce uncertainty perception and positively affect feelings and safety perceptions in interpersonal interactions. Unlike in a group with prior interactions, where individuals can build knowledge-based trust, when interacting with online strangers, individuals form trust swiftly (e.g., ingroup trust) by using perceived homophily as a salient proxy/cue to reduce uncertainty (Robert et al., 2009).

In this study, when individuals viewed a stranger's social media profile, perceived homophily and information valence provided cues for judgments of perceived trustworthiness. Signaling theory suggests that individuals will make inferences based on any available data when they either do not have access to complete data or when they feel uncertain about the target person (Spence, 1974). However, when cues from a single aspect (e.g., valence) do not adequately reduce uncertainty regarding the trustworthiness perception of a stranger, how individuals derive more cues from other aspects (e.g., perceived homophily) is still

FIGURE 1 | Conceptual model.
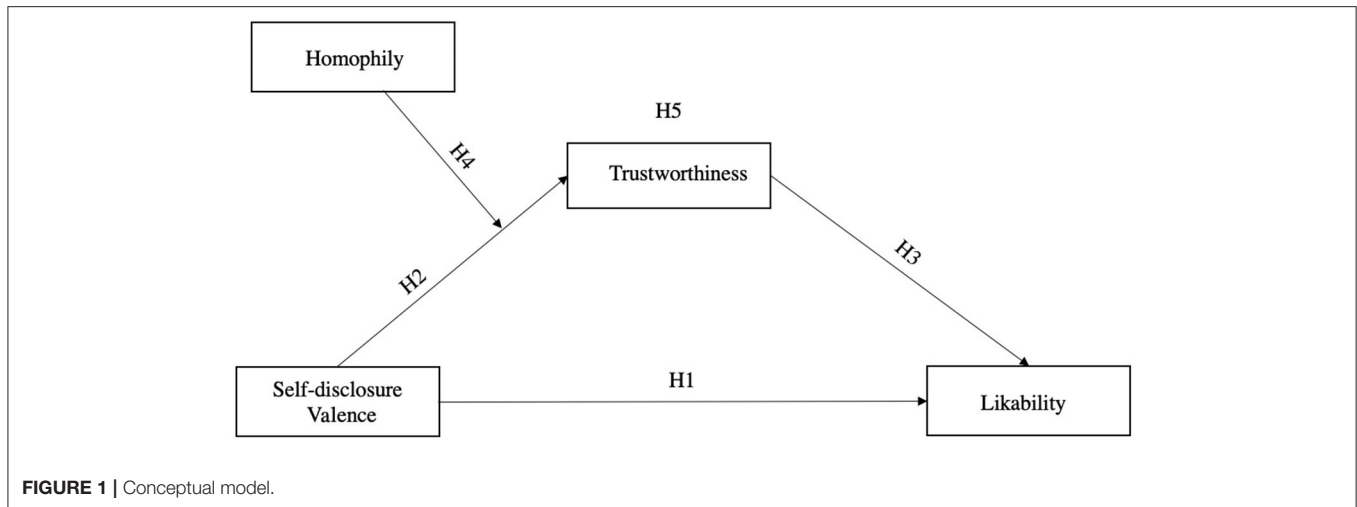
uncertain. A previous study found that the effect of information valence on decision making was significant when a reader of an online travel site perceived a low level of similarity with a reviewer on the site (i.e., surface-level similarity) (Chan et al., 2017). A possible reason for this is that individuals tend to pay less attention to the information itself once they view the information source as being credible because of the perceived similarity, or vice versa. The relationship between the information itself and decision making therefore becomes either weaker or stronger, depending on the level of perceived similarity. Thus, we proposed the following hypothesis regarding the moderating effect of perceived homophily:

H4: Perceived homophily negatively moderates the effect of online self-disclosure valence on trustworthiness. More specifically, the influence of valence on trustworthiness will be stronger (weaker) when perceived homophily is low (high).

Overall, a combination of H1–H4 suggests a moderated mediation model. In other words, we predict that the valence of self-disclosure has a significant effect on perceived trustworthiness, which, in turn, affects interpersonal liking. The mediation effect of trustworthiness is influenced by perceived homophily. Thus, we propose the final hypothesis:

H5: The mediation effect of trustworthiness on the relationship between self-disclosure and likability is moderated by perceived homophily.

Figure 1 presents the oveall research model and hypotheses.

METHOD

Sample and Procedures

We collected data from October 6th to October 25th, 2018. We conducted two focus groups, two pretests, and an online experiment. The online experiment was conducted to examine the proposed hypotheses. To determine the sample size of the experiment, a power analysis was conducted using G*power 3.1 (Faul et al., 2009). Cohen (1988) suggested setting statistical power at 0.80 given an alpha level of 0.05, thus, at least 200 responses needed to be collected to detect a relatively small effect size ($b = 0.25$). A total of 224 undergraduates in China volunteered to participate in the study. After eliminating all incomplete answers, 204 valid questionnaires were used for data analysis. The participants' age was from 18 to 27 years old ($M = 20.22$; $SD = 1.40$), and 65.2% were female, and 34.8% were male. The recruited undergraduate students were sampled from various majors and universities to guarantee heterogeneity. A web link with access to the questionnaire was sent to each participant after they agreed to join the project. Each link, with one version of the stimuli, was randomly assigned by the online survey system. A consent form was provided at the beginning of the questionnaire, followed by a scenario introduction that read: "You have already accepted a friend request on WeChat from a stranger in your club. Your club leader told you that you would collaborate with him/her in the future, and now you are going to check his/her WeChat profile to get to know him/her."

Each participant was randomly assigned to one of five experimental conditions that contained a mock-up of a WeChat profile that contained eight valenced posts by the "owner" of the profile (i.e., a mock-up collaborator). Each condition had different proportions of valenced self-disclosure posts generated by the collaborator that represented different levels of self-disclosure valence: (a) 100% positive self-disclosure posts; (b) 75% positive self-disclosure posts and 25% negative self-disclosure posts; (c) 50% positive self-disclosure posts and 50% negative self-disclosure posts; (d) 25% positive self-disclosure posts and 75% negative self-disclosure posts; and (e) 100% negative self-disclosure posts. To diminish the primacy effect and recency effect in impression formation, the valence of the first and last post was randomized in conditions (b), (c), and (d).

After reading their assigned profile, participants were asked to rate their perceived homophily, trustworthiness, likability, and valence. Participants also had to answer questions about their WeChat use and demographics. The experiment typically took less than 10 min.

Stimuli and Manipulation

We chose WeChat profiles as stimuli since WeChat is one of the most popular social networking sites (SNSs) in China (Lin et al., 2017). Moreover, as noted earlier, the layout and content of WeChat profiles are more straightforward compared to other SNS profiles. This is beneficial as it minimizes any confounding factors in the experiment. The WeChat profile consists of five elements: the cover photo, profile owner's photo, profile owner's name, self-disclosure posts, and time of each self-disclosure message. For all stimuli, the cover photo, profile owner's photo, profile's owner's name, and time of each message were the same. We designed all of the stimuli to have no cover photo and used a neutral scenic photo as the profile owner's photo (see **Supplementary Figure 1** for the actual stimuli).

The main purpose of this study is to estimate the effect of self-disclosure valence, which is conceptualized as the positivity, neutrality, or negativity of the information disclosed (Orben and Dunbar, 2017) and operationalized by the proportion of valenced posts in a social media profile. Therefore, we created five conditions based on the level of self-disclosure valence as noted in above.

To make the experiment stimuli more realistic and valid, as well as to better eliminate the confounding of self-disclosure topics and emotion types, we organized two online focus groups (each consisting of four to five undergraduates) to determine the appropriate topics (e.g., study, love, and interpersonal relationships) and emotion types for undergraduates' self-disclosure posts on WeChat. Drawn from the focus group's findings, 16 self-disclosure posts were created to reflect different valences of the designed profiles. Two pretests ($n = 25$, $n = 5$) were conducted to check the manipulation of the valence (positive vs. negative) of each self-disclosure message. The first pretest was performed to investigate the valence of 16 postings, and the second pretest was conducted to investigate the valence of five mock-up profiles in which these postings appeared. The results indicated that the manipulation in the current study was successful to the extent that participants could correctly distinguish between the valence of each posting and profile. Therefore, the five mock-up profiles were employed in the following actual experiment.

Measures

For all the measures,[1] we employed multiple item scales adapted from pre-validated studies. All items were translated into Chinese to ensure that participants could accurately understand the meaning of each item. Seven-point Likert scales were used throughout.

Likability

Likability was measured using an 8-item scale ($\alpha = 0.97$) adapted from Reysen (2005). This scale is used to test the degree to which an individual is perceived as friendly and approachable (e.g.,

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[1]We also measured perceived realism to check whether the experiment has ecological validity. However, the two items that created for this study failed to meet the reliability. Also, the perceived realism was not the focus of this study. Thus, the factor was not reported.

"This person is friendly," "This person is warm," "I would like to be friends with this person").

Trustworthiness

The trustworthiness perception of the profile owner was assessed using seven semantic differential-type items ($\alpha = 0.90$) adapted from the Individualized Trust Scale (Wheeless and Grotz, 1977). Items include "Trustworthy-Untrustworthy," "Trustful of this person-Distrustful of this person," "Confidential-Divulging," "Candid-Deceptive," "Not Deceitful-Deceitful," "Straightforward-Tricky," and "Honest-Dishonest."

Homophily

Perceived homophily was assessed using three items ($\alpha = 0.95$) adopted from the Perceived Homophily Measure (McCroskey et al., 1975) and comprised "The author thinks like me," "The author behaves like me," and "The author is similar to me."

Control Variables

Similar to other relevant studies (e.g., Orben and Dunbar, 2017), this study also measured the participants' familiarity with WeChat, their intensity of WeChat use, and their demographics (e.g., age and gender) as controls, since these may influence the results. The familiarity of WeChat was tested by asking, "How long have you been actively using your WeChat account?" ($M = 3.34$, $SD = 0.75$). The intensity of WeChat use was assessed by two items: "On a typical day, how often do you check WeChat?" and "On a typical day, how often do you browse others' posts on WeChat?" ($M = 3.95$, $SD = 1.16$).

Manipulation Checks
Perceived Valence

To test whether participants accurately perceived the dominant self-disclosure valence as we expected, we asked participants to report their level of agreement with "Most of the information is positive" on a 7-point Likert scale ranging from "1 = Strongly disagree" to "7 = Strongly agree." The results of one-way ANOVA showed a significant difference between the five conditions [$F_{(4)} = 34.09$, $p < 0.001$], with the 100% positive conditions ($M = 4.80$, $SD = 1.54$) and 75% positive condition receiving higher scores ($M = 4.75$, $SD = 1.75$), followed by the neutral condition ($M = 3.45$, $SD = 2.00$), the 75% negative condition ($M = 2.12$, $SD = 1.29$), and the 100% negative condition ($M = 1.58$, $SD = 1.22$). The post hoc analysis showed that participants could distinguish between dominant positive, neutral, and dominant negative, while there was no significant difference between the 75% positive condition and the 100% positive condition ($M_{\text{difference}} = -0.05$, $p = 0.89$), as well as the 75% negative condition and the 100% negative condition ($M_{\text{difference}} = 0.54$, $p = 0.12$). That is, as long as more than half of postings are positive/negative, the fine distinction (i.e., 100 vs. 75%) appeared to be unimportant. Thus, we combined the 100 and 75% groups to represent the dominantly positive valence condition and the dominantly negative valence condition, respectively. Following this, three conditions were determined (dominantly positive vs. neutral vs. dominantly negative).

FIGURE 2 | Mean differences between self-disclosure valances in likability.
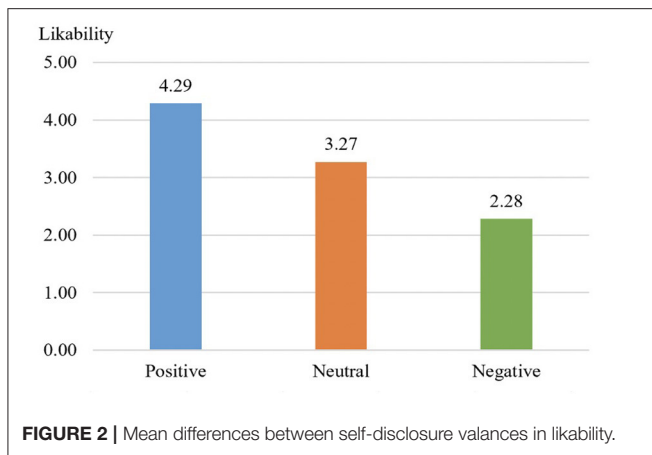
RESULTS

The data were analyzed using IBM SPSS Statistics 22 and PROCESS macro 3.1 for SPSS. A One-Way ANOVA was employed to test our baseline hypothesis (H1), while Model 7 in SPSS PROCESS macro (Hayes, 2013) was employed to examine other hypotheses (H2-H5) involving mediation and moderation effects. We used 10,000 bias-corrected estimates and iterations. Online self-disclosure valence (IV) was operated as a multicategorical variable, and the negative condition was selected as the baseline group. Moderation effects of perceived homophily were investigated at plus (high level) and minus (low level) one standard deviation around the mean of perceived homophily.

H1 predicted the significant effect of self-disclosure valence on likability. Specifically, we predicted that dominantly positive self-disclosure would lead to the highest likability level, followed by neutral self-disclosure, followed in turn by dominantly negative self-disclosure. The result shown in **Figure 2** indicated that there is a significant between-group difference in terms of likability $[F_{(2)} = 44.43, p < 0.001]$. Moreover, the profile owner with dominant positive self-disclosure information attained highest level of likability ($M = 4.29, SD = 1.27$), followed by neutral self-disclosure ($M = 3.27, SD = 1.56$), and the least is dominant negative self-disclosure ($M = 2.28, SD = 1.33$). A Tukey's post hoc test was further conducted, and the result showed that there was a significant difference between each pair in terms of likability (positive vs. neutral: $p < 0.001$; positive vs., negative: $p < 0.001$; neutral vs. negative: $p < 0.001$), therefore, H1 was supported.

Table 1 presents the results of moderated mediation analyses, testing H2–H5. With regard to trustworthiness (H2), the result showed that dominantly positive self-disclosure acquired a significantly higher perception of trustworthiness compared to negative self-disclosure ($b = 1.37, p < 0.001$), while there was no significant difference between neutral self-disclosure and dominantly negative self-disclosure ($b = 0.22, p = 0.59$). Hence, H2 is partially supported.

H3 predicted the direct positive effect of trustworthiness on likability. The result (see **Table 1**) showed that trustworthiness

has a significant positive effect on likability ($b = 0.57, p < 0.001$). Thus, H3 is supported.

H4 predicted that perceived homophily moderated the effect of online self-disclosure valence on the perception of trustworthiness. The results showed (see **Table 1**) that perceived homophily had a significant interaction effect with dominantly positive self-disclosure on trust ($b = -0.30, p < 0.05, SE = 0.15, 95\%$ CI $= -0.59$ to -0.01). More specifically, the impact of dominantly positive self-disclosure on trustworthiness (operationalized here as the difference between positive self-disclosure and the baseline, negative self-disclosure) was significant when perceived homophily was at a low level (-1 SD) ($b = 1.08, p < 0.001, SE = 0.27, 95\%$ CI $= 0.55$ to 1.60) and at an average level ($b = 0.65, p < 0.01, SE = 0.21, 95\%$ CI $= 0.23$ to 1.07). In contrast, dominantly positive self-disclosure had no significant effect ($b = 0.18, p = 0.61, SE = 0.35, 95\%$ CI $= -0.51$ to 0.87) at a high level ($+1$ SD). This means that individuals rely on the self-disclosure valence to make an interpersonal judgment of trustworthiness when they interact with dissimilar individuals (i.e., low homophily), as they are likely to look for other signals to "fill the gap" and produce a trustworthiness perception due to increased levels of uncertainty associated with dissimilar others. However, the interaction between neutral self-disclosure and perceived homophily was nonsignificant ($b = -0.00, p = 0.99, 95\%$ CI $= -0.30$ to 0.30). Taken together with those of H2, the findings suggest that the difference in trustworthiness between neutral condition and negative condition was insignificant, regardless of perceived homophily. Thus, H4 is partially supported.

Figure 3 shows estimated marginal means of trustworthiness across conditions, depicting overall interaction patterns. Although the positive condition attained the highest trustworthiness when perceived homophily is at a low or average level, the situation changed when perceived homophily is at high level as the neutral condition had the highest level of trustworthiness. Actually, the estimated marginal means of trustworthiness in three conditions were close to each other when perceived homophily was high, compared to the discrepancies in the three conditions when perceived homophily was at low or average level. It also indicated that the effect of self-disclosure valence on trustworthiness depends on the level of perceived homophily. In addition, **Figure 3** shows the trustworthiness perception is relatively stable at different levels of perceived homophily; thus, the significant interaction effect founded in the positive condition may result from the difference between positive condition and negative condition (baseline).

It is worthwhile to note that, as shown in **Figure 3**, the neutral condition and the negative condition were almost identical (and substantially different from the positive condition), although the neutral condition consisted of the same proportion of positive posts and negative posts. The insignificant effects pertaining to the neutral condition observed in this study indicate that the negative self-disclosure posts seemed to weigh more than positive self-disclosure posts when the amount was the same.

H5 predicted that the mediation effect was moderated by perceived homophily. The results showed that compared

TABLE 1 | Moderated mediation effect of trustworthiness on likability.

Effects on trustworthiness		Unstandardized b	SE	t	95% CI
Neutral	(H2)	0.22	0.42	0.54	−0.60 to 1.05
Positive		1.37***	0.38	3.63	0.63 to 2.12
Homophily		0.31**	0.12	2.61	0.08 to 0.55
Neutral*Homophily	(H4)	−0.00	0.15	−0.01	−0.30 to 0.30
Positive*Homophily		−0.30*	0.15	−2.01	−0.59 to −0.01
Familiarity of WeChat		−0.15	0.12	−1.25	−0.38 to 0.08
WeChat use intensity		−0.09	0.07	−1.19	−0.24 to 0.06
Relatively direct effects on likability					
Neutral		0.68**	0.22	3.07	0.24 to 1.11
Positive		1.50***	0.19	7.92	1.13 to 1.88
Trustworthiness (H3)		0.57***	0.07	8.70	0.44 to 0.70
Familiarity of Wechat		−0.26*	0.11	−2.37	−0.48 to −0.04
WeChat use intensity		0.08	0.07	1.16	−0.06 to 0.22
Conditional indirect effects on likability (H5)					
Neutral*Homophily		−0.00	0.15		−0.34 to 0.25
Neutral*Homophily (−1 SD)		0.13	0.17		−0.20 to 0.48
Neutral*Homophily (0 SD)		0.13	0.18		−0.26 to 0.42
Neutal*Homophily (+1 SD)		0.12	0.38		−0.73 to 0.73
Positive*Homophily		−0.17	0.16		−0.53 to 0.08
Positive*Homophily (−1 SD)		0.61	0.18		0.30 to 1.00
Positive*Homophily (0 SD)		0.37	0.17		0.02 to 0.67
Positive*Homophily (+1 SD)		0.10	0.38		−0.73 to 0.70

*p < 0.05, **p < 0.01, ***p < 0.001; Reference group is the negative condition, so the independent variables compare positive and neutral conditions with the negative condition; Regarding indirect effects, if zero is not included in the 95% confidence limits, the indirect effect test is significant; otherwise, it is non-significant.

FIGURE 3 | Patterns of interaction effects of valence and homophily on trustworthiness. This figure shows the estimated marginal means of trustworthniness at +1, 0, and −1 SD of perceived homophily.
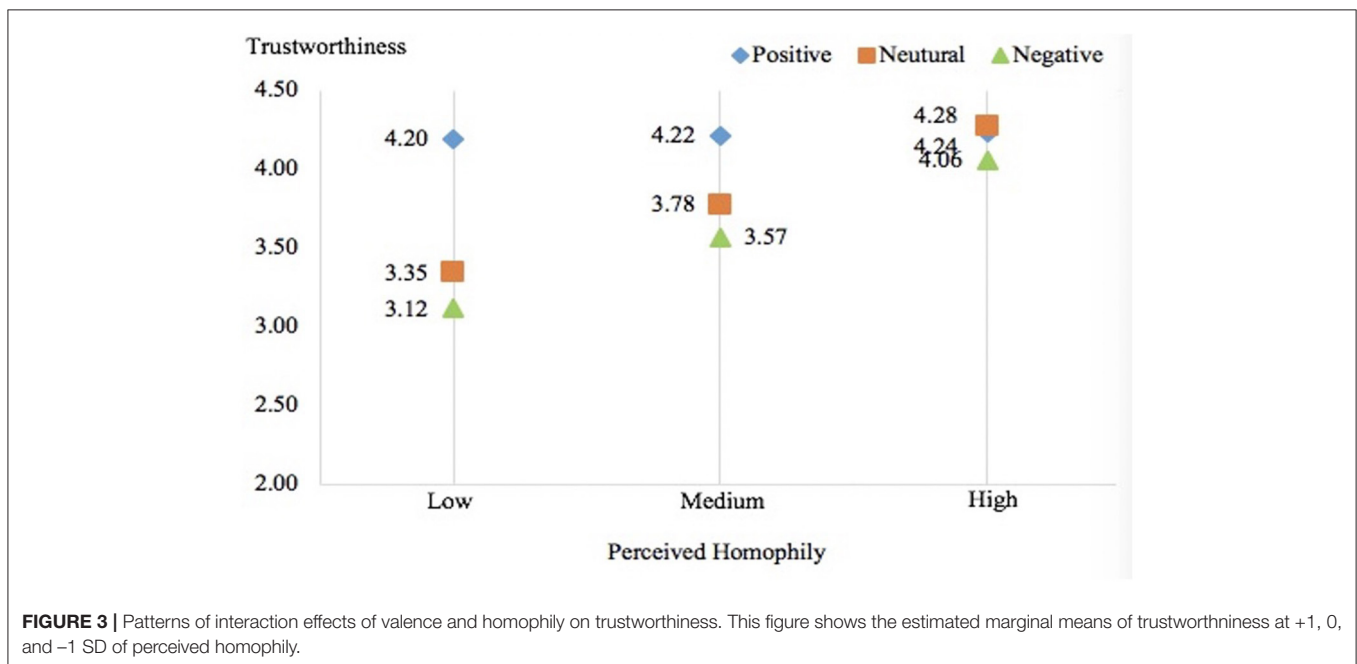
to the negative condition (see **Table 1**), the moderated mediation effect in the positive condition depends on the level of perceived homophily. More specifically, the mediation effect of trustworthiness in the relationship between positive self-disclosure and likability was moderated by perceived homophily when perceived homophily was at a low level (−1 SD) (b = 0.61, 95% CI = 0.30 to 1.00) and at an average level (b = 0.37, 95% CI = 0.02 to 0.67), while a high level (+1 SD)

of perceived homophily did not affect the mediation effect of trustworthiness ($b = 0.10$, 95% CI $= -0.73$ to 0.70). The relative direct effect of dominantly positive self-disclosure on likability (b direct $= 1.50$, $p < 0.001$, $SE = 0.19$, 95% CI $=$ 1.13 to 1.88) remained significant, indicating that the effect of self-disclosure valence on likability was partially mediated by trustworthiness perception under positive conditions when the perceived homophily was at the lower or average level. However, although the direct effect of neutral self-disclosure on likability was still significant ($b = 0.68$, $p < 0.01$), there was no moderated mediation ($b = -0.00$, 95% CI $= -0.34$ to 0.25) across all neutral conditions as the path from the neutral valence to perceived trustworthiness was insignificant ($b = 0.22$, $p = 0.59$). Thus, H5 is partially supported.

DISCUSSION

The current study examined the effect of self-disclosure valence on first impression formation in the context of social media through online data from 204 WeChat users. This study also examined the mechanisms underlying this process by testing the mediation effect of trustworthiness and the moderation effect of perceived homophily. In sum, the results indicate that, although the valence of an impression judgment tends to be in line with a stranger's self-disclosure valence, the role of self-disclosure in the first impression is affected by the level of trustworthiness and perceived homophily. Trustworthiness plays an important role by mediating the effect of self-disclosure valence on likability. Perceived homophily moderates the mediation effect: individuals rely more on cues from self-disclosure valence when they feel dissimilar from strangers.

The findings discussed in the present study enrich the existing literature about online self-disclosure valence and first impression formation. First, the findings regarding the main effects that dominantly positive self-disclosure could have in terms of attaining the highest likability reinforce previous research, where it was found that positive self-disclosure has a positive influence on interpersonal perceptions, especially at the initial stages (e.g., Blau, 1964; Gilbert and Horenstein, 1975; Miller et al., 1992; Rains and Brunner, 2015). It confirms that self-disclosure valence is a central factor affecting interpersonal perceptions. For self-disclosure and interpersonal evaluation, it is usually positive self-disclosure that is linked with positive interpersonal evaluations, whereas negative self-disclosure is associated with negative interpersonal evaluations (Gilbert and Horenstein, 1975; Orben and Dunbar, 2017; i.e., the valence of interpersonal evaluation usually matches the valence of self-disclosure information). Miller et al. (1992) also found that individuals who positively disclose were judged as the most likable. Blau (1964) emphasized that individuals must present themselves in a positive way to obtain a favorable impression, especially in the early acquaintance stage. This is because an individual's negative self-disclosure in an initial encounter, comprising a display of deficiencies, would not succeed in conveying a signal that said individual is approachable (Blau, 1964).

Second, as for the relationship between self-disclosure valence and trustworthiness, the results are in line with previous studies that indicated positive self-disclosure is positively related to perceived trustworthiness (e.g., Runge and Archer, 1981; Miller et al., 2013). Previous studies have shown that negative or neutral self-disclosure leads to higher trustworthiness than positive self-disclosure does (e.g., Robinson et al., 1995; Ma et al., 2019). There could be a few reasons why disclosing dominantly positive information instead of dominantly negative information results in higher trustworthiness in this study. First, as discussed above, positive self-disclosure tends to produce a favorable impression. Thus, if individuals consider trustworthiness to be a good personal trait included in impression judgments, it is likely to be subjectively influenced by the overall impression instead of objectively affected by the credibility of self-disclosure information. In reality, individuals often have no access to others' self-disclosure information in terms of its "accuracy" (Miller et al., 1992); thus, perceived trustworthiness is likely to be considered as a subjective personal perception. Second, it might also be related to the different norms of self-disclosure on social media. Individuals are always motivated to selectively present themselves in CMC and disclose positive aspects of themselves to present an ideal self that has become prevalent on social media (Walther et al., 2015). Thus, disclosing dominantly positive information is normal and easy to accept.

Also, the findings show a positive relationship between trustworthiness and likability, which might have occurred because trustworthiness has a halo effect on first impressions, where limited information is given and there is a lack of previous interactions. The halo effect is formed through two different mechanisms: (a) individuals categorize overall impressions into either positive or negative evaluations that result in a single judgment, and (b) a single salient trait will be transferred onto an individual's judgments of other traits (Bierhoff and Klein, 1989). In the context of this study, we assume that both mechanisms may occur because some individuals may form a likability judgment, depending on their overall positive impression, which they could derive from perceived trustworthiness, while others may like the target because they consider trustworthiness a salient single trait. Previous literature has even emphasized that trust is the second most important antecedent of interpersonal liking, following personality (Hawke and Heffernan, 2006). Hence, perceived trustworthiness also plays an important mediating role in positive conditions.

As for the moderating role of perceived homophily, the results emphasized the role of different levels of perceived homophily which uncovered the different mechanisms in the course of making a trustworthiness judgment based on self-disclosure valence. The results showed that, when we encounter a stranger who is dissimilar or slightly similar to ourselves, we are more likely to rely on disclosure valence to form interpersonal trust. This is because, per uncertainty reduction theory, similarities can decrease uncertainty, whereas dissimilarities lead to increased uncertainty (Berger and Calabrese, 1975). The latter effect causes individuals to be more inclined to seek additional signals from relevant aspects (e.g., self-disclosure valence) to ensure that they make more accurate interpersonal judgments of strangers in a

short period of time, according to signal theory (Spence, 1974). In contrast, when there are high levels of perceived homophily, individuals need not rely on other cues because they feel low levels of uncertainty. Moreover, the estimated marginal means of trustworthiness across six conditions showed that neutral conditions attained the highest trustworthiness when perceived homophily was high, which indicated that the effect of valence of trustworthiness does depend on the perceived homophily.

Consistent with the results of the moderation effect, dominantly positive self-disclosure has only a moderate mediation effect when perceived homophily is at the low/average level. An interaction pattern analysis indicates that, except when we encounter strangers who are quite similar to us, in most cases, we rely on self-disclosure valence to form our trustworthiness perception, which, in turn, has a positive effect on a first impression in terms of likability. Trustworthiness is important for helping us decide whether we like a stranger when we perceive a low/average level of homophily.

Lastly, the results related to the moderation effect and the moderated mediation effect suggest no significant difference between the neutral condition and the dominantly negative condition. This could be explained by negativity bias, which indicates that negative cues are more informative compared to positive cues in social cognition and interpersonal perception (Fiske, 1980). Individuals tend to hold a chronic positivity bias in interpersonal perceptions, where personal cues are predominantly positive and negative information is scarce, regardless of self-reporting or evaluations from others. Thus, while positive cues seem to apply to everyone, they are difficult to distinguish between, and they are universal and similar to modal cues that are defined as uninformative. In contrast, negative cues are highly valued for their rarity, which is in line with extremity effects (Fiske, 1980). Because negative self-disclosure cues embody more discriminant information, the levels of interpersonal liking and trustworthiness in the neutral condition are similar to those in the dominantly negative condition, regardless of perceived homophily, although the number of positive self-disclosure posts and negative self-disclosure posts are the same in the neutral condition.

Taken together, the findings in this study specify the different processes of first impression formation when individuals view different forms of valenced self-disclosure in strangers' online profiles. The most important theoretical implication is that the effect of self-disclosure valence on interpersonal perception is conditional, determined by relatively complex mechanisms involving mediation through trust and moderation by perceived homophily. The present findings thus not only offer a novel connection to a broader literature on interpersonal formation online but also inform understanding of when this psychological process is determined by self-disclosure valance, trust, and perceived homophily.

LIMITATIONS AND FUTURE STUDY

There are a few limitations of the current study that may also provide directions for future studies. First, a clear limitation of our research is that it is impossible to completely separate emotion valence from the topics of the posts, as we adopted an experimental method. Similar to other studies that used experiments to estimate the effect of information valence, we conducted focus groups and pretests to find the optimal topics that would guarantee the realism and validity of the valenced information. Also, we intended to select the topics that undergraduates disclose in daily life, whether positive or negative, and ensured that these topics were balanced across the different conditions. However, we do not know to what degree these topics may contaminate interpersonal perceptions. For instance, perceivers who are single may have different attitudes toward positive/negative self-disclosures involving love (one of the topics in this study) compared to those of reviewers who are in relationships. We recommend that future experimental studies that deal with self-disclosure valence on WeChat focus on other topics or consider the interaction effect between the valence and the content so as to obtain more definitive results.

Secondly, the scenario that we established for the online experiment to ensure a realistic setting might have had an effect on the results. We believe that the participants' anticipation of future interaction encouraged them to deliberately make impression judgments of strangers, while at the same time, some participants may have paid more attention to "future cooperation" in the scenario and thus made task-oriented impression judgments. Hence, future research needs to minimize the scenario impact or create various scenarios to confirm these findings.

Third, though we explain the findings using motivational and cognitive approaches, we did not directly examine the role of related concepts, such as the level of uncertainty, motivations, and perceived risks, that are central to these explanations. Future studies should assess these variables and incorporate them in their research models to further verify the proposed theoretical mechanisms.

Last, although the Individualized Trust Scale used in this study is widely accepted in studies about self-disclosure and interpersonal trust, including recent research (e.g., Li et al., 2015; Hesse and Rauscher, 2019), the self-disclosure context is different from the context in which the scale was created decades ago. As a complicated concept, the judgment of trust could be influenced by the context, the task being evaluated, and the target person (Pascual-Ferrá, 2021). Thus, we suggest that future studies should employ or develop new comprehensive trust scales to test different social dimensions of trust.

CONCLUSIONS

Valence is inherently embedded in self-disclosure, and it either unconsciously or consciously influences receivers' interpersonal perceptions. However, it is risky to consider the effects of valence on interpersonal perceptions without considering contexts and/or by neglecting the different mechanisms behind different valences. Thus, this study builds on the findings of previous studies on self-disclosure and contributes to this area of research by integrating trustworthiness as a mediator and perceived homophily as a moderator during first impression formation that is based on self-disclosure valence in social media profiles. The most interesting finding in our study was that perceived trustworthiness is essential to making a judgment of likability

when we encounter strangers who are not highly similar to us. Trustworthiness formation occurs by seeking cues from both self-disclosure valence and perceived homophily. Also, negative self-disclosure is likely to have more discriminant power to influence trustworthiness perception compared to the same amount of positive self-disclosure. As noted earlier, we suggest that concerted efforts should be made to reveal the complex relationship between self-disclosure, valence, and impression formation online.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by NUS Institutional Review Board (IRB). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

YQ was responsible for the entire research, including proposing the idea, collecting data, and writing. PL discussed the research with other authors all the time, analyzed the data, and tried to find a home for the paper. HC gave a lot of useful suggestions to design the study and improve the paper. LZ made an effort in data collection and paper writing. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.656365/full#supplementary-material

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Effects of Social Media Use on Psychological Well-Being: A Mediated Model

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The growth in social media use has given rise to concerns about the impacts it may have on users' psychological well-being. This paper's main objective is to shed light on the effect of social media use on psychological well-being. Building on contributions from various fields in the literature, it provides a more comprehensive study of the phenomenon by considering a set of mediators, including social capital types (i.e., bonding social capital and bridging social capital), social isolation, and smartphone addiction. The paper includes a quantitative study of 940 social media users from Mexico, using structural equation modeling (SEM) to test the proposed hypotheses. The findings point to an overall positive indirect impact of social media usage on psychological well-being, mainly due to the positive effect of bonding and bridging social capital. The empirical model's explanatory power is 45.1%. This paper provides empirical evidence and robust statistical analysis that demonstrates both positive and negative effects coexist, helping to reconcile the inconsistencies found so far in the literature.

Keywords: smartphone addiction, social isolation, bonding social capital, bridging social capital, phubbing, social media use

INTRODUCTION

The use of social media has grown substantially in recent years (Leong et al., 2019; Kemp, 2020). Social media refers to "the websites and online tools that facilitate interactions between users by providing them opportunities to share information, opinions, and interest" (Swar and Hameed, 2017, p. 141). Individuals use social media for many reasons, including entertainment, communication, and searching for information. Notably, adolescents and young adults are spending an increasing amount of time on online networking sites, e-games, texting, and other social media (Twenge and Campbell, 2019). In fact, some authors (e.g., Dhir et al., 2018; Tateno et al., 2019) have suggested that social media has altered the forms of group interaction and its users' individual and collective behavior around the world.

Consequently, there are increased concerns regarding the possible negative impacts associated with social media usage addiction (Swar and Hameed, 2017; Kircaburun et al., 2020), particularly on psychological well-being (Chotpitayasunondh and Douglas, 2016; Jiao et al., 2017; Choi and Noh, 2019; Chatterjee, 2020). Smartphones sometimes distract their users from relationships and social interaction (Chotpitayasunondh and Douglas, 2016; Li et al., 2020a), and several authors have

stressed that the excessive use of social media may lead to smartphone addiction (Swar and Hameed, 2017; Leong et al., 2019), primarily because of the fear of missing out (Reer et al., 2019; Roberts and David, 2020). Social media usage has been associated with anxiety, loneliness, and depression (Dhir et al., 2018; Reer et al., 2019), social isolation (Van Den Eijnden et al., 2016; Whaite et al., 2018), and "phubbing," which refers to the extent to which an individual uses, or is distracted by, their smartphone during face-to-face communication with others (Chotpitayasunondh and Douglas, 2016; Jiao et al., 2017; Choi and Noh, 2019; Chatterjee, 2020).

However, social media use also contributes to building a sense of connectedness with relevant others (Twenge and Campbell, 2019), which may reduce social isolation. Indeed, social media provides several ways to interact both with close ties, such as family, friends, and relatives, and weak ties, including coworkers, acquaintances, and strangers (Chen and Li, 2017), and plays a key role among people of all ages as they exploit their sense of belonging in different communities (Roberts and David, 2020). Consequently, despite the fears regarding the possible negative impacts of social media usage on well-being, there is also an increasing number of studies highlighting social media as a new communication channel (Twenge and Campbell, 2019; Barbosa et al., 2020), stressing that it can play a crucial role in developing one's presence, identity, and reputation, thus facilitating social interaction, forming and maintaining relationships, and sharing ideas (Carlson et al., 2016), which consequently may be significantly correlated to social support (Chen and Li, 2017; Holliman et al., 2021). Interestingly, recent studies (e.g., David et al., 2018; Bano et al., 2019; Barbosa et al., 2020) have suggested that the impact of smartphone usage on psychological well-being depends on the time spent on each type of application and the activities that users engage in.

Hence, the literature provides contradictory cues regarding the impacts of social media on users' well-being, highlighting both the possible negative impacts and the social enhancement it can potentially provide. In line with views on the need to further investigate social media usage (Karikari et al., 2017), particularly regarding its societal implications (Jiao et al., 2017), this paper argues that there is an urgent need to further understand the impact of the time spent on social media on users' psychological well-being, namely by considering other variables that mediate and further explain this effect.

One of the relevant perspectives worth considering is that provided by social capital theory, which is adopted in this paper. Social capital theory has previously been used to study how social media usage affects psychological well-being (e.g., Bano et al., 2019). However, extant literature has so far presented only partial models of associations that, although statistically acceptable and contributing to the understanding of the scope of social networks, do not provide as comprehensive a vision of the phenomenon as that proposed within this paper. Furthermore, the contradictory views, suggesting both negative (e.g., Chotpitayasunondh and Douglas, 2016; Van Den Eijnden et al., 2016; Jiao et al., 2017; Whaite et al., 2018; Choi and Noh, 2019; Chatterjee, 2020) and positive impacts (Carlson et al., 2016; Chen and Li, 2017; Twenge

and Campbell, 2019) of social media on psychological well-being, have not been adequately explored.

Given this research gap, this paper's main objective is to shed light on the effect of social media use on psychological well-being. As explained in detail in the next section, this paper explores the mediating effect of bonding and bridging social capital. To provide a broad view of the phenomenon, it also considers several variables highlighted in the literature as affecting the relationship between social media usage and psychological well-being, namely smartphone addiction, social isolation, and phubbing. The paper utilizes a quantitative study conducted in Mexico, comprising 940 social media users, and uses structural equation modeling (SEM) to test a set of research hypotheses.

This article provides several contributions. First, it adds to existing literature regarding the effect of social media use on psychological well-being and explores the contradictory indications provided by different approaches. Second, it proposes a conceptual model that integrates complementary perspectives on the direct and indirect effects of social media use. Third, it offers empirical evidence and robust statistical analysis that demonstrates that both positive and negative effects coexist, helping resolve the inconsistencies found so far in the literature. Finally, this paper provides insights on how to help reduce the potential negative effects of social media use, as it demonstrates that, through bridging and bonding social capital, social media usage positively impacts psychological well-being. Overall, the article offers valuable insights for academics, practitioners, and society in general.

The remainder of this paper is organized as follows. Section Literature Review presents a literature review focusing on the factors that explain the impact of social media usage on psychological well-being. Based on the literature review, a set of hypotheses are defined, resulting in the proposed conceptual model, which includes both the direct and indirect effects of social media usage on psychological well-being. Section Research Methodology explains the methodological procedures of the research, followed by the presentation and discussion of the study's results in section Results. Section Discussion is dedicated to the conclusions and includes implications, limitations, and suggestions for future research.

LITERATURE REVIEW

Putnam (1995, p. 664–665) defined social capital as "features of social life – networks, norms, and trust – that enable participants to act together more effectively to pursue shared objectives." Li and Chen (2014, p. 117) further explained that social capital encompasses "resources embedded in one's social network, which can be assessed and used for instrumental or expressive returns such as mutual support, reciprocity, and cooperation."

Putnam (1995, 2000) conceptualized social capital as comprising two dimensions, bridging and bonding, considering the different norms and networks in which they occur. Bridging social capital refers to the inclusive nature of social interaction and occurs when individuals from different origins establish connections through social networks. Hence, bridging social

capital is typically provided by heterogeneous weak ties (Li and Chen, 2014). This dimension widens individual social horizons and perspectives and provides extended access to resources and information. Bonding social capital refers to the social and emotional support each individual receives from his or her social networks, particularly from close ties (e.g., family and friends).

Overall, social capital is expected to be positively associated with psychological well-being (Bano et al., 2019). Indeed, Williams (2006) stressed that interaction generates affective connections, resulting in positive impacts, such as emotional support. The following sub-sections use the lens of social capital theory to explore further the relationship between the use of social media and psychological well-being.

Social Media Use, Social Capital, and Psychological Well-Being

The effects of social media usage on social capital have gained increasing scholarly attention, and recent studies have highlighted a positive relationship between social media use and social capital (Brown and Michinov, 2019; Tefertiller et al., 2020). Li and Chen (2014) hypothesized that the intensity of Facebook use by Chinese international students in the United States was positively related to social capital forms. A longitudinal survey based on the quota sampling approach illustrated the positive effects of social media use on the two social capital dimensions (Chen and Li, 2017). Abbas and Mesch (2018) argued that, as Facebook usage increases, it will also increase users' social capital. Karikari et al. (2017) also found positive effects of social media use on social capital. Similarly, Pang (2018) studied Chinese students residing in Germany and found positive effects of social networking sites' use on social capital, which, in turn, was positively associated with psychological well-being. Bano et al. (2019) analyzed the 266 students' data and found positive effects of WhatsApp use on social capital forms and the positive effect of social capital on psychological well-being, emphasizing the role of social integration in mediating this positive effect.

Kim and Kim (2017) stressed the importance of having a heterogeneous network of contacts, which ultimately enhances the potential social capital. Overall, the manifest and social relations between people from close social circles (bonding social capital) and from distant social circles (bridging social capital) are strengthened when they promote communication, social support, and the sharing of interests, knowledge, and skills, which are shared with other members. This is linked to positive effects on interactions, such as acceptance, trust, and reciprocity, which are related to the individuals' health and psychological well-being (Bekalu et al., 2019), including when social media helps to maintain social capital between social circles that exist outside of virtual communities (Ellison et al., 2007).

Grounded on the above literature, this study proposes the following hypotheses:

H1a: Social media use is positively associated with bonding social capital.

H1b: Bonding social capital is positively associated with psychological well-being.

H2a: Social media use is positively associated with bridging social capital.

H2b: Bridging social capital is positively associated with psychological well-being.

Social Media Use, Social Isolation, and Psychological Well-Being

Social isolation is defined as "a deficit of personal relationships or being excluded from social networks" (Choi and Noh, 2019, p. 4). The state that occurs when an individual lacks true engagement with others, a sense of social belonging, and a satisfying relationship is related to increased mortality and morbidity (Primack et al., 2017). Those who experience social isolation are deprived of social relationships and lack contact with others or involvement in social activities (Schinka et al., 2012). Social media usage has been associated with anxiety, loneliness, and depression (Dhir et al., 2018; Reer et al., 2019), and social isolation (Van Den Eijnden et al., 2016; Whaite et al., 2018). However, some recent studies have argued that social media use decreases social isolation (Primack et al., 2017; Meshi et al., 2020). Indeed, the increased use of social media platforms such as Facebook, WhatsApp, Instagram, and Twitter, among others, may provide opportunities for decreasing social isolation. For instance, the improved interpersonal connectivity achieved via videos and images on social media helps users evidence intimacy, attenuating social isolation (Whaite et al., 2018).

Chappell and Badger (1989) stated that social isolation leads to decreased psychological well-being, while Choi and Noh (2019) concluded that greater social isolation is linked to increased suicide risk. Schinka et al. (2012) further argued that, when individuals experience social isolation from siblings, friends, family, or society, their psychological well-being tends to decrease. Thus, based on the literature cited above, this study proposes the following hypotheses:

H3a: Social media use is significantly associated with social isolation.

H3b: Social isolation is negatively associated with psychological well-being.

Social Media Use, Smartphone Addiction, Phubbing, and Psychological Well-Being

Smartphone addiction refers to "an individuals' excessive use of a smartphone and its negative effects on his/her life as a result of his/her inability to control his behavior" (Gökçearslan et al., 2018, p. 48). Regardless of its form, smartphone addiction results in social, medical, and psychological harm to people by limiting their ability to make their own choices (Chotpitayasunondh and Douglas, 2016). The rapid advancement of information and communication technologies has led to the concept of social media, e-games, and also to smartphone addiction (Chatterjee, 2020). The excessive use of smartphones for social media use, entertainment (watching videos, listening to music), and playing e-games is more common amongst people addicted to smartphones (Jeong et al., 2016). In fact, previous studies have evidenced the relationship between social use and smartphone

addiction (Salehan and Negahban, 2013; Jeong et al., 2016; Swar and Hameed, 2017). In line with this, the following hypotheses are proposed:

H4a: Social media use is positively associated with smartphone addiction.

H4b: Smartphone addiction is negatively associated with psychological well-being.

While smartphones are bringing individuals closer, they are also, to some extent, pulling people apart (Tonacci et al., 2019). For instance, they can lead to individuals ignoring others with whom they have close ties or physical interactions; this situation normally occurs due to extreme smartphone use (i.e., at the dinner table, in meetings, at get-togethers and parties, and in other daily activities). This act of ignoring others is called phubbing and is considered a common phenomenon in communication activities (Guazzini et al., 2019; Chatterjee, 2020). Phubbing is also referred to as an act of snubbing others (Chatterjee, 2020). This term was initially used in May 2012 by an Australian advertising agency to describe the "growing phenomenon of individuals ignoring their families and friends who were called phubbee (a person who is a recipients of phubbing behavior) victim of phubber (a person who start phubbing her or his companion)" (Chotpitayasunondh and Douglas, 2018). Smartphone addiction has been found to be a determinant of phubbing (Kim et al., 2018). Other recent studies have also evidenced the association between smartphones and phubbing (Chotpitayasunondh and Douglas, 2016; Guazzini et al., 2019; Tonacci et al., 2019; Chatterjee, 2020). Vallespín et al. (2017) argued that phubbing behavior has a negative influence on psychological well-being and satisfaction. Furthermore, smartphone addiction is considered responsible for the development of new technologies. It may also negatively influence individual's psychological proximity (Chatterjee, 2020). Therefore, based on the above discussion and calls for the association between phubbing and psychological well-being to be further explored, this study proposes the following hypotheses:

H5: Smartphone addiction is positively associated with phubbing.

H6: Phubbing is negatively associated with psychological well-being.

Indirect Relationship Between Social Media Use and Psychological Well-Being

Beyond the direct hypotheses proposed above, this study investigates the indirect effects of social media use on psychological well-being mediated by social capital forms, social isolation, and phubbing. As described above, most prior studies have focused on the direct influence of social media use on social capital forms, social isolation, smartphone addiction, and phubbing, as well as the direct impact of social capital forms, social isolation, smartphone addiction, and phubbing on psychological well-being. Very few studies, however, have focused on and evidenced the mediating role of social capital forms, social isolation, smartphone addiction, and phubbing derived from social media use in improving psychological

well-being (Chen and Li, 2017; Pang, 2018; Bano et al., 2019; Choi and Noh, 2019). Moreover, little is known about smartphone addiction's mediating role between social media use and psychological well-being. Therefore, this study aims to fill this gap in the existing literature by investigating the mediation of social capital forms, social isolation, and smartphone addiction. Further, examining the mediating influence will contribute to a more comprehensive understanding of social media use on psychological well-being via the mediating associations of smartphone addiction and psychological factors. Therefore, based on the above, we propose the following hypotheses (the conceptual model is presented in **Figure 1**):

H7: (a) Bonding social capital; (b) bridging social capital; (c) social isolation; and (d) smartphone addiction mediate the relationship between social media use and psychological well-being.

RESEARCH METHODOLOGY

Sample Procedure and Online Survey

This study randomly selected students from universities in Mexico. We chose University students for the following reasons. First, students are considered the most appropriate sample for e-commerce studies, particularly in the social media context (Oghazi et al., 2018; Shi et al., 2018). Second, University students are considered to be frequent users and addicted to smartphones (Mou et al., 2017; Stouthuysen et al., 2018). Third, this study ensured that respondents were experienced, well-educated, and possessed sufficient knowledge of the drawbacks of social media and the extreme use of smartphones. A total sample size of 940 University students was ultimately achieved from the 1,500 students contacted, using a convenience random sampling approach, due both to the COVID-19 pandemic and budget and time constraints. Additionally, in order to test the model, a quantitative empirical study was conducted, using an online survey method to collect data. This study used a web-based survey distributed via social media platforms for two reasons: the COVID-19 pandemic; and to reach a large number of respondents (Qalati et al., 2021). Furthermore, online surveys are considered a powerful and authenticated tool for new research (Fan et al., 2021), while also representing a fast, simple, and less costly approach to collecting data (Dutot and Bergeron, 2016).

Data Collection Procedures and Respondent's Information

Data were collected by disseminating a link to the survey by e-mail and social network sites. Before presenting the closed-ended questionnaire, respondents were assured that their participation would remain voluntary, confidential, and anonymous. Data collection occurred from July 2020 to December 2020 (during the pandemic). It should be noted that, because data were collected during the pandemic, this may have had an influence on the results of the study. The reason for choosing a six-month lag time was to mitigate common method bias (CMB) (Li et al., 2020b). In the present study, 1,500 students were contacted via University e-mail and social applications (Facebook, WhatsApp,
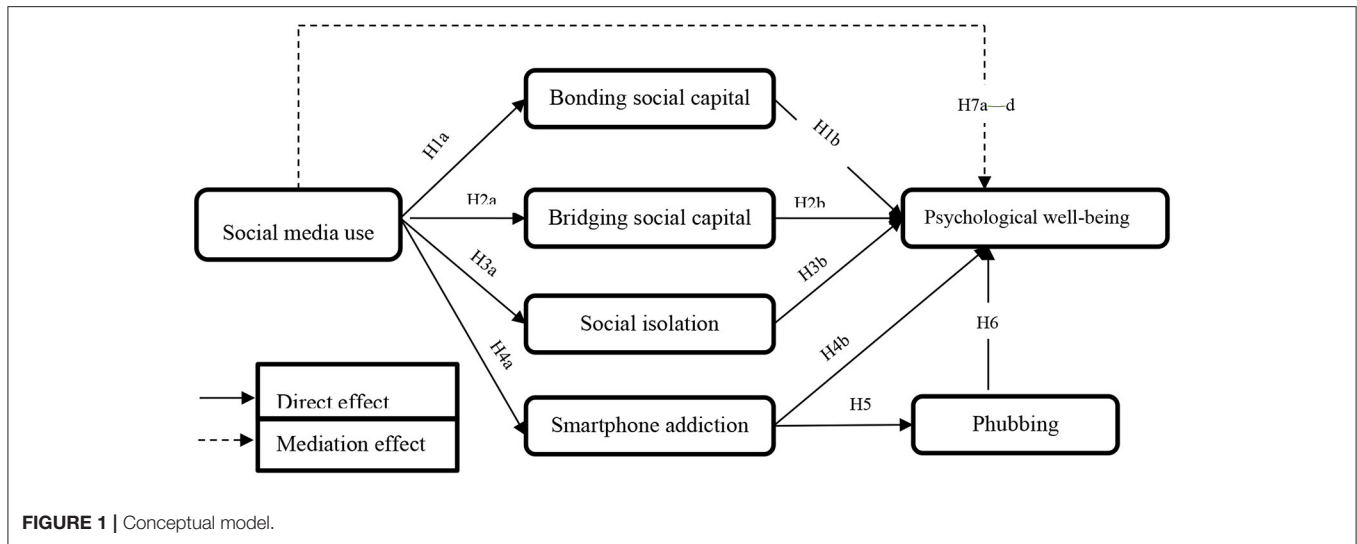
FIGURE 1 | Conceptual model.

and Instagram). We sent a reminder every month for 6 months (a total of six reminders), resulting in 940 valid responses. Thus, 940 (62.6% response rate) responses were used for hypotheses testing.

Table 1 reveals that, of the 940 participants, three-quarters were female (76.4%, $n = 719$) and nearly one-quarter (23.6%, $n = 221$) were male. Nearly half of the participants (48.8%, $n = 459$) were aged between 26 and 35 years, followed by 36 to 35 years (21.9%, $n = 206$), <26 (20.3%, $n = 191$), and over 45 (8.9%, $n = 84$). Approximately two-thirds (65%, $n = 611$) had a bachelor's degree or above, while one-third had up to 12 years of education. Regarding the daily frequency of using the Internet, nearly half (48.6%, $n = 457$) of the respondents reported between 5 and 8 h a day, and over one-quarter (27.2%) 9–12 h a day. Regarding the social media platforms used, over 38.5 and 39.6% reported Facebook and WhatsApp, respectively. Of the 940 respondents, only 22.1% reported Instagram (12.8%) and Twitter (9.2%). It should be noted, however, that the sample is predominantly female and well-educated.

Measurement Items

The study used five-point Likert scales (1 = "strongly disagree;" 5 = "strongly agree") to record responses.

Social Media Use

Social media use was assessed using four items adapted from Karikari et al. (2017). Sample items include "Social media is part of my everyday activity," "Social media has become part of my daily life," "I would be sorry if social media shut down," and "I feel out of touch, when I have not logged onto social media for a while." The adapted items had robust reliability and validity (CA = 783, CR = 0.857, AVE = 0.600).

Social Capital

Social capital was measured using a total of eight items, representing bonding social capital (four items) and bridging social capital (four items) adapted from Chan (2015). Sample

TABLE 1 | Respondents' characteristics.

Respondents' characteristics	Frequency	Percent
GENDER		
Female	719	76.489
Male	221	23.510
AGE (YEARS)		
<26	191	20.319
26–35	459	48.829
36–45	206	21.914
> 45	84	8.936
EDUCATION LEVEL		
Up to 12 years of education	329	35.000
Bachelor's degree or above	611	65.000
FREQUENCY OF USING INTERNET (h)		
< 4	118	12.553
5–8	457	48.617
9–12	256	27.234
> 12	109	11.595
SOCIAL MEDIA PLATFORM		
Facebook	362	38.510
WhatsApp	370	39.361
Instagram	121	12.872
Twitter	87	9.255

construct items include: bonging social capital ("I am willing to spend time to support general community activities," "I interact with people who are quite different from me") and bridging social capital ("My social media community is a good place to be," "Interacting with people on social media makes me want to try new things"). The adapted items had robust reliability and validity [bonding social capital (CA = 0.785, CR = 0.861, AVE = 0.608) and bridging social capital (CA = 0.834, CR = 0.883, AVE = 0.601)].

Social Isolation

Social isolation was assessed using three items from Choi and Noh (2019). Sample items include "I do not have anyone to play with," "I feel alone from people," and "I have no one I can trust." This adapted scale had substantial reliability and validity (CA = 0.890, CR = 0.928, AVE = 0.811).

Smartphone Addiction

Smartphone addiction was assessed using five items taken from Salehan and Negahban (2013). Sample items include "I am always preoccupied with my mobile," "Using my mobile phone keeps me relaxed," and "I am not able to control myself from frequent use of mobile phones." Again, these adapted items showed substantial reliability and validity (CA = 903, CR = 0.928, AVE = 0.809).

Phubbing

Phubbing was assessed using four items from Chotpitayasunondh and Douglas (2018). Sample items include: "I have conflicts with others because I am using my phone" and "I would rather pay attention to my phone than talk to others." This construct also demonstrated significant reliability and validity (CA = 770, CR = 0.894, AVE = 0.809).

Psychological Well-Being

Psychological well-being was assessed using five items from Jiao et al. (2017). Sample items include "I lead a purposeful and meaningful life with the help of others," "My social relationships are supportive and rewarding in social media," and "I am engaged and interested in my daily on social media." This study evidenced that this adapted scale had substantial reliability and validity (CA = 0.886, CR = 0.917, AVE = 0.688).

Data Analysis

Based on the complexity of the association between the proposed construct and the widespread use and acceptance of SmartPLS 3.0 in several fields (Hair et al., 2019), we utilized SEM, using SmartPLS 3.0, to examine the relationships between constructs. Structural equation modeling is a multivariate statistical analysis technique that is used to investigate relationships. Further, it is a combination of factor and multivariate regression analysis, and is employed to explore the relationship between observed and latent constructs.

SmartPLS 3.0 "is a more comprehensive software program with an intuitive graphical user interface to run partial square SEM analysis, certainly has had a massive impact" (Sarstedt and Cheah, 2019). According to Ringle et al. (2015), this commercial software offers a wide range of algorithmic and modeling options, improved usability, and user-friendly and professional support. Furthermore, Sarstedt and Cheah (2019) suggested that structural equation models enable the specification of complex interrelationships between observed and latent constructs. Hair et al. (2019) argued that, in recent years, the number of articles published using partial least squares SEM has increased significantly in contrast to covariance-based SEM. In addition, partial least squares SEM using SmartPLS is more appealing for several scholars as it enables them to predict more complex models with several variables, indicator constructs, and

structural paths, instead of imposing distributional assumptions on the data (Hair et al., 2019). Therefore, this study utilized the partial least squares SEM approach using SmartPLS 3.0.

RESULTS

Common Method Bias (CMB) Test

This study used the Kaiser–Meyer–Olkin (KMO) test to measure the sampling adequacy and ensure data suitability. The KMO test result was 0.874, which is greater than an acceptable threshold of 0.50 (Ali Qalati et al., 2021; Shrestha, 2021), and hence considered suitable for explanatory factor analysis. Moreover, Bartlett's test results demonstrated a significance level of 0.001, which is considered good as it is below the accepted threshold of 0.05.

The term CMB is associated with Campbell and Fiske (1959), who highlighted the importance of CMB and identified that a portion of variance in the research may be due to the methods employed. It occurs when all scales of the study are measured at the same time using a single questionnaire survey (Podsakoff and Organ, 1986); subsequently, estimates of the relationship among the variables might be distorted by the impacts of CMB. It is considered a serious issue that has a potential to "jeopardize" the validity of the study findings (Tehseen et al., 2017). There are several reasons for CMB: (1) it mainly occurs due to response "tendencies that raters can apply uniformity across the measures;" and (2) it also occurs due to similarities in the wording and structure of the survey items that produce similar results (Jordan and Troth, 2019). Harman's single factor test and a full collinearity approach were employed to ensure that the data was free from CMB (Tehseen et al., 2017; Jordan and Troth, 2019; Ali Qalati et al., 2021). Harman's single factor test showed a single factor explained only 22.8% of the total variance, which is far below the 50.0% acceptable threshold (Podsakoff et al., 2003).

Additionally, the variance inflation factor (VIF) was used, which is a measure of the amount of multicollinearity in a set of multiple regression constructs and also considered a way of detecting CMB (Hair et al., 2019). Hair et al. (2019) suggested that the acceptable threshold for the VIF is 3.0; as the computed VIFs for the present study ranged from 1.189 to 1.626, CMB is not a key concern (see **Table 2**). Bagozzi et al. (1991) suggested a correlation-matrix procedure to detect CMB. Common method bias is evident if correlation among the principle constructs is >0.9 (Tehseen et al., 2020); however, no values >0.9 were found in this study (see section Assessment of Measurement Model).

TABLE 2 | Common method bias (full collinearity VIF).

Construct	Inner VIF
Social media use	1.391
Bonding social capital	1.626
Bridging social capital	1.560
Social isolation	1.193
Smartphone addiction	1.408
Phubbing	1.189

This study used a two-step approach to evaluate the measurement model and the structural model.

Assessment of Measurement Model

Before conducting the SEM analysis, the measurement model was assessed to examine individual item reliability, internal consistency, and convergent and discriminant validity. **Table 3** exhibits the values of outer loading used to measure an individual item's reliability (Hair et al., 2012). Hair et al. (2017) proposed that the value for each outer loading should be ≥0.7; following this principle, two items of phubbing (PHUB3—I get irritated if others ask me to get off my phone and talk to them; PHUB4—I use my phone even though I know it irritated others) were removed from the analysis Hair et al. (2019). According to Nunnally (1978), Cronbach's alpha values should exceed 0.7. The threshold values of constructs in this study ranged from 0.77 to 0.903. Regarding internal consistency, Bagozzi and Yi (1988) suggested that composite reliability (CR) should be ≥0.7. The coefficient value for CR in this study was between 0.857 and 0.928. Regarding convergent validity, Fornell and Larcker (1981)

suggested that the average variance extracted (AVE) should be ≥0.5. Average variance extracted values in this study were between 0.60 and 0.811. Finally, regarding discriminant validity, according to Fornell and Larcker (1981), the square root of the AVE for each construct should exceed the inter-correlations of the construct with other model constructs. That was the case in this study, as shown in **Table 4**.

Hence, by analyzing the results of the measurement model, it can be concluded that the data are adequate for structural equation estimation.

Assessment of the Structural Model

This study used the PLS algorithm and a bootstrapping technique with 5,000 bootstraps as proposed by Hair et al. (2019) to generate the path coefficient values and their level of significance. The coefficient of determination (R^2) is an important measure to assess the structural model and its explanatory power (Henseler et al., 2009; Hair et al., 2019). **Table 5** and **Figure 2** reveal that the R^2 value in the present study was 0.451 for psychological well-being, which means that 45.1% of changes in psychological

TABLE 3 | Study measures, factor loading, and the constructs' reliability and convergent validity.

Construct	Item code	Loading	CA	CR	AVE
Social media use	SMU1—Social media is part of my everyday activity	0.756	0.783	0.857	0.600
	SMU2—Social media has become part of my daily routine	0.758			
	SMU3—I feel out of touch when I have not logged onto social media for a while	0.834			
	SMU4—I would be sorry if social media shut down	0.747			
Bonding social capital	BoSC1—Based on the people I interact with; it is easy for me to hear about the latest news and trends	0.781	0.785	0.861	0.608
	BoSC2—Interacting with people makes me curious about things and places outside of my daily life	0.829			
	BoSC3—I am willing to spend time to support general community activities	0.793			
	BoSC4—I interact with people who are quite different from me	0.710			
Bridging social capital	BrSC1—I am interested in what goes on in my social media community	0.706	0.834	0.883	0.601
	BrSC2—My social media community is a good place to be	0.786			
	BrSC3—Interacting with people on social media makes me want to try new things	0.749			
	BrSC4—Interacting with people on social media makes me feel like part of a larger community	0.831			
Social isolation	SI1—I do not have anyone to play with	0.923	0.890	0.928	0.811
	SI2—I feel alone from people	0.931			
	SI3—I have no one I can trust	0.846			
Smartphone addiction	SPA1—I am always preoccupied with my mobile phone	0.793	0.903	0.928	0.723
	SPA2—Using my mobile phone keeps me relaxed	0.783			
	SPA3—I feel restless or irritable when attempting to cut down mobile phone use	0.904			
	SPA4—I can't stay even for a moment without a mobile phone	0.884			
	SPA5—I am not able to control myself from frequent use of mobile phone	0.879			
Phubbing	PHUB1—I have conflicts with others because I am using my phone	0.933	0.770	0.894	0.809
	PHUB2—I would rather pay attention to my phone and talk to them	0.865			
Psychological well-being	PWB1—I lead a purposeful and meaningful life with the help of social media	0.826	0.886	0.917	0.688
	PWB2—My social relationships are supportive and rewarding in social media	0.793			
	PWB3—I am engaged and interested in my daily activities on social media	0.868			
	PWB4—I actively contributes to the happiness and well-being of others on social media	0.825			
	PWB5—I am optimistic about my future with the help of social media	0.834			

TABLE 4 | Discriminant validity and correlation.

Construct	1	2	3	4	5	6	7
Bonding social capital	**0.779**						
Bridging social capital	0.464	**0.776**					
Phubbing	0.017	0.242	**0.899**				
Psychological well-being	0.414	0.641	0.243	**0.829**			
Smartphone addiction	−0.290	0.121	0.244	−0.019	**0.850**		
Social isolation	−0.098	0.087	0.305	0.005	0.319	**0.901**	
Social media use	0.332	0.440	0.174	0.343	0.224	0.146	**0.775**

Bold values are the square root of the AVE.

TABLE 5 | Summary of path coefficients and hypothesis testing.

Hypothesis	Relationship	Path coefficient	SD	t-value	p-value	Decision
DIRECT EFFECT						
H1a	Social media use → Bonding social capital	0.332	0.032	10.283*	0.001	Accepted
H1b	Bonding social capital → Psychological well-being	0.127	0.031	4.077*	0.001	Accepted
H2a	Social media use → Bridging social capital	0.439	0.028	15.543*	0.001	Accepted
H2b	Bridging social capital → Psychological well-being	0.561	0.027	20.953*	0.001	Accepted
H3a	Social media use → Social isolation	0.145	0.029	4.985*	0.001	Accepted
H3b	Social isolation → Psychological well-being	−0.051	0.025	2.010*	0.044	Accepted
H4a	Social media use → Smartphone addiction	0.223	0.036	6.241*	0.001	Accepted
H4b	Smartphone addiction → Psychological well-being	−0.068	0.028	2.387*	0.017	Accepted
H5	Smartphone addiction → Phubbing	0.244	0.032	7.555*	0.001	Accepted
H6	Phubbing → Psychological well-being	0.137	0.028	4.938*	0.001	Accepted
INDIRECT EFFECT						
H7a	Social media use → Bonding social capital → Psychological well-being	0.042	0.011	3.740*	0.002	Accepted
H7b	Social media use → Bridging social capital → Psychological well-being	0.246	0.021	11.677*	0.001	Accepted
H7c	Social media use → Social isolation → Psychological well-being	−0.080	0.004	1.987*	0.047	Accepted
H7d	Social media use → Smartphone addiction → Psychological well-being	−0.019	0.008	2.528*	0.011	Accepted

*p-value < 0.05, t-value > 1.96.

well-being occurred due to social media use, social capital forms (i.e., bonding and bridging), social isolation, smartphone addiction, and phubbing. Cohen (1998) proposed that R^2 values of 0.60, 0.33, and 0.19 are considered substantial, moderate, and weak. Following Cohen's (1998) threshold values, this research demonstrates a moderate predicting power for psychological well-being among Mexican respondents (**Table 6**).

Apart from the R^2 measure, the present study also used cross-validated redundancy measures, or effect sizes (q^2), to assess the proposed model and validate the results (Ringle et al., 2012). Hair et al. (2019) suggested that a model exhibiting an effect size $q^2 > 0$ has predictive relevance (**Table 6**). This study's results evidenced that it has a 0.15 < 0.29 < 0.35 (medium) predictive relevance, as 0.02, 0.15, and 0.35 are considered small, medium, and large, respectively (Cohen, 1998). Regarding the goodness-of-fit indices, Hair et al. (2019) suggested the standardized root mean square residual (SRMR) to evaluate the goodness of fit. Standardized root mean square is an absolute measure of fit: a value of zero indicates perfect fit and a value <0.08 is considered good fit (Hair et al., 2019). This study exhibits an adequate model fitness level with an SRMR value of 0.063 (**Table 6**).

Table 5 reveals that all hypotheses of the study were accepted base on the criterion (p-value < 0.05). *H1a* (β = 0.332, t = 10.283, p = 0.001) was confirmed, with the second most robust positive and significant relationship (between social media use and bonding social capital). In addition, this study evidenced a positive and significant relationship between bonding social capital and psychological well-being (β = 0.127, t = 4.077, p = 0.001); therefore, *H1b* was accepted. Regarding social media use and bridging social capital, the present study found the most robust positive and significant impact (β = 0.439, t = 15.543, p = 0.001); therefore, *H2a* was accepted. The study also evidenced a positive and significant association between bridging social capital and psychological well-being (β = 0.561, t = 20.953, p = 0.001); thus, *H2b* was accepted. The present study evidenced a significant effect of social media use on social isolation (β = 0.145, t = 4.985, p = 0.001); thus, *H3a* was accepted. In addition, this study accepted *H3b* (β = −0.051, t = 2.01, p = 0.044). Furthermore, this study evidenced a positive and significant effect of social media use on smartphone addiction (β = 0.223, t = 6.241, p = 0.001); therefore, *H4a* was accepted. Furthermore, the present study found that smartphone addiction

FIGURE 2 | Structural model.
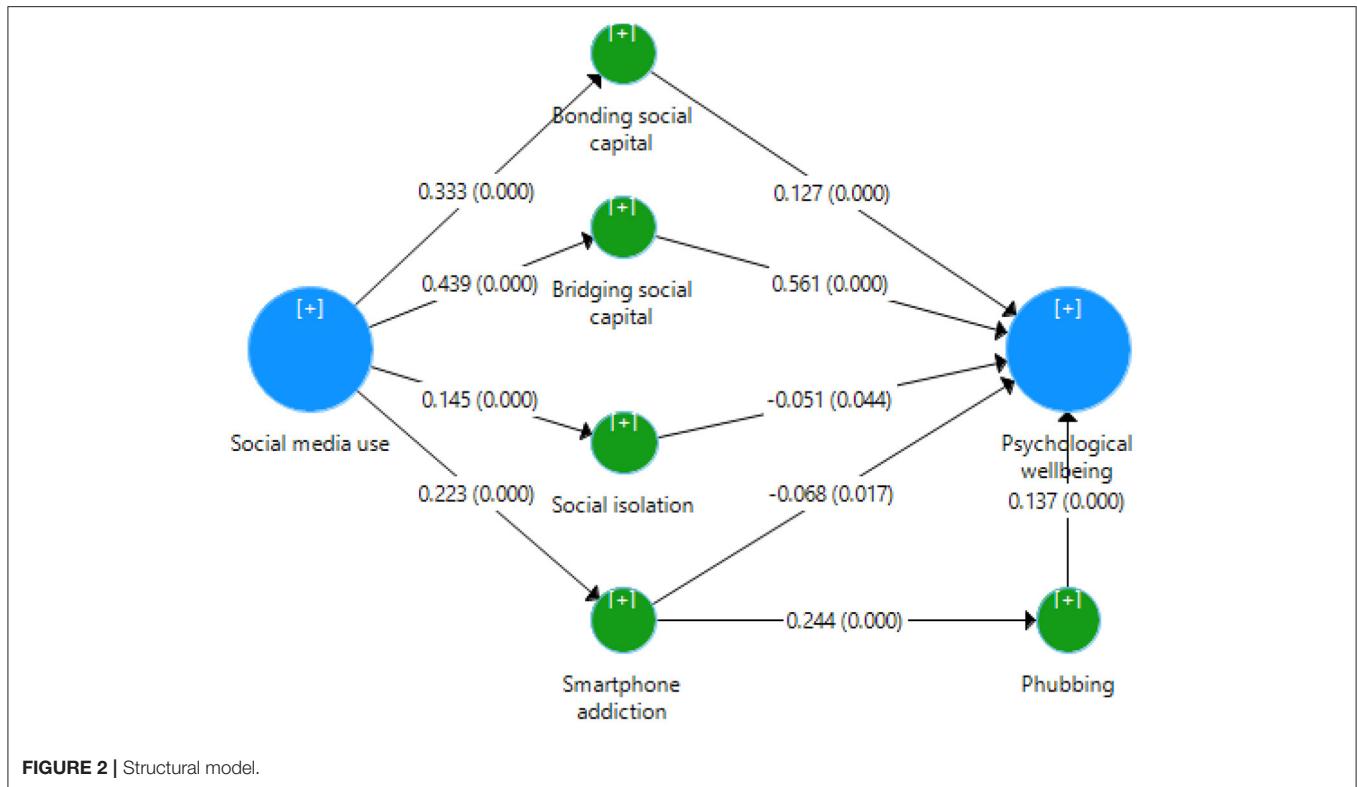
TABLE 6 | Strength of the model (Predictive relevance, coefficient of determination, and model fit indices).

	Effect size			**Coefficient of determination**	
Construct	**SSO**	**SSE**	**Q^2 (=1 − SSE/SSO)**	**R^2**	**Adj. R^2**
Psychological well-being	4,700.00	4,543.37	0.29	0.451	0.447

Goodness of fit → SRMR = 0.063; d_ULS = 1.589; d_G = 0.512; chi-square = 2,910.744.

has a negative significant influence on psychological well-being ($\beta = -0.068$, $t = 2.387$, $p = 0.017$); therefore, *H4b* was accepted. Regarding the relationship between smartphone addiction and phubbing, this study found a positive and significant effect of smartphone addiction on phubbing ($\beta = 0.244$, $t = 7.555$, $p = 0.001$); therefore, *H5* was accepted. Furthermore, the present research evidenced a positive and significant influence of phubbing on psychological well-being ($\beta = 0.137$, $t = 4.938$, $p = 0.001$); therefore, *H6* was accepted. Finally, the study provides interesting findings on the indirect effect of social media use on psychological well-being (t-value > 1.96 and p-value < 0.05); therefore, *H7a–d* were accepted.

Furthermore, to test the mediating analysis, Preacher and Hayes's (2008) approach was used. The key characteristic of an indirect relationship is that it involves a third construct, which plays a mediating role in the relationship between the independent and dependent constructs. Logically, the effect of A (independent construct) on C (the dependent construct) is mediated by B (a third variable). Preacher and Hayes (2008) suggested the following: B is a construct acting as a mediator if A significantly influences B, A significantly accounts for variability in C, B significantly influences C when controlling

for A, and the influence of A on C decreases significantly when B is added simultaneously with A as a predictor of C. According to Matthews et al. (2018), if the indirect effect is significant while the direct insignificant, full mediation has occurred, while if both direct and indirect effects are substantial, partial mediation has occurred. This study evidenced that there is partial mediation in the proposed construct (**Table 5**). Following Preacher and Hayes (2008) this study evidenced that there is partial mediation in the proposed construct, because the relationship between independent variable (social media use) and dependent variable (psychological well-being) is significant (p-value < 0.05) and indirect effect among them after introducing mediator (bonding social capital, bridging social capital, social isolation, and smartphone addiction) is also significant (p-value < 0.05), therefore it is evidenced that when there is a significant effect both direct and indirect it's called partial mediation.

DISCUSSION

The present study reveals that the social and psychological impacts of social media use among University students is

becoming more complex as there is continuing advancement in technology, offering a range of affordable interaction opportunities. Based on the 940 valid responses collected, all the hypotheses were accepted ($p < 0.05$).

H1a finding suggests that social media use is a significant influencing factor of bonding social capital. This implies that, during a pandemic, social media use enables students to continue their close relationships with family members, friends, and those with whom they have close ties. This finding is in line with prior work of Chan (2015) and Ellison et al. (2007), who evidenced that social bonding capital is predicted by Facebook use and having a mobile phone. *H1b* findings suggest that, when individuals believe that social communication can help overcome obstacles to interaction and encourage more virtual self-disclosure, social media use can improve trust and promote the establishment of social associations, thereby enhancing well-being. These findings are in line with those of Gong et al. (2021), who also witnessed the significant effect of bonding social capital on immigrants' psychological well-being, subsequently calling for the further evidence to confirm the proposed relationship.

The findings of the present study related to *H2a* suggest that students are more likely to use social media platforms to receive more emotional support, increase their ability to mobilize others, and to build social networks, which leads to social belongingness. Furthermore, the findings suggest that social media platforms enable students to accumulate and maintain bridging social capital; further, online classes can benefit students who feel shy when participating in offline classes. This study supports the previous findings of Chan (2015) and Karikari et al. (2017). Notably, the present study is not limited to a single social networking platform, taking instead a holistic view of social media. The *H2b* findings are consistent with those of Bano et al. (2019), who also confirmed the link between bonding social capital and psychological well-being among University students using WhatsApp as social media platform, as well as those of Chen and Li (2017).

The *H3a* findings suggest that, during the COVID-19 pandemic when most people around the world have had limited offline or face-to-face interaction and have used social media to connect with families, friends, and social communities, they have often been unable to connect with them. This is due to many individuals avoiding using social media because of fake news, financial constraints, and a lack of trust in social media; thus, the lack both of offline and online interaction, coupled with negative experiences on social media use, enhances the level of social isolation (Hajek and König, 2021). These findings are consistent with those of Adnan and Anwar (2020). The *H3b* suggests that higher levels of social isolation have a negative impact on psychological well-being. These result indicating that, consistent with Choi and Noh (2019), social isolation is negatively and significantly related to psychological well-being.

The *H4a* results suggests that substantial use of social media use leads to an increase in smartphone addiction. These findings are in line with those of Jeong et al. (2016), who stated that the excessive use of smartphones for social media, entertainment (watching videos, listening to music), and playing e-games was more likely to lead to smartphone addiction. These findings

also confirm the previous work of Jeong et al. (2016), Salehan and Negahban (2013), and Swar and Hameed (2017). The *H4b* results revealed that a single unit increase in smartphone addiction results in a 6.8% decrease in psychological well-being. These findings are in line with those of Tangmunkongvorakul et al. (2019), who showed that students with higher levels of smartphone addiction had lower psychological well-being scores. These findings also support those of Shoukat (2019), who showed that smartphone addiction inversely influences individuals' mental health.

This suggests that the greater the smartphone addiction, the greater the phubbing. The *H5* findings are in line with those of Chatterjee (2020), Chotpitayasunondh and Douglas (2016), Guazzini et al. (2019), and Tonacci et al. (2019), who also evidenced a significant impact of smartphone addiction and phubbing. Similarly, Chotpitayasunondh and Douglas (2018) corroborated that smartphone addiction is the main predictor of phubbing behavior. However, these findings are inconsistent with those of Vallespín et al. (2017), who found a negative influence of phubbing.

The H6 results suggests that phubbing is one of the significant predictors of psychological well-being. Furthermore, these findings suggest that, when phubbers use a cellphone during interaction with someone, especially during the current pandemic, and they are connected with many family members, friends, and relatives; therefore, this kind of action gives them more satisfaction, which simultaneously results in increased relaxation and decreased depression (Chotpitayasunondh and Douglas, 2018). These findings support those of Davey et al. (2018), who evidenced that phubbing has a significant influence on adolescents and social health students in India.

The findings showed a significant and positive effect of social media use on psychological well-being both through bridging and bonding social capital. However, a significant and negative effect of social media use on psychological well-being through smartphone addiction and through social isolation was also found. Hence, this study provides evidence that could shed light on the contradictory contributions in the literature suggesting both positive (e.g., Chen and Li, 2017; Twenge and Campbell, 2019; Roberts and David, 2020) and negative (e.g., Chotpitayasunondh and Douglas, 2016; Jiao et al., 2017; Choi and Noh, 2019; Chatterjee, 2020) effects of social media use on psychological well-being. This study concludes that the overall impact is positive, despite some degree of negative indirect impact.

Theoretical Contributions

This study's findings contribute to the current literature, both by providing empirical evidence for the relationships suggested by extant literature and by demonstrating the relevance of adopting a more complex approach that considers, in particular, the indirect effect of social media on psychological well-being. As such, this study constitutes a basis for future research (Van Den Eijnden et al., 2016; Whaite et al., 2018) aiming to understand the impacts of social media use and to find ways to reduce its possible negative impacts.

In line with Kim and Kim (2017), who stressed the importance of heterogeneous social networks in improving social capital, this paper suggests that, to positively impact psychological well-being, social media usage should be associated both with strong and weak ties, as both are important in building social capital, and hence associated with its bonding and bridging facets. Interestingly, though, bridging capital was shown as having the greatest impact on psychological well-being. Thus, the importance of wider social horizons, the inclusion in different groups, and establishing new connections (Putnam, 1995, 2000) with heterogeneous weak ties (Li and Chen, 2014) are highlighted in this paper.

Practical Contributions

These findings are significant for practitioners, particularly those interested in dealing with the possible negative impacts of social media use on psychological well-being. Although social media use is associated with factors that negatively impact psychological well-being, particularly smartphone addiction and social isolation, these negative impacts can be lessened if the connections with both strong and weak ties are facilitated and featured by social media. Indeed, social media platforms offer several features, from facilitating communication with family, friends, and acquaintances, to identifying and offering access to other people with shared interests. However, it is important to access heterogeneous weak ties (Li and Chen, 2014) so that social media offers access to wider sources of information and new resources, hence enhancing bridging social capital.

Limitations and Directions for Future Studies

This study is not without limitations. For example, this study used a convenience sampling approach to reach to a large number of respondents. Further, this study was conducted in Mexico only, limiting the generalizability of the results; future research should therefore use a cross-cultural approach to investigate the impacts of social media use on psychological well-being and the mediating role of proposed constructs (e.g., bonding and bridging social capital, social isolation, and smartphone addiction). The sample distribution may also be regarded as a limitation of the study because respondents were mainly well-educated and female. Moreover, although Internet channels represent a particularly suitable way to approach social media users, the fact that this study adopted an online survey does not guarantee a representative sample of the population. Hence, extrapolating the results requires caution, and study replication is recommended, particularly with social media users from other countries and cultures. The present study was conducted in the context of mainly University students, primarily well-educated females, via an online survey on in Mexico; therefore, the findings represent a snapshot at a particular time. Notably, however, the effect of social media use is increasing due to COVID-19 around the globe and is volatile over time.

Two of the proposed hypotheses of this study, namely the expected negative impacts of social media use on social isolation and of phubbing on psychological well-being, should be further explored. One possible approach is to consider the type of connections (i.e., weak and strong ties) to explain further the impact of social media usage on social isolation. Apparently, the prevalence of weak ties, although facilitating bridging social capital, may have an adverse impact in terms of social isolation. Regarding phubbing, the fact that the findings point to a possible positive impact on psychological well-being should be carefully addressed, specifically by psychology theorists and scholars, in order to identify factors that may help further understand this phenomenon. Other suggestions for future research include using mixed-method approaches, as qualitative studies could help further validate the results and provide complementary perspectives on the relationships between the considered variables.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Jiangsu University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

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

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Attachment Style and Jealousy in the Digital Age: Do Attitudes About Online Communication Matter?

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Romantic jealousy, a complex response to a real or perceived threat to a romantic relationship, can have serious negative consequences for individuals, partners and perceived rivals. The likelihood of a jealous response is heightened among individuals who experience attachment anxiety, and online communication and social media provide unique fodder for romantic jealousy. The purpose of the current study is to test whether the association between attachment anxiety and online jealousy (jealous response to ambiguous hypothetical online scenarios) is moderated by negative attitudes about online communication. Individuals in dating relationships were asked about attachment anxiety and attitudes about online communication (i.e., apprehension and concern about misunderstandings) as well as emotional, cognitive, and behavioral online jealousy. Hierarchical linear regression revealed an attachment anxiety-attitude interaction, such that the link between attachment anxiety and jealousy was stronger for participants with relatively low levels of negative attitudes about online communication compared to participants with relatively high levels of negative attitudes. The current study expands knowledge about attachment anxiety and jealousy in the context of online communication and social media, and highlights the importance of considering attitudes about online communication when studying relationship processes in the digital arena.

Keywords: jealousy, dating relationships, online communication, social media, attachment, attitudes

INTRODUCTION

The association between attachment style and romantic jealousy is well-established (Dandurand and Lafontaine, 2014; see Martinex-Leon et al., 2017 for a recent review) and jealousy, a complex response to a real or perceived threat to an intimate relationship, can have negative, serious – even fatal – consequences for individuals, partners and perceived rivals (Mužinié et al., 2003). In the digital age, the ease with which individuals can access information about and monitor their partners (Rus and Tiemensma, 2017), along with the ubiquity of social media, makes the importance of understanding processes related to jealousy in the digital arena clear.

Attachment Anxiety and Jealousy

Some individuals are more likely to respond to real or perceived threats with jealousy – across partners and situations – than others. Considerable evidence points to attachment anxiety – anxiety about being abandoned or rejected by one's relationship partner – as a key predictor of offline jealous response (Dandurand and Lafontaine, 2014; Martinex-Leon et al., 2017). Attachment theory

posits that attachment styles are formed based on early experiences with caregivers (Bowlby, 1988). Caregiver responsiveness leads individuals to develop working models of the self (I am worthy of love/I am not worthy of love) and others (Others are trustworthy/Others are not trustworthy). When early caregivers respond erratically to a child's needs, she develops an insecure attachment style, believing that she is not worthy of love and/or that others are not dependable (Ainsworth et al., 1978). These working models are quite stable, and ample evidence suggests they affect intimate relationships in adulthood (Collins and Read, 1990; Simpson, 1990). Adult attachment style is commonly characterized using two dimensions, anxiety and avoidance (Bartholomew and Horowitz, 1991); attachment anxiety refers to high scores on the anxiety dimension, which may be further categorized as preoccupied/anxious (when avoidance is low) and fearful (when avoidance is high).

Research on adult attachment has shown that those high in attachment anxiety are more likely to monitor partner behavior as they seek assurance of continued interest, and are more likely to perceive emotional and sexual threats to their relationships (White and Mullen, 1989). They experience jealousy more frequently and intensively than avoidant and securely attached individuals, and respond to jealousy-provoking situations with more fear, anger, and sadness (Sharpsteen and Kirkpatrick, 1997; Guerrero, 1998; Rodriguez et al., 2015; Tani and Ponti, 2016).

Attachment style is differentially associated with specific jealousy components, often conceptualized as emotional (affective responses to perceived threats), cognitive (thoughts, suspicions, and worries about a partner's extradyadic behaviors), and behavioral (behavioral reactions to jealousy-evoking situations, such as checking, snooping, and surveillance; Pfeiffer and Wong, 1989). Some studies have found associations between attachment anxiety and cognitive and behavioral jealousy, but not emotional jealousy (e.g., Rydell and Bringle, 2007). Other studies have found attachment anxiety to be related to all three components of jealousy (e.g., Elphinston et al., 2011; Rodriguez et al., 2015), though the strength of associations varied, with the association between attachment anxiety and cognitive and behavioral jealousy being about twice as strong as the association between attachment anxiety and emotional jealousy (Rodriguez et al., 2015; Bevan, 2017).

Attachment Anxiety and Online Jealousy

The affordances of social media allow people high in attachment anxiety new ways to manifest their fear of abandonment (e.g., making relationship status public and highly visible) and to reassure themselves of their partners' continuing love and fidelity (e.g., monitoring partners' activities). These affordances provide unparalleled access to information about romantic partners [via posts, pictures, location tracing, and granting or restricting access to information (e.g., enabling read receipts); Muscanell et al., 2013; Muise et al., 2014]; further, the information gleaned from social media can be ambiguous and open to interpretation, making it easier for individuals high in attachment anxiety to interpret information as threatening to their relationships.

Although distinct from offline jealousy, findings from studies of online jealousy and attachment anxiety echo findings from studies of offline jealousy (Muise et al., 2014). In two studies of attachment style and Facebook-related jealousy and surveillance, attachment anxiety was associated with higher Facebook jealousy and more surveillance cross-sectionally, and more surveillance over a one-week period (Marshall et al., 2013; Hira and Bhogal, 2020). In the context of viewing pictures of romantic partners touching an opposite-sex friend, individuals high in preoccupied/anxious attachment reported higher levels of fear and anger compared to individuals low in attachment anxiety (Miller et al., 2014). In response to ambiguous, potentially threatening Facebook content on a partner's wall, individuals higher in preoccupied/anxious attachment were more likely to experience negative emotions, such as fear, worry, and jealousy (Fleuriet et al., 2014). Individuals with attachment anxiety were more likely to use Facebook to increase relationship visibility (e.g., reporting relationship statues; Emery et al., 2014); and individuals high in preoccupied/anxious and fearful attachment expressed more uncertainty about their relationships, and engaged in more interpersonal electronic surveillance (Fox and Warber, 2014) and jealousy induction (Wegner et al., 2018).

These findings shed light on the association between attachment anxiety and jealousy in the digital arena, however, unique variability in the context of online communication and social media remains to be fully explored. In their review of research on social network site use and romantic relationships, Rus and Tiemensma (2017) concluded that the impact of individual difference variables, such as attachment style, on romantic jealousy may be amplified or mitigated in the online environment, and subsequent research suggests that the strength of the association between attachment anxiety and online jealousy may vary based on individual and relationship factors (e.g., Wegner et al., 2018).

A key variable in understanding how and to what extent individuals react to ambiguous online information with jealousy may be individuals' attitudes about the medium (e.g., concern about misunderstandings). Online communication attitudes are conceptualized as cognitive and affective orientations toward online communication (Ledbetter et al., 2011). Negative orientations include apprehension about online communication and concern that online communication will lead to misunderstandings (Ledbetter, 2009; Bernhold and Rice, 2020). While there is scant research examining online communication attitudes and romantic jealousy, there is evidence that the way individuals think and feel about communication via digital media strengthen or inhibit the impact of communication variables (e.g., communication goals, frequency of communication) on relationship variables (e.g., relational closeness; e.g., Ledbetter and Mazer, 2014; Bernhold and Rice, 2020). In this paper, we propose that the strength of the association between attachment anxiety and online jealousy will depend, in part, on individuals' negative attitudes about online communication with their romantic partners.

Purpose and Hypotheses

The purpose of the current study is to replicate and extend the findings regarding the association between attachment anxiety

and online jealousy and to evaluate whether this association varies based on attitudes about online communication. Based on previous research, we predict that attachment anxiety will be positively associated with online jealousy (e.g., Muise et al., 2014), and that these associations will be stronger for cognitive and behavioral jealousy compared to emotional jealousy (e.g., Rydell and Bringle, 2007). Given the lack of previous research on online attitudes and jealousy, we make no specific predictions about associations between negative online attitudes (i.e., concern about misunderstandings and apprehension about using online communication) and online jealousy, nor do we have specific predictions as to the nature of any interaction between attachment anxiety and negative online attitudes. A significant interaction, if found, may take the form of a potentiating model wherein negative attitudes strengthen the association between attachment anxiety and online jealousy; that is, the correlation between attachment anxiety and jealousy will be stronger for participants who report relatively high concern about potential misunderstandings and apprehension about online communication, compared to those report relatively little apprehension or concern. Alternatively, an interaction may take the form of a mitigating model, wherein strong negative attitudes weaken the association between attachment anxiety and jealousy; that is, the correlation between attachment anxiety and jealousy will be weaker for participants who report relatively high concern about potential misunderstandings and apprehension about online communication, compared to those report relatively little apprehension and concern.

There is some evidence of gender differences in online jealousy and in the association between attachment anxiety and online jealousy (e.g., Muise et al., 2009; Emery et al., 2014; Wegner et al., 2018) so gender differences in online jealousy and attitudes are also examined, as well as gender differences in the association between attachment anxiety and online jealousy.

MATERIALS AND METHODS

Participants

Participants were drawn from a university on the west coast of the United States. General Psychology students who were in dating relationships ($N = 84$[1]) were recruited via a participation pool. Participants were White (51.2%), Asian-American (26.2%), Latinx (22.6%), African-American (3.6%), and Native American (0.01%); 69% were women. The mean relationship length was 14.9 months (SD = 13.1). Two participants were engaged; none were married. Only one participant reported that she was currently living with her dating partner. Three participants reported being in same-sex relationships. Participants received course credit for participation, which was not mandatory; an alternative assignment was available for students to earn equivalent credit for their general psychology course.

[1] Power analysis (using G*Power 3.1; Faul et al., 2009) indicated that this sample size provided sufficient power to detect an effect size ≥ 0.15, given a p value of 0.05 using linear regression with three predictors.

Procedure

Before beginning the study, institutional review board approval was obtained. All students in general psychology classes were invited to log onto a participation pool website. Students who indicated they were in a dating relationship were invited to sign up for a lab session; there were no additional eligibility requirements. Participants read an informed consent form that explained the study and indicated that they could withdraw from the study at any time and/or skip any questions and still receive course credit for participating. These points were reiterated verbally by researchers. No participants withdrew from the study. Participants filled out a series of online questionnaires assessing demographics, attachment style, attitudes toward online communication, as well as emotional, cognitive and behavioral jealousy related to hypothetical online scenarios.

Measures

Attachment anxiety. Attachment anxiety was assessed using the anxiety subscale of the Revised Adult Attachment Scale (Collins and Read, 1990). Participants were instructed to "rate the extent to which each item describes you and your feelings about romantic relationships. Think about all your romantic relationships (past and present) and respond in terms of how you generally feel in these relationships." Participants responded to each item on a scale of 1 (does not describe me at all) to 5 (describes me very well). An example item is "In relationships, I often worry that my partner does not really love me." Coefficient alpha for this scale was 0.77.

Online Jealousy. Online jealousy was assessed by adapting questions from the Facebook Jealousy Scale (FJS; Muise et al., 2009) to refer to social networking sites generally as well as personal messaging (see Sullivan and Bruchmann, unpublished, for a psychometric analysis of a similar measure adapted from the FJS). For items assessing emotional jealousy participants were instructed to rate how they would feel in various hypothetical online situations, from 1 (not upset) to 7 (very upset) for the emotional subscale (10 items; e.g., "Your partner posted/sent a message to someone of the preferred sex"). For items assessing cognitive and behavioral jealousy participants were instructed to rate "how likely they were to do each of the following." Four items assessed cognitive jealousy (e.g., "Worry that your partner is using social media to reconnect with past romantic or sexual partners?") and six items assessed behavioral jealousy (e.g., "Monitor your partner's social media activity?") Participants responded to each item a scale from 1 (very unlikely) to 7 (very likely). Coefficient alpha for the emotional, cognitive, and behavioral jealousy scales were 0.91, 0.79, and 0.81, respectively.

Attitudes about communicating online with dating partner. Attitudes about communicating online were assessed by adapting the misunderstanding (5 items) and apprehension (8 items) subscales of the Online Attitudes Questionnaire (OAQ) developed by Ledbetter (2009). The OAQ was developed to assess interpersonal relationships generally; we adapted the questions to refer specifically to dating partners. Participants responded to each item on a scale of 1 (strongly disagree)

to 7 (strongly agree). Example items include "It is easy to take meanings that my partner did not intend when reading online messages" (misunderstandings), "I feel tense and nervous when communicating with my partner online" (apprehension). Coefficient alphas for the subscales were 0.89 (misunderstanding) and 0.86 (apprehension).

RESULTS

Descriptive statistics and correlations among all variables can be seen in **Table 1**. As expected, the correlations between attachment anxiety and jealousy subscales were positive and significant. Fisher r to z transformations were used to determine whether the associations between attachment anxiety and jealousy were significantly higher cognitive ($r = 0.37$) and/or behavioral ($r = 0.36$) jealousy than the association between attachment anxiety and emotional jealousy ($r = 0.26$). No significant differences were found, $z = -0.75$, $p = 0.24$ (emotional vs. cognitive jealousy); $z = -0.68$, $p = 0.24$ (emotional vs. behavioral jealousy). The attitude subscales, misunderstanding and apprehension, were positively related to the jealousy subscales and the jealousy variables were positively related to one another. Cognitive and behavioral jealousy were highly correlated with one another, calling into question how distinct these two components were; thus, the total score of items assessing cognitive and behavioral subscales was used for all subsequent analyses. The online attitude subscales were positively related to attachment anxiety and to one another.

Gender differences in attitudes and online jealousy were assessed using a one-way analysis of variance (ANOVA). No significant gender differences were found for concern about misunderstandings ($t = -0.41$, $p = 0.59$) or apprehension ($t = 0.49$, $p = 0.16$) nor for emotional ($t = 0.88$, $p = 0.42$) or cognitive/behavioral ($t = -0.89$, $p = 0.38$) jealousy. Fisher r to z transformations were used to compare correlation coefficients between attachment anxiety and jealousy for men and women; no significant differences were found for emotional jealousy ($z = 0.04$, $p = 0.12$) or for cognitive/behavioral jealousy ($z = 0.54$, $p = 0.42$).

Four hierarchical linear regression models were run to assess 1) whether attachment anxiety and the attitudes scales were significantly associated with emotional and/or cognitive/behavioral jealousy (main effects) and whether the attitudes scales moderated the relationship between attachment anxiety and the jealousy subscales (see **Table 2**). First, attachment anxiety and attitude (misunderstanding or apprehension) were entered as a block (Step 1), then the relevant interaction term was entered (Step 2). To reduce multicollinearity, all variables were centered for these analyses (Aiken and West, 1991).

Emotional Jealousy

Regarding emotional jealousy and concern about misunderstandings, there was no main effect of attachment anxiety on emotional jealousy, however, there was a significant main effect of concern about misunderstandings, such that individuals with relatively high levels of concern reported higher

levels of jealousy compared to those with relatively low levels of concern, regardless of level of attachment anxiety. There was also a significant interaction between attachment anxiety and concern about misunderstandings. To explore the interaction, emotional jealousy scores were plotted for each of the variables at one standard deviation below and above the mean (see **Figure 1**). Simple slopes analyses were conducted to test the significance of differences in emotional jealousy (Baron and Kenny, 1986; Holmbeck, 2002); results indicated that, among individuals relatively low in concern, emotional jealousy was significantly higher for participants with relatively high levels of attachment anxiety compared to those with relatively low levels of attachment anxiety, $t = 2.70$, $p < 0.01$. When concern was relatively high, however, there was no significant difference between participants high in attachment anxiety compared to those low in attachment anxiety, $t = -0.65$, $p = 0.31$.

Similarly, regarding emotional jealousy and apprehension about online communication, no main effect of attachment anxiety was found, but there was a significant main effect of apprehension wherein apprehension was positively related to emotional jealousy, regardless of level of attachment anxiety. There was a marginal interaction effect ($p = 0.062$) and simple slopes analysis confirmed the same pattern found in the misunderstandings model (**Figure 2**); that is, for individuals low in apprehension, emotional jealousy was significantly higher for participants with high levels of attachment anxiety compared to those with relatively low levels of attachment anxiety, $t = 2.48$, $p < 0.05$. When apprehension was high, however, there was no significant difference between participants high in attachment anxiety compared to those low in attachment anxiety, $t = 0.11$, $p = 0.91$.

Cognitive/Behavioral Jealousy

Regarding cognitive/behavioral jealousy and concern about misunderstandings, there was a significant main effect of attachment anxiety on cognitive/behavioral jealousy such that individuals relatively high in attachment anxiety reported higher levels of cognitive/behavioral jealousy compared to individuals relatively low in attachment anxiety, regardless of level of attachment anxiety. There was also a significant main effect of concern about misunderstandings, such that individuals with relatively high levels of concern reported higher levels of cognitive/behavioral jealousy compared to those with relatively low levels of concern, regardless of level of attachment anxiety. There was also a significant interaction, similar to that found with emotional jealousy models (**Figure 3**); simple slopes analyses revealed that, among individuals with low levels of concern, emotional jealousy was significantly higher for participants with relatively high levels of attachment anxiety compared to those with relatively low levels of attachment anxiety, $t = 4.52$, $p < 0.001$. When concern was high, however, there was no significant difference between participants high in attachment anxiety compared to those low in attachment anxiety, $t = -0.88$, $p = 0.45$.

Finally, regarding cognitive/behavioral jealousy and apprehension, there were main effects of attachment anxiety and apprehension wherein attachment anxiety was positively

TABLE 1 | Descriptive statistics and correlations among all variables.

Variables	Range	M	SD	1	2	3	4	5
(1) Attachment Anxiety	7–28	15.36	4.41					
Online Jealousy								
(2) Jealous Emotions	10–64	31.85	12.10	0.26*				
(3) Jealous Thoughts	4–19	8.23	4.77	0.37**	0.5***			
(4) Jealous Behaviors	6–28	12.02	6.31	0.36**	0.5***	0.77***		
Attitudes About Online Communication								
(5) Concern About Misunderstanding	5–35	20.67	7.84	0.32**	0.32**	0.37**	0.47***	
(6) Apprehension	17–56	22.58	9.88	0.48***	0.4***	0.38**	0.38*	0.54***

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

TABLE 2 | Hierarchical linear regression analyses of anxious attachment and online attitudes predicting jealousy.

Models	B	SE B	β	Adjusted ΔF	r2	ΔR²	B	SE B	β	Adjusted ΔF	r2	ΔR²
				Jealous Feelings						**Jealous Cognitions and Behavior**		
Misunderstandings												
Step 1				5.91**	0.11					15.3***	0.26	
Attachment Anxiety	0.51	0.31	0.18				0.63	0.24	0.27***			
Misunderstandings	0.39	0.17	0.25*				0.49	0.13	0.37***			
Step 2				5.03*	0.15	0.05*				9.32**	0.33	0.08**
AnxiousxMisunderstandings	0.08	0.04	1.2*				0.08	0.03	1.5**			
Apprehension												
Step 1				7.71**	0.14					10.79***	0.19	
Attachment Anxiety	0.25	0.33	0.09				0.6	0.27	0.25*			
Apprehension	0.43	0.15	0.35**				0.3	0.12	0.28*			
Step 2				3.62#	0.17	0.04#				0	0.18	0
AnxietyxApprehension	0.06	0.03	1.12#				0	0.03	0.02			

#$p < 0.10$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

FIGURE 1 | Attachment style and concern about misunderstandings interact to predict cognitive/behavioral jealousy.

FIGURE 2 | Attachment style and apprehension about communicating online interact to predict emotional jealousy.
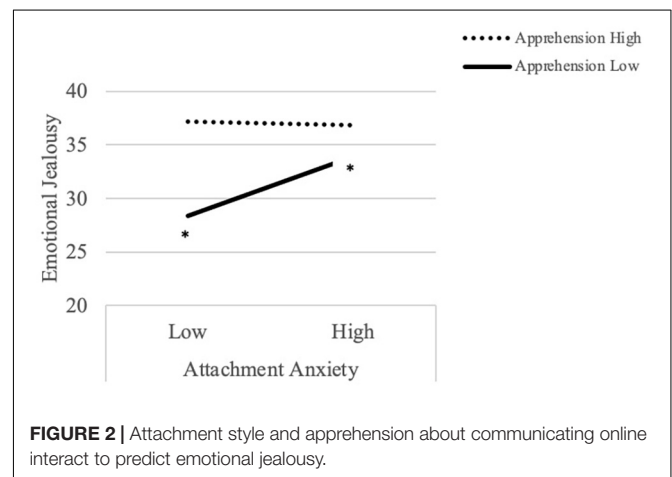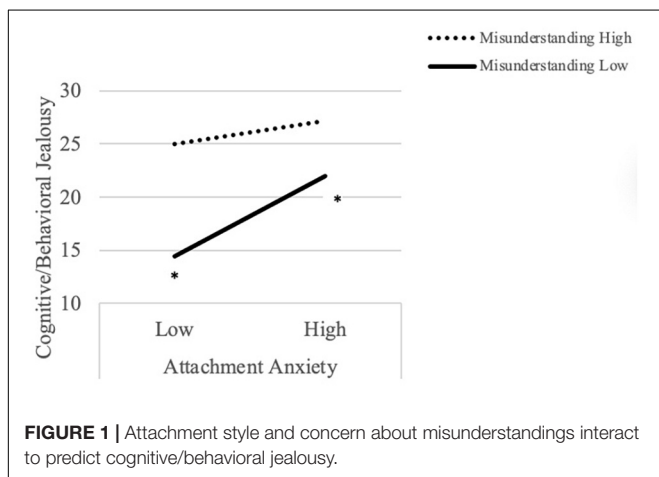
related to cognitive/behavioral jealousy, regardless of level of apprehension, and apprehension was positively related to cognitive/behavioral jealousy, regardless of level of attachment anxiety. There was no significant interaction between attachment anxiety and apprehension.

DISCUSSION

Summary and Implications

The current findings replicate and extend previous findings about attachment anxiety and online jealousy. Consistent

FIGURE 3 | Attachment style and concern about misunderstandings interact to predict emotional jealousy.

with predictions and past studies (e.g., Marshall et al., 2013; Miller et al., 2014; Wegner et al., 2018), zero-order correlations indicated that attachment anxiety was related to online jealousy. Contrary to predictions, zero-order correlations between attachment anxiety and cognitive and behavioral online jealousy were not significantly higher than correlations between attachment anxiety and emotional online jealousy. This is contradictory to previous findings that suggest that attachment anxiety correlates more strongly with cognitive and behavioral jealousy than with emotional jealousy (e.g., Rydell and Bringle, 2007). Notably, however, the current study found no main effect of attachment anxiety on emotional jealousy in regression analyses, but did find a significant main effect of attachment anxiety on cognitive/behavioral jealousy. These main effects and the interaction effects (discussed presently) echo findings by Rodriguez et al. (2015) that trust did not moderate the association between attachment anxiety and emotional jealousy, but did moderate the associations between attachment anxiety and cognitive and behavioral jealousy. Further, distrust was more strongly related to cognitive jealousy when attachment anxiety was high, compared to when attachment anxiety was low, and distrust was only related to behavioral jealousy when attachment anxiety was high. Based on these findings, the researchers speculated that "it may be more natural to experience cognitions associated with jealousy when experiencing lower levels of trust in one's partner, but it is less natural to act on those thoughts" (pp. 310). At the very least, evidence presented here as well as evidence from previous studies indicate that nuanced models will be necessary to fully account for variance in attachment anxiety and jealousy feelings, thoughts, and behaviors (see also Rydell and Bringle, 2007). Null results regarding gender differences in the current study are consistent with some, but not all, past research (e.g., Muise et al., 2009; Emery et al., 2014; Wegner et al., 2018) thus more nuanced models of gender differences may be required as well. Regarding exploratory analyses of attitudes about online communication, concern about misunderstandings and apprehension about communicating online were associated with higher levels of online emotional and cognitive/behavioral jealousy, and the strength of the association

between attachment anxiety and online jealousy depended, in part, on online attitudes. These findings are most consistent with a mitigating model wherein the association between attachment anxiety and jealousy appears to be diminished by strong negative attitudes about online communication. That is, the impact of attachment anxiety on jealous responses is lower for individuals who are very concerned about misunderstandings when communicating online with dating partners, compared to those relatively unconcerned about misunderstandings in online communications. There is some evidence, although marginal, that this holds true for apprehension about online communication in the context of emotional jealousy, though not for cognitive/behavioral jealousy.

At this point, however, given the correlational nature of the design, construing that negative attitudes affect the impact of attachment anxiety on jealousy is speculative. It may be, for example, that jealousy is driving attitudes about online communication. Further, given the lack of previous research examining the associations among attachment anxiety, negative online attitudes and jealousy, replication of these findings is critical before accepting these findings – and their implications – with confidence. Keeping these important limitations in mind, we offer some initial thoughts about what the current finding may imply. If we begin with the assumption that attachment anxiety does indeed affect jealous responses – a reasonable assumption based on past findings regarding online and offline jealousy (e.g., Marshall et al., 2013; Hira and Bhogal, 2020) – it appears the association found among those who are relatively confident about online communication is relatively unremarkable. The finding that there is no significant association between attachment anxiety and jealousy among those who have concerns about online communication, therefore, is of particular interest. We can only speculate as to how heightened concern (and possibly apprehension) may reduce the association between attachment anxiety and online jealousy. One possible explanation is that individuals with heightened concern about misunderstandings when communicating online with their partners tend to communicate more in person or to quickly check in with their partners for clarification when confronted by ambiguous online content. Alternatively, or additionally, dating partners of individuals who have heightened concern about misunderstandings may deliberately limit the content of personal messaging and social media posts, thereby reducing opportunities for jealous reactions by their partners.

Limitations

There are a number of limitations that should be considered when interpreting these findings. First, individuals, rather than couples, were used in this study; studying couples would allow for examination of dyadic processes. Second, the use of hypothetical scenarios to measure jealousy responses precludes generalization to actual jealous-provoking experiences. Third, the attachment measure that was used, while brief and similar in content to more recent measures (Fraley et al., 2000), has less evidence supporting its psychometric properties and does not allow for examining preoccupied/anxious and fearful attachment

separately. Fourth, as mentioned, cross-sectional design was used, so causal inferences cannot be inferred. Attachment anxiety and online attitudes were conceptualized as predictor variables in the current study and online jealousy as the outcome variable. While it seems plausible that attachment style, an individual difference variable that is rooted in infancy and stable over time, precedes online attitudes and online jealousy, there is insufficient evidence to determine the causal directions among attachment, attitudes, and jealousy. Fifth, while power analyses indicated that the sample size was sufficient, there is evidence to suggest that interactions may require substantially more power than main effects to detect. It is possible that a larger sample size would detect additional significant interactions (e.g., attachment anxiety and apprehension as predictors of cognitive/behavioral jealousy), or significant differences in correlations between attachment anxiety and type of jealousy, or correlations between men and women. Finally, our sample consisted of college students in dating relationships, thus we must be cautious about generalizing to other types of relationships (e.g., working adults, married couples, etc.).

Implications and Suggestions for Future Research

As researchers continue to examine relationship dynamics in the digital arena, the current study suggests that it will be important to consider individuals' attitudes about online communication. In addition to replicating the current findings, further research is needed to clarify how attitudes moderate the impact of attachment anxiety on jealousy; optimal approaches might involve collecting data on the frequency and content of online communication and social media posts for individuals high (and low) in attachment anxiety and their dating partners.

Collecting dyadic data will also be important to investigate bidirectional influences among these variables. The exploration of additional factors that may enhance or mitigate online jealousy will likely be useful as well; indeed, there is already evidence that self-esteem (Utz and Beukeboom, 2011), may be influential in predicting online jealousy and other digital relationship processes. Continued development of theory (e.g., attachment theory, the investment model, and self-expansion theory; Rus and Tiemensma, 2017) and the use of a variety of methodological approaches such as observational (e.g., daily diary studies), longitudinal, and experimental designs, are necessary to provide a thorough understanding of relationship processes in the digital arena.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Santa Clara University Institutional Review Board. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

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

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A Literature Review of Online Identity Reconstruction

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The tremendous development of the Internet enables people to present themselves freely. Some people may reconstruct their identity on the Internet to build an online identity that is partly or even completely different from their real identity in the offline world. Given that research on online identity reconstruction is fragmented, it is important to evaluate the current state of the literature. In this paper, a review of literature related to online identity reconstruction was conducted. This study summarized the theoretical and methodological preferences of relevant research. In addition, it elaborated why and how people engage in online identity reconstruction. The predictors and effects of online identity reconstruction were also discussed. The results of this study provided an overview of the thematic patterns of existing research. This review also identified current research gaps and recommended possible directions for future studies.

Keywords: identity reconstruction, false self-presentation, strategic self-presentation, internet, literature review

INTRODUCTION

Online identity refers to "a configuration of the defining characteristics of a person in the online space" (Kim et al., 2011). Ruyter and Conroy (2002) defined online identity as the combination of characteristics that help to define a person in cyberspace, thereby, makes him or her different from other online users. The rapid development of information technology has provided people with various tools to create their online identity and present themselves.

It is suggested that an individual's identity in the online world may be different from his or her offline identity (Kim et al., 2011; Hu et al., 2015). An individual's offline identity is constrained by his or her corporal body and the physical situations (Bargh et al., 2002; Donath, 2002; Schau and Gilly, 2003; Kim et al., 2011). Factors (e.g., race, age, and gender) that affect an individual's offline identity are usually beyond his or her control (Kim et al., 2011). However, in the online world, people can construct and present their online identity selectively (Kim et al., 2011; Hu et al., 2015). In this case, the virtual identity that an individual builds online is not necessarily tied to his or her offline identity (Hongladarom, 2011). An individual can use different digital means to create an identity that he or she wishes to express online (Kim et al., 2011).

The phenomenon that people build an online identity that is partly or even completely different from their real identity by hiding or faking certain characteristics is defined as online identity reconstruction (Hu et al., 2015). It should be noted that an individual's identity is "fluid" rather than "static." It is socially constructed in a given context (Hatoss, 2012). Individuals often present themselves differently in different situations. Online identity reconstruction is different from online identity construction. Identity construction is a complex process in which

people develop self-definition (Slay and Smith, 2011). It is usually related to personal attributes and social roles (Simpson and Carroll, 2008). For example, a teacher constructs his/her identity as a teacher researcher by participating in teacher education programs (Taylor, 2017); software engineering students build up their professional identity through training (Tomer and Mishra, 2016).

The studies about identity construction online mainly focus on how individuals build their self-image online. For example, adolescents create their online identity with the disclosure of intimate information and the use of various web-based resources (Alvermann et al., 2012; Jordán-Conde et al., 2014). People use different profile photos to present themselves (Hum et al., 2011), utilize various photographic and textual material to construct an alcohol-identity (Ridout et al., 2012), and edit the messages carefully in online interactions (Ditchfield, 2020).

Prior studies about online identity reconstruction paid more emphasis on the factors that make people's online and offline identities different, such as strategic self-presentation (Kim and Baek, 2014; Fox and Rooney, 2015; Bareket-Bojmel et al., 2016), deceptive self-presentation (Toma and Hancock, 2010; Ranzini and Lutz, 2017), or false self-presentation (Gil-Or et al., 2015; Jackson and Luchner, 2018; Wright et al., 2018). For example, an unattractive girl may reconstruct her identity online by posting edited photos that make her look more attractive. Some people also regard online identity reconstruction as a way to explore their identity (Valkenburg et al., 2005; Valkenburg and Peter, 2008). For instance, adolescents may pretend to be someone else online to try different aspects of their possible identity (Valkenburg and Peter, 2008). Existing research has examined the associations between online identity reconstruction and various factors, such as well-being (Kim and Lee, 2011; Jang et al., 2018), sense of identity (Valkenburg and Peter, 2008), self-esteem (Kim and Baek, 2014; Gil-Or et al., 2015), and so on.

Although, increasingly more attention has been paid to online identity reconstruction, it is difficult for readers (researchers and practitioners) to understand the phenomenon of online identity reconstruction thoroughly, given that the existing research is quite diverse and fragmented. An extensive review of research in this area is thus necessary. A review of the growing literature can provide an overview of the current status of research concerning online identity reconstruction (such as methodological preference and research themes) and help researchers recognize research trends in this area. Therefore, this study aims to review what is already known about the phenomenon of online identity reconstruction. Specifically, the current study attempts to analyze the motivations, strategies, predictors, and effects of online identity reconstruction. Moreover, it will identify research gaps in the existing literature and provide recommendations for future research at the same time.

ONLINE IDENTITY RECONSTRUCTION

On the Internet, physical cues are absent (Suler, 2004). People cannot physically see or hear each other which increases the perceived distance between people and the audiences

(Bullingham and Vasconcelos, 2013). In addition, people's online identity is usually determined by the information they disclose to others (Marwick, 2013). The physical detachment from audiences and the control on self-presentation makes it easier to hide or fake personal characteristics.

Previous research suggested that game characters created by players are more similar to their ideal self than to their actual self (Bessière et al., 2007). Moreover, research concerning online dating sites indicated that some people may engage in deceptive self-presentation, providing exaggerated or false information about themselves (Yurchisin et al., 2005; Toma et al., 2008). For example, people tend to present the "hoped-for possible self" on dating websites (Yurchisin et al., 2005). Some people lie about their height, while some lie about their weight to make themselves more attractive (Toma et al., 2008).

In comparison with other online self-presentation tools, social network platforms enable people to present themselves in a more structured and personalized way (Manago et al., 2008). In online profiles, people can share their basic personal information (such as gender, age, education, etc.), describe their preferences (e.g., people they are interested in), list their own interests (such as hobbies and favorite movies), and so on. In addition to profiles, people can also present themselves through other features on social network platforms, such as updating their status and sharing photos. Given that users can decide what information to disclose, the construction of identity on social network platforms is flexible (Manago et al., 2008). This means that identity reconstruction becomes possible because people can design and create their own online identity. People can hide or even alter their identity if they want (Suler, 2004). Previous research suggested that, on Facebook, individuals tended to build an online identity that is more socially desirable than their offline identity to make themselves appear more popular (Zhao et al., 2008). Given that individuals are able to reconstruct their online identity based on their own ideas, their identity on social network platforms could be partly, or even completely, different from their existing identity in the offline world (Hu et al., 2015).

Online Identity Reconstruction and Strategic Self-Presentation

Before the concept of online identity reconstruction was proposed, the terms "strategic self-presentation" and "selective self-presentation" were frequently used in studies about building a different identity online. As suggested by Goffman (1959), people are concerned about their public images. To control the impressions they make on others, individuals tend to employ various strategies for self-presentation during online interactions, such as emphasizing the attractive aspects of themselves (Rui and Stefanone, 2013). Individuals who are not satisfied with certain characteristics of themselves are more likely to engage in self-enhancement online (Bessière et al., 2007). For instance, on social network platforms, people selectively post favorable personal information in their profiles and share positive life events more than negative ones (Bareket-Bojmel et al., 2016).

In addition to strategic self-presentation, the online environment also provides opportunities for online identity

experiment, which refers to the tendency to pretend to be someone else in the online world. In comparison to offline contexts, online contexts are less limited by time and geographical distance, creating more opportunities for identity exploration (Shapiro and Margolin, 2014). In online contexts, people perceive increased disconnectedness from offline contexts and lower levels of surveillance (Selwyn, 2008). Therefore, young people tend to feel that there is less adult supervision online, which enables them to experiment with new values, ideas, and behaviors to a greater extent (Valkenburg and Peter, 2008). For example, a previous study showed that sexual minority adolescents (such as homosexuals) felt more comfortable expressing their sexuality to others in online contexts (Hillier and Harrison, 2007).

When engaging in strategic self-presentation or identity experiment, individuals intentionally build an online identity that is different from their offline identity to some extent. Therefore, they are actually engaging in online identity reconstruction. However, online identity reconstruction is more complex than strategic self-presentation and online identity experiment.

When presenting themselves strategically, people are still telling the truth, but mainly highlighting positive facts or exaggerating the truth on purpose. However, in online identity reconstruction, people are no longer limited to the truth. They may stretch the truth, hide personal information, or even tell lies. In addition, the motivations for online identity reconstruction are more complicated. The primary motivation for strategic self-presentation is to build a positive public image. For online identity experiment, individuals mainly want to talk and behave freely to explore the reactions of others (Valkenburg et al., 2005; Ceyhan, 2014). When engaging in online identity reconstruction, people are seeking the benefits brought about by the reconstructed identity, which is more than a positive image or the freedom to talk and behave. Some people try to pursue positive outcomes of online identity reconstruction, such as the fulfillment of vanity needs and access to new social networks (Hu et al., 2015). Some people reconstruct their identity to avoid negative outcomes, such as privacy risks (Hu et al., 2015).

METHODOLOGY

To capture an overview of the diverse research concerning online identity reconstruction, this study aims to address five research questions as listed below. However, it should be mentioned that this study only answers the research questions based on the findings of the literature surveyed. More empirical research is needed to obtain definitive answers to these questions.

RQ1: What research methods and theories have been used in online identity reconstruction research?

RQ2: Why do people reconstruct their identity online?

RQ3: How do people reconstruct their identity online?

RQ4: What factors will affect online identity reconstruction behavior?

RQ5: What are the effects of online identity reconstruction?

Search Strategy and Keywords

To collect relevant sources about online identity reconstruction, several academic databases were selected in this study, including Web of Science, Scopus, Academic Search Complete, and ScienceDirect. These four databases were selected because they cover a wide range of disciplines and a large number of academic journals. For example, Web of Science includes over 20,000 peer-reviewed journals in over 250 disciplines, while Scopus is a comprehensive abstract and citation database that covers more than 23,000 peer-reviewed journals. The use of multiple databases reduces the risk of omitting research related to online identity reconstruction.

The focus of the current study is on the issues related to creating or using an online identity that is somehow different from people's offline identity. Some existing studies have investigated how people establish a general online identity through different technologies, such as profile photos (Hum et al., 2011), status updates (Yuan, 2018), and blogs (Fullwood et al., 2009; Sima and Pugsley, 2010). However, the construction or creation of a general online identity is not the focus of the present study. Therefore, the term "identity reconstruction/re-creation," rather than "identity construction/creation," was combined with terms that suggest an online context (such as "online" and "Internet"). Various terms were used before the concept of online identity reconstruction was proposed, such as "strategic self-presentation," "deceptive self-presentation," "false self-presentation," and "identity experiment." People may employ different strategies to build a different identity in the online context. When engaging in strategic self-presentation, individuals usually present positive aspects of the self to manage the impression they make on others (Bareket-Bojmel et al., 2016). In deceptive and false self-presentation, people provide inaccurate information about themselves, such as lying about their age, height, weight, occupation, and achievements (Toma and Hancock, 2010; Wright et al., 2018). Identity experiments are primarily used by adolescents. They explore and experiment with different identities on the Internet by emphasizing, changing, or concealing certain features of the self (Valkenburg and Peter, 2008; Ceyhan, 2014). Therefore, the terms that imply deviations between the online and offline identities were also included as keywords to search titles and abstracts in the selected databases.

Inclusion and Exclusion Criteria

To ensure the quality of the sources for review, the search results were limited to research papers published in peer-reviewed journals. Therefore, to be included in the review, the article must be: (a) published in a peer-reviewed academic journal by 31st December 2020; (b) written in English; and (c) mainly focusing on the investigation of the reconstructed online identity that is partly or even totally different from people's offline identity. Exclusion criteria ensured that selected articles are not: (a) book chapters, conference papers, review articles, dissertations, or non-academic studies; (b) focusing on identity reconstruction in the offline world; and (c) only focusing on the general strategies for self-presentation that are not intended to build a different online identity.

Study Selection and Data Extraction

The literature search process in the selected databases identified 299 studies. After removing duplicates, 145 articles were left. The titles, abstracts, and keywords of the articles were screened, resulting in the exclusion of 69 sources that are clearly irrelevant. After that, the authors examined the full text of the remaining 76 papers independently to determine their relevance based on the eligibility criteria. Disagreements were resolved through discussion. In this process, 39 articles were excluded. Most of the excluded articles were focusing on the general strategies for online self-presentation, rather than online identity reconstruction. For example, some studies investigated how people present themselves to multiple audiences; some research examined the strategies for establishing a general online identity; some examined gender differences in self-presentation strategies between male and female users.

Finally, 37 papers were selected for review. The papers were examined thoroughly. The following variables were coded for each study: author(s), year of publication, research context, participant details, methodology, theoretical background, and key findings.

RESULTS

Demographic

About the research context, the most frequently used research site is a social network platform. Sixteen studies (43.3%) were conducted on a specific social network platform (such as Facebook, Instagram, MySpace, WeChat, and QQ), while six studies (16.2%) focused on the general context of social network platforms. Additionally, seven articles (18.9%) investigated online dating sites or apps; five papers (13.5%) have examined online identity reconstruction in the general online environment and three studies (8.1%) looked into online gaming contexts. Most of the studies that looked into online identity reconstruction in online dating sites or the general online environment were published before the year 2015. Twenty-one of the reviewed papers (56.8%) were published after 2015, and they mainly investigated online identity reconstruction in the context of social network platforms.

When it comes to the samples, over one-third of the reviewed articles (13 studies, 35.1%) used a student sample. Among the articles that used a general sample, eight studies (21.6%) recruited the participants through crowdsourcing services, such as Amazon.com's Mechanical Turk, Qualtrics. The sample sizes of reviewed articles ranged from 10 to 1,158, depending on the applied methodology (i.e., qualitative or quantitative).

Theoretical and Methodological Preference

The quantitative approach was the major methodology applied in previous research on online identity reconstruction. A total of 28 studies (75.7%) used quantitative research methods for data collection and data analysis, while seven studies (18.9%) employed qualitative methods and only two studies (5.4%)

used mixed-methods (both quantitative and qualitative) for investigation. The most frequently used method for data collection was survey, followed by experiment, interview, focus group, and observation.

Ten studies did not have a clear theoretical foundation to explain the phenomenon of online identity reconstruction. The remaining studies mainly relied on theory of Goffman (1959) about self-presentation and different concepts of the self-proposed by various theorists. Goffman (1959) proposed that when people are interacting with others, they strategically present their best self to others, just like actors performing on a stage. Some studies suggested that people highlight positive aspects of themselves or present the ideal self on social network sites in order to create a more socially desirable identity online (e.g., Ranzini and Lutz, 2017; Alsaggaf, 2019).

Self-discrepancy theory was also used frequently as the theoretical background. The theory proposed three domains of the self: the actual self (attributes one current possess), the ideal self (attributes one hopes to possess, reflecting wishes and dreams), and the ought self (attributes one should possess, reflecting duties and responsibilities; Higgins, 1987). People usually use the ideal self and the ought self as self-guides to regulate their behavior. The gap between the actual self and self-guide is referred to as self-discrepancy. Greater self-discrepancy will lead to greater psychological discomfort, such as disappointment and anxiety (Higgins, 1987). The Internet provides opportunities for online identity reconstruction, making it easier to fulfill self-guides and reduce self-discrepancy (Hu et al., 2017). For example, people can create game avatars that are more similar to their ideal self than their actual self (Bessière et al., 2007; Dengah and Snodgrass, 2020). Individuals who are not satisfied with their appearance (i.e., with great actual-ideal self-discrepancy) tend to edit their selfies more frequently (Lyu, 2016).

Why Do People Reconstruct Their Identity Online?

The Internet gives individuals an avenue to present themselves freely. There is growing evidence that people reconstruct an online identity that is somehow different from their real identity in the offline world (Bessière et al., 2007; Toma and Hancock, 2010; Hu et al., 2015; Jackson and Luchner, 2018). The reasons for online identity reconstruction are complicated.

After reviewing the selected papers, we found that people were mainly driven by various needs during online identity reconstruction. Some people were motivated by social needs. For example, Ranzini and Lutz (2017) found that hooking up/sex and self-validation were important motivations for users of online dating sites to present a deceptive self-image. People want to attract sexual partners and gain self-validation on the dating site (Ranzini and Lutz, 2017). On social network sites, fear of missing out can lead to positive self-presentation (Duan et al., 2020). Hu et al. (2015) suggested that people may reconstruct their online identity due to vanity, enjoyment, access to new social networks, and escape from old social networks (Hu et al., 2015). Other researchers found that adolescents who presented a different identity online were mainly driven by self-exploration, social compensation, and

social facilitation (Valkenburg et al., 2005; Ceyhan, 2014). They want to explore the reactions of others, communicate more easily (overcome shyness), and meet new friends (Valkenburg et al., 2005; Ceyhan, 2014). People may also reconstruct an online identity to present their true self (such as traits or beliefs that cannot be easily expressed in the offline world; Hu et al., 2017). In addition to the above-mentioned social needs, people were also motivated by security needs in online identity reconstruction. For instance, people may reconstruct their online identity due to disinhibition, privacy concern, and avoidance of disturbance (Hu et al., 2015). They want to be anonymous and protect themselves online.

Gender and cultural differences were salient in the motivations for online identity reconstruction (Valkenburg et al., 2005; Huang et al., 2020). For example, it is found that when compared with Chinese social network users, Malaysian users were more likely to reconstruct their identity due to privacy concerns (Huang et al., 2020). Girls placed more emphasis on self-exploration and social compensation than boys (Valkenburg et al., 2005), while boys were more likely to be motivated by social facilitation (Ceyhan, 2014). In addition, it is suggested that men are more likely to be motivated by bridging social capital and disinhibition than women (Huang et al., 2018).

How Do People Reconstruct Their Identity Online?

Positive self-presentation is a strategy used frequently for online identity reconstruction. People try to build a better self-image by presenting themselves positively. Individuals may only share contents that show the good side of their life and avoid posting negative events (Kim and Lee, 2011; Kim and Tussyadiah, 2013; Bareket-Bojmel et al., 2016). Presenting one's ideal self is also used as a strategy for online identity reconstruction. For example, people may present the "hoped-for possible self" on dating sites to impress others (Yurchisin et al., 2005). On social network sites, individuals often present themselves in the way they want to be (Michikyan et al., 2015; Kang and Wei, 2019). They sometimes use multiple accounts to manage their online identity (Alsaggaf, 2019).

In addition, people may reconstruct their identity by altering the information they post online. For instance, in online dating sites, people often enhance their profile photos (Hancock and Toma, 2009; Toma and Hancock, 2010). Sometimes, they even lie about their physical descriptors (such as height and weight; Toma et al., 2008). It is found that online daters tend to exaggerate their attractiveness by presenting their personality traits in a more desirable way (Guadagno et al., 2012). Online daters build a better identity by deceptive self-presentation in order to improve their attractiveness to potential partners (Ranzini and Lutz, 2017). In addition, individuals also edit the photos they post on social network sites (Fox and Rooney, 2015; Lyu, 2016). People with lower social-economic status try to build a better image online by altering self-presentation, with an attempt to gain social mobility to the upper class (Pitcan et al., 2018). Individuals may also present a false self to deceive others or to explore their identity (Valkenburg and Peter, 2008; Jackson and Luchner, 2018).

What Factors Will Affect Online Identity Reconstruction Behavior?

In addition to the motivations and strategies for online identity reconstruction, existing studies have identified many other predictors that are significantly associated with the behavior of online identity reconstruction.

Personality Traits

Several articles reviewed in this study have examined the role of personality traits in online identity reconstruction (Utz et al., 2012; Fox and Rooney, 2015; Gil-Or et al., 2015; Ranzini and Lutz, 2017). Some personality traits are positively associated with online identity reconstruction. With a sample of 1,000 male social network site users, Fox and Rooney (2015) found that narcissism trait was a significant predictor of photo editing behavior. Highly narcissistic males posted more selfies and edited the photos more frequently to make themselves look better (Fox and Rooney, 2015). Similarly, Utz et al. (2012) indicated that people with a greater need for popularity are more likely to engage in social grooming, profile enhancement, and strategic self-presentation on social network sites (Utz et al., 2012).

While some personality traits promote online identity reconstruction, some traits are negatively associated with this behavior. The effect of self-esteem has attracted much attention from researchers (Gil-Or et al., 2015; Michikyan et al., 2015; Ranzini and Lutz, 2017). Ranzini and Lutz (2017) found that people with a low level of self-esteem tend to present themselves more deceptively in the online dating context. The level of self-esteem can also affect video game players' construction of game characters (Dengah and Snodgrass, 2020). Using a sample of 258 adult Facebook users, Gil-Or et al. (2015) suggested that self-esteem has negative impacts on false self-presentation, which refers to present oneself in a manner that is inconsistent with who the person really is. Individuals with a higher level of self-esteem are less likely to present a false self on Facebook (Gil-Or et al., 2015). In addition, it is suggested that adolescents with a lower level of self-esteem are more likely to engage in false self-presentation (Michikyan et al., 2015). Sexual orientation can also influence an individual's behavior of online identity reconstruction (Ranzini and Lutz, 2017). People who identified themselves as homosexual and bisexual were more likely to present themselves in a less authentic way (Ranzini and Lutz, 2017).

Physical Attractiveness

Previous research found that people's concern about their physical appearance had significant influences on online identity reconstruction behavior (Fox and Rooney, 2015; Lyu, 2016). For example, Fox and Rooney (2015) investigated the association between self-objectification (treating one's appearance as objects that are evaluated by others) and online identity reconstruction with a male sample. Their findings suggested that men with a higher level of self-objectification edit the photos of themselves more frequently on social network sites (Fox and Rooney, 2015). Later, Lyu (2016) found a similar effect of self-objectification on online identity reconstruction with a female

sample. Results showed that women who were dissatisfied with their appearance were more likely to engage in photo editing behavior. In addition, women who frequently monitor and compare their appearance with others tend to fabricate their photos purposefully (Lyu, 2016). In addition, Toma and Hancock (2010) found that people with less attractive physical appearances were more likely to enhance their photographs and lie about their height, weight, and age.

Psychological Status

Psychological status is another important predictor of online identity reconstruction behavior (Bessière et al., 2007; Valkenburg and Peter, 2008). Bessière et al. (2007) found that online gamers tended to create a game character with attributes that were more favorable than their own attributes, and the discrepancy between game characters and one's real attributes was greater among players with a lower level of psychological well-being (e.g., a high level of depression; Bessière et al., 2007). This means that players with a lower level of psychological well-being are likely to reconstruct their identity in online games to a greater extent.

Some studies have focused on adolescents' online identity reconstruction (Valkenburg et al., 2005; Valkenburg and Peter, 2008; Ceyhan, 2014; Michikyan et al., 2015). Adolescents pretend to be someone else online (such as someone older, smarter, less shy, more beautiful) to explore their own identity (Valkenburg et al., 2005). It is suggested that the sense of identity is negatively associated with online identity reconstruction (Ceyhan, 2014; Michikyan et al., 2015). Adolescents with a less coherent sense of the self are more likely to engage in identity experiments on the Internet (Ceyhan, 2014), and present their false self to a greater extent on Facebook (Michikyan et al., 2015). Emerging adults who still have doubts about what they want to be are more likely to engage in online self-exploration to better understand different aspects of themselves (Michikyan et al., 2015). In addition, Valkenburg and Peter (2008) found that loneliness positively predicted online identity experiment. Lonely adolescents explore their identity with online identity reconstruction more frequently than non-lonely peers (Valkenburg and Peter, 2008).

Demographic Factors

Demographic variables (such as gender, age, and educational level) can also influence online identity reconstruction. It is found that women's profile photos were perceived to be less accurate than men's (Hancock and Toma, 2009), and women indeed engaged in self-enhancement more than men (Toma and Hancock, 2010; Bareket-Bojmel et al., 2016). In addition, age was a negative predictor of false self-presentation, indicating that younger people are more likely to reconstruct their identity online (Wright et al., 2018). Interestingly, Ranzini and Lutz (2017) found that individuals with a higher educational level presented themselves deceptively to a greater extent than those who are less educated.

Other Factors

In addition to personality traits, physical attractiveness, psychological status, and demographic variables, existing studies have also examined the role of other factors in online identity reconstruction. For example, Bareket-Bojmel et al. (2016) investigated how the goals of social network site use affect users' actual behavior on Facebook. Using a sample of 156 undergraduate students, they suggested that students with performance goals (e.g., try to demonstrate their competence to others) have a greater desire for self-enhancement, which in turn, drive them to present themselves in a positive and socially desirable manner to impress others with their competence or talent (Bareket-Bojmel et al., 2016).

Perceived moral norm also has an impact on people's identity reconstruction behavior on Facebook (Wright et al., 2018). Individuals are more likely to engage in false self-presentation (such as updating status of doing something they did not actually do) if they perceive the behavior of online identity reconstruction is morally acceptable (Wright et al., 2018). For instance, people may lie about their achievements when they think the behavior is acceptable. In the context of online dating, the intention to seek romantic relationships negatively influences deceptive self-presentation (Ranzini and Lutz, 2017). People with long-term relational goals are less likely to engage in self-enhancement (Toma and Hancock, 2010).

What Are the Effects of Online Identity Reconstruction?

Effects on Well-Being

Some studies reported that online identity reconstruction has positive effects on well-being. Kim and Lee (2011) examined the impact of online identity reconstruction on the subjective well-being of Facebook users. Results showed that individuals tend to feel happier when they can present a positive self-image on Facebook, but the positive self-presentation is not likely to improve the perceived social support (Kim and Lee, 2011). Similarly, Jang et al. (2018) found that people who present themselves positively on social network sites reported a higher level of happiness, regardless of their self-esteem level. In addition, it is suggested that selective self-presentation will increase people's online life satisfaction when they have a low level of self-esteem or have a high level of social trust toward other online users (Kim and Baek, 2014). Moreover, Hu et al. (2020) indicated that online identity reconstruction has a positive impact on psychological well-being. People who reconstruct their identity online tend to feel more autonomous and have a higher level of self-acceptance, which in turn, improves their overall satisfaction online (Hu et al., 2020).

Online identity reconstruction is also associated with negative psychological outcomes (Visser et al., 2013; Wright et al., 2018; Duan et al., 2020). It is suggested that false self-presentation is significantly correlated with negative mental health, such as anxiety, depression, and stress (Wright et al., 2018; Duan et al., 2020). In addition, identity experiments in online games are positively associated with feelings of loneliness. Players who create a game character that is inconsistent with their real identity are likely to feel lonely to a greater extent (Visser et al., 2013).

Other Effects

Online identity reconstruction is positively associated with the responses of audiences (Bareket-Bojmel et al., 2016). Individuals who present themselves in a positive and socially desirable way receive more likes and comments from their friends on Facebook (Bareket-Bojmel et al., 2016). It is suggested that trying out ideal selves in MySpace is beneficial for the development of adolescents' personal identity (Manago et al., 2008). In addition, online identity experiments stimulate adolescents' communication with people of different ages and from different backgrounds, which in turn, makes them feel a higher level of social competence in the offline world (Valkenburg and Peter, 2008).

Moderation and Mediation Effects

In addition to the direct effects, prior studies have also investigated the role of online identity reconstruction as a moderator or mediator. Huang et al. (2019) examined the predictors of online satisfaction. Their findings suggested that bridging social capital and privacy concern have significant impacts on satisfaction, and these influences are moderated by online identity reconstruction. For individuals who reconstruct their identity to a greater extent, the effect of bridging social capital on satisfaction is stronger, while the effect of privacy concern on satisfaction is weaker (Huang et al., 2019). Kim and Tussyadiah (2013) found that social network site use was positively associated with the social support users receive, and this relationship was stronger among users who reconstructed their identity to build a positive self-image. In addition, Jackson and Luchner (2018) found that highly self-critical people (who point out their own perceived flaws frequently) more often presented themselves falsely with a deceptive intention. False self-presentation mediated the relationship between self-criticism and negative emotional response to Instagram feedback (Jackson and Luchner, 2018).

DISCUSSION

This review has provided an overview of the current trends in online identity reconstruction research. In addition to summarizing the research contexts and sample characteristics, this study revealed that quantitative methods were the preferred methodological approach, and the most popular theories were Goffman's self-presentation theory and Higgins' self-discrepancy theory. The analysis of the key findings of existing literature provided insight into the motivations, strategies, predictors, and effects of online identity reconstruction. It is found that people might reconstruct their identity online to fulfill various social needs and security needs, such as to improve sexual attractiveness, explore identity, and protect privacy (Valkenburg et al., 2005; Ceyhan, 2014). The main strategies people use to reconstruct their identity online are positive self-presentation (e.g., presenting their ideal self) and false self-presentation (e.g., altering personal information; Michikyan et al., 2015; Kang and Wei, 2019). Personality traits, physical attractiveness level, psychological status, and

demographic factors are important predictors of online identity reconstruction (Bessière et al., 2007; Toma and Hancock, 2010; Utz et al., 2012; Wright et al., 2018). Moreover, online identity reconstruction has influences on individuals' well-being (such as happiness, perceived support, and depression; Kim and Lee, 2011; Jang et al., 2018; Wright et al., 2018).

Based on the review of relevant articles, we found some weaknesses in online identity reconstruction research in the past years. There are some gaps in existing research. In the following section, we offer critiques and suggestions for possible future directions in online identity reconstruction research.

Recommendations for Future Research

First, more efforts should be made to explore the effectiveness of online identity reconstruction behavior. Previous research suggested that people may reconstruct their online identity due to different reasons. For example, some people reconstruct their identity to build a positive image and fulfill their need for vanity; some people want to extend their social network (Hu et al., 2015). Although, existing studies have identified various motivations for online identity reconstruction, the effectiveness of online identity reconstruction is not clear. Do people really get what they want (e.g., more positive images and bridging social capital) through online identity reconstruction? Therefore, future studies are suggested to examine the effectiveness of online identity reconstruction. For example, experiments could be designed to evaluate the changes (if any) in perceived physical attractiveness or bridging social capital before and after online identity reconstruction.

Second, the causal relationship between online identity reconstruction and well-being is not clear. As suggested by the reviewed studies, negative psychological status is a significant predictor of online identity reconstruction behavior (Valkenburg et al., 2005; Bessière et al., 2007; Michikyan et al., 2015), while online identity reconstruction is also associated with both positive and negative well-being (Kim and Lee, 2011; Jang et al., 2018; Wright et al., 2018). However, the existing research used cross-sectional data. It is not clear whether well-being affects online identity reconstruction behavior (e.g., promote the behavior), or online identity reconstruction leads to negative (or positive) well-being. Therefore, longitudinal studies are needed to take a closer look at the causal relationship between well-being and online identity reconstruction. Future research can examine the long-term role of well-being in online identity reconstruction.

Third, opportunities exist to investigate the effects of the big five personality traits. Existing studies have examined the effect of personality traits on the behavior of online identity reconstruction (Utz et al., 2012; Fox and Rooney, 2015; Gil-Or et al., 2015). However, they mainly focused on self-esteem or other traits related to physical appearance. There is a lack of research on the effect of the big five personality traits (i.e., Extraversion, Neuroticism, Agreeableness, Conscientiousness, and Openness to Experience). The big five personality traits were found to be significantly associated with self-presentation (Lee et al., 2014; Eşkisu et al., 2017) and motivations for

Facebook use (Seidman, 2013). Therefore, it is likely that these personality traits can also influence online identity reconstruction behavior. Thus, future studies can investigate whether the big five personality traits are associated with the motivations for online identity reconstruction or the actual behavior of reconstructing an online identity.

Fourth, there is a lack of research on the potential negative impacts of online identity reconstruction. Some of the reviewed articles have examined online identity reconstruction in the context of online dating (Yurchisin et al., 2005; Ellison et al., 2006; Wotipka and High, 2016; Ranzini and Lutz, 2017). Individuals mispresent their physical characteristics to make themselves more attractive to potential romantic partners (Toma et al., 2008). Given that the online daters are expecting to build a romantic relationship in the offline world (Toma and Hancock, 2010), they only reconstruct their identity to a limited extent. In the context of social network platforms, people may also face some difficulties when they try to reconstruct their identity, because the reconstructed online identity may be judged by their friends who share offline connections with them (Zhao et al., 2008). It is also difficult to control the information posted by others (Rui and Stefanone, 2013). Therefore, it is an interesting direction to investigate whether online identity reconstruction in a non-anonymous environment will induce negative impacts on individuals, such as reduced credibility or negative social evaluations.

Contributions and Limitations

As a literature review paper that looks closely into the phenomenon of online identity reconstruction, the present study makes several contributions. First, it provides a thorough understanding of online identity reconstruction by identifying the motivations, strategies, predictors, and effects of online identity reconstruction. In addition to these key findings, this study also analyzed the basic characteristics of related research. It provides an overview of the current status of emerging literature. We also identified several knowledge gaps after reviewing existing studies. The recommendations for future research may take the research of online identity reconstruction further. They offer clear directions for researchers in this field. However, this study also has limitations. It should be noted that non-English papers, conference proceedings, and book chapters were excluded from the literature search process. Although, we have increased the coverage of potentially relevant papers by searching several large databases, future reviews are suggested to enlarge the pool of literature selection to achieve a more complete understanding of online identity reconstruction phenomenon.

AUTHOR CONTRIBUTIONS

JH, SK, and CH contributed to the conception and design of the study. SK provided the supervision and advice throughout this study. JH and CH contributed to the literature search, literature selection, and data analysis. JH wrote the first draft of the manuscript. All authors contributed to the article and approved the submitted version.

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Ephemerality in Social Media: Unpacking the Personal and Social Characteristics of Time Limit Users on WeChat Moments

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Social media platforms increasingly give users the option of ephemerality through settings that delete or hide posted content after a set period of time. Many individuals apply these settings to manage their posting history and, in turn, reduce concerns about self-presentation. Despite the growing popularity of this feature, few studies have empirically explored it. This study examines the Time Limit setting on WeChat Moments as an example and investigates how users using the Time Limit setting differ from nonusers in terms of personal characteristics (demographics, personality traits, psychological factors, and previous behavioral patterns) and social characteristics (audience size and audience diversity). Compared with nonusers, users using Time Limit setting scored significantly higher on posting frequency and privacy setting use and scored significantly lower on audience size. We also examine how personal and social characteristics vary between user groups with different degrees of ephemerality (i.e., low, medium, or high). Our findings show that users using the Time Limit setting who scored higher on measures of life changes, self-monitoring, posting frequency, and audience size and lower on perceived stress were more likely to opt for the low (i.e., 6 months) rather than the medium (i.e., 1 month) or high (i.e., 3 days) degree of ephemerality. Our work contributes to the understanding of ephemerality settings on social media platforms and provides insights that help practitioners design more effective platforms.

Keywords: ephemerality, Time Limit, WeChat Moments, personal characteristics, social characteristics, users and nonusers

INTRODUCTION

Most social media platforms keep past posts online indefinitely to help users with their long-term self-presentation and interactions with others (Zhao et al., 2013; Özkul and Humphreys, 2015). However, this feature may also create challenges for users when past posts are inconsistent with their current self-presentation (Schoenebeck et al., 2016; Huang et al., 2020). As such, it is becoming increasingly common for social media platforms to allow users to make their posted content ephemeral using relevant settings (Xu et al., 2016; Chen and Cheung, 2019). For instance, on Snapchat Stories and Instagram Stories, users' posted content disappears after

24 h. Most users of this feature report fewer privacy concerns and perceive greater enjoyment when using Snapchat (Morlok et al., 2017; Choi and Sung, 2018). Nonetheless, they also experience certain types of loss such as media loss (e.g., the failure to save photographs) or context loss (e.g., the lack of a message history; Cavalcanti et al., 2017).

Likewise, WeChat Moments, one of the most popular social media platforms in China, provides a Time Limit option, which allows users to set a time span (3 days, 1 month, or 6 months) for the visibility of their posts, after which their content expires and becomes viewable only by the posters themselves. A report from January 2021 (Tencent, 2021) states that more than 200 million users make use of the "Time Limit" feature. Despite the fact that it can, in certain circumstances, have negative effects such as undermining social relationships when contacts have a feeling that the person using the feature does not trust them (Li et al., 2018), it can also have positive effects by supporting users' evolving self-presentation (Huang et al., 2020). Zheng and Zhao (2020) identified 16 factors that influence the "Time Limit" usage: influence of old and new relation, information changes, self-recording, etc. However, research on the Time Limit usage is still in its infancy, and further investigation is needed (e.g., in profiling users using this feature).

Investigating the differences between users and nonusers of ephemerality settings can lead to an understanding of individuals' adoption behaviors. It can also provide insight into how relevant settings on social media platforms can be improved. Prior research has indicated that personal characteristics (e.g., demographics, personality traits) are the main factors that influence innovation–adoption behaviors and social media use (Hargittai, 2007; Meng et al., 2015; Brailovskaia and Margraf, 2016; Scott et al., 2020). Also, social characteristics (e.g., the number of intimate friendships) were found to affect users' attitudes and behaviors on social media (Ljepava et al., 2013; Grieve, 2017). This study examines the differences between users and nonusers of ephemerality settings by focusing on their personal and social characteristics, using the Time Limit setting on WeChat Moments as an example. Building on relevant research on the use of privacy settings in social media (Vitak, 2012; Litt, 2013; Stern and Salb, 2015; Li et al., 2018; Ran et al., 2020), we focus on personal characteristics related to demographics (i.e., age, gender, education, and life change experiences), personality traits (i.e., self-esteem, self-monitoring, and emotional stability), psychological factors (i.e., social anxiety, perceived stress, and loneliness), previous behavior patterns (i.e., posting frequency and privacy setting use), and social characteristics (i.e., audience size and audience diversity). Time Limit users can also be categorized into three groups based on the degree of ephemerality they adopt: those who opt for a low level of ephemerality (i.e., the 6-month option), those who opt for a medium level of ephemerality (i.e., the 1-month option) and those who choose a high level of ephemerality (i.e., the 3-day option). Accordingly, we also examine the differences between these Time Limit user groups. Our research questions are as follows.

RQ1: What are the differences between Time Limit users and nonusers in terms of their personal and social characteristics?

RQ2: How do personal and social characteristics vary between Time Limit user groups that have different degrees of ephemerality (i.e., low, medium, and high)?

Our work contributes to the literature in the following ways. First, it allows for a better understanding of the usage of ephemerality settings by revealing the characteristics of users and nonusers. Second, it highlights the roles that personal and social characteristics play in innovation adoption by comparing how these factors differ between the user and nonuser groups. Third, our work provides new insight into the usage of ephemerality settings by exploring the differences between user groups with different levels of ephemerality.

THEORETICAL BACKGROUND

Ephemerality in Social Media

As social media posts accumulate, there is a growing worry among users that the long-term visibility of historical information may damage their self-image and pose a threat to future interactions (Zhao et al., 2013; Xu et al., 2016). As such, some scholars have claimed that it is essential to allow individuals to set an expiration date for their posts (Mayer-Schönberger, 2011; Ayalon and Toch, 2013). Some social media platforms (e.g., Snapchat, Instagram Stories, and WeChat Moments) allow users to make their posts ephemeral (Piwek and Joinson, 2016; McRoberts et al., 2017; Huang et al., 2020) – the posts are deleted or hidden after a specific period of time. Given the increased use of ephemerality settings on social media platforms, some scholars have begun to explore why individuals opt to make their content ephemeral and how this influences users' attitudes and behaviors. For instance, Xu et al. (2016) explored the ephemerality feature on Snapchat and found that users could find values in ephemeral communication, such as reducing self-consciousness, preventing the accumulation of embarrassing content, and with less need to worry about unintended audiences. Also, the ephemerality could make users express authentic self (Choi and Sung, 2018; Choi et al., 2020) as well as support their evolving self-identity (Huang et al., 2020; Luria and Foulds, 2021). Likewise, Chen and Cheung (2019) investigated individuals' motivations for using social media and found that the fear of missing out, trust, immediacy, and social pressure influence individuals' feelings of gratification, which then facilitate their engagement with ephemeral content.

Nonetheless, the availability of ephemerality on social media platforms may also have negative effects. For instance, Cavalcanti et al. (2017) claimed that individuals who use ephemeral settings experience three types of losses: media loss, meaning loss, and context loss. Particularly, individuals lost their ability to display meaningful past posts (e.g., travel photos) to intended new friends for impression management. The use of ephemerality settings on social media platforms may also undermine social relationships because it may lead online contacts to feel that they are not trusted by the user, leading to feelings of being rejected (Li et al., 2018). The use of these settings may also

create negative impressions among new friends, who may perceive the use of such settings as defensive, isolated, or aloof (Huang et al., 2020).

Factors Influencing the Use of Privacy Settings on Social Media

Social media platforms provide users with various privacy settings to help them manage their audience and control their privacy (Chen and Marcus, 2012; Young and Quan-Haase, 2013). For instance, the Friend Lists feature on Facebook helps users segment their audience and direct information to particular people (Vitak, 2012). Research on the topic has explored the factors that affect individuals' use of privacy settings on social media. Most found that the use of privacy settings was often associated with negative experiences such as privacy intrusion. Litt (2013) found that users with strong privacy concerns or who had undergone turbulent online experiences were more likely to use social media privacy tools. Research has also revealed that users' personal characteristics (e.g., demographics, previous behavior patterns) affect their use of privacy settings. For instance, Brandtzæg et al. (2010) found that younger adults use more privacy settings on Facebook than do older adults. Stern and Salb (2015) suggested that individuals who frequently use social media are more likely to use privacy settings. Other scholars have found that some social characteristics (e.g., the quality of peer relationships) can also affect individuals' use of social media privacy settings (Lewis et al., 2008; Vitak, 2012; Li et al., 2018). Vitak (2012) found that Facebook users with many and diverse online friends in their social networks are more likely to use the Facebook Friend Lists setting.

Although some scholars have explored which factors are associated with the use of privacy settings on social media platforms, most of this work has focused on general privacy settings, rather than a specific privacy setting. We aim to fill this gap by focusing on the Time Limit feature on WeChat Moments. Specifically, we compare the differences between Time Limit users and nonusers in terms of their personal and social characteristics. The findings from this study will advance the understanding of users' attitudes and behaviors on social media platforms.

The Time Limit Setting on WeChat Moments

WeChat Moments, a function of the instant messaging application WeChat, is one of the most popular social media platforms in China. It was reported that every day in January 2021, 780 million users viewed Moments and 120 million users shared a post on the platform (Tencent, 2021). WeChat Moments is similar to Facebook, but posts made on the platform are only viewable to people on users' WeChat contact lists. To mitigate users' concerns about past posts, Moments launched the Time Limit setting in 2017. The feature allows users to choose a time span for their posted content – 3 days, 1 month, or 6 months – after which posted content is hidden from contacts and viewable only by the user (see **Appendix A**; if the "all" option is selected, then the users' posts do not expire). When users

employ the Time Limit setting, their profile pages display the notice "Only [time span] of Moments are visible" to their WeChat friends (see **Appendix B**). Once selected, the setting is universal in that it applies to all of the user's posts and audiences until the setting is changed. In other words, the setting cannot be applied only to certain posts or a select audience.

Research on the Time Limit setting on Moments is very limited. To the best of our knowledge, only three studies have preliminarily explored it. Relying on interview data, Li et al. (2018) found that the use of the Time Limit setting undermined social relationships among users. In a separate study, which also relied on interviews, Huang et al. (2020) investigated how the Time Limit setting supports users' evolving self-presentation and claimed that this setting could help users effortlessly manage their desired self-presentation as they matured. By conducting a text-mining analysis, Ran et al. (2020) found that audience management, mystery, emotional state, the intensity of use of other social networking services, peer influence, and life changes were factors that could possibly influence the use of the Time Limit setting.

METHODOLOGY

Participants and Procedure

The data for this study were collected through an online survey platform Sojump[1] during December 2020 and January 2021, in China. Sojump is a professional online survey platform consists of 2.6 million members and more than 1 million people fill out questionnaires on this platform every day (Sojump, 2020). Participants will be randomly invited to join in a survey. We posted an advertisement on Sojump to recruit participants, and anyone who is interested in our survey could join us. To increase the response rate, we offered a reward of 5 yuan to 10 yuan to each participant. To set the screening criteria, participants were first asked whether they were users of WeChat. If they were not WeChat users, they did not need to fill out the rest of the questionnaire. If they were, they were asked questions about their use of the Time Limit setting on WeChat Moments, their personal characteristics (i.e., demographics, personality traits, psychological factors, and previous behavior patterns), and the characteristics of their social networks (i.e., audience size and audience diversity). We scrutinized the completed questionnaires and excluded responses from participants who gave duplicate answers, or who had completed the survey in an unrealistically short time (less than 2 min). The final dataset comprised responses from 390 respondents. Most of the participants were female (56.4%), and most of them were 26–40 years old (71.7%). The majority of the participants (77.7%) were company employees. Among them, 97 users set their WeChat Moments Time Limit to 3 days, 101 users set it to 1 month, and 65 users set it to 6 months. A prior power analysis using G*Power (Faul et al., 2007) indicated that a sample size of $n = 70$ Time Limit users and $n = 70$ nonusers (total $N = 140$) was required for power to be at

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[1]https://www.sojump.com

0.90 to reveal a medium effect, with alpha set at the 0.1 level (Greenwood et al., 2016; Schroeder and Cavanaugh, 2018). With $n = 263$ Time Limit users and $n = 127$ Time Limit nonusers, our sample satisfied the required size.

Measurements

Unless otherwise noted, participants were asked to score each item on a five-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*). Based on the back-translation approach (Brislin, 1980), we translated the English measurements into Chinese by one English major graduate student, and then translated Chinese into English by an experienced professor. We compared them with the original English content and modified the inconsistencies. Then, we refined items further *via* feedback from two experts and four WeChat active users to improve the face validity of instruments.

Personal Characteristics
Demographics
Participants indicated their age (1 = *20 years or below*, 2 = *21–25 years*, 3 = *26–30 years*, 4 = *31–40 years*, 5 = *41 years and above*), gender (1 = *male*, 2 = *female*), and educational attainment (1 = *junior high school or below*, 2 = *high school degree*, 3 = *college degree*, 4 = *bachelor's degree*, and 5 = *master's degree and above*). Life change experiences were measured using Ayalon and Toch's (2017) three-item scale ($\alpha = 0.839$). Sample items included "Since publishing the post I have had major changes in my personal life (new relationship, new baby, moved to a new town or state, etc.)" and "Since publishing the post I have had major changes in my professional life (switched to a new job, finished college, etc.)."

Personality Traits
Self-esteem was measured using the 10-item scale adopted by Rosenberg (1965; $\alpha = 0.918$). Item 8, "I wish I could have more respect for myself," was not suitable to the Chinese context and was deleted (Tian, 2006; Ding et al., 2017), leaving nine items. Sample items included "On the whole, I am satisfied with myself" and "All in all, I am inclined to feel that I am a failure (reverse)." Relying on previous literature (Child and Agyeman-Budu, 2010; Kauppinen-Raisanen et al., 2018), we adopted the first part of the self-monitoring scale (Lennox and Wolfe, 1984) to measure one's ability to modify self-presentation ($\alpha = 0.792$). Sample items included "Once I know what the situation calls for, it is easy for me to regulate my actions accordingly" and "I have found that I can adjust my behavior to meet the requirements of any situation I find myself in." The two-item subscale from the Ten-Item Personality Inventory (TIPI; Gosling et al., 2003) was used to measure emotional stability ($\alpha = 0.766$). Sample items included "I am anxious or easily upset (reverse)" and "I am calm or emotionally stable."

Psychological Factors
We adopted the social anxiety subscale in the Self-Consciousness Scale (Fenigstein et al., 1975) to measure social anxiety ($\alpha = 0.895$). Sample items were "Large groups make me nervous" and "I have trouble working when someone is watching me."

Perceived stress was measured using the 14-item scale developed by Cohen et al. (1983; $\alpha = 0.928$). Sample items were "I often feel that I am unable to control the important things in my life" and "I often feel difficulties are piling up so high that I cannot overcome them (reverse)." Loneliness was measured using the 10-item abbreviated version of the UCLA Loneliness Scale (Russell, 1996; Reid and Reid, 2007; $\alpha = 0.879$). Participants were asked to report the quality of interpersonal relationships by responding to five positively and five negatively worded statements. Sample items were "How often do you feel you have nobody to talk to?" and "How often do you feel completely alone?"

Previous Behavior Patterns
The measure of posting frequency was adopted from Weiser's (2015) research to measure the number of posts or user updates per month, using a five-point scale ranging from 1 (*once a month or less frequently*) to 5 (*eight times a month or more*). The use of privacy settings was measured by asking "How often do you use the tags when you share a post?" (1 = *never use*, 2 = *sometimes use*, 3 = *frequently use*) as suggested by Vitak (2012). The tags feature is similar to Friend Lists on Facebook, which enables users to select audiences for a certain post, as shown in **Appendix C**.

Social Characteristics
Audience size was measured adopting the instrument developed by Lankton et al. (2017): we used a five-point scale ranging from 1 (*100 and below*) to 5 (*401 and above*) to measure the total size of each respondent's WeChat audience. Audience diversity was measured using an approach similar to those of Vitak (2012) and Oeldorf-Hirsch et al. (2017). Participants were asked which types of online friends were part of their WeChat social networks: partner/spouse, friends, acquaintances, classmates, coworkers, family, boss, potential employers, teachers, strangers, and others. Audience diversity was calculated by taking the sum of the number of categories selected and using the number as the score (ranging from 1 to 11).

RESULTS

Descriptive Statistics
Supplementary Table 1 shows the descriptive statistics and correlations between variables, as well as **Supplementary Figures 1–3** shows frequency in age, gender, and education.

Differences Between Time Limit Users and Nonusers
Differences in Personal Characteristics
To examine whether the Time Limit user and nonuser groups differed in terms of demographics, personality traits, psychological factors, and previous behavior patterns, we conducted independent sample t tests with the personal characteristics as dependent variables and the grouping variable (user vs. nonuser) as the factor. The scores for posting frequency and

privacy setting use were treated as ordinals; thus, nonparametric group comparisons (Mann–Whitney U test) were conducted on these two variables. Gender was analyzed using Pearson chi-square tests (Gainsbury et al., 2016; shown in **Supplementary Table 2**). Moreover, we applied the false discovery rate (FDR; Benjamini and Hochberg, 1995) for multiple testing corrections with FDR-adjusted value of p reported. The results indicated that compared with nonusers, Time Limit users scored higher on education ($t = 1.85$, $p = 0.066$), posting frequency ($U = 12710.50$, $p = 0.000$) and privacy setting use ($U = 12259.00$, $p = 0.000$) and lower on social anxiety ($t = −1.81$, $p = 0.072$) and perceived stress ($t = −1.78$, $p = 0.076$). Nevertheless, only posting frequency ($FDRp = 0.000$) and privacy setting use ($FDRp = 0.000$) differed significantly between Time Limit user and nonuser groups after applying FDR correction. Also, we found no significant differences in terms of age, gender, life change experiences, self-esteem, self-monitoring, emotional stability, or loneliness between Time Limit users and nonusers.

Differences in Social Characteristics

Supplementary Table 3 presents the independent sample t-test statistics and FDR correction for the social network characteristics. The results revealed that Time Limit nonusers scored significantly higher in terms of audience size ($t = −2.68$, $p = 0.008$) compared with users, after the correction procedure, the FDR-adjusted value of p was 0.032. Meanwhile, there were no significant differences in audience diversity between Time Limit users and nonusers.

Supplemental Analysis

To further detect the influencing factors of Time Limit setting adoption, we conducted a binary logistic regression analysis by setting Time Limit setting use as a dependent variable (nonuser = 0, user = 1). As suggested by Meng et al. (2015), to build upon the results of the previous analysis, we only incorporate factors of personal and social characteristics with significant differences into the regression model. Also, we conducted FDR correction. As shown in the **Supplementary Table 4**, the results show the positive effects of posting frequency ($B = 0.30$, $p = 0.002$, $Exp(B) = 1.35$) and privacy setting use ($B = 0.78$, $p = 0.000$, $Exp(B) = 2.17$) on Time Limit setting use, suggesting that individuals who post frequently and use other privacy settings could be more likely to employ the Time Limit setting. The negative effect of audience size on Time Limit setting use ($B = −0.46$, $p = 0.000$, $Exp(B) = 0.63$) is also demonstrated, indicating that individuals with large audience sizes would be less likely to apply the Time Limit setting. The above results remain significant after the FDR correction, and the supplemental analysis results support part of our prior findings.

Differences Between Low-, Medium, and High-Ephemerality User Groups
Differences in Personal Characteristics

To examine whether the user groups that had opted for low, medium, or high degrees of ephemerality differed from each other in terms of demographics, personality traits, psychological factors, and previous behavior patterns, we conducted an ANOVA with the personal characteristics as dependent variables and the grouping variable (low, medium, or high) as the factor. No violation of the assumption of variance homogeneity was found, such as the nonsignificant result of Levene's statistics (except for self-esteem: $p = 0.023$ and age: $p = 0.010$), for which the Welch F test of robust and asymptotic distribution was adopted (Timmermans et al., 2018). Comparisons between genders were done using the Person chi-square test (Gainsbury et al., 2016). **Supplementary Table 5** presents the ANOVA statistics for personal characteristics. The results revealed that there were significant differences in terms of experiences of life changes, self-monitoring, perceived stress, and privacy setting use between users using the Time Limit setting who had opted for low, medium, and high degrees of ephemerality.

Differences in Social Characteristics

Supplementary Table 6 presents the ANOVA for social characteristics. The results revealed that there were significant differences in terms of audience size between the user groups with low, medium, and high degrees of ephemerality, but there were no significant differences in terms of audience diversity.

Post hoc Tests

For variables that differed significantly between time limit user groups with different degrees of ephemerality, we continued to conduct *post hoc* tests and adopted the FDR correction method to adjust the multiple comparison issue. The results revealed that the low-ephemerality user group scored higher on life change experiences than did the high-ephemerality ($Md = 0.624$, $p = 0.000$, $FDRp = 0.000$) and medium-ephemerality ($Md = 0.540$, $p = 0.000$, $FDRp = 0.000$) user groups. Also, the low-ephemerality group scored higher on self-monitoring than did the high-ephemerality ($Md = 0.247$, $p = 0.006$, $FDRp = 0.012$) and medium-ephemerality ($Md = 0.192$, $p = 0.033$, $FDRp = 0.033$) groups. As for perceived stress, the high-ephemerality user group had higher levels of perceived stress than did the medium ($Md = 0.150$, $p = 0.092$, $FDRp = 0.092$) and low ($Md = 0.225$, $p = 0.025$, $FDRp = 0.050$) groups. Meanwhile, the low-ephemerality user group scored higher on posting frequency than did the high-ephemerality group ($Z = −2.820$, $p = 0.005$, $FDRp = 0.010$), but scored lower compared with the medium-ephemerality group ($Z = −2.109$, $p = 0.035$, $FDRp = 0.035$). The high-ephemerality user group also had smaller audience sizes than both the medium-ephemerality ($Md = −0.279$, $p = 0.094$, $FDRp = 0.094$) and low-ephemerality ($Md = −0.413$, $p = 0.028$, $FDRp = 0.056$) groups. However, we found no differences in privacy setting use between user groups with different degrees of ephemerality.

DISCUSSION

This exploratory study examined how users of the Time Limit setting differ from nonusers in terms of personal and

social characteristics. We also investigated the differences between user groups with different levels of ephemerality. Our findings indicate significant differences in terms of previous behavior patterns (i.e., posting frequency and privacy setting use) and social characteristics (i.e., audience size) between the Time Limit users and nonusers. Moreover, we also found some differences in personal and social characteristics between user groups with low, medium, and high degrees of ephemerality.

Differences Between Time Limit Users and Nonusers

In terms of personal characteristics, our results indicate that users using Time Limit setting differ significantly from nonusers in terms of previous behavior patterns. Specifically, users using Time Limit setting reported higher levels of posting frequency and privacy setting use (i.e., the use of tags) compared with nonusers. This result is consistent with previous studies, which indicate that individuals who frequently use social media are more likely to use privacy settings (Stern and Salb, 2015). Moreover, individuals who use the tags feature may be concerned that some audiences who are blocked from viewing their content might nonetheless learn about certain posts from common friends, resulting in interpersonal conflicts or embarrassment (Choi et al., 2015). These concerns may push them to use the Time Limit feature to hide certain posts and destroy evidence of their blocking behaviors on social media. This finding supports Li et al.'s (2018) study concerning that concerns of using tags may facilitate users to employ the Time Limit setting.

Further, the results of education, perceived stress, and social anxiety did not survive FDR correction, suggesting there were no differences between Time Limit users and nonusers regarding these factors. However, minimizing the type I error increases the type II error (Rothman, 1990), so these results need to be interpreted with caution. In terms of education, our result is contrary to previous studies which highlight education is an important factor of innovation adoption (Litt, 2013; Meng et al., 2015) and social media use (Smith et al., 2011; Bogg, 2017). This may be because that using the Time Limit setting does not need much knowledge, resulting in no differences are found between users and nonusers regarding education. Likewise, we found no differences between Time Limit users and nonusers in terms of perceived stress and social anxiety. However, previous studies indicate the ephemerality of content gives users more control over their information (Morlok et al., 2017) and in turn mitigates their concerns of self-presentation and impression management (Bayer et al., 2016; Choi et al., 2020). One possible explanation is that we fail to capture participants' actual psychological state. Due to social desirability (Krumpal, 2013; Larson, 2019), participants may refuse to report their perceived stress and social anxiety.

In addition, no significant group differences were found for age, gender, or the experience of life changes. Similarly, studies on social media use have reported inconsistent findings regarding users' demographics (Mohamed and Ahmad, 2012; Chang and Heo, 2014; Li, 2014). In particular, our results are contrary to the findings in Brandtzæg et al.'s (2010) study which indicated

that younger adults apply more privacy settings than do older adults. The nonsignificant results may be because that old adults account for a very small percentage in our sample. Also, we found no differences between Time Limit users and nonusers in terms of personality traits regarding self-esteem, self-monitoring, or emotional stability. One possible explanation for this could be the failure of the measures we used to capture individuals' true traits; for example, only two items from a subscale of the Big Five were used to measure emotional stability. We also did not find any difference in loneliness between Time Limit users and nonusers. One possible explanation is that individuals who experience greater loneliness may use the Time Limit setting to maintain an air of mystery to protect themselves, due to the lack of security sense (Cacioppo and Hawkley, 2009), and persons low in loneliness may use this setting for impression management (Sheldon, 2012; Ljepava et al., 2013).

In terms of social characteristics, users using Time Limit setting scored lower than nonusers on audience size, suggesting that individuals with a larger audience size are less likely to use the Time Limit setting. Studies have claimed that users with large audiences post frequently to maintain interpersonal ties and enhance their social capital (Chang and Heo, 2014; Lankton et al., 2017), thereby compelling them to self-censor their posted content and focus on impression management (Vitak, 2012). Accordingly, individuals with large audiences use past posts to exhibit their long-term identities, thereby making it unnecessary for them to use the Time Limit setting. This finding is also consistent with prior research which shows individuals with large audiences tend to share long-term content to interact with audiences and in turn improve the use of gratification (Wakefield and Bennett, 2018). Moreover, we did not find any difference in audience diversity between Time Limit users and nonusers. This may be because individuals with diverse audiences utilize an alternative strategy regarding strictly manage their audiences (e.g., sharing work links with leaders and colleagues, disclosing personal information with family, and discussing gossip with friends) instead of using the Time Limit setting to achieve impression management (Zheng and Zhao, 2020).

Differences Between Time Limit User Groups With Different Degrees of Ephemerality

Our results showed some variance in personal characteristics (i.e., life change experiences, self-monitoring, perceived stress, posting frequency, and privacy setting use) and social characteristics (i.e., audience size) between the low-, medium-, and high-ephemerality user groups. The user group with a low degree of ephemerality (i.e., those who had chosen the 6-month option) had more experiences of life changes than the user groups with medium (i.e., those who had chosen the 1-month option) and high (i.e., those who had chosen the 3-day option) degrees of ephemerality. These findings suggest that individuals who experience more life changes may opt for lower degrees of ephemerality. One possible explanation is that individuals who often experience life changes may opt

not to post content frequently to maintain consistency in their self-presentation (Ayalon and Toch, 2017). As such, they do not need to choose a more restrictive setting. This finding supports prior ephemerality research revealing that ephemeral content in social media helps users manage their evolving self-presentation or identities (Huang et al., 2020; Luria and Foulds, 2021). Also, personal information management practices indicate that life changes could affect one's information management strategies (Whittaker and Massey, 2020).

In terms of self-monitoring, our results showed that the users in the low-ephemerality group had higher levels of self-monitoring than did the users in both the medium- and high-ephemerality groups. These results support the notion that individuals who engage in self-monitoring care more about how others evaluate their past posts (Litt and Hargittai, 2014; Zhang et al., 2021); the Time Limit setting may thus help them to manage their future audience. Individuals who self-monitor may also be effective at adjusting their behaviors to align with social norms (Lankton et al., 2017), suggesting that they are more likely to self-censor when they post content to avoid interpersonal uncertainty; this may lead them to prefer a low rather than a medium or high degree of ephemerality. We also found that users using Time Limit setting in the high-ephemerality group had higher levels of perceived stress than did users in both the medium and low-ephemerality groups. One possible explanation is that individuals with higher levels of perceived stress do not have enough energy to manage their past posts, so they choose the more restrictive setting to hide old content to avoid interpersonal uncertainty in the future (Huang et al., 2020). These findings highlight the important role of perceived stress in social media use which was stated in prior studies (Bevan et al., 2014; Wendorf and Yang, 2015).

In terms of posting frequency, we found that users using Time Limit setting in the medium-ephemerality group posted more frequently than users in the low-ephemerality group; users in the low-ephemerality group posted more frequently than users in the high-ephemerality group. These findings suggest that individuals who post frequently are more likely to choose the 1- or 6-month option rather than the 3-day option. This may be because individuals who post frequently are often active social media users, and they might be concerned that using the restrictive setting (i.e., 3-day option) may leave a negative impression on others (e.g., isolated, not friendly, or aloof; Huang et al., 2020). Thus, active users could not employ the restricted Time Limit setting to avoid damaging their social capital. This finding indirectly supports the point that using Time Limit setting may undermine social interactions especially the use of restrictive ones (Li et al., 2018). Meanwhile, in terms of social characteristics, we found that users using Time Limit setting with larger audiences were more likely to choose low or medium-ephemerality options rather than the high option. Individuals with larger audiences may often utilize the "lowest common denominator" strategies regarding only post information that is suitable for everyone (Hogan, 2010), to deal with posting content to large and diverse audiences. As such, they do not need to utilize the overly restive Time Limit setting.

IMPLICATIONS AND LIMITATIONS

Theoretical Implications

Our findings have several theoretical implications. First, we extend privacy setting research by discussing a specific feature (i.e., Time Limit setting), while previous studies mainly focused on general privacy settings (Litt, 2013; Stern and Salb, 2015). Considering specific characteristics of a popular privacy setting could deepen our understanding of users' attitudes and behavior when using social media. Moreover, our work enriches the literature on ephemerality in social media by exploring differences between user and non-user of an ephemerality-related design, while limited previous studies on ephemerality mainly examined how ephemeral content impacted users' social and emotional experiences through the in-depth interviews (Bayer et al., 2016; Xu et al., 2016; Huang et al., 2020). By investigating how personal and social characteristics varied between users and nonusers of an ephemerality setting, our work adds new knowledge about the availability of ephemerality features in social media.

Second, we highlight the critical role of personal characteristics in ephemerality setting use, by systematically exploring how Time Limit users differ from nonusers regarding demographics, personality traits, psychological factors, and previous behavior patterns. Although several ephemerality studies indicated individual characteristics (e.g., life changes, maturity) would impact ephemeral content engagement in social media (Li et al., 2018; Luria and Foulds, 2021), as well as ephemerality feature could mitigate users' concerns (Bayer et al., 2016; Choi et al., 2020), these studies are fragment and most of them based on the qualitative method. Our work extends these prior studies as we empirically verified that individuals with higher level of posting frequency and privacy setting use would be more likely to employ the Time Limit setting.

Third, our work enriches the knowledge about how characteristics of social networks impact ephemerality setting use, by investigating differences in audience diversity and audience size between Time Limit users and nonusers. Although one study claimed changes in users' social networks could encourage them to engage in ephemeral content (Huang et al., 2020), there is a lack of theoretical understanding about what specific factors of social networks would exert these effects. We demonstrated that individuals with larger audience size would be less likely to employ the Time Limit setting, implying the negative impact of ephemerality feature on social interactions, which enrich the literature on negative consequences (e.g., feeling of loss and undermining social relationships) of using ephemerality in social media (Bayer et al., 2016; Cavalcanti et al., 2017).

Finally, we shed new light on studying ephemerality in social media by detecting the differences between user groups that opted for different levels of ephemerality. While one study described users' perception of short-term and long-term ephemerality and suggested ephemerality could support users' evolving identities through an 8-day qualitative diary study (Luria and Foulds, 2021), it failed to explain why individuals choose different levels of ephemerality in social media. Our work extends prior research by indicating that factors regarding life change

experiences, self-monitoring, perceived stress, posting frequency, and audience size may impact the selection of different degrees of ephemerality. The present study also responds to the call for more detailed research on exploring different degrees of ephemerality in social media (Xu et al., 2016; Huang et al., 2020).

Practical Implications

This study provides useful insights for social media practitioners. In particular, our findings can guide practitioners in designing more effective ephemerality settings on social media platforms. Our findings suggest that posting frequency, privacy setting use, and audience size are significant predictors of whether individuals use or do not use the Time Limit setting on WeChat Moments. Consideration of these influencing factors can help practitioners improve ephemerality features on social media platforms.

Specifically, since our findings show that individuals' other privacy setting use (i.e., the use of tags) could impact how they employ Time Limit setting, platforms could inform users of more details about differences and links between current ephemerality setting and other privacy tools. This is because the final outcome of ephemerality setting use is associated with the implementation of other privacy management strategies. Moreover, individuals with larger audiences preferred not to use the Time Limit setting, indicating that the costs of using this setting (e.g., the loss of the ability to display valuable past posts to enable social interactions) may be a dissuading factor. A possible response from practitioners to this information may be to make ephemerality settings more flexible, such as by enabling a user to toggle ephemerality settings for individual posts rather than for one's entire posting history or by enabling a user to toggle ephemerality settings for certain audiences rather than one's entire audience. Also, we found some variance in personal and social characteristics between Time Limit user groups that opted for different degrees of ephemerality, suggesting that individuals have different ephemerality needs on social media platforms. Building on this insight, practitioners may opt to allow users to set a specific time span (e.g., 1 day) for their past posts to remain visible to their audiences, rather than limiting their time span options.

Limitations and Future Research

This study is limited in a few ways. First, given that social media platforms increasingly provide users with the option to make their posts ephemeral, focusing only on the Time Limit setting in WeChat Moments to explore our research questions limited the generalizability of our findings (Montag et al., 2018). Future studies could investigate the ephemerality settings on other platforms such as Snapchat or Instagram. Also, cross-cultural studies are encouraged to examine the differences in ephemerality setting usage across different cultures.

Second, the majority of our respondents were company employees, and individuals in different occupations may have different perceptions of the Time Limit feature. Future research could investigate a more representative sample to confirm our findings. Moreover, most of our respondents are young people, future studies could explore how old adults use the Time Limit setting. For Research Question 2, we worked with small subgroups,

indicating that our data may not have had enough statistical power to allow for the identification of significant differences regarding personal and social characteristics. Future research could explore this issue further with larger samples. Also, cross-cultural studies are encouraged to explore differences in users' perceptions of using ephemerality settings on social media platforms.

Third, our data were collected through self-reports, which may have limited our understanding of users' actual personal characteristics. This may explain why few significant differences in personality traits and psychological factors were found between Time Limit users and nonusers. Further research could use experience sampling or secondary data to more effectively capture users' personal characteristics.

Fourth, we only compared personal and social characteristics between Time Limit users and nonusers, future studies could examine individuals' other perceptions (e.g., the benefits and costs of using ephemerality settings, social influence, or interpersonal relationships). In particular, regarding factors of privacy setting use, we only explored how using tags influence users' Time Limit setting usage, but failed to consider how the effects of other privacy management strategies (e.g., using multiple accounts, only disclosing non-sensitive information). Thus, future studies could further elaborate these ideas. Meanwhile, this study only considered three factors of personality traits and found few significant differences for these variables. This may be due to the measure we used, and future research could explore the use of more effective measurements (e.g., the Big Five) and could consider other personality traits (e.g., narcissism and shyness; Scott et al., 2018; Yu et al., 2020). We also encourage researchers to investigate how motives may vary between Time Limit user groups with different degrees of ephemerality. In addition, we did not ask participants how long and how often they used the Time Limit feature; whether a user is an early or late adopter of the feature may be relevant as well.

CONCLUSION

Given that most individuals are concerned about the long-term visibility of their past posts, it is becoming more common for social media platforms to provide users with the option to make their content ephemeral. Nonetheless, the number of studies that explore ephemerality settings on social media is limited. Using the Time Limit feature on WeChat Moments as an example, this study is the first to provide empirical insight into the differences between users and nonusers of ephemerality settings. Our findings indicate that compared with nonusers of the feature, users using Time Limit setting post content more frequently, use the Friend Lists feature, and have smaller audiences. Meanwhile, our findings indicate that among Time Limit users, those who have experienced more life changes have higher levels of self-monitoring and less perceived stress, post content more frequently, and have larger audiences are more likely to opt for a low degree of ephemerality (i.e., the 6-month option) rather than a medium (i.e., the 1-month option) or high (i.e., the 3-day option) degree. Customizable settings on social media platforms should be improved over time to support users' evolving attitudes

and behaviors. Thus, it is essential to explore this new ephemerality setting further to provide insights that can facilitate the development of social media platforms.

DATA AVAILABILITY STATEMENT

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

AUTHOR CONTRIBUTIONS

YZ contributed to the idea of the study and wrote the manuscript. HW performed the data analyses and wrote the manuscript.

CL contributed to the analysis and manuscript preparation. SC performed the data collection and helped with the analysis part. All authors contributed to the article and approved the submitted version.

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Vulnerable Narcissism in Social Networking Sites: The Role of Upward and Downward Social Comparisons

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Social networking sites (SNSs) have provided a new platform for people to present their narcissism. The objective of the current study was to investigate the underlying mechanisms between active and passive SNS use and vulnerable narcissism among college students. In achieving this, the study based its method on the media effect and social comparative theory and recruited 529 participants to complete the Surveillance Use Scale, Iowa–Netherlands Comparison Orientation Measure, and Hypersensitivity Narcissistic Scale. The results showed that active and passive SNS use were positively related to upward and downward social comparisons. Active and passive SNS use also indirectly predicted vulnerable narcissism through the parallel mediation of upward and downward social comparisons. This study also revealed the vital role of social comparison in the association between SNS use and vulnerable narcissism.

Keywords: social networking sites, vulnerable narcissism, social comparison, parallel mediate, social media

INTRODUCTION

Narcissism, as a dimensional personality trait, reflects an inflated self-concept and behaviors that intend to maintain this self-concept in the face of reality (Morf and Rhodewalt, 2001). Early research has distinguished two forms of narcissism, namely, the grandiose and vulnerable subtypes (Wink, 1991). These subtypes are significantly different despite their shared commonalities, which refer to feelings of superiority and antagonism, in essence (Krizan and Herlache, 2018). In particular, grandiose narcissism is characterized by overt confidence, extraversion, and dominance, whereas vulnerable narcissism reflects high emotional sensitivity, defensiveness, and the expectation of attention (Miller et al., 2011). In comparison with grandiose narcissism, vulnerable narcissists tend to report higher interpersonal distress (Dickinson and Pincus, 2003), have poorer cognitive flexibility (Ng et al., 2014), and rely more on social feedback mechanisms to regulate themselves (Zeigler-Hill et al., 2008). In social networks, people with grandiose narcissism often make positive self-disclosures in communication, while those with vulnerable narcissism use more objective and indirect communication methods to fulfill their needs (Ozimek et al., 2017). Thus, the emergence of social networks has provided a platform for vulnerable narcissists to express themselves. For instance, studies have found a close relationship between Facebook use and vulnerable narcissism (Ozimek et al., 2018).

A recent study found that over 989 billion Chinese people exhausted ample time communicating on social networking sites (SNSs) by the end of 2020, with most of these users being teenagers (CNNIC, 2021). The internet became a social environment that

could boost positive self-views and had the prime ability to integrate into the lives of people (Twenge, 2013). SNSs, in particular, provide users with unique platforms that allow them to share their information through personalized web pages and interact with others using the internet. These characteristics enable many people to use SNSs to satisfy their need for self-expression (Nadkarni and Hofmann, 2012). However, research has found that narcissists may use the internet to gain admiration and recognition (Dickinson and Pincus, 2003). On the one hand, "weak tie" network platforms, i.e., less reciprocal platforms that lack close emotional support such as Twitter, satisfy the need of vulnerable narcissists to get the attention of many users while averting direct communication (Bergman et al., 2011). On the other hand, the asynchrony of the internet allows individuals to elaborate their information, subsequently increasing their psychological need to get feedback (Hendin and Cheek, 1997). Nonetheless, the characteristics of social networks may also affect individual preferences according to media effects (Valkenburg et al., 2016). Therefore, in addition to the characteristics of the Internet use of narcissists that have been emphasized in previous studies, e.g., Ng et al. (2014), we should also look at the effects of SNSs on individuals in the context of such a considerable number of users. Thus, this study intended to explore the relationship between SNSs and individual preferences vis-à-vis vulnerable narcissism.

SNSs Use and Vulnerable Narcissism

The relationship between SNS use and narcissism has been explored in previous studies, most of which indicate that high levels of narcissism have the tendency to lead to intensive SNS use (Bergman et al., 2011; Gnambs and Appel, 2018). Despite this, the continuous SNS usage of narcissists remains a question. According to the model of "reinforcing spirals" (Slater, 2007), SNS use and narcissism may interact with each other, which leads to the formation of a cross-lagged process. For example, the 1-year longitudinal study by Halpern et al. (2016) found that the frequency of taking selfies of narcissist individuals is directly correlated with the increase in selfie production, which can also raise levels of narcissism over time. Another study by Trepte and Reinecke (2013) confirmed the interaction between SNSs and individual self-disclosure traits, wherein individuals with high self-disclosure traits are more inclined to use SNSs and have more frequent social interactions. Website usage activities also increase the tendency of individuals to self-disclose online. In contrast, media effects or socialization effects reveal that spending time on SNS profiles causes young people to endorse more positive self-views (Gentile et al., 2012). In discussing the relationship between SNSs and vulnerable narcissism, there are at least two directions worthy of our consideration. On the one hand, SNSs provide vulnerable narcissists with opportunities for positive self-presentation. Unlike grandiose narcissists, vulnerable narcissists exhibit low extroversion, which means they are more likely to avoid social activities and appear to be more introverted or withdrawn from the attention of others (Pincus and Lukowitsky, 2010). Thus, SNSs are their "outlets" and tools for self-presentation, as these sites allow individuals to present self-enhancing content on their homepages, wall posts,

and status updates (Kauten et al., 2015). In this way, individuals are encouraged to gradually internalize their perfect self-images that were carefully constructed on the internet, which, in turn, promotes a more positive self-concept (Walters and Horton, 2015). On the other hand, vulnerable narcissists have access to supportive resources coming from SNSs. Vulnerable narcissists are usually highly sensitive to the opinions of others, especially when it comes to negative evaluation. Conversely, they are eager to seek positive reviews such as recognition and praise (Pincus and Lukowitsky, 2010). SNSs encourage users to respond positively to the information of other people, which is why most of the comment sections in SNSs are active (Greitemeyer et al., 2014). This continuous positive feedback can enhance the superiority of an individual and further enhance their self-concept (Gentile et al., 2012), which is the cognitive cornerstone of the narcissistic system (Walters and Horton, 2015).

The utilization of SNSs can be dichotomized into active and passive SNS use (Burke et al., 2010; Verduyn et al., 2015). SNSs provide opportunities for vulnerable narcissistic individuals to promote themselves. Vulnerable narcissists tend to be afraid of their relationships with others because they are protecting themselves from shame and potential negative evaluation during their search for admiration (Casale and Fioravanti, 2018). Conversely, they are more likely to have a stronger preference for online social interactions using platforms with less reciprocation (Casale et al., 2016). These behaviors displayed by vulnerable narcissists may be passively perceived by others, with these passive behaviors in social networks being called passive SNSs. The passive use of SNSs indicates that the communication behavior of an individual only involves browsing information and without necessarily having direct exchanges with other individuals, e.g., viewing the dynamics of others and browsing their web page recommendations. On the other hand, the active use of SNS includes activities that promote communication, e.g., posting status updates and commenting on the moments of others (Burke et al., 2010). Furthermore, various forms of SNS use may affect users differently. For example, active SNS use is often associated with increased life satisfaction (Kim and Lee, 2011) and decreased negative feelings (Fardouly et al., 2015). However, the passive use of SNS negatively predicts depression (Tandoc et al., 2015) and self-esteem (Liu et al., 2017). As pointed out in a study by Panek et al. (2013), future studies about SNS use and personality traits must distinguish between different types of SNSs and different types of use. Therefore, exploring the influence of SNS use on individuals by combining active and passive use is essential.

Mediating Role of Social Comparison

According to previous studies, if an indirect effect does not receive proper attention, the relationship between two variables of concern may not be fully considered (Raykov and Marcoulides, 2012). Social comparison is a universal phenomenon in human social life, but the convenience and immediacy of social networks make these social comparisons happen instantly. This means that social networks have become an important place for individual social comparisons (Coyne et al., 2017) in different ways. First, individuals can obtain information from others, make

social comparisons, and influence their self-evaluation process through social networks anytime and anywhere (Vogel et al., 2014). Second, social comparison is an important means of individual self-enhancement. Specifically, individuals obtain self-evaluation information by comparing what they have with what others possess (Festinger, 1954). Therefore, it is important to understand the functions of social comparison during the use of SNSs.

The social comparison indicates that people define their social traits through comparisons with others (Xing and Yu, 2005). Social comparison can be divided into three types according to its directions. The first is the parallel direction, where the comparison takes place between people with similar levels. The second is the downward direction, which means the comparison happens between the individual and the people who are inferior to them. The third is the upward direction, where the comparison occurs between the individual and the people who are superior to them. Some characteristics of SNSs, e.g., asynchrony and multiple audiences, make it an ideal platform for social comparisons (Lee, 2014). Specifically, active SNS use can stimulate individuals to make upward social comparisons. Given that we always hope to be better than others when the attitudes of people expressed on SNSs collide with the ideas of others, individuals can realize their shortcomings and continuously improve themselves after marking upward comparisons. In addition, people may prefer to browse information to express their opinions on SNSs (Rozgonjuk et al., 2019). Some researchers believe that passive SNS use can predict upward social comparisons (Burnell et al., 2019; Hu and Liu, 2020), which can be induced in individuals by viewing good information (Chou and Edge, 2012). A study by McEwan (2013) claimed that the passive use of social media is done to reduce uncertainty and seek approval. Moreover, another study by Alicke and Govorun (2005) proposed the better-than-average effect, in which people believe that they perform better in many aspects compared with most people.

Contrary to the discussed ideas on the upward comparison, once a user experiences negative emotions after a social comparison, the desire to maintain a positive self could encourage them to adjust the level of a downward comparison (Gong and Zhang, 2020). Thus, people end up spending more time editing and revising the information to be presented to gain the approval of others. Additionally, the "like" and "comment" features on SNSs may encourage individuals to make downward social comparisons after enhancing their senses of superiority and privilege. Downward social comparisons on SNSs can significantly predict individual vulnerable narcissism (Kong et al., 2020). Furthermore, social comparison theory states that self-evaluation is gradually formed in the process of comparing with others (Festinger, 1954). The downward social comparison also improves individual satisfaction, self-esteem, and self-evaluation, which are important characteristics of narcissists (Foddy and Kashima, 2002). Conversely, users might think that other people have better and happier lives because of their good individual images created on SNSs in the process of upward social comparison (Chou and Edge, 2012). In turn, this might reduce their self-evaluation level (Appel et al., 2015).

Therefore, upward and downward social comparisons have probable effects on levels of self-evaluation. In particular, as a subordinate concept of narcissism, vulnerable narcissism may be influenced by social comparisons. Ultimately, the objective of the current study was to provide a deeper understanding of the relationship between the two forms of SNS use and vulnerable narcissism. It also aimed to explore the role of social comparison among these two variables. Based on the related literature discussed in the previous sections, the present study postulated the following hypotheses:
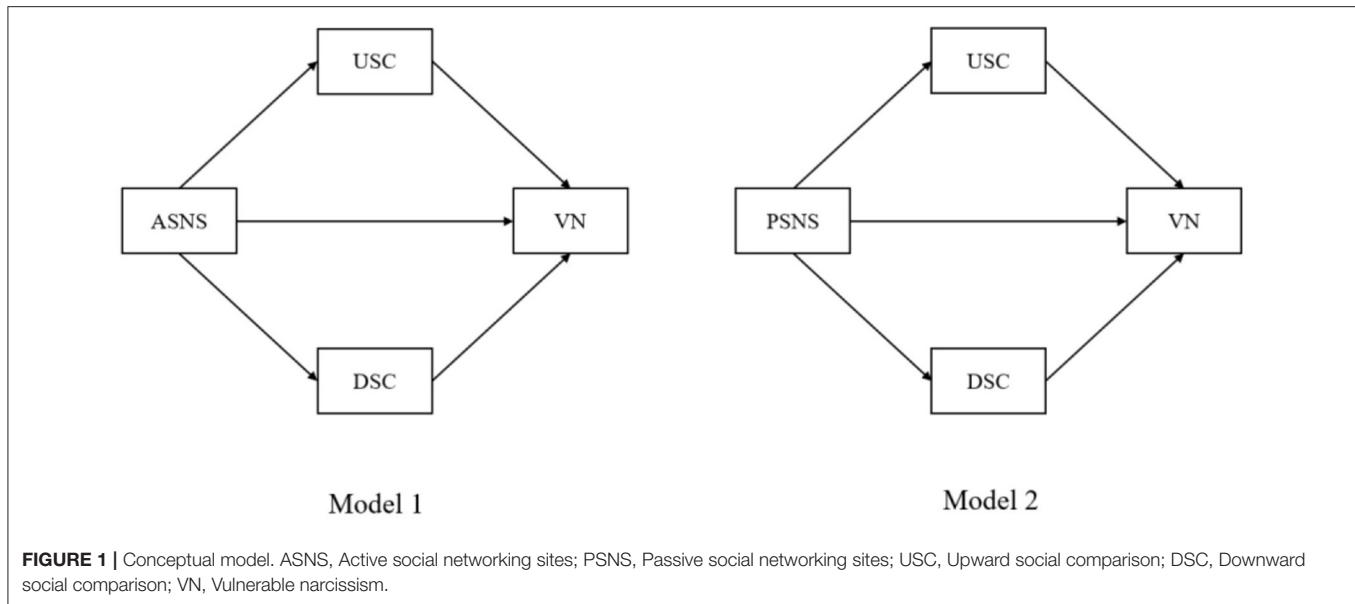
- Hypothesis 1a: Active SNS use positively predicts vulnerable narcissism.
- Hypothesis 1b: Passive SNS use positively predicts vulnerable narcissism.
- Hypothesis 2a: Upward and downward social comparisons mediate the relationship between active SNS use and vulnerable narcissism.
- Hypothesis 2b: Upward and downward social comparisons mediate the relationship between passive SNS use and vulnerable narcissism.

The overall conceptual model is displayed in **Figure 1**.

METHOD

Participants

The study used the pwrSEM app before conducting the investigation to make an *a priori* power analysis for the mediation analysis according to the contributions of a study conducted by Wang and Rhemtulla (2021). We set the regression coefficient of each path to 0.3, which represents the moderate effect size. When the number of simulations was set at 10,000, the results showed that the test had at least 0.95 power in both the direct and indirect effects for the parallel mediation model with a sample size of 600 and an alpha level of 0.05. Data were collected from a university in Wuhan City, Hubei Province, China. There were 600 participants who completed the survey regarding SNSs, social comparison, narcissism, and demographics information, i.e., age and gender, using the Wenjuanxing platform, which is an online and free-charge survey tool. The platform provided us with information about the login time of the participants on the platform and the amount of time taken to complete the questionnaire; the reaction times of all the participants were enough ($M = 457.62$ s, $SD = 78.43$, ranged from 269 to 546 s). After finishing the survey, each participant was rewarded with an amount of ¥5. We used the pwrSEM app (developed by Y. Andre Wang) to make a power analysis for the mediation analysis according to the contributions of a study conducted by Wang and Rhemtulla (2021). We set the regression coefficient of each path to 0.3, which represents the moderate effect size. When the number of simulations was set at 10,000, the results showed that the test had at least 0.95 power in both the direct and indirect effects for the parallel mediation model with a sample size of 600 and an alpha level of 0.05. We then deleted 71 questionnaires with random responses, such as questionnaires in which only one answer was selected and questionnaires in which the answers were in stepped shapes. After the data sorting was administered, the final sample size was reduced to 529. Of all the participants,

FIGURE 1 | Conceptual model. ASNS, Active social networking sites; PSNS, Passive social networking sites; USC, Upward social comparison; DSC, Downward social comparison; VN, Vulnerable narcissism.

133 (74.9%) were men and the mean age was 19.33 years ($SD = 1.1$). All participants were Chinese people and spoke Chinese as their mother tongue.

To benefit from the strong medical and health services provided by the motherland, most Chinese schools have opened normally since September 2020 according to the policies of the Ministry of Education. Students can study and live normally, which largely prevented the impact of the pandemic and brought benefits to our testing. Furthermore, all the participants provided informed consent before participating in the present study. They also completed all the questions online with the guidance and help of our trained psychological graduate students. We ensured the confidentiality and anonymity of the obtained responses. Meanwhile, the University Ethics Committee of our team provided the approval for the study.

Measures
Surveillance Use Scale
The current study measured active and passive SNS use with a revised version of the Surveillance Use Scale by Liu et al. (2017), which was first developed by Tandoc et al. (2015). This scale has been widely used in Chinese samples, with good reliability and validity (Lian et al., 2018). Furthermore, 8 items measured the frequency of SNS use. In the scale, the study measured the active use of SNS in items 1–4, e.g., "write a status update," and measured the passive use of SNS in items 5–8, e.g., "view a friend's photo." We required the participants to rate each item on a scale of 1 (never) to 5 (very often). A higher score implied that the participant had a greater frequency of SNS use. The alpha coefficient of the active SNS use subscale was 0.85 and 0.84 for the passive SNS use subscale.

Iowa–Netherlands Comparison Orientation Measure (INCOM)
This study measured social comparison using the INCOM revised by Bai et al. (2013), which was first developed by

Gibbons and Buunk (1999). However, the scope of comparison in the questionnaire was limited to "on SNS" to improve the reliability of measurement content which is according to the method in the study of Niu et al. (2016). The scale comprised 12 items with a 5-point Likert-type response from 1 (strongly disagree) to 5 (strongly agree). Notably, determining the preferred method of comparison of the participants by calculating their scores was impossible. Thus, the sample items include "In social networking sites, I often compare with others who are better than me" and "When I mess up, I often think others who do things worse than me in social networking sites." The alpha coefficient of the upward social comparison subscale was 0.85 and 0.84 for the downward social comparison subscale.

Hypersensitivity Narcissism Scale (HSNS)
The present study used the HSNS to measure vulnerable narcissism, which was revised by Wang (2008) and first developed by Hendin and Cheek (1997). The scale has been widely used, with high reliability and validity (Given-Wilson et al., 2011; Brookes, 2015). The scale comprises 10 items with a 5-point Likert-type response from 1 (strongly disagree) to 5 (strongly agree). Sample items include "I feel that I am temperamentally different from most people" and "My feelings are easily hurt by ridicule or by the slighting remarks of others." We then calculated the score of each participant and considered the higher scores of the participants as showing higher levels of vulnerable narcissism. The Cronbach's alpha for the scale in the present study was 0.72.

Statistical Analysis
For data analysis, we performed descriptive analyses with SPSS 24 (IBM, New York). Based on our hypothesis, Pearson's correlations were used to analyze the bivariate correlations between the variables. Subsequently, we conducted mediation analyses with the PROCESS macro for SPSS (Model 4) provided by Hayes (2017), who, according to his contributions, stated

TABLE 1 | Descriptive statistics and inter-correlations between main variables.

Variables	M	SD	1	2	3	4	5
1 ASNS	2.613	0.608	–				
2 PSNS	3.015	0.773	0.514***	–			
3 USC	3.165	0.806	0.156***	0.110*	–		
4 DSC	2.365	0.725	0.089*	0.106*	0.186***	–	
5 VN	2.521	0.663	0.104*	0.094*	0.200***	0.255***	–

N, 529. ASNS, Active social networking sites; PSNS, Passive social networking sites; USC, Upward social comparison; DSC, Downward social comparison; VN, Vulnerable narcissism. *p < 0.05; ***p < 0.001, two-tailed p for all tests.

that "the indirect effect of X on Y through $M_i = a_i \ b_i$, and model 4 allows up to 10 mediators operating in parallel (p.7)." In addition, previous studies have revealed that individuals of different genders may differ in their performances in social comparison (Guimond et al., 2006) and narcissism (Grijalva et al., 2015). Thus, it was treated as the control variable in this study to eliminate potential confounding effects.

RESULTS

Descriptive Statistics

Table 1 exhibits that all the variables were significantly correlated. Specifically, active and passive SNS use were positively associated with vulnerable narcissism ($r = 0.104$, $p < 0.05$; $r = 0.094$, $p < 0.05$), upward social comparison ($r = 0.156$, $p < 0.001$; $r = 0.11$, $p < 0.05$), and downward social comparison ($r = 0.089$, $p < 0.05$; $r = 0.106$, $p < 0.05$). Moreover, upward and downward social comparisons were positively associated with vulnerable narcissism ($r = 0.2$, $p < 0.001$; $r = 0.255$, $p < 0.001$).

Mediation Analyses

Based on the results of the correlation analysis, we used Model 4 in the PROCESS macro to test the mediating effect. We also controlled for gender in both Model 1 and Model 2 to rule out the possible effects of those variables. The results showed that leaving out the control variable did not change the general results. Active SNS use positively predicted upward social comparison [$\beta = 0.148$, 95% CIs (0.065, 0.232), $p < 0.001$, $R^2 = 0.049$] and downward social comparison [$\beta = 0.09$, 95% CIs (0.049, 0.176), $p < 0.05$, $R^2 = 0.013$]. Passive SNS use also positively predicted upward social comparison [$\beta = 0.091$, 95% CIs (0.006, 0.176), $p < 0.05$, $R^2 = 0.035$] and downward social comparison [$\beta = 0.112$, 95% CIs (0.026, 0.198), $p < 0.05$, $R^2 = 0.013$]. In Model 1, mediation analyses found that upward and downward social comparisons served as the predictors for vulnerable narcissism [$\beta = 0.149$, 95% CIs (0.064, 0.234), $p <0.001$; $\beta = 0.222$, 95% CIs (0.139, 0.306), $p < 0.001$; $R^2 = 0.093$], but active SNS did not predict vulnerable narcissism ($\beta = 0.061$, $p > 0.05$) (as shown in **Figure 2**). The results also revealed that the indirect relationships between active SNS use and vulnerable narcissism through upward and downward social comparisons were significant [95% CIs (0.006, 0.044), (0.001, 0.043)] (as shown in **Table 2**). In Model 2 (as shown in **Figure 2**), upward and downward social

comparisons served as the predictors for vulnerable narcissism [$\beta = 0.154$, 95% CIs (0.069, 0.238), $p < 0.001$; $\beta = 0.221$, 95% CIs (0.137, 0.304), $p < 0.001$; $R^2 = 0.092$], but passive SNS did not predict vulnerable narcissism ($\beta = 0.055$, $p > 0.05$). The indirect relationships between passive SNS use and vulnerable narcissism through upward and downward social comparisons were also significant [95% CIs (0.001, 0.032), (0.006, 0.047)] (as shown in **Table 2**). Therefore, upward and downward social comparisons act as full mediators in Model 1 and Model 2.
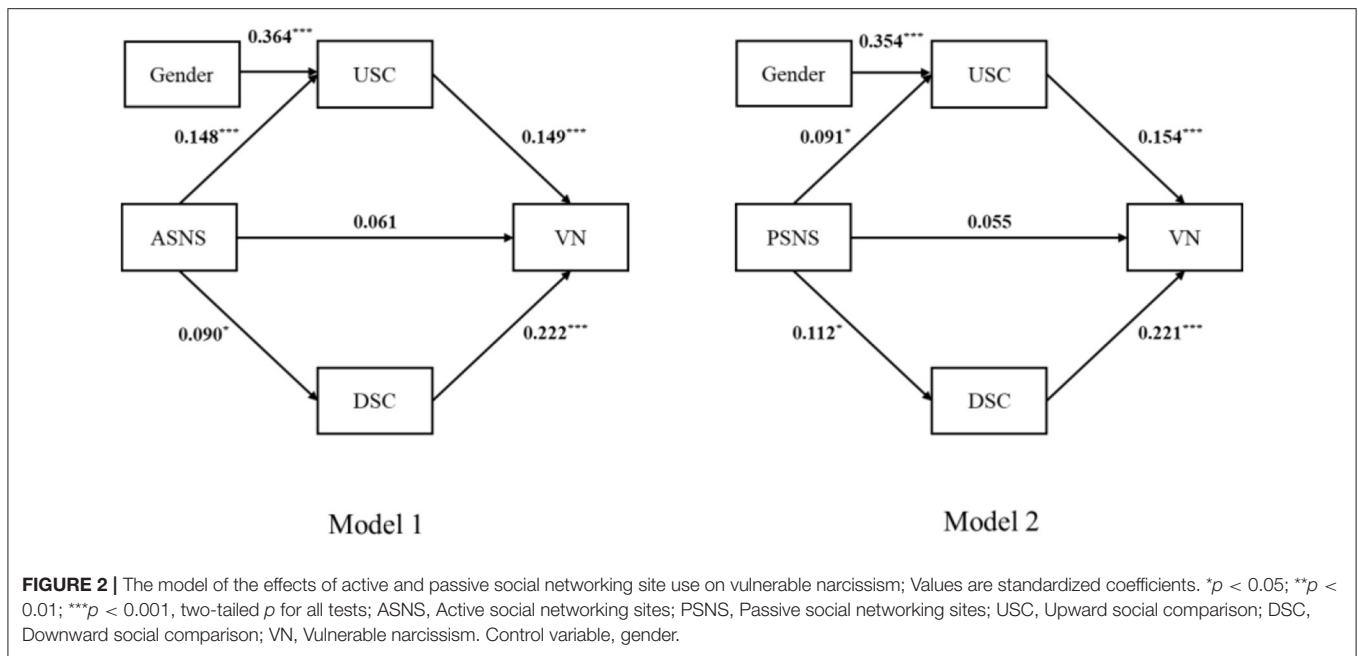
DISCUSSION

Social Networking Site Use and Vulnerable Narcissism

This study showed that active or passive SNS use did not significantly relate to vulnerable narcissism. However, active and passive SNS use can indirectly predict the vulnerable narcissism of an individual. The findings of the present study were inconsistent with previous research results, which found that active and passive SNS use have different effects on individuals (Chen et al., 2016; Wang et al., 2018). These results are not surprising. As some researchers have pointed out, most media effects are indirect rather than direct, which means that we need to specify the boundary conditions of media effects (Valkenburg et al., 2016). Intervening variables should not be ignored even if we cannot assert the impact of SNS use on narcissism just because SNS provide opportunities for high-level narcissists to improve themselves and seek attention (McKinney et al., 2012; Walters and Horton, 2015). The mediating mechanism can provide essential explanations on how and why media effects occur. Therefore, this mediating mechanism can be helpful in establishing prevention and intervention programs.

Mediating Role of Social Comparison

The result revealed that upward and downward social comparisons are the parallel mediating variables in the relationship between SNS use and vulnerable narcissism, which supports Hypothesis 2. Both active and passive SNS use could show pretty much identical relationships in both models. On the one hand, both active and passive SNS use could significantly predict social comparison. First, individuals publish a lot of information about themselves on SNSs; simultaneously, they inevitably become the audience for other users when posting content (Vogel et al., 2014). Therefore, the social comparison seems inevitable in the process of using SNSs. In addition, individuals actively choose one or a certain class of objects for comparison according to different purposes, e.g., individuals choose upward social comparison to motivate themselves or deliberately choose downward social comparison to maintain a good sense of themselves. As pointed out by the study of Festinger (1954), social comparison is a process by which individuals actively seek relevant information from others to obtain an accurate self-evaluation. The positive information of others and the visibility of the feedback presented on SNS encourage individuals to make upward social comparisons (Fox and Vendemia, 2016). Moreover, in the absence of motivation for an individual to perform active comparisons, a social comparison

FIGURE 2 | The model of the effects of active and passive social networking site use on vulnerable narcissism; Values are standardized coefficients. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$, two-tailed p for all tests; ASNS, Active social networking sites; PSNS, Passive social networking sites; USC, Upward social comparison; DSC, Downward social comparison; VN, Vulnerable narcissism. Control variable, gender.

TABLE 2 | Indirect effects with upward and downward social comparisons as mediators.

		Indirect effect	Boot SE	Boot 95% CI	
				LL	UL
Model 1	Total indirect effect	0.042	0.015	0.015	0.072
	USC	0.022	0.010	0.006	0.044
	DSC	0.020	0.011	0.001	0.043
	USC-DSC	0.002	0.015	−0.026	0.031
Model 2	Total indirect effect	0.039	0.013	0.016	0.065
	USC	0.014	0.008	0.001	0.032
	DSC	0.025	0.011	0.006	0.047
	USC-DSC	−0.011	0.013	−0.038	0.015

N, 529. Bootstrap resample size, 5,000; SE, Standard error; LL, Lower limit; UL, Upper limit; CI, Confidence interval. Control variable, gender.

may happen automatically as long as the information of others is presented (Mussweiler and Rüter, 2003; Chatard et al., 2017). Previous studies have indicated that passive SNS usage is positively associated with upward social comparison (Lee, 2014; Zheng et al., 2020), and the results revealed that social comparison may be an unconscious and spontaneous behavior. Thus, a social comparison might happen automatically in the process of obtaining the information of other people regardless of the individuals use the network actively or passively; this is especially evident to those who spend more time on social networks (Lee, 2014). Hence, active SNS use and passive SNS use showed similar patterns among different models.

On the other hand, the results showed that both upward social comparison and downward social comparison could significantly predict vulnerable narcissism. There are at least two reasons that can explain this phenomenon, one being the assimilation effect on positive information. Many previous studies have focused on the negative effects of upward social comparison on individuals, e.g., Pang (2021). However, few studies have found that upward social comparison can be used as a strategy for the long-term self-improvement of individuals, i.e., Michinov and Bavent (2001). Thus, when an individual faces social comparison information, the self-evaluation level displaces toward the comparison goal (Collins, 1996). For example, a study on Twitter found that users might post more tweets after viewing the positive tweets of others (Ferrara and Yang, 2015). Furthermore, it has been found that upward social comparisons promote the highest levels of motivation for self-improvement compared with downward social comparisons (Peng et al., 2019). Therefore, an individual may show their narcissism when they increase their self-evaluation level when facing upward comparison information. The second reason for both upward and downward social comparisons significantly predicting vulnerable narcissism is the contrast effect induced by the negative information of other people. According to the previous findings, compared with people who had fewer likes on social networks, participants experienced more positive emotions (Rosenthal-von der Pütten et al., 2019) and vulnerable narcissists had the tendency to pay great attention to themselves, eager to be affirmed and praised by others (Pincus and Lukowitsky, 2010). Moreover, the present study also found a significant positive correlation between downward social comparison and vulnerable narcissism, which was consistent with the previous studies (Kong et al., 2020). Thus, the social comparison makes efforts in narcissism.

Limitations and Directions

This study holds certain limitations. First, active and passive SNS use exist in social networking activities simultaneously, which may entail a mutual influence. The personalities and beliefs of individuals may influence their choices of

information and communication style. In turn, media use may also affect individual attitudes and behaviors. Future research can use a longitudinal design to investigate the relationship between SNSs and vulnerable narcissism in a dynamic interaction process. Second, the current study used a self-report method, in which some social desire effects may exist. Future studies can explore the relationship between SNSs and vulnerable narcissism in behavioral and neuroscience experiments. Third, due to the inherent imperfections of statistical procedures, the alpha correction, and other statistical methods, e.g., Bayesian analysis, should be considered to clarify the studied relationship further.

CONCLUSIONS

This study demonstrated that close relationships exist between SNS use and social comparison and vulnerable narcissism. Moreover, upward and downward social comparisons were the parallel mediators in the relationship between active or passive SNS use and vulnerable narcissism.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics Committee of Central China Normal University. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

FK conceived the idea and conducted the literature searches. MW and FK wrote and revised the manuscript. XZ and XL collected the research data and performed the statistical analysis. XS polished the language of this manuscript. All the authors read and approved the submitted version.

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"Why Are You Running Away From Social Media?" Analysis of the Factors Influencing Social Media Fatigue: An Empirical Data Study Based on Chinese Youth

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In the digital era, social media is increasingly permeating the fragmented lives of people. While enjoying the convenience and speed of online socializing, people are gradually surrounded by a variety of information. Through observations and interviews, we found that young people are plagued by negative comparisons, interaction dysfunction, information overload, social overload, and intergenerational communication in the process of participating in social media. Increasing numbers of young people feel overwhelmed in the process of online socialization and the phenomenon of social media fatigue (SMF) gradually spreads. This study combined the existing relevant theoretical models of the influencing factors of SMF and the real-life empirical materials of youth groups. Furthermore, this study enriched into new research variables and validated the data of relevant variables through a questionnaire survey ($n = 663$) to explore the influencing factors of SMF of youth groups and inductively analyze the inner logic of the emergence of SMF among such groups. It was found that negative comparison, interaction dysregulation, information overload, social overload, self-efficacy, and impression management all had significant positive effects on SMF behaviors, while privacy anxiety and intergenerational communication had no significant positive effects on SMF behaviors.

Keywords: social media, youth group, social media fatigue, influencing factors, social escape

INTRODUCTION

The emergence of social media plays an important role in promoting offline social activities and related identity construction (Hercheui, 2011). According to the 47th "statistical report on the development of Internet in China" released by CNNIC, there are more than 900 million Internet users in China, accounting for one-fifth of the Internet users around the world. More and more users share information and establish contacts with others through social media. Among them, young people who are the main users of social media have different degrees of dependence on social media in their daily work and study life and have better psychological and behavioral experience in the use of social media. However, with the explosive development of social media, some "dark side" has gradually emerged in recent years (Salo et al., 2018). Some young people spend most of their time on social media and even indulge in it. However, after immersion and awakening, they

become tired of social media. Many users begin to show resistance and fatigue, and the loss of users has gradually become an urgent crisis for each social platform.

As early as 2011, Gartner, a market research organization surveyed 6,295 social media users aged 13–74 in 11 countries and found that the social media market has become mature. Some market segments have shown signs of social fatigue, and 24% of the users now use social media less frequently than when they first used it (Goasduff and Pettey, 2011). In 2018, Hill Holliday released the "Z generation social media survey report," which shows that more than half of young people have reduced their use of social media, and 34% of young people have stopped accessing social media (Hill Holliday, 2018). When users are surrounded by a lot of information and need to spend a lot of time dealing with these social contacts, some users will choose to stay away from and give up social media. This shows that the activity of social media is declining, and many researchers say that social media fatigue (SMF) may be the direct cause of this phenomenon. At present, the academic circles must calm down, re-examine, and reflect on the relationship between technology and human beings. They must pay attention to the situation of young people as Internet aborigines, bid farewell to alienation, get rid of the control of social media, and explore the way of subject freedom and extrication. Based on this, this study discussed the following issues:

(1) Why do young people escape from social media? What are the reasons for escape and fatigue?

(2) Which factor has the highest contribution rate in the model? How to explain?

LITERATURE REVIEW

Social Media Fatigue

In the academic world, Adam Patrick first noticed that people were inundated by an endless stream of social networking sites. He first proposed the concept of SMF, and then SMF aroused widespread concern. At present, researchers at home and abroad mainly define the concept of SMF from the perspective of emotion and behavior. Some scholars believe that communication media fatigue is a psychological concept, which is the negative emotional response of the audience to social media activities, such as fatigue, boredom, disinterest, and indifference, among others (Ling et al., 2015). Researchers from the perspective of behavior mostly define it as a kind of negative use behavior. Some scholars point out that SMF is not only used to describe depression, exhaustion, and other feelings but also includes low willingness to participate in social media (Bernstein, 2009). The study of Bright and other scholars defines SMF from the perspective of information overload, which is the tendency of the audience to escape from social media when they are exposed to excessive information (Bright et al., 2015).

In addition, relevant studies have proved that when individuals are exposed to information beyond their effective management and scope, they will produce negative emotions and psychological pressure (Cao and Sun, 2018). There are also many studies focusing on the relationship between social fatigue and the psychological state of adolescents. For example, social fatigue is more likely to increase the depression and anxiety of adolescents (Dhir et al., 2018), which will lead to a certain degree of social escape (Zong et al., 2019). In order to get rid of the pressure and negative emotions, some users gradually become numb or turn a blind eye to a large amount of information on social media. This behavior of deliberately avoiding and reducing the use of social media or even giving up the use of social media is called SMF (Bright et al., 2015). It also allows individuals to control, interrupt and switch to social media (Sajad et al., 2018).

Influencing Factors of SMF

More and more studies have proved that "overload" is usually divided into social overload and information overload, and both have an important impact on SMF (Sasaki et al., 2015). At the same time, technical pressure is also the main reason for the SMF of users (Lee A. R. et al., 2016). Another study on Facebook found that "platform attribute," "self-immersion," "information content," "member interaction," and "life cycle" of social media may affect social fatigue (Ravindran et al., 2014). In addition, some studies have proved that the daily living environment and personality characteristics of individuals are also important causes of social fatigue (Lee S. B. et al., 2016).

Although previous studies have explained the influence mechanism of overload and technical pressure on SMF in more detail, the main discussion is the negative impact of the influencing factors of social fatigue on the use of social media of users, and less attention is paid to the social interaction attribute and privacy anxiety of social media. At the same time, the task processing of social media mostly exists in young people, who will spend more time on social media or deal with other similar activities (Voorveld and Goot, 2013). They will pay more attention to their impression management and privacy. Through the interview conducted in this study, we found that the privacy anxiety and relational pressure of social media can make young people feel pressure, fatigue, and even anxiety and depression. In order to better understand the phenomenon of SMF of young people, this study explored the SMF of users from the four aspects namely, Relational stress, overload, personal-psychological characteristics, and social behavior characteristics. Furthermore, this study enriched relevant new variable conditions, and further developed and updated the influencing factor model of SMF behavior of young people.

RESEARCH HYPOTHESIS

Relational Stress (Negative Comparisons, Interaction Dysfunction)

According to the social psychologist Gergen, the whole world is constructed by relationships, our environment is mutually constitutive, and there is no separate self, much less a consciousness that is separated from objects which all means that everything is a product of relationality (Gergen, 2009). The study of Rosa incorporated the ideas of Logan and also emphasized that "self-perceptions and identities are formed from actions, experiences, and relationships, as well as from the

space-time, social world, and physical world in which we live." They further accounted that nowadays, we no longer have the ability to integrate these contexts into our own experiences and actions, we lose control, and we become "ego-depleted" amid overwhelming commitments. Also, we have lost control and are "self-exhausted" amid our own affairs (Rosa, 2013). This "self-exhaustion" is the most pronounced feeling of SMF. In this way, the theoretical perspective of "relational constructs" is naturally linked to SMF as a social theoretical path to explain the problem. This article reflected this relational stress through negative comparisons and interaction dysregulation because interactions can represent relational constructs at the behavioral level and are easier to measure.

In terms of negative comparisons, the study of Swallow found that information posted by others through social media causes users to make correlational comparisons based on their own situations. When users perceive themselves to be at a disadvantage in online social comparisons, they are prone to negative self-evaluations and may even reduce their social media use due to low self-esteem and anxiety (Swallow and Kuiper, 1988).

In terms of interaction dysfunction, when youth groups engage in social media, the online interaction style can make them feel meaningless. Moreover, when faced with cold technological media, they cannot get a sense of the interaction of offline social life. This makes online socializing evoke a feeling of emptiness, intrusiveness, or even negative indifference to them, producing an imbalance in interpersonal interaction (Selwyn, 2003). Online socialization can over-immerse them, leading to a lot of wasted time and out-of-control self-immersion. This interaction dysfunction constructs a theoretical perspective that becomes an explanatory path for the factors influencing SMF. Based on this, this article proposed the following hypotheses.

H1: Negative comparison has a significant positive effect on SMF behavior of youth groups.

H2: Interaction dysregulation has a significant positive effect on SMF behavior of youth groups.

Overload (Information Overload and Social Overload)

Social media carries a lot of information. Although some information is beneficial to individuals, the receptive and cognitive abilities of people are limited (Lang, 2010). When the amount of information people contact exceeds their ability to accept information, information overload will occur (Eppler and Mengis, 2004). Through interviews and observation, the research team found that in social media with complex information, young people cannot get access to the information they really want to know because they push too much content. Some individuals with low media literacy need to spend a lot of time to identify, which leads to the low efficiency of social media use (Bawden and Robinson, 2009). At the same time, social media platforms usually push much invalid information, such as advertising and false information, among others, which leads to confusion of platform information and negative emotions of individuals.

As an important factor of social fatigue, social overload has been verified in previous studies. Social overload refers to the state in which an individual perceives that he must respond to the excessive social support demands of others on social media (Maier et al., 2015). It also reflects the burden on social media providers caused by the excessive social support needs of others. Some scholars believe that the number of interpersonal relationships that individuals can control at the same time in cognition is about 150. Once the number exceeds the upper limit, there will be no more ability to manage interpersonal relationships (Dunbar, 1992). However, the number of online social interactions on social media has far exceeded this number (Walther et al., 2008). Through interviews and observation, we also found that the interpersonal relationships that young people need to maintain are mainly coming from work, school, kinship, and friends, among others. They need to invest a lot of time to maintain social relations, so they will feel tired. Based on this, this article forwarded the following hypotheses:

H3: Information overload has a significant positive impact on the SMF behavior of youth groups.

H4: Social overload has a significant positive impact on the SMF behavior of youth groups.

Personal-Psychological Traits (Self-Efficacy and Privacy Anxiety)

Regarding the dimension of psychological characteristics of the youth group, it is divided into two dimensions which measured self-efficacy and privacy anxiety. According to the study of Bandura, self-efficacy refers to the ability and beliefs of a person to organize and perform specific actions (Bandura, 1986). Self-efficacy then has an important role for youth groups during social media use. In a general sense, as social media use increases, the self-efficacy of individuals strengthens. In turn, their expectations of social media use increase, and their experience of engagement further encourages social media use behavior, resulting in a decrease in social fatigue (Eastin and Larose, 2000). When youth groups believe that the skills they have cannot use social media or cannot play various types of social media fluently, they will refuse or reduce the frequency of using social media. Some scholars call this phenomenon as self-efficacy of using social media, which mainly refers to the degree of confidence that users can use the skills they have to complete a certain task. In this regard, self-efficacy affects the behavioral choices, cognitive processes, emotional processes of people, etc. (Huang and Yuan, 2018). Therefore, this study concluded that the more exposure to social media sites, the higher the self-efficacy of individuals and the less likely they are to develop SMF behaviors. Conversely, the lower the self-efficacy, the more likely individuals are to avoid social media and the more likely they are to develop SMF behaviors.

At the same time, in the process of using social media, people will have anxiety because of the privacy exposure problem. Worrying about the privacy exposure problem, they are afraid that the use of social media will expose their own identity information, home address, and phone number, among other salient information. The problem of social media privacy disclosure is mainly due to the existence of some

social media platforms "excessive authorization" to disclose user privacy. User information privacy is very attractive to operators, especially when user privacy issues are provided by social media platforms to advertisers or unidentified business, including user identity information confirmation problems (Chen and Michael, 2012). Browsing information disclosure, or privacy disclosure of health status, family status, and work status can infringe personal interests. Some individuals will worry about privacy disclosure and generate anxiety in the process of participating in social media, which leads to social fatigue behavior (Malhotra et al., 2004). Based on this, this article puts forward the following hypotheses:

H5: Self-efficacy has a significant negative impact on the SMF behavior of youth groups.

H6: Privacy anxiety has a significant positive impact on the SMF of youth groups.

Social Behavior Traits (Impression Management and Interaction Disorder)

Based on previous research and participant observation of SMF in youth groups, this study measured two dimensions of social behavior traits in youth groups namely, individual impression management and intergenerational communication. Individual impression management is a determining factor in social media use, and social media is also a presentation booth for shaping the "idealized" self (Gibbs et al., 2013). The impression management of young people is very important in their online social activities, and they can construct and manage their personal image by posting dynamics. Because they attach more importance to their online social image, this impression management can easily bring a psychological burden to users over time. Impression management theory holds that in order to achieve a certain goal, people may try to manage or change the perception of others to their own impression, and any behavior of individuals or organizations on social media in the network environment may affect their impression. At the same time, scholars also found that in order to create a good image, individuals sometimes have to suppress their emotions and hide their personalities to please others, which makes them feel anxious, tired, and even lose confidence in social media (Jones and Harris, 1967).

In addition, intergenerational communication is also an important variable to be considered in this study. Young people are the natives of the Internet and they are labeled as independent and maverick. They are quick to receive information from the outside world, tend to communicate online, and insist on their own opinions. This can lead to misunderstandings and conflicts. As a result, the intergenerational gap between the two parties is widening, which then affects family relationships. For caring and educational purposes, fathers sometimes take means to interfere with online activities which may reduce the interest of their offspring in social media use (Lee et al., 2018). Based on this, this article proposed the following hypothesis:

H7: impression management has a significant positive impact on the SMF behavior of youth groups.

H8: poor intergenerational communication has a significant positive impact on the SMF behavior of youth groups.

Combined with the above assumptions, this article built a research model on the influencing factors of youth SMF behavior, as shown in **Figure 1**.

RESEARCH METHOD AND DATA COLLECTION

The main research method of this study was in-depth interview method and questionnaire method. The research subjects were young social media users aged 18–35 because there is no unified standard for the age definition of the youth group. According to the age definition of youth from the WHO, people aged 18–44 are considered as youth group, and more previous studies also followed this youth group age division standard. Therefore, with reference to previous studies, the subjects selected for this study were consistent with the age range of the youth group. This study did not specify a specific social media for the participants but asked them to choose a social media application that they often use.

First, this study conducted participant observation and in-depth interviews on the social fatigue behaviors of the youth group through qualitative research methods to grasp their daily lifestyles and the composition of their virtual social relationships through the observation of their social fatigue behaviors. However, the observation could only give a general grasp of their SMF behavior, but not a deeper understanding of their psychological motivation. Therefore, this article selected 16 participants with a high willingness to cooperate to conduct semi-structured in-depth interviews. The interviews were conducted online and offline. The research questions were designed according to previous studies. Variables of different dimensions such as relational stress, intergenerational relationships, online identity management, and individual psychology were extracted from the interviews. The interviews also included their growth experiences and the deep psychological motives of SMF behaviors, combining empirical and theoretical materials from shallow to deep.

Next, questionnaires were conducted for the relevant variables to further verify the scientific validity and influence degree of the variables. The questionnaire observation indexes involved questions on a 7-level Likert scale which was set up on a scale of 1–7, with 7 representing "strongly agree," 4 representing "neutral," and 1 representing "strongly disagree." In order to avoid semantic and structural problems of the items and to ensure the convergent and discriminant validity of the items to be measured, 30 masters and doctoral students were invited to conduct a pre-survey of the questionnaire. Furthermore, they were invited to discuss the ambiguities and misunderstandings and to delete and adjust the inappropriate items in the questionnaire.

The survey questionnaire was distributed online in the form of snowball on Weibo, WeChat, QQ community, and friends circle, covering the whole of China. The questionnaires were collected through the professional survey distribution platform "Questionnaire Star" (www.wjx.cn). Participants who agreed to complete the questionnaire were informed of the anonymity of

FIGURE 1 | Theoretical model.
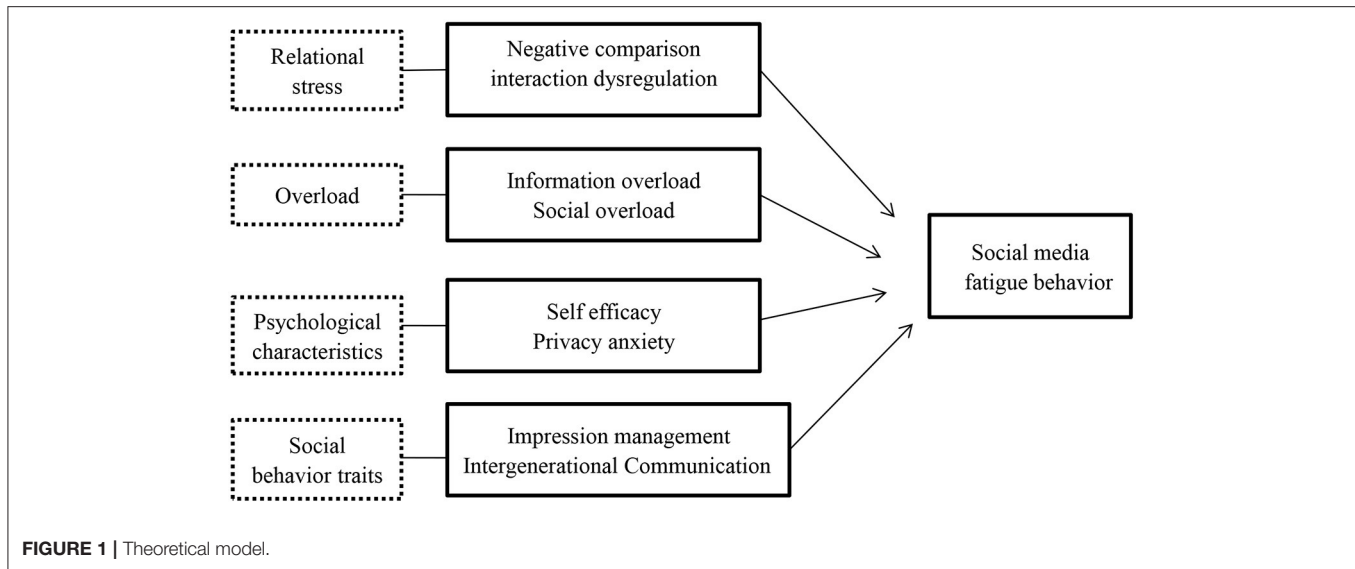
the study. A total of 700 questionnaires were collected, including 500 online questionnaires and 200 offline questionnaires. Thirty-seven unqualified questionnaires were excluded, e.g., unqualified answers, less time spent, inconsistencies, etc., and 663 questionnaires were valid, with a 94% qualification rate. The male sample accounted for 55% and the female sample accounted for 45%. The age of the sample was concentrated between 18 and 23 years old, accounting for 47% of the total number of samples. In the education part, the sample was concentrated on those who have a bachelor's degree, which accounted for 61%. In terms of the frequency of updating personal home page information, the samples focus on publishing information many times a month, accounting for 46%. The basic demographic variables are tabulated as shown in **Table 1**.

Variable Measurements and Reliability Testing

The questionnaire involved variables that were measured as much as possible using well-established scales that have been used in related studies, but the questioning of some specific items was fine-tuned to suit the characteristics of the youth group. For the measurement of negative comparisons refer to the scale developed by the study of Gan et al. (2018). For measures of interaction dysregulation, refer to the scale developed by the study of Bright et al. (2015). For measures of social overload, refer to the scale designed by the study of Maier et al. (2015), while for information overload, refer to the scale designed by the study of Koroleva (2010). For measures of self-efficacy and privacy anxiety, refer to the relevant scales in the study of Zhang et al. (2016). The impression management and intergenerational communication scales were selected using the scale designed by the study of Goswami (2012). Lastly, for the measurement of SMF, the main reference was the SMF Scale of Maier et al. (2012).

In this study, IBM SPSS statistics 24 (International Business Machines Corporation, Armonk, New York) was used for data analysis. Reliability analysis was used to calculate the Cronbach alpha coefficient of the scale to judge the stability of the scale.

TABLE 1 | Statistical table of basic information of effective samples.

Statistical items	Specific content	Statistical value	Percentage
Gender	Male	367	55%
	Female	296	45%
Age	18–23	309	47%
	24–29	231	35%
	30–35	123	18%
	Over 35	0	–
Educational background	High school	87	13%
	Undergraduate	402	61%
	Master	153	23%
	Doctor	21	3%
Frequency of updating dynamics	Multiple times per day	71	11%
	Multiple times per week	186	28%
	Multiple times per month	304	46%
	No posting	102	15%

Validity analysis was mainly based on kmo value and Bartlett sphere test. The reliability of the total scale was 0.813, while the reliability of the subscales is higher than 0.7 and most of them are more than 0.8. All these indicated that the internal consistency of the scale in the questionnaire is high and the reliability of the scale is ideal. The kmo value of each variable was above 0.7, and the sig value of the Bartlett sphere test was 0.000, indicating that the validity of each scale was high. The reliability and validity of each scale are shown in **Table 2**.

DATA ANALYSIS

Correlation Analysis and Regression Analysis

Using the method of correlation analysis can test the correlation between independent variables and dependent variables. In this study, the independent variables belonged to the fixed

TABLE 2 | Items and reliability and validity of the scale.

Variable	Code	Measuring project	Cronbach's Alpha	KMO
Negative comparison	A1	My life is not as exciting as others	0.741	0.750
	A2	Seeing other people's lives increases my anxiety		
	A3	Compared to others, I feel that I am not capable		
Dysfunctional interaction	B1	Most of my social media chats are not for small talk, but for business or other trifles	0.718	0.709
	B2	My friends seldom take the initiative to chat with me every day		
	B3	I spend a lot of time on social media every day		
	B4	I think it's very difficult to control how much time you use social media		
	B5	The overuse of WeChat has affected my normal life, work and study		
Information overload	C1	I'm overwhelmed by the amount of information on social media	0.833	0.713
	C2	Social media is full of useless advertising information		
	C3	Useless information on social media often drowns out important information		
Social overload	D1	I'm very concerned about what's going on in other people's social media	0.804	0.819
	D2	I often keep in touch with others through social media interaction		
	D3	I often express my concern for others by way of likes and comments		
Self-efficacy	E1	I have some expertise information and experience information to share with others in social media	0.841	0.801
	E2	I can view other people's news in social media smoothly, and can comment, reply, forward, like, add or delete comments smoothly		
	E3	I'm sure I can provide valuable information to other people in social media		
Privacy anxiety	F1	I care about my privacy on social media	0.807	0.784
	F2	My personal information is easy to use by advertisers and other marketing personnel		
	F3	I've disclosed a lot of personal privacy information on social media		
Impression management	G1	The content I post on social media is generally positive, healthy and positive	0.753	0.837
	G2	I will carefully select the photos that I am satisfied with and upload them to social media		
	G3	When I make a speech, I think about my own language in time to avoid hurting others		
Intergenerational Communication	H1	My parents usually don't understand me	0.746	0.713
	H2	My elders and I have a big difference in our thinking		
	H3	I don't want my elders to see my social media status		
	H4	There is conflict between my parents and me		
	H5	My parents interfere with my friendships and social activities		
Social media fatigue behavior	I1	I don't use social media to actively chat with others now	0.812	0.705
	I2	Now I have less dynamic comments and praise for others		
	I3	Now my WeChat chat with my friends has become simpler and less in-depth		
	I4	I will often cancel the official account or the push of the screen		
	I5	I don't want to experience the new features of social media anymore		
	I6	I'm going to cancel my current social account		
	I7	I want to go back to the simple and traditional way of social communication (making phone calls, meeting and chatting, etc.)		

distance variables, while the dependent variable was the mean value of the items added under the three dimensions, so it also belonged to the fixed distance variables. Pearson coefficient was used to measure the correlation of variables. Pearson correlation coefficient was used to measure the linear relationship between distance variables. The range of correlation coefficients was between −1 and +1. A positive value represents a positive correlation while a negative value represents a negative correlation. Through correlation analysis,

we found that there is a significant correlation between independent variables and dependent variables. The correlation coefficient of the independent variable and dependent variable showed a significant correlation at the level of 0.01 ($P < 0.01$). The specific correlation analysis table is shown in **Table 3**.

The correlations between the variables and factors were verified, and it was confirmed that there was a correlation between all the variables. The next step was performing

TABLE 3 | Correlation analysis table.

variable		Social Media Fatigue
Negative comparison	Pearson	0.436**
	Sig.	0.000
Interaction dysregulation	Pearson	0.481*
	Sig.	0.004
Information overload	Pearson	0.647**
	Sig.	0.000
Social overload	Pearson	0.326**
	Sig.	0.000
Self-efficacy	Pearson	0.543*
	Sig.	0.002
Privacy anxiety	Pearson	0.350**
	Sig.	0.000
Impression management	Pearson	0.536**
	Sig.	0.000
Intergenerational Communication	Pearson	0.342**
	Sig.	0.000

*(N = 663).**P < 0.01, *P < 0.05.*

regression analysis on each variable to further prove whether the research hypothesis is valid. Based on the correlation analysis above, it was found that negative comparison (0.436**, $p < 0.01$), interaction dysregulation (0.481*, $p < 0.05$), information overload (0.647**, $p < 0.01$), social overload (0.362**, $p < 0.01$), self-efficacy (0.543*, $p < 0.05$), privacy anxiety (0.350**, $p < 0.01$), impression management (0.536**, $p < 0.01$), and intergenerational communication (0.342**, $p < 0.01$) were significantly associated with SMF. Therefore, eight variables were included in the multiple regression analysis.

To further analyze the degree of influence of each variable on SMF behavior, negative comparison, interaction dysregulation, information overload, social overload, self-efficacy, privacy anxiety, and impression management interaction dysregulation were set as independent variables and SMF behavior was set as the dependent variable, and multiple linear regression was conducted using SPSS, controlling for demographic variables, including gender, age, and income. In the theoretical construction of independent variable selection, there were deep theoretical differences in three aspects of relational stress, overload, and personal traits, so three layers of independent variables were put into the regression analysis. Finally, three regression models were obtained and the significant differences of the three models were similar. Through **Table 4**, we chose model three (adjusted $R^2 = 0.327$, $p < 0.001$), which had the highest explanatory power, as the main basis for testing the hypotheses. The empirical data showed that the effects of privacy anxiety were not significant in the model and hypotheses H6 did not hold. Negative comparison ($\beta = 0.227$, $p < 0.001$) was significantly and positively related to SMF behavior and hypothesis H1 held. Interaction dysregulation ($\beta = 0.221$, $p < 0.005$) was significantly and positively related to SMF behavior and hypothesis H2 held. Information overload ($\beta = 0.349$, $p < 0.005$) was significantly and positively related

to SMF behavior and hypothesis H3 held. Social overload ($\beta = 0.196$, $p < 0.005$) was significantly and positively related to SMF behavior and hypothesis H4 held. Self-efficacy ($\beta = 0.283$, $p < 0.005$) was significantly and positively related to SMF behavior, empirical data results and hypothesis H5 reversed. Impression management ($\beta = 0.303$, $p < 0.005$) was significantly and positively associated with SMF behavior and hypothesis H7 held. Intergenerational communication ($\beta = 0.212$, $p < 0.000$) was significantly and positively correlated with SMF behavior and hypothesis H8 held. The specific regression analysis table is shown in **Table 4**.

Model Modification

From the results of the above analysis, it can be seen that six of the original hypotheses are valid, one hypothesis was not valid, and one hypothesis was contrary to the empirical results, which shows that negative comparison, interaction dysregulation, information overload, social overload, self-efficacy, impression management, intergenerational communication, and SMF behaviors were all significantly and positively influenced by the following revised model as shown in **Figure 2**.

Research Results and Findings

This study explored the SMF behavior of youth groups from four aspects namely, relational stress, overload, personal-psychological traits, and social-behavioral traits. Furthermore, this study enriched relevant new variable conditions and further expanded the model of factors influencing SMF behavior of young people. Firstly, the empirical data showed that in terms of relational stress, negative comparison and interaction dysregulation have a significant positive effect on SMF behavior of youth groups. Meaning, information overload and social overload have a significant positive effect on social fatigue behavior, which is consistent with the findings of previous studies. In the section on personal psychological traits, self-efficacy and privacy anxiety were added to the factors influencing SMF behavior, and it was proved that privacy anxiety had no significant positive effect on SMF behavior in the youth group. Furthermore, this aspect also tested the conjecture of related scholars on the variable of self-efficacy, and the results of the study could provide reference and guidance for other subsequent studies of scholars. In addition, individual impression management and intergenerational communication were added to the model for validation, and the data showed a positive effect on SMF behavior. This enriched the variable conditions in the model and made the study more complete, and, to a certain extent, promoted the research process of this topic.

RESEARCH CONCLUSION AND DISCUSSION

Research Conclusion

The following is the specific analysis of each variable in this study based on the results of the empirical data.

In terms of relational stress, negative comparison and interaction dysregulation positively affect SMF. Some researchers have found that Qzone uses positively affects negative social

TABLE 4 | Regression analysis table.

Dependent variable	Social media fatigue behavior								
Predictive variables	Model one			Model two			Model three		
Control variable	β	t	P	β	t	P	β	t	P
Gender	0.541	0.677	0.459	0.016	0.514	0.251	0.415	0.656	0.536
Age	0.134	4.322	0.115	0.324	4.601	0.191	0.540	2.842	0.317
Education level	0.131	5.305	0.158	0.238	2.452	0.638	0.157	6.375	0.045
income	0.351	4.654	0.621	0.523	3.145	0.728	0.524	5.093	0.551
Independent variable									
Negative comparison	0.351	3.141	0.004	0.345	5.211	0.002	0.227	3.014	0.000
Interaction dysregulation	0.237	3.542	0.007	0.394	6.125	0.006	0.374	4.204	0.004
Information overload	0.417	2.943	0.003	0.562	4.410	0.002	0.349	2.036	0.003
Social overload	0.794	3.908	0.005	0.443	5.153	0.006	0.196	1.502	0.004
Self-efficacy	0.408	2.954	0.005	0.511	3.451	0.004	0.283	1.135	0.002
Privacy anxiety	0.572	3.245	0.182	0.603	8.505	0.304	0.237	3.156	0.426
impression management	0.205	2.852	0.008	0.431	6.236	0.102	0.303	2.632	0.002
Intergenerational Communication	0.391	4.923	0.005	0.259	5.445	0.002	0.212	5.320	0.000
R^2	0.251			0.277			0.362		
Adjusted R^2	0.207			0.219			0.327		
F-value	20.644			18.019			10.241		
Significant F	0.002			0.001			0.003		
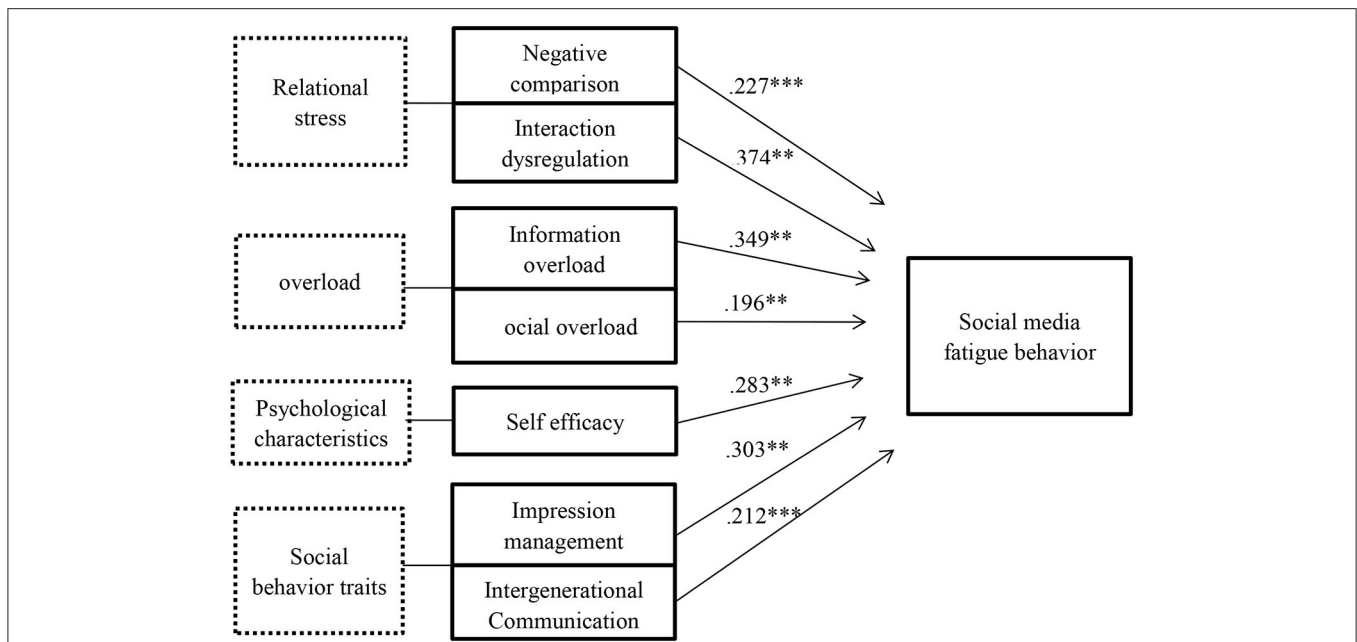
FIGURE 2 | Model modification chart. **$p < 0.01$, ***$p < 0.001$.

comparison, and negative social comparison positively affects the depression of users (Niu et al., 2018). In turn, the author proposed the research hypothesis that negative social comparison positively affects SMF, and the empirical data also proved the objectivity of this hypothesis. This suggested that negative social comparisons brought about by social media are a common phenomenon among youth groups and that upward social comparisons made by young people with positive self-presenting

others during social media use positively predict their SMF. Youth social media users may tend to respond to the stress of social comparison with negative emotions (Lim and Yang, 2015); thus, SMF may be a coping measure for youth in such stressful situations. However, in our interviews with some respondents, we found that young people with high self-esteem generally did not agree that people around them are better off than they are, and it is possible that they intentionally concealed their true thoughts since the questionnaire was anonymous and would reflect a more realistic inner situation. Thus, we believe that the relational pressure of negative social comparison cannot be ignored. A plausible explanation is that young people reduce uncertainty in their self-assessment by comparing themselves to others during social media use in order to obtain information (Gilbert et al., 1995). However, since other social media users prefer to present their positive selves (Reinecke et al., 2017), and to best represent their ideal selves in a way that describes themselves, youth social media users may develop negative emotions during this social comparison (Rosenberg and Egbert, 2011). Therefore, this study suggested that negative social comparison tendencies are significantly associated with negative experiences and fatigue during youth social media use.

Through the empirical data, we have seen that interaction dysregulation contributed the most to the model. In fact, social media contains complex social relations and social capital. SMF behavior cannot be simply regarded as the weariness of the individual toward media technology. The deeper sense of fatigue comes from the relational pressure brought by social media (Bane et al., 2010). Among young social media users, the interaction imbalance is mainly reflected in the weakening of individual social interaction and self-immersion out of control. More and more young people feel the pressure and ineffectiveness of social activities. Most of them, as independent individuals, will feel complex interpersonal pressure when they face social chat. Through the interview, we also found that many young people think that they have no friends. In the face of cold media technology in social media, only relying on online communication will make their friends in life go away. In addition, self-immersion out of control also has an important impact on the SMF of young people. The self-control ability of young people is relatively poor, and the entertainment and interaction of social media easily make them indulge in it. When users wake up from the immersion state and perceive the waste of time and energy, they are likely to feel guilty and thus reduce their interest in using social media (Ravindran et al., 2014b).

(2) In terms of information overload and social overload, empirical data showed that information overload and social overload positively affect social fatigue behavior, which can also confirm previous theoretical results. Several studies have proved that the energy of people in processing information is limited. Some interviewees said that with regard to information overload, including a large number of useless advertisements and excessive software services, users will feel tired when the quality of the system is low. Through participation and observation, we also find that social media plays an important role in the daily life of young people, and even becomes the only channel for people to obtain information and socialize. People put a lot of

energy into it and must feel the huge pressure of information overload and relationship maintenance. At the same time, some respondents said that when the information is too complicated, they will pay more attention to check their social media accounts, hoping to obtain key information. However, there will be more invalid information and similar information usually, further aggravating their fear of missing key information. They will pay more energy and time costs, thus feeling overwhelmed and causing bad emotions. In the face of this situation, many young people take an indifferent attitude to social information. The pressure of information overload and social overload makes individuals have the behavior of staying away from social media.

(3) The empirical data showed that self-efficacy positively influences social fatigue behavior, a finding that is contrary to the research hypothesis. In the hypothesis formulation process, self-efficacy theory is built on the level of confidence that the youth group has the skills and accomplishes a certain task. In fact, the acquisition of individual self-efficacy is nonetheless far more complex than we think, and individual self-efficacy includes several pathways through which self-efficacy is acquired through first-hand learned experiences, alternative learned experiences, social feedback, and positive physical and emotional states (Bandura, 1982). Nowadays, more and more people rely on social media, especially young people who are "Internet natives" and rely more on the Internet and social media for information. Most of them have the ability to use information tools skillfully. In our initial hypothesis, we assumed that young people would be unable to master social media skills and thus develop SMF behavior, but such young people represented only a very small minority of the sample. The sample data showed that the younger cohort generally had a high level of self-efficacy, and during the interviews, we also found that respondents with a high level of social media self-efficacy were likely to use social media to a higher degree because they felt capable of using this form of media. As a result, they may experience high levels of SMF due to increased usage. This means that as social media users become more self-efficacious, their experiences will encourage further social media use (Bandura, 1982). Individuals with low self-efficacy are less likely to perform related behaviors in the future, which also means that users with low self-efficacy are less motivated to engage in social media-related behaviors and activities than those with high self-efficacy. Also, individuals with higher self-efficacy have higher self-esteem (Compeau and Higgins, 1995). Through interviews, we found that the parent groups with high self-efficacy would carefully consider the interest and accuracy of their published content before updating their published articles. Most of them would pursue the quality of published content, so they would become more cautious in publishing, and SMF would occur over time.

In terms of privacy anxiety of young people, it has no significant positive effect on SMF. In various research of scholars, privacy anxiety positively affects SMF behavior. Because social media as a tool for interaction between friends, information exchange is established within a certain boundary. However, if this boundary is broken, it will lead to individual privacy

concerns and further results in SMF behavior (Bright et al., 2015). Nonetheless, the sample in this study focused on young social media users aged 18–29, most of whom grow up in the environment of rapid development of network society and have good confidence in the network environment. Through an interview, some interviewees said that the social media technology platform also has good privacy protection schemes, such as publishing information content group visible, limiting the visible range of information publishing, comment protection, and strengthening blacklist, among other methods. They also fully trust the network security technology. For the anonymity and openness of social media, they say that even if their privacy is exposed, it will not cause great losses (Wang et al., 2006).

(4) In social behavior traits, individual impression management and interaction disorder have a significant positive impact on social fatigue behavior. In social media, the pictures and words we publish every day are an important self-presentation management strategy (Pearson, 2010). In the view of Goffman, performance is everywhere. In the real world, we shape the social identity of an individual through the front stage display and self-presentation. The front stage consists of "appearance" and "manner" stimuli. We expect certain consistency between appearance and behavior to shape our role, which can make social interaction continue (Goffman, 1959). Through the interview, we found that young people in social media individuals will also maintain the reality of self-presentation. In order to show their good image, they will generally show their positive image on social media, with the intention of weakening their own shortcomings through good impression management. At the same time, we also found that the self-image presented by some young people in social media is quite different from that in reality. They may present a completely different image because of their work and social needs. Once they "disguise" themselves, they may be another new identity. This identity may be different from the real self, and this "performance style" self-presentation, needs to be shaped by individual impression management. However, this kind of impression management behavior will make young people easily feel tired in the process of social media self-presentation. They will no longer update their information status and shape their own image with the help of social media platforms, resulting in SMF behavior.

Empirical data showed that intergenerational communication positively affects SMF among youth. The Internet has exacerbated the digital divide between offspring and fathers. The differences in online expression, information selection, and media use habits have become important causes of intergenerational conflicts. Youth groups often take measures such as setting groups and blocking friends to avoid the excessive interference of their elders in their online social activities. Although this approach can reduce conflicts to a certain extent, the related settings are more cumbersome, which will affect the experience and comfort of social media use by the offspring, Moreover, there is a risk of being detected by the perception of elder, which will easily make users anxious and worried. During our interviews, many young people said that the development of Internet media has made them form new values, and the communication between them and their parents will be more separated, forming an irreconcilable digital divide. The complexity and variability of the online environment make parents more worried about the online social situation of their children, which can lead to over-intervention (Jiang and Gong, 2016). Young people are too lazy to explain to their parents, resulting in a growing intergenerational divide between them. This circumstance further affects family relationships and directly affects their emotions about social media use, leading to SMF.

Research Discussion

According to the results of the study, among the seven factors influencing social fatigue behavior, which are interaction dysfunction, information overload, and impression management, the last one made the highest contribution in the model. This result confirmed the influencing factors such as relational stress and platform information overload mentioned in many studies. Several studies have proved that people avoid coping in the face of massive amounts of information and feel tired in the face of complex and diverse online interpersonal relationships. The empirical results of this study further suggested that interpersonal stress may not be the main source of SMF. In-depth interviews with selected youth groups revealed that the problem with social media for youth may not be that people are overwhelmed by daily chats, but that the functionality of social media has changed. Many interviewees mentioned the relationship between social media and work, the increasing number of group chats, and the fact that most social media group chats are created for organizational and work purposes. In the original sense, social media is a field for private social activities. However, with the development of the social media era, the public sphere has gradually invaded the private sphere wherein work matters are increasingly colonized into private space through social media (Endeshaw, 2004). Both interaction dissonance and information overload directly reflected this problem. Because daily social activities are linked to capital, the youth group may not have reasonable control over their time use, even if they feel uncomfortable. Respondents also reported that such SMF is not only aggravated, but also accompanied by various anxieties such as "I can't miss important information," and the more anxious they are, the more fatigue they will experience, thus creating a vicious circle. This relational pressure and overloaded media environment are overwhelming for the youth. Respondents also reported that it takes a lot of self-discipline and even some cost when they want to control their social media usage time to combat this pressure that has invaded their private lives. Therefore, in our observations, we found that it is important to examine the impact of this relational pressure on social fatigue behavior by focusing not only on online interpersonal pressure but also on the relational pressure between people and technology and capital. Behind the SMF behavior is the alienation that is brought by social acceleration to the youth group in the whole range of space, time, thought, experience, interaction, and behavior (Lee et al., 2013).

Social behavioral traits are also important influencing factors in SMF behavior, and the maintenance of self-image and selective

presentation of individuals in social media interaction studies is a topic that cannot be ignored (Laghi et al., 2011). In this study, online impression management has been shown as an important influencing factor of the SMF behavior of young people. When individuals present themselves in different scenarios, they tend to highlight the part of their role traits that are adapted to the current situation and hide other traits. Evidently, how to present oneself and manage the self-image of an individual in a virtual environment is still an important part of online social interaction. However, many respondents said that although online identity building can create a good identity image, by showing videos, photos, and images on social media, the sense of self of an individual can be shown. This in turn has a role-building effect and makes it easier for people to idealize the person they are communicating with. Such behavior can also create an inauthentic social environment, where everyone wants to present the best side of themselves. Furthermore, when online relationships were transferred to offline relationships, many real images and those managed online do not match, increasing social risks and the negativity of social comparisons (Endeshaw, 2004). Over time, the youth group is tired of managing their online identity image and social fatigue is becoming stronger.

At the same time, respondents said that relationships in social media are equally divided into two different states, strong and weak, based on the proximity of interpersonal relationships. The so-called strong ties are a relationship state with long interaction time, strong emotional color, forming a certain intimacy, such as the connection with friends and relatives in reality, which is reflected in the weak ties on the contrary (Granovetter, 1973). These acquaintances are the groups of good friends, workmates, lovers, and family members in the chain of "strong ties." However, within these different strong ties, there are still significant differences. Specifically, in online communication with acquaintances, workmates, lovers, and other strong ties are grouped at the same level. Moreover, there is no communication difference at the same level, communication is more equal, and the other party does not pose pressure on their interaction behavior. If acquaintances, friends, and colleagues are strong ties groups with the communicator at the same level, then parents, elders, mentors, and leaders, re actually in a non-reciprocal communication relationship with the communicator, i.e., there is a hierarchical difference of "superior-subordinate" (Bian, 1994). Furthermore, in the interpersonal network, in addition to the horizontal "closeness" difference, there is also another vertical hierarchy, which sometimes causes intergenerational miscommunication or a huge digital information gap. This, in turn, interferes with the daily life behavior of the youth group and puts more pressure on their social media behaviors causing greater pressure. Some respondents also said that when public affairs invade the social life of individuals, many online friends and workmates are not familiar with each other and it is a "weak tie" (Granovetter, 1983), for which the posting of life status may cause privacy disclosure and unnecessary troubles. This leads to SMF, which eventually makes the youth group avoid social media.

STRENGTHS

The strengths and theoretical contributions of this study are elaborated. This is a very interesting topic, young people are active in social networks and are an important part of social media users, but various reasons have caused SMF behavior in the youth group in recent years. Thus, we have obtained some important influencing factors through empirical research, some findings can verify previous studies, some findings are innovative. The study expanded the research related to the field of people and technology. For example, this study expanded the study of SMF behavior in youth groups, enriched new influencing factors, and explained them with appropriate empirical materials and academic theories. In addition, previous studies on social fatigue have mostly been conducted from perceptions and social relationships in psychology, but this study also enriched the influence of relational stress and personality psychology and behavioral traits on SMF behavior, with a more comprehensive perspective. New variables which were not focused on in previous studies were added, such as the effects of negative comparison, self-efficacy, and intergenerational communication on SMF behaviors. In terms of research methodology, this study combined quantitative and qualitative approaches, which is more scientific and objective and led to more consistent conclusions, presenting objectively the relationship between fatigue behaviors of youth groups and their influencing factors with precise data and interpretation of empirical materials. The empirical results obtained were more standardized and reliable, which enriched the research content of social media user behavior and expands the research ideas in this field.

From a practical point of view, the empirical research results could help social media operators understand the formation mechanism of SMF behavior, to effectively avoid the problems of declining activity and user loss caused by SMF behavior. The middle-aged and elderly population is concerned about the usefulness and ease of use of technology platforms, but the youth group is not. Therefore, the usefulness and ease of use of the media platform should not be deliberately emphasized, and different service functions should be set according to the different needs of the audience. In order to avoid information overload, developers and operators should provide information filtering and information management functions to improve the efficiency of the use of social media of users, help users better manage their own information networks and social relationship networks, better use social media to carry out related services, strengthen the user experience, and effectively manage SMF behavior according to the interactions of influencing factors.

LIMITATIONS

This study also has some limitations. First of all, this study uses a convenient sample, which involved people aged 18–35. Most of the participants are young social media users, so the results of this study cannot be extended to a wider range of the whole. The age difference of users was small, which cannot compare the differences of SMF behavior of users of different ages, which to a certain extent narrowed the scope of the study and

affected the comprehensiveness of the data. In future research, we should increase the sample size to avoid data concentration and involving different age groups. In addition, this study did not limit the types of social media platforms, because different social media technology platforms also have differences, and the SMF behavior of users will also have differences. In the future, we can compare the differences in the SMF levels of users on different types of social media platforms. At the same time, because social media has largely blurred the boundaries between the private field and the work field (Bucher et al., 2013), future research can also explore the potential causes and consequences of SMF in different life scenarios.

The model of this study was based on the discussion of personal psychological and behavioral characteristics. Through the collation of relevant influencing factors of previous studies and some interview empirical materials, we could obtain the influencing factors of SMF behavior of youth groups as independent variables, but it may not be limited to these conditions. The later research should expand the exploration field and add the introduction of new variables to improve the corresponding research methods Theoretical model. In future research, it is necessary to increase the strength of interviews, as much as possible multi-dimensional analysis and research, to make this research more universal and reasonable. The grasp of SMF behavior is helpful to promote the sustainable development of social media platforms in the information society and promote the harmonious progress of human society. Therefore, the research on SMF behavior needs to be further explored.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Shenzhen University Ethics Committee. The patients/participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

YL is responsible for the overall research design and thesis writing. JH is responsible for the collation of the questionnaire and data guidance. All authors in the research team has contributed to the thesis.

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The Moderating Role of Social Network Size on Social Media Use and Self-Esteem: An Evolutionary Mismatch Perspective

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Existing meta-analyses have shown that the relationship between social media use and self-esteem is negative, but at very small effect sizes, suggesting the presence of moderators that change the relationship between social media use and self-esteem. Employing principles from social comparison and evolutionary mismatch theories, we propose that the social network sizes one has on social media play a key role in the relationship between social media use and self-esteem. In our study ($N = 123$), we showed that social media use was negatively related to self-esteem, but only when their social network size was within an evolutionarily familiar level. Social media use was not related to self-esteem when people's social networks were at evolutionarily novel sizes. The data supported both social comparison and evolutionary mismatch theories and elucidated the small effect size found for the relationship between social media use and self-esteem in current literature. More critically, the findings of this study highlight the need to consider evolutionarily novel stimuli that are present on social media to better understand the behaviors of people in this social environment.

Keywords: social media use, social comparison, self-esteem, evolutionary mismatch, social network size

INTRODUCTION

Popular social media platforms such as Facebook and Instagram have observed at least 50% of their users visiting the platforms on a daily basis (Smith and Anderson, 2018). Users typically spend a total of 2 h 25 min on social media each day, which can be equated to a full day of their waking hours each week (Datareportal, 2021). As virtual engagement with others on social media becomes an integral part of everyday life, the real-life consequences it carries for its users have become key public concerns and received notable research attention (e.g., Kim et al., 2009; Valenzuela et al., 2009; Morrison and Gore, 2010; Nabi et al., 2013; Neira and Barber, 2014; Sbarra et al., 2019)—one such area of research is its effects on self-esteem. While existing findings do show a negative relationship between social media use and self-esteem, the effect sizes found for this relationship are extremely small (Liu and Baumeister, 2016; Huang, 2017; Saiphoo et al., 2020).

Researchers described the relationship between social media use and self-esteem as a "puzzling" one, accompanied with complicated conclusions (Liu and Baumeister, 2016). Using principles from social comparison and evolutionary mismatch theories, this paper aims to borrow an evolutionary lens in untangling the complex relationship between social media use and self-esteem.

Social Comparison on Social Media

According to social comparison theory, people have an innate tendency to compare themselves to others (Festinger, 1954). In doing so, they derive at various outcomes, including an evaluation of themselves (Festinger, 1954), regulation of emotions and well-being (Taylor and Brown, 1988), and aspirations to improve their skills or abilities (Wood, 1989). Upward social comparison occurs when people compare themselves to others who are better than them; although upward social comparison motivates people to become more like their comparison target, it also causes dissatisfaction and lowers self-esteem (Emmons and Diener, 1985; Taylor and Lobel, 1989; Wheeler and Miyake, 1992). In contrast, downward social comparison occurs when people compare themselves to others who are worse-off than them and such comparison often leads to more positive self-evaluation and enhanced mood (Wills, 1981; Pyszczynski et al., 1985).

People are highly selective in what they present on social media (Mendelson and Papacharissi, 2010). They carefully curate the things they upload on social media that portrays the "perfect" aspects of their lives, such as flattering photographs, expensive goods, and personal successes (Siibak, 2009; Gonzales and Hancock, 2011; Blease, 2015). People also tend to present themselves positively on social media (Vogel and Rose, 2016). They typically upload content that best represents their ideal self (Rosenberg and Egbert, 2011), or a version of themselves that they believe will be best liked by others (Madden and Smith, 2010). As such, what results is a proliferation of profiles on social media suggesting that a large number of people are doing well and lead happy and perfect lives. On top of these, the "like" button provides further information about a person's popularity and social capital (Kim and Lee, 2011; Vitak and Ellison, 2013). Collectively, these serve as social information that people take in and compare themselves against (Fox and Moreland, 2015).

While people engage in both upward and downward social comparisons when they use social media, existing evidence suggest that upward social comparisons are engaged more frequently than downward social comparisons. Through experiential sampling, where participants were monitored across 2 weeks, Kross et al. (2013) found that Facebook use was associated with declines in subjective well-being over time. Blease (2015) also proposed that depression, resulting from Facebook use, is likely to be brought about by the conspicuous amount of positive impressions people are exposed to from their Facebook friends, which opens up opportunities for comparison and escalates risk for negative appraisals. These studies suggest that the use of social media triggers upward social comparisons, or "harmful" social comparisons (Kross et al., 2013), which

underlies the declines in subjective well-being and increased likelihood for depression.

With the constant exposure to information about how perfect the lives of others are, people consistently perceive that others are better off than oneself (Chou and Edge, 2012; de Vries and Kühne, 2015; Appel et al., 2016). Consequently, the constant upward social comparison that people engage in while using social media results in lowered self-appraisals or self-esteem (Vogel et al., 2014). Existing meta-analyses show support for a negative relationship between social media use and self-esteem, evidencing that increased social media use is associated with decreased self-esteem (Liu and Baumeister, 2016; Huang, 2017; Saiphoo et al., 2020). However, the effect sizes reported for the relationship between social media use and self-esteem are often very small [$r = -0.09$ by Liu and Baumeister (2016); $r = -0.04$ by Huang (2017); and $r = -0.08$ by Saiphoo et al. (2020)], suggesting the presence of moderators that account for the different relationships between these variables.

Higher effect sizes for the negative association between social media use and self-esteem were found for studies that assessed problematic social media use (i.e., addictive social media use) than those that measured the frequency of general social media use (Saiphoo et al., 2020). Studies that measured social and collective self-esteem, instead of global self-esteem, reported a positive relationship between social media use and social self-esteem (Valkenburg et al., 2017; Saiphoo et al., 2020). A recent study by Valkenburg et al. (2021), which employed a 3-week experience sampling design, showed that people differed in their susceptibility toward the content on social media (e.g., not receiving many likes), which contributes to the small effect size found between social media use and self-esteem People who were less susceptible to social media content reported smaller fluctuations in their self-esteem; in contrast, people who were more susceptible to social media were likely to experience bigger fluctuations in self-esteem that would have canceled each other out across time (Valkenburg et al., 2021).

In this paper, beyond measurement artifacts and individual differences, we turn our focus to the features of social media and propose that the amount of social information uniquely afforded by social media plays a significant role in determining the relationship between social media use and self-esteem. Employing an evolutionary mismatch perspective, we argue that novel features of social media—in particular, large social network sizes—influence the social comparison process such that greater social media use may not necessarily result in self-esteem loss.

Evolutionary Mismatch and Social Media

The evolutionary mismatch perspective posits that our evolved psychological mechanisms, which are designed to be adaptive in ancestral environments, are not well-suited to handle novel elements within the modern context (see Li et al., 2018, 2020). A classic example of the evolutionary mismatch concerns our evolved preference for sweet and fatty foods. As sweet and fatty foods were higher in calories, the preference for these foods were adaptive in the ancestral environment where such caloric-rich food were scarce. However, in modern environments where there is an abundance of over-processed food and food

that contain large amounts of manufactured sugar, this food preference leads people to overconsume sweet and fatty foods, more than what our physiological systems are designed to handle. Because our mechanisms did not evolve to process the unnaturally high levels of fats and sugar found in modern contexts, health conditions such as obesity and diabetes ensues (Gluckman and Hanson, 2006).

Similarly, social media is a modern feature that contains several evolutionarily novel elements that can potentially influence the functioning of our evolved psychological mechanisms. Of particular focus in this paper is its affordance for an evolutionarily novel large social network size. Most popular social media platforms allow registered members to create personal profiles and interact with other users. Registered members can seek other users out *via* a search engine, browse their profiles, and befriend them (Blease, 2015). This ease of befriending others contributes to the large "friend" networks people have on social media. The average adult Facebook user has 338 "friends"; beyond people who they actually are friends with in real life, this social network also comprises of people who are not close friends and people they have never met (Osman, 2021). However, humans have evolved to handle only a limited number of relationships (Tooby and Cosmides, 1996). Specifically, humans have evolved a neocortex size to maintain a network size of 150 individuals (Dunbar, 1998). This introduces a mismatch situation, which carries important implications for the psychological mechanisms governing social comparison.

As people are exposed to the "perfect" lives of others on social media, the evolved tendency to take in the social information and compare themselves to others results in self-esteem loss. Typically, the more one uses social media, the more social comparisons are engaged, and the more one feels worse about themselves. Moreover, on the surface, we might expect this to be even more true for networks with a greater vs. lesser number of people. Just as how our preference for sweet and fatty foods is hijacked by the modern environment, the social comparison process is hijacked by the large amount of social information introduced by large social network sizes, such that people are drawn into more social comparisons within larger networks. As such, on one hand, larger networks increase the occurrence for comparative social evaluation, which escalates the likelihood of one feeling more depressed and greater loss of self-esteem (e.g., Blease, 2015). Yet, a key evolutionary principal suggests otherwise. That is, given the natural limitations on humans' ability to process network sizes, when social networks are beyond the size of 150 individuals, the enormous amount of available social information may be increasingly difficult for psychological mechanisms underlying social comparison to process. As such, on the other hand, for evolutionarily novel social network sizes that exceed 150 individuals, greater use of social media may not lead to greater loss of self-esteem.

The Present Research

We began our research with the aim of understanding the negative but weak relationship between social media use and self-esteem. Using principles from social comparison theory and the evolutionary mismatch theory, we explore how social network size influences the relationship between social media use and self-esteem. Specifically, we predict that greater social media use is likely to be associated with lower levels of self-esteem when one's social network size is within 150 individuals, the number of relationships we have evolved to handle. When social network sizes are larger than 150 individuals, we test the competing predictions: on one hand, with more targets for social comparison, greater use of social media is likely to result in greater self-esteem loss; on the other hand, the huge, evolutionarily novel amount of social information makes it difficult for psychological mechanisms underlying social comparison to process such that greater use of social media is not associated with low self-esteem.

MATERIALS AND METHODS

Participants

A total of 123 participants were recruited through an Australian university's subject pool system (106 females, M_{age} = 22.78, SD_{age} = 7.92). All participants indicated that they engage in at least one social media platform (M = 2.76, SD = 0.82), with Facebook (N = 111) and Instagram (N = 104) being the most used social media platforms. Participants reported having a mean of 1,186 friends (SD = 1,601) across all social media platforms that they engaged in.[1]

Procedure

Upon providing informed consent, participants completed a series of questionnaires that measured their social media usage and self-esteem. Participants were also required to provide the number of friends they have across all the social media platforms they use. Finally, participants provided demographic details before completing the study.

Materials

Social Media Use

Social media use was assessed with 10 items adapted from the Media and Technology Usage and Attitudes Scale (Rosen et al., 2013). Participants indicated the frequency of which they engaged in activities on social media; they responded to items such as "Post updates on your social media," and "Browsed through profiles and photos" on a 10-point scale (1 = *never*, 10 = *all the time*). The items were averaged to form a single index for social media usage, where higher scores indicated more frequent usage (M = 4.83, SD = 1.18, α = 0.91).

Self-Esteem

Self-esteem was assessed using Rosenberg's (1965) Self-esteem Scale. Participants responded to 10 items, such as "On the whole, I am satisfied with myself," and "I feel that I'm a person of worth," on a 4-point scale (1 = *Strongly disagree*, 4 = *Strongly agree*). Negatively worded items were reversed scored, and together,

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[1]On average, participants reported a mean of 482 friends (SD = 749) per social media platform.

the 10 items were averaged to form a single index for self-esteem, where higher scores indicated higher levels of self-esteem ($M = 2.82$, SD $= 0.56$, $\alpha = 0.89$).

Analytical Strategy

Descriptive statistics were provided for social media use, self-esteem, and number of friends. The assumption of normality was first assessed. Values for skewness and kurtosis for social media use (Skew $= -1.26$, Kurtosis $= 1.67$) and self-esteem (Skew $= -0.08$, Kurtosis $= 0.22$) were between -2 and $+2$, which were acceptable standards for a normal distribution (George and Mallery, 2010). For number of friends, the values for skewness and kurtosis were 3.46 and 15.19 respectively, indicating that this variable was not normally distributed. However, as we intended to convert number of friends into a categorical variable that reflects the different social network layers proposed by Dunbar (2011); Dunbar et al. (2015), we did not perform any other transformation of this variable to fit within acceptable standards of skewness and kurtosis. Univariate outliers were identified for social media use ($N = 5$), self-esteem ($N = 1$), and number of friends ($N = 7$). The subsequent moderation analysis was conducted with and without these univariate outliers.

As we are interested to examine number of friends in terms of evolutionarily familiar vs. evolutionarily novel levels (instead of number of friends *per se*), we transformed the number of friends participants reported they had across all their social media platforms into a categorical variable, which should ideally correspond to the social network layers identified by Dunbar (2011) and Dunbar et al. (2015). Dunbar (2011) and Dunbar et al. (2015) identified a mean network size of 150 individuals as a personal network, a mean network size of 500 individuals as a network characterized by acquaintances; beyond these, one's social network of approximately 1,500 individuals is likely to consist of individuals one would merely recognize and not share meaningful relationships with. Through categorizing number of friends according to quartiles, we derived at four groups: participants with a social network size of 276 and below (small social network, $N = 31$, $M = 114.26$, SD $= 91.85$), participants with a social network size of 700 and below (medium social network, $N = 31$, $M = 466.13$, SD $= 139.11$), participants with a social network size of 1,500 and below (big social network, $N = 32$, $M = 1,112.97$, SD $= 265.84$), and participants above 1,500 (large social network, $N = 29$; $M = 3,179.90$, SD $= 2,256.90$). Although the cut-off values for the number of friends in small and medium social network groups are higher than those identified by Dunbar (2011) and Dunbar et al. (2015), researchers have recognized that there is wide variance around the mean network sizes (e.g., for the mean network size of 150, the lower and upper bounds are 100 and 250) (Dunbar, 2018) and are likely to be higher in an online context (Wellman, 2012). As such, the difference in values for social network sizes between our study and those identified by Dunbar (2011) and Dunbar et al. (2015) is unlikely to be of major concern.

To examine if the relationship between social media use and self-esteem differs at different social network sizes, we planned to conduct a moderation analysis. Prior to testing the moderation model, statistical assumptions relevant to a multiple regression analysis—that is, normality, linearity and homoscedasticity of residuals, and multicollinearity between predictors- was examined, and no assumptions violations were noted.

RESULTS

Table 1 displays the means, standard deviations, skewness, kurtosis, and intercorrelations of all the variables involved in this study. Correlation analysis indicated that social media use was not correlated to self-esteem ($r = -0.08$, $p = 0.35$), but social media use was positively associated with number of friends ($r = 0.38$, $p < 0.01$). Self-esteem was also not related to number of friends ($r = 0.14$, $p = 0.12$).

A moderation analysis using PROCESS (Hayes, 2017) was conducted to examine if social network size moderated the relation between social media use and self-esteem. The four level categorical variable of social network size was dummy coded to reflect three vector codes (0's and 1's), with small social network size as the reference category. The moderation model accounted for significant unique variance in social media use, $R^2 = 0.20$, $F(7, 101) = 3.64$, $p < 0.01$, $f^2 = 0.25$.[2] Social media use was associated negatively with self-esteem, $B = -0.37$, $t(101) = -3.79$, $p < 0.01$. Dummy coded variables, reflecting the difference between the small vs. medium social network size [$B = -1.43$, $t(101) = -2.19$, $p = 0.03$], and the difference between small and big social network size [$B = -2.12$, $t(101) = -2.57$, $p = 0.01$] was negatively related to self-esteem. The interaction term between social media use and social network size accounted for a significant 8.45% of the variance in self-esteem, $F(3, 101) = 3.56$, $p = 0.02$.

Probing the moderation effect with simple slopes plot revealed that the relationship between social media use and self-esteem was significant only for small social network size, $B_{small} = -0.37$, $p < 0.01$, 95% CI $[-0.56, -0.18]$ (**Figure 1**). The relationship between self-esteem and social media usage was not significant for medium [$B_{medium} = -0.05$, $p = 0.64$, 95% CI $(-0.24, 0.15)$], big [$B_{big} = 0.13$, $p = 0.34$, 95% CI $(-0.14, 0.40)$], and large social network sizes [$B_{large} = -0.22$, $p = 0.19$, 95% CI $(-0.55, 0.11)$]. These results showed that the number of friends one has on social media moderated the relation between one's self-esteem

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[2] We conducted a sensitivity power analysis using G-Power, which indicated that a minimum effect size of $f^2 = 0.12$ is required for a total sample size of 109 to detect a power of 0.80 at $\alpha = 0.05$.

TABLE 1 | Descriptive statistics and intercorrelations of all variables ($N = 123$).

Variables	1.	2.	3.
1. Social media use	—		
2. Self-esteem	−0.08	—	
3. Number of friends	0.38**	0.14	—
Mean	4.83	2.82	1,185.65
SD	1.18	0.56	1,601.18
Skew	−1.26	−0.08	3.46
Kurtosis	1.67	−0.07	15.26

**Correlation significant at p < 0.01.

FIGURE 1 | Moderation of social network size on social media use and self-esteem (*N* = 109).
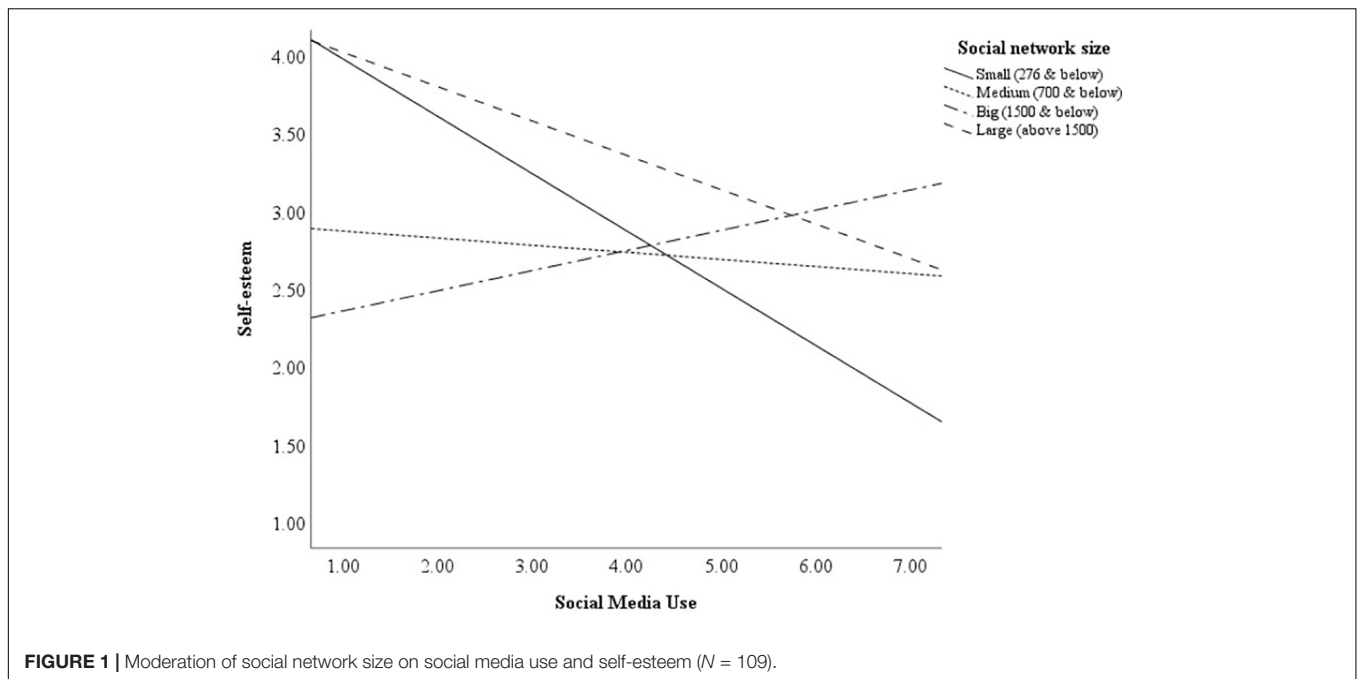
and social media usage. **Figure 1** demonstrates that at larger network sizes, the amount of social media use was not related to a person's self-esteem.[3]

DISCUSSION

This study aimed to examine the negative, but weak, relationship between self-esteem and social media use. Employing principles from social comparison and evolutionary mismatch theories, we proposed that large social networks afforded by social media influences the functioning of psychological mechanisms involved in social comparison. Specifically, we argued that evolutionarily novel social network sizes (i.e., larger than 150 individuals) make it difficult for psychological mechanisms governing social comparison to process; and as such, the usual response, in which greater self-esteem loss results from increased social media use, is not produced. In this sense, greater social media use is likely to be associated with lower levels of self-esteem only when one's social network size is evolutionarily familiar—that is, within 150 individuals—but not when social network sizes are larger than that. Our findings supported our prediction—social media use was negatively associated with self-esteem when social network size was small. Within this social network size, greater use of social media was associated with lower levels of self-esteem. In contrast, at larger social network sizes social media use was not significantly associated with self-esteem.

Consistent with existing meta-analyses, our results demonstrate that social media use share a negative relationship with self-esteem (Liu and Baumeister, 2016; Huang, 2017; Saiphoo et al., 2020). Beyond that, our study extends current literature by revealing that one's social network size on social media moderates the relationship between social media use and self-esteem. Specifically, the characteristic of one's social network size—whether it is evolutionarily familiar or novel—accounts for the different relationships between social media use and self-esteem, rather than absolute social network size *per se*. Kross et al. (2013) examined the moderating role number of Facebook friends between Facebook use and subjective well-being, and found that number of friends was not a significant moderator. Moreover, distinct from existing studies that have focused on individual differences, such as the tendency to engage in social comparisons (de Vries et al., 2018), and the susceptibility toward social media content (Valkenburg et al., 2021), this paper emphasizes on the amount of social information one is exposed to on social media in moderating the relationship between social media use and self-esteem. This emphasis on social information implies that people can potentially control their exposure to social information and its resulting outcomes, unlike the constrains present for individual differences (e.g., it is challenging to change one's tendency to compare).

Furthermore, the current work extends both conceptual and empirical work on social comparison theory (Festinger, 1954). The application of social comparison theory to the context of social media has found an array of adverse consequences resulting from social media use. Across various social media platforms such as Facebook, people curate content to emphasize their most desirable traits and qualities and positive aspects of their lives (Manago et al., 2008; Vogel et al., 2014). As such, this perpetuates the persistent perception of being outnumbered by

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[3]The moderation analysis reported here excluded the univariate outliers. A similar analysis was conducted without removing the univariate outliers and similar results were found. Although the interaction term only approached significance, $F (3, 115) = 1.77$, $p = 0.16$, a significant negative relationship between social media use and self-esteem was evident only when social network size was small, $B_{small} = -0.20$, $p < 0.01$, 95% CI [−0.32, −0.07].

others who are succeeding in life. Coupled with our innate tendency to crave and digest social information, the exposure to such social information leads to comparative evaluations and negative appraisals about oneself (Ozimek and Bierhoff, 2020). Such upward online comparison more often causes people to feel inadequate, have poorer self-evaluations — which have been linked to various negative outcomes including depressive symptoms and negative emotions (Haferkamp and Krämer, 2011; Kalpidou et al., 2011; Feinstein et al., 2013; Blease, 2015). Our findings add on to this list of empirical work by demonstrating that greater social media is associated with lower levels of self-esteem.

The present research extends prior work on social comparison theory by revealing that social comparison can be influenced by evolutionary novel features of such media—the amount of social information that an individual is exposed to. While prior studies suggest that with larger social network sizes, people would engage in more social comparison (due to the presence of more comparison targets), and feel worse about themselves (Blease, 2015), our findings show that that is not the case. With an evolutionarily novel larger social network size, the use of social media is not associated with self-esteem. This suggests that at large social network sizes, social comparison affects people less, and hence, did not result in significant self-esteem loss.

Our findings also support evolutionary mismatch theory (Li et al., 2018, 2020), supporting the notion that inputs from the modern environment changes the normal functioning, and consequently, outputs, of ancestrally adaptive psychological mechanisms. Typically, the greater use of social media is accompanied by lower levels of self-esteem as people compare themselves with the flashy lifestyles and successes of others more. However, when social network sizes are larger than 150 individuals, this introduces a mismatch situation where the social information that is available is more than what we have evolved to handle (i.e., 150 individuals). And because large amounts of social information (when networks are beyond 150) are hard to process, greater social media use with large network sizes does not lead to greater loss of self-esteem. The results of our study reflects this pattern—social media use was associated with lower levels of self-esteem when social network size was evolutionarily familiar (i.e., within 150 individuals). On a broader level, this demonstrates that evolutionarily novel social network sizes affect the psychological output of the social comparison process.

Our results indicated that self-esteem levels were higher when social network sizes were larger. This could be due to people perceiving their relational values to be higher when their social network sizes are larger. According to the sociometer theory, self-esteem acts as a gauge to an individual's relational value (Leary et al., 1995; Leary, 2005). Relational value refers to the degree to which one perceives their relationships with others is important and valuable (Leary, 2001). Existing studies have consistently demonstrated that one's relational value is associated to their self-esteem; when people were made to believe that they possessed low relational value, through manipulations such as knowing others did not desire to interact with them or were excluded from groups, their self-esteem dropped (Leary et al., 1995; Leary, 2005). With a larger social network, coupled with

our inability to distinguish real from virtual friends (Kanazawa, 2002), it leads to the perception that one had more "friends" and hence, a higher relational value. This would offer an explanation to the higher levels of self-esteem observed when one's social network size was larger.

Limitations and Future Directions

Our work is far from conclusive and poses questions for future work. Within the evolutionary framework, general intelligence may have evolved to solve evolutionarily novel problems (Kanazawa, 2010). This implies that the evolutionary constraints on the human brain proposed by the mismatch theory may be less strong among more intelligent than less intelligent individuals as they are more able to comprehend and deal with evolutionarily novel entities and situations (e.g., Kanazawa and Li, 2015). Given the evolutionarily novel nature of social media and large social networks, it is likely that intelligence may play an important role in influencing the effects of large social network sizes. For instance, more intelligent people may be more likely to be able to process the inputs of group sizes larger than the evolutionarily familiar limit of 150, and hence, engage in social comparisons as they would for network sizes of 150 individuals. However, it is also possible that they may be more able to perceive that these social networks consist of people who are not real (i.e., virtual friends) and not have their self-esteem affected in the first place. As such, future directions should examine the effects of intelligence on social media use.

Similar to existing studies that had examined the effect of social media use on subjective well-being (Kross et al., 2013) and depression (Blease, 2015), we proposed that social comparisons underlie the relationship between social media use and self-esteem, and that upward social comparisons tend to be made when people are engaged in social media, which would account the negative relationship observed between social media use and self-esteem (Liu and Baumeister, 2016; Huang, 2017; Saiphoo et al., 2020). While our findings show support for this negative relationship, social comparisons were not directly measured in this paper—we are only able to infer the social comparisons that could have taken place based on self-esteem, which would not accurately elucidate the social comparison process. Moreover, the type of social comparison influences self-esteem differently; while upward social comparisons result in low self-esteem, downward social comparison can boost self-esteem (Vogel et al., 2014). Future studies should explicitly assess the type and frequency of social comparisons people make when they engage in social media. Examining the social comparison process would not only provide evidence for the type of social comparisons people make when using social media, it would also shed light on how exactly large social networks affect the functioning of psychological mechanism governing social comparisons.

The analytic approach employed in this paper allows us to draw inferences about the association between naturally occurring levels of social media use and self-esteem, but it is not conclusive of the definitive causal relations between them. As such, an alternative interpretation to the findings in this paper is that self-esteem is also likely to influence social media use. Social media typically offers users opportunities for self-disclosure,

feedback validation, and relationship development (Stern, 2004; Boyd, 2008; Reich et al., 2012). With these opportunities, social media was deemed to be particularly useful for individuals with lower levels of self-esteem who face difficulties in social situations in real life. Social media allows them to compensate their need for social interactions by allowing them to expand their social capital (Forest and Wood, 2012; Błachnio et al., 2013, 2016) and social snack through photos, representational reminders of social connections, and parasocial relationships (see Gardner et al., 2005). Thus, experiments manipulating social media use, and the number of friends one has, would be required to establish causal relationship between social media use and self-esteem. That said, these experiments would have to be carefully set up as participants should still feel socially connected after the possible manipulations (e.g., manipulated social profiles) in order to elicit meaningful social comparisons.

Having used a university's psychology subject pool system, we recognize some of the shortcomings that accompany this sample. Participants in our participants were predominantly women who may be more influenced by the cues on social media than men. Compared to men, they tend to internalize media-promoted ideals to a higher degree (Knauss et al., 2007) and are more oriented to the activities of others when using social media (Steinsbekk et al., 2021). Studies also show that women were more likely to have negative emotional responses and experience depressive symptoms than men when using social media (Fleuriet et al., 2014; Kelly et al., 2018). As such, the effect of social media use on self-esteem is likely to be more pronounced in the current sample than if it was from a more gender-balanced sample. To this end, future studies may want to consider including non-binary gender measures to derive at more accurate conclusions for the effects of social media use (Cameron and Stinson, 2019). Additionally, participants were categorized into groups according to the quartiles of the number of friends they reported they had across all their social media platforms. While we observed significant findings for the interaction term and simple slopes, the number of participants in each group is considered small (roughly 30 per group). Hence, a larger sample size in future studies would provide greater confidence to the findings of this paper.

Furthermore, the amount of social information one is exposed to on social media is inferred from the number of friends one has in this study, which may not be a nuanced enough measure. The exposure to social information could be different depending on specific behaviors and the types of activities people engage in on social media. For instance, they may spend more time curating their profiles and working on their own posts than reading and interacting with those of others, and this implies that they would be less exposed to social information regardless of the number of friends they have on social media. As such, it would be beneficial for future studies to breakdown social information exposure through the different ways people spend their time on social media.

CONCLUSION

This study aimed to examine the negative, but weak, relationship between social media use and self-esteem. Employing social comparison theory and an evolutionary mismatch perspective, we found that people's social network size on social media moderated the relationship between social media use and self-esteem. Specifically, we found that greater social media use was associated with lower self-esteem only when social network size was evolutionarily familiar (i.e., within 150 individuals). When social network sizes were evolutionarily novel (i.e., social network sizes larger than 150 individuals), social media use was not associated with self-esteem. Our findings provide empirical evidence for a mismatch between the large social network sizes on social media and psychological mechanisms governing social comparison processes.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

AUTHOR CONTRIBUTIONS

AL conceptualised the research idea, collected and analyzed the data, and drafted the manuscript. CL conducted initial data analyses and contributed to the literature review. NL contributed to the conceptualization of the research idea. All authors read, edited, and approved the final manuscript and agreed to be accountable for the content of this article.

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