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Gender differences in the associations between parental phubbing, fear of missing out, and social networking sites addiction: A cross-lagged panel study

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Abstract

Despite the exploration of detrimental consequences of parental phubbing and adolescent social networking site (SNS) addiction, research regarding their bidirectional relationships and underlying mechanisms is lacking. To address this research gap, this study explored the longitudinal and bidirectional relationships between parental phubbing, fear of missing out (FoMO), and adolescent SNS addiction. Furthermore, this study investigated the mediating role of FoMO and the moderating role of gender therein. Data were collected among 1,447 Chinese adolescents in June 2019 (T1) and January 2020 (T2). The results showed significant positive correlations among all three variables in both waves. There were bidirectional associations between parental phubbing and adolescent SNS addiction. T1 parental phubbing positively predicted T2 FoMO and T1 FoMO positively predicted T2 SNS addiction, but not vice versa. FoMO mediated the link between parental phubbing and subsequent adolescent SNS addiction. T1 SNS addiction predicted T2 parental phubbing and T1 FoMO predicted T2 SNS addiction – but these effects were significant only among girls. The effect of T1 FoMO on T2 FoMO was significantly stronger among girls than in boys. The findings contribute to the literature on parental phubbing and adolescent SNS addiction and provide insights for prevention and intervention programs addressing adolescent SNS addiction.

Keywords: parental phubbing, fear of missing out, social networking sites addiction, adolescent, gender difference, cross-lagged panel analysis

1. Introduction

Smartphones have now become ubiquitous in many countries worldwide (Abbasi, 2021; Khan et al., 2021). The large growth in communication technologies has led to smartphones becoming an integral part of individuals' daily lives (Han, 2022; Roberts & David, 2020). By the end of 2022, approximately 1.06 billion individuals owned a smartphone in China (China Internet Network Information Center, 2023). Despite the multiple benefits, the increasing use of smartphones is not without concerns (Chi et al., 2022), including the rising prevalence of phubbing (Büttner et al., 2022). As a portmanteau of the words 'phone' and 'snubbing' (Macquarie Dictionary Blog, 2016), phubbing depicts instances when individuals snub others around them to focus on their smartphones (Roberts & David, 2016). Such acts appear to have become commonplace in various everyday interaction settings (Chotpitayasunondh & Douglas, 2016), an example being parental phubbing in parent-adolescent communications (Xie & Xie, 2020).

Prior research has demonstrated parental phubbing to be a predictor of adolescent mental health and various problematic behaviors, such as depression (Xie & Xie, 2020), problematic smartphone use (Geng et al., 2021), cyberbullying (X. Wang et al., 2022) suicidal ideation (Wang & Qiao, 2022), learning burnout (Wang et al., 2023), and adolescent social networking site (SNS) addiction (Dong et al., 2023). Although the positive association between parental phubbing and adolescent SNS addiction has already been identified in prior studies (e.g., Dong et al., 2023; Wang & Lei, 2022; P. Wang, Hu et al., 2022), longitudinal data demonstrating their causal relationship remain scarce. Moreover, the internal mechanisms underlying the association are largely unexplored, limiting the understanding of their relationship.

SNS addiction is defined as an inordinate preoccupation with SNSs and an act

of devoting excessive time and energy to SNSs motivated by an uncontrollable desire to log in and use SNSs that clinically impairs other vital areas of life (Ahmed et al., 2021; Andreassen & Pallesen, 2014). Considerable research has established a strong association of SNS addiction with various detrimental outcomes among adolescents, such as poor psychological functioning (Sampasa-Kanyinga & Lewis, 2015), insomnia (Lin et al., 2021), psychological distress (e.g., anxiety and depression) (Marino et al., 2018; P. Wang, Wang et al., 2018), and lower subjective happiness (Longobardi et al., 2020). Considering the commonness of parental phubbing and the harmful effects of SNS addiction on adolescents, investigating the link between parental phubbing and adolescent SNS addiction would be instructive in the prevention and early intervention of adolescent SNS addiction and minimizing its consequent adverse effects.

Therefore, in light of the research gaps and the practical significance of this contemporary issue, the present study adopted a cross-lagged panel model to examine the longitudinal and bidirectional relationships between parental phubbing, fear of missing out, and adolescent SNS addiction. In addition, the study explored the mediating effect of fear of missing out and the moderating role of gender in such associations. This study advances existing literature in several ways. Specifically, this research design allows for a deeper understanding of the causal and temporal dynamics between these variables, shedding light on their developmental trajectories. Moreover, by examining the reciprocal influences between these variables, the research provides valuable insights into the complex interplay and potential feedback loops that may exist. Such a comprehensive understanding of the bidirectional relationships helps to enhance our knowledge of the underlying mechanisms driving the development and maintenance of adolescents' SNS addiction. Furthermore,

considering gender as a moderating factor enables a more comprehensive understanding of how parental phubbing, FoMO, and SNS addiction may operate differently across genders. This inclusion offers valuable insights for tailoring interventions and prevention strategies to address gender-specific needs.

1.1 Parental phubbing and adolescent SNS addiction

Parental phubbing refers to the act of parents being more absorbed by their smartphones while neglecting their children during offline face-to-face interactions (Xie & Xie, 2020). It fosters an atmosphere of indifference in parent-child interactions, making adolescents feel ostracized and alienated from their parents (Wang & Lei, 2022). According to the compensatory model of internet use (), negative life situations can induce motivations to use SNSs to alleviate negative emotions, which leads to a greater likelihood of addiction to SNSs (Kardefelt-Winther, 2014). Therefore, as a negative circumstance in parent-child communications, parental phubbing may drive adolescents to use SNSs heavily and subsequently develop SNS addiction. On the other hand, social learning theory posits that observational learning serves as a vital pathway for individual socialization. In the case of adolescents, parents serve as their primary role models for observational learning (Bandura, 1971). Consequently, adolescents' behaviors are shaped through their observation of parental activities (Grusec, 1992). Therefore, because parental phubbing sets a poor example for adolescents, it can lead their children to check and use SNSs more frequently, resulting in a greater risk of SNS addiction (Dong et al., 2023). Prior studies have established a positive association between parental phubbing and adolescent SNS addiction (e.g., Dong et al., 2023; Wang & Lei, 2022; P. Wang, Hu et al., 2022), but these investigations were based on cross-sectional designs, leaving limited knowledge about the prospective impact of parental phubbing on

adolescent SNS addiction over time.

Although it is unclear whether adolescent SNS addiction predicts parental phubbing, there is suggestive evidence of such a relationship. Transactional theory argues that the behaviors of parents and children have a reciprocal impact on each other, creating cycles of reciprocal causality that result in changes for both parties over time (Sameroff, 1975). According to this theory, adolescent-parent relationships are bidirectional and mutually influential. That is, parents shape adolescents as much as adolescents shape parents (Lerner, 2004; Reitz et al., 2006). Moreover, adolescent behaviors can trigger specific patterns of parental responses (Baker et al., 2020). Empirical findings have shown that parents adjust their subsequent parenting strategies and behaviors in response to children's problem behaviors (Dishion et al., 2004; Gault-Sherman, 2012; Pinquart, 2017; Williams & Steinberg, 2011; Zhu & Shek, 2020). More specifically, in reaction to children's externalizing behaviors, parents may become disengaged (Dishion et al., 2004), reduce their warmth (Williams & Steinberg, 2011; Zhu & Shek, 2020), and become less supportive (Pinquart, 2017; Stice & Barrera, 1995). Because phubbing is an act demonstrating inattention, disinterest, and neglect of others (Roberts & David, 2016), it is postulated that parents may opt to cope with their children's SNS addiction through phubbing behaviors. Therefore, the present study investigated the bidirectional associations between parental phubbing and adolescent SNS addiction with a cross-lagged panel analysis.

1.2 Parental phubbing and fear of missing out

Fear of missing out (FoMO) describes a pervasive and intense apprehension that individuals have when they are absent, and think that others might be having positive and rewarding experiences without them (Przybylski et al., 2013). Self-determination theory (Deci & Ryan, 1985) proposes that individuals have three

fundamental psychological needs: autonomy (the perception of freedom from external pressure), competence (the sense of effectiveness in one's actions), and relatedness (the feeling of connection and care), and FoMO occurs when such a need is not met (Przybylski et al., 2013). Prior studies have indicated that parental phubbing significantly negatively predicts adolescent relatedness need satisfaction (Pancani et al., 2021; Xie & Xie, 2020), and that individuals whose relatedness needs are unfilled experience more FoMO (Elhai et al., 2020; Xie et al., 2018). Therefore, it is postulated that parental phubbing could positively predict adolescent FoMO. Two previous studies have provided initial evidence for such a hypothesis. In particular, Xiao (2022) found that parental phubbing predicted adolescent FoMO via mindfulness, and Geng et al. (2021) reported that parental phubbing positively affected subsequent adolescent FoMO via loneliness. It is, therefore, plausible to assume that parental phubbing would positively impact subsequent adolescent FoMO.

Few studies have considered the influences of adolescent FoMO on parental phubbing. However, empirical evidence has shown that individuals' FoMO is positively correlated with their sensitivity to social exclusion (Holte et al., 2022), and that adolescents tend to exhibit greater sensitivity to ostracism (Konijn et al., 2015). Since parental phubbing is frequently accompanied by a range of ostracism cues, such as eye contact avoidance (Chotpitayasunondh & Douglas, 2018), and inappropriate conversational pauses (Hales et al., 2018), adolescents with high FoMO levels might be more sensitive to parental phubbing as well as perceiving and reporting more parental phubbing. Therefore, it is plausible to hypothesize that adolescent FoMO may positively predict perceived parental phubbing. Taken together, the present study examined the bidirectional link between parental phubbing and adolescent FoMO.

1.3 FoMO and adolescent SNS addiction

Since the concept of FoMO was introduced, a growing body of research has explored its possible role on problematic online behaviors (Elhai et al., 2020). Because FoMO stems from an unmet need for relatedness, experiencing it would signify an aversive state of negative emotion (Elhai et al., 2018). In light of the compensatory model of internet use, negative emotions are conceptualized as the driving factors of using (and problematically using) SNSs in contemporary society (Kardefelt-Winther, 2014). Put simply, FoMO underlies SNS addiction (Akbari et al., 2021). A meta-analysis study also supported the robust and positive associations between two (Fioravanti et al., 2021). Therefore, it is reasonable to argue that FoMO would positively associate with SNS addiction, and is supported by a relatively large body of research (e.g., Elhai et al., 2018; Fabris et al., 2020; Franchina et al., 2018; Oberst et al., 2017). Nevertheless, considering the cross-sectional nature of these studies, the longitudinal association between FoMO and adolescent SNS addiction remains unclear.

Moreover, it has been claimed that enhanced SNS use leads to the possibility that FoMO is increasingly becoming embedded in users' psyches (Przybylski et al., 2013), namely, more SNS use may predict the development of FoMO. Nevertheless, to the best of the present authors' knowledge, very little research has explored the impacts of SNS addiction on FoMO. One cross-sectional study found that adolescent SNS addiction positively predicted their FoMO (i.e., Yin et al., 2021). Furthermore, a re-EEG study provided neuroscientific evidence for the effects of SNS addiction on FoMO (Yin et al., 2023). Another longitudinal study found that SNS use increased subsequent FoMO (Buglass et al., 2017). However, the samples of the latter two studies were from the general population rather than focusing specifically on adolescents. Consequently, the longitudinal and bidirectional relationship between

adolescent SNS addiction and FoMO requires further exploration (Elhai et al., 2021).

1.4 The theoretical framework for the mediating role of FoMO

The compensatory internet use theory of (Kardefelt-Winther, 2014) posits that individuals who experience unfavorable circumstances in real-life are more prone to negative emotions. This, in turn, promotes them to seek escape or relief by engaging in virtual online spaces or to compensate for the lack of real-life social interactions, thus increasing the likelihood of developing internet addiction. This theory also applies to SNS addiction (Zsido et al., 2021).

Based on the compensatory internet use theory, it is hypothesized that parental phubbing indirectly affects adolescent SNS addiction through FoMO. More specifically, parental phubbing, a behavior that has been extensively linked to numerous negative consequences for adolescents (Wang & Qiao, 2022; Xie & Xie, 2020), represents a negative life situation for adolescents (Xie & Xie, 2020). This situation often gives rise to negative emotions, including FoMO (Elhai et al., 2018; Przybylski et al., 2013; Xiao, 2022), which is characterized as a negative emotional experience arising from unfulfilled relatedness needs (Przybylski et al., 2013). Consequently, FoMO could be a potential mediator in the association between parental phubbing and adolescent SNS addiction.

One previous longitudinal study provides indirect support for the mediating role of FoMO. More specifically, Geng et al. (2021) found that loneliness and FoMO played chain mediating roles in the relationship between parental phubbing and adolescent problematic smartphone use. Considering Geng et al.'s (2021) definition of problematic smartphone use as a behavioral addiction, we posit that problematic smartphone use and SNS addiction share common core characteristics, which have also been supported by previous research (e.g., Kuss & Griffiths, 2017; Seo & Ray,

2019). Based on the theoretical and empirical support mentioned above, we believe that hypothesizing FoMO as a mediator in the longitudinal association between parental phubbing and adolescent SNS addiction is plausible. Therefore, the present study employed a longitudinal design to investigate the mediating effect of FoMO in the link between parental phubbing and adolescent SNS addiction. Figure 1 depicts the conceptual model for this research.

1.5 Gender differences

Findings from previous studies suggest that gender differences in the proposed model are worth exploring. First, research examining gender differences in SNS addiction has reported inconsistent results. Some studies have found that males' addictive tendencies to SNSs were higher than females' (Brailovskaia et al., 2023; Xuan & Amat, 2021). Some other studies have found the opposite (Andreassen et al., 2017; Chae et al., 2018; Chen, 2019). Meanwhile, some studies have reported no gender differences regarding SNS addiction (Müller et al., 2016). Second, studies on gender differences in FoMO have also shown inconsistent results. Males have been found to have greater FoMO than females in some studies (Przybylski et al., 2013), whereas other studies have indicated the opposite (Casale et al., 2018; Elhai et al., 2018), or have found no gender differences regarding FoMO (Milyavskaya et al., 2018; Rozgonjuk et al., 2020; Tomczyk & Selmanagic-Lizde, 2018). Third, gender differences in the link between parental phubbing and adolescent SNS addiction have been supported by prior studies. For instance, Xie et al. (2019) found that male adolescents were more likely than female adolescents to experience deviant peer relationships and smartphone addiction when perceiving parental phubbing. Finally, research evidence has reported gender differences between FoMO and SNS addiction. For instance, Brailovskaia et al. (2023) reported that the relationship between FoMO

and SNS addiction was more robust among males than females. Therefore, the present study conducted a multi-group path analysis to explore gender differences in the associations between parental phubbing, FoMO, and adolescent SNS addiction.

1.6 The present study

The present study investigated the concurrent and longitudinal reciprocal associations between parental pubbing, FoMO, and adolescent SNS addiction, as well as the mediating role of FoMO and the gender differences therein. More specifically, the study aimed to test the following hypotheses: parental pubbing would positively predict subsequent adolescent SNS addiction, and vice versa (H_1); parental pubbing would positively predict subsequent adolescent FoMO, and vice versa (H_2); FoMO would positively predict subsequent adolescent SNS addiction, and vice versa (H_3); and FoMO would mediate the longitudinal link between parental pubbing and adolescent SNS addiction (H_4). In addition, the study examined how the aforementioned relationships differed between male and female adolescents.

2. Methods

2.1 Participants

The data were collected in two waves in June 2019 (hereafter T1) and January 2020 (hereafter T2). The initial sample in the first assessment comprised 1,520 Chinese students, of whom eight were excluded due to not completing all the questions. At T2, 1,447 out of the 1,512 participants from T1 completed all the questions. The drop-out rate was 4.3%. Therefore, the final sample comprised 1,447 Chinese students (60.5% females; $M_{age} = 16.15$, $SD = .65$). More detailed demographic information is shown in Table 1.

The attrition analyses showed no significant differences between participants and dropouts in T1 parental phubbing ($M_{dropout} = 2.40$, $SD_{dropout} = .77$, $M_{stay} = 2.23$,

$SD_{\text{stay}} = .79$; $t(1510) = -1.62$, $p = .105$), T1 FoMO ($M_{\text{dropout}} = 3.12$, $SD_{\text{dropout}} = 1.19$, $M_{\text{stay}} = 3.12$, $SD_{\text{stay}} = 1.15$; $t(1510) = .002$, $p = .998$), T1 adolescent SNS addiction ($M_{\text{dropout}} = 2.91$, $SD_{\text{dropout}} = 1.33$, $M_{\text{stay}} = 2.95$, $SD_{\text{stay}} = 1.25$; $t(1510) = .286$, $p = .775$), and gender ($N_{\text{girls dropout}} = 36$, $N_{\text{girls stay}} = 875$, $N_{\text{boys dropout}} = 29$, $N_{\text{boys stay}} = 572$, $\chi^2(1) = .67$, $p = .412$), indicating that no structural attrition of participants existed.

2.2 Procedure

The study protocol was approved by the Ethics Committee of the corresponding author's institution. The data was gathered in paper-pencil format from students enrolled in two senior high schools in Jiangsu and Hebei provinces in China. The corresponding author contacted the school authorities, and got informed consent from participants, teachers, and administrators prior to data collection. Participants were informed that their participation was entirely voluntary and that they had the right to quit the survey anytime. They were also told that the data collected would be anonymous and treated confidentially. To guarantee the standardization of the data collection process, the entire process was carried out by trained collectors following a procedure manual. Participants received a small gift for their participation.

2.3 Measures

2.3.1 Parental phubbing

An adaption of the 22-item Generic Scale of Being Phubbed (GSBP; Chotpitayasunondh & Douglas, 2018) was used to assess parental phubbing, in which the subject in the items was modified from "others" to "my father/mother" (e.g., "My father/mother pay attention to their phones rather than focusing on me"). Items were rated on a seven-point scale from 1 (*never*) to 7 (*always*), and the average score of all items was calculated, with higher scores indicating higher levels of parental phubbing. Parental phubbing was indicated by the average scores of father phubbing and mother

phubbing. The scale has shown high reliability in both previous studies (e.g., P. Wang, Mao et al., 2022) and the present study ($\alpha_{T1} = .92$; $\alpha_{T2} = .95$). Confirmatory factor analysis suggested that the scale had acceptable model fit at T1 ($\chi^2 = 2193.02$, $df = 199$, $p < .001$, Comparative Fit Index (CFI) = .91, Tucker-Lewis Index (TLI) = .90, Root Mean Square Error of Approximation (RMSEA) = .08, Standardized Root Mean Square Residual (SRMR) = .05) and T2 ($\chi^2 = 2172.40$, $df = 199$, $p < .001$, CFI = .93, TLI = .92, RMSEA = .08, SRMR = .05).

2.3.2 Fear of missing out

The adapted 10-item FoMO Scale (FoMOS; Przybylski et al., 2013) was used to assess FoMO. Items (e.g., “*I get worried when I find out my friends are having fun without me*”) were rated on a seven-point scale from 1 (*not at all true of me*) to 7 (*extremely true of me*). The average score of all items was calculated, with higher scores indicating higher levels of FoMO. Satisfactory reliability was reported in both previous studies with Chinese samples (e.g., P. Wang, Xie et al., 2018) and the present study ($\alpha_{T1} = .85$; $\alpha_{T2} = .91$). Confirmatory factor analysis suggested that the scale had acceptable model fit at T1 ($\chi^2 = 187.14$, $df = 29$, $p < .001$, CFI = .97, TLI = .95, RMSEA = .06, SRMR = .03) and T2 ($\chi^2 = 193.51$, $df = 29$, $p < .001$, CFI = .98, TLI = .97, RMSEA = .06, SRMR = .02).

2.3.3 Adolescent SNS addiction

The eight-item Facebook Intrusion Questionnaire (FIQ, Elphinston & Noller, 2011) was used to assess adolescent SNS addiction, in which the subject in the items was modified from “Facebook” to “SNSs”. Items (e.g., “*I often think about SNSs when I am not using it*”) were rated on a seven-point scale, ranging from 1 (*never*) to 7 (*always*). The mean of all items were calculated with higher scores indicating higher levels of SNS addiction. The scale is applicable to Chinese samples and showed high

reliability in both previous studies (e.g., Yin et al., 2021) and the present study ($\alpha_{T1} = .87$; $\alpha_{T2} = .91$). Confirmatory factor analysis suggested that the scale had acceptable model fit at T1 ($\chi^2 = 54.18$, $df = 14$, $p < .001$, CFI = .99, TLI = .98, RMSEA = .05, SRMR = .02) and T2 ($\chi^2 = 98.66$, $df = 14$, $p < .001$, CFI = .99, TLI = .98, RMSEA = .07, SRMR = .02).

2.4 Statistical analysis

Preliminary analyses, including descriptive and correlational analyses, were performed using SPSS 26.0. Mplus 8.0 was then utilized to estimate the structural equation model. In particular, the hypothesized cross-lagged model test, the mediation analysis, and multiple-group path analyses were performed. Additionally, considering that the constructs in this study include more than five items, we employed the item-to-construct balance parceling technique to address non-normal data, minimize parameter estimation bias, simplify the structure of latent variable model, and enhance the stability and parsimony of the measurement and structural model (Bandalos, 2002; Little et al., 2002; Little et al., 2007), similar to previous longitudinal studies (e.g., Mesdaghinia et al., 2023; Seibert et al., 2021).

Firstly, the configural, metric, as well as scalar invariance of measurement models imposed equality constraints, were examined to guarantee an across-time comparable measurement structure for the latent constructs. Secondly, the fit indices of the autoregressive model were tested. Thirdly, a two-wave cross-lagged panel model was performed to investigate the associations between parental phubbing, FoMO, and adolescent SNS addiction. Fourthly, the mediating effect of FoMO was investigated. It was estimated that the product of the cross-lagged regression coefficients of T1 parental phubbing on T2 FoMO (path α) and T1 FoMO on T2 SNS addiction (path β) as the mediation effect based on prior scholars' advice regarding

the two-wave model (i.e., Maxwell & Cole, 2007). A statistically significant $\alpha\beta$ value (i.e., the confidence interval excluding zero) indicates that FoMO could mediate the impact of T1 parental phubbing on T2 SNS addiction. Fifthly, a bootstrap sample of 5000 was performed to gauge the 95% bootstrap confidence interval of the indirect effect. A significant mediating role of FoMO is suggested by a confidence interval not including zero. Last, to explore the gender differences regarding the longitudinal links between parental phubbing, FoMO, and adolescent SNS addiction, multiple-group path analyses and validation of the results with Wald tests were conducted.

Specifically, measurement invariance between genders was examined for all potential variables firstly. Then, a gender-based multi-group cross-lagged model was conducted to test whether there would be a variant path pattern across gender. Afterwards, we constrained each path to be equal across gender groups to assess differences. A significant difference was determined if the chi-square statistic (χ^2) values (degrees of freedom (df) = 1) exceeded 3.84. For instance, when we constrained the T1 parental phubbing to T2 FoMO path to be equal between males and females and observed that $\chi^2(1) > 3.84$, it indicated a significant gender difference in this particular path.

The analysis assessed the overall model fit with χ^2 statistics, df , RMSEA, CFI, TLI, and SRMR. For these indexes, the model with TLI and CFI values $> .90$, respectively, is acceptable (Hu & Bentler, 1999); for RMSEA and SRMR, values < 0.08 suggests that the model fit could be acceptable (Browne & Cudeck, 1992). ΔCFI , ΔTLI , and $\Delta RMSEA$ were also utilized to assess measurement models (Hu & Bentler, 1999), with ΔCFI and ΔTLI values both $< .010$ and $\Delta RMSEA$ values $< .015$ demonstrating an equivalent fit between models (Chen, 2007). Taking into account that χ^2 has a high sensitivity to sample size and its tendency to produce statistically significant values, it was not used as a gauge of model fit, although it was reported

(Cheung & Rensvold, 2002).

3. Results

3.1 Preliminary analyses

Table 2 presents the descriptive statistics (i.e., means and standard deviations) and correlation coefficients for the main variables. As expected, the pattern of correlations between the variables in both waves was similar. Parental phubbing, FoMO, and adolescent SNS addiction were significantly and positively correlated in each wave.

3.2 Cross-lagged analysis

3.2.1 Measurement invariance between two time-points

Measurement invariance was established between the two time-points. Three, five, and two parcels were employed for parental phubbing, FoMO, and SNS addiction, respectively. Then, a configural invariance model analysis (see M1 in Table 3), a metric invariance model analysis (see M2 in Table 3), and a scalar invariance model analysis were conducted (see M3 in Table 3). As indicated in Table 3, both the metric invariance model and the configural invariance model achieved suitable model fits, meeting the aforementioned standards (i.e., ΔCFI and ΔTLI values both $< .010$, and $\Delta RMSEA$ values $< .015$). The scalar invariance model almost achieved a suitable model fit except that the value of ΔCFI equaled $.010$. Following previous studies (P. Wang, Pan et al., 2022), an unconstrained model was retained in the subsequent analyses.

3.2.2 The auto-regressive model

Following this, an autoregressive model, including all auto-regressive pathways between the T1 and T2 measurements of parental phubbing, FoMO, and SNS addiction, were tested. As is shown in Table 3 (see M4), the autoregressive

model fitted well. All autoregressive paths were significant.

3.2.3 The cross-lagged model

A cross-lagged panel model was conducted to examine the longitudinal and bidirectional relationships between the variables of interest, in which the associations of all the variables at the same measuring point were incorporated to control for cross-sectional correlations. The fit indices of the hypothesized model were acceptable (see M5 in Table 3). The significant paths are shown in Figure 2, indicating that (i) parental phubbing was significantly correlated with SNS addiction ($r_{T1} = .31, p < .001$; $r_{T2} = .18, p < .001$), (ii) parental phubbing was significantly correlated with FoMO ($r_{T1} = .23, p < .001$; $r_{T2} = .22, p < .001$), and (iii) FoMO was significantly correlated with SNS addiction ($r_{T1} = .55, p < .001$; $r_{T2} = .67, p < .001$).

As for the cross-lagged effects, the standardized regression coefficients of T1 parental phubbing on T2 SNS addiction ($\beta = .08, p = .004$) showed that more parental phubbing predicted greater adolescent SNS addiction at the subsequent time-point. Higher levels of T1 adolescent SNS addiction, reciprocally, significantly predicted more T2 parental phubbing ($\beta = .08, p = .011$). As hypothesized, T1 parental phubbing significantly and positively predicted T2 FoMO ($\beta = .11, p < .001$), whereas T1 FoMO did not predict T2 parental phubbing ($\beta = -.004, p = .889$). Moreover, T1 FoMO significantly and positively predicted T2 SNS addiction ($\beta = .09, p = .005$), while T1 SNS addiction did not predict T2 FoMO ($\beta = .06, p = .077$).

3.2.4 The mediation model

To investigate if FoMO mediated the longitudinal link between parental phubbing and adolescent SNS addiction, the cross-lagged panel model for half-longitudinal designs, suitable for testing mediation with two time-points, was used (Preacher, 2015). Using the SEM and bootstrapping method (bootstrap = 5,000), the

mediating role of FoMO in the relationship between T1 parental phubbing and T2 SNS addiction was examined. The mediation model fitted the data well: $\chi^2 (145) = 737.546, p < .001$, CFI = .968, TLI = .958, RMSEA = .053, and SRMR = .039. The standardized indirect effect of FoMO was .01, 95 % CI [.003, .028], and zero was not included, indicating that FoMO mediated the association between parental phubbing and SNS addiction stably across time.

3.2.5 Multiple group analysis

To explore the gender differences within the interaction mechanisms between parental phubbing, FoMO, and adolescent SNS addiction, measurement invariance tests for gender and multi-group path analyses were performed. First, measurement invariance between genders was examined for all potential variables. The fully unconstrained measurement model in which all parameters (i.e., indicators of latent variables and their errors) were estimated freely fitted well ($\chi^2 (290) = 906.779, p < .001$, CFI = .967, TLI = .957, RMSEA = .054, SRMR = .042). The fully constrained measurement model in which all parameters were fixed for both gender groups also had a good model fit ($\chi^2 (304) = 960.506, p < .001$, CFI = .965, TLI = .956, RMSEA = .055, SRMR = .043). Given that $\Delta CFI < .010$, $\Delta TLI < .010$, and $\Delta RMSEA < .015$, measurement invariance was established between genders. As in prior studies (P. Wang, Pan et al., 2022), the fully unconstrained model was retained in the subsequent analyses.

Second, a gender-based multi-group cross-lagged model was conducted. More specifically, the freely estimated model to the fully constrained model was compared. It was found that when cross-gender path coefficients were constrained to be equal, the constrained model was significantly distinct from the unconstrained one ($\Delta\chi^2 (9) = 19.15, p = .024$). Therefore, a variant path pattern was observed across gender.

To further examine how the path coefficient varied between males and females, a set of models was tested by constraining each path, one at a time, to be equal across gender groups. For example, we tested for gender differences in the T1 FoMO to T2 SNS addiction path by constraining it to be equal for males and females. We repeated this procedure for all paths in the model to check gender difference differences on all the paths. A significant gender difference would be indicated if $\Delta\chi^2(1) > 3.84$. As shown in Table 4, the results indicated that the coefficients of the following three paths significantly differed across gender: T1 FoMO to T2 SNS addiction ($\Delta\chi^2(1) = 5.35, p = .021$), T1 SNS addiction to T2 parental phubbing ($\Delta\chi^2(1) = 4.66, p = .031$), and T1 FoMO to T2 FoMO ($\Delta\chi^2(1) = 5.19, p = .023$). In particular, the effect of T1 FoMO on T2 SNS addiction was significant among females ($\beta = .16, p < .001$), but not among males ($\beta = -.01, p = .863$). The effect of T1 SNS addiction on T2 parental phubbing was also significant among females ($\beta = .15, p < .001$), but not among males ($\beta = -.01, p = .862$). The effect of T1 FoMO on T2 FoMO was significantly higher among females ($\beta = .44, p < .001$) than among males ($\beta = .27, p < .001$).

4. Discussion

Although much of the extant psychological literature has investigated the adverse impacts of parental phubbing, it was not known how parental phubbing, adolescent FoMO, and SNS addiction related over time. It is in this specific regard that the present study contributes to the existing literature by addressing these gaps in previous studies. Specifically, adopting a longitudinal approach spanning two time-points, this study examined the bidirectional associations between parental phubbing, adolescent FoMO, and SNS addiction among Chinese adolescents. Additionally, the mediating effect of FoMO in the link between parental phubbing and adolescent SNS

addiction, as well as the gender differences of the proposed research model, were explored.

Cross-lagged analysis with latent variables showed that parental phubbing was significantly positively related to subsequent adolescent FoMO and SNS addiction, and there was a reciprocal association between parental phubbing and adolescent SNS addiction. Moreover, FoMO mediated the link between parental phubbing and subsequent adolescent SNS addiction. Gender differences were found in the three pathways in the research model. More specifically, T1 FoMO positively predicted T2 adolescent SNS addiction among females; T1 adolescent SNS addiction positively predicted T2 parental phubbing among females; and the prediction of T1 FoMO on T2 FoMO was stronger among females.

4.1 Parental phubbing and adolescent SNS addiction

As expected, parental phubbing significantly positively affected subsequent adolescent SNS addiction (supporting H₁). This finding lends support to both the compensatory model of internet use (Kardefelt-Winther, 2014) and social learning theory (Bandura, 1971). More specifically, on one hand, parental phubbing (as a negative life situation) induced adolescents to use SNSs to alleviate the negative emotions arising from their parents only focusing on their smartphones and neglecting them, which facilitated SNS addiction. On the other hand, parents' frequent use of smartphones when being with their children sets a poor example for adolescents to emulate, leading adolescents to learn and imitate their parents' behaviors, which facilitated the development of SNS addiction. The finding congeries with previous cross-sectional studies which found parental phubbing to be positively related to adolescent SNS addiction (e.g., Dong et al., 2023; Wang & Lei, 2022; P. Wang, Hu et al., 2022). Additionally, the current study contributes to the existing literature by

providing longitudinal evidence of the association between these behaviors using a cross-lagged panel research design.

In addition, the results indicated that adolescent SNS addiction positively predicted subsequent parental phubbing. This finding supports transactional theory (Sameroff, 1975). More specifically, it confirms that the association between parents and adolescents is bidirectional and mutually reinforcing. Adolescent behaviors trigger specific patterns of parents' reactions (Baker et al., 2020). It is consistent with previous findings that parents respond to children's externalizing behaviors, such as SNS addiction with disengagement, lack of warmth, and reduced support (Dishion et al., 2004; Pinquart, 2017; Zhu & Shek, 2020). Building upon these findings, the present study innovatively provides direct longitudinal evidence of the impact of parental phubbing on adolescents, thereby enriching the existing literature.

Collectively, there appears to be a vicious circle between parental phubbing and adolescent SNS addiction. The reciprocal associations offer researchers a new lens to understand why parents carry out phubbing behaviors and the potential consequences for their children. Based on the present study's findings, parents are encouraged to find positive ways to cope with their children's SNS addiction rather than resorting avoidance and negative approach by always being on their smartphones.

4.2 Parental phubbing and FoMO

As expected, parental phubbing positively and significantly predicted subsequent adolescent FoMO (supporting H₂). The finding supports self-determination theory (Deci & Ryan, 1985), which posits that FoMO occurs when individuals' need for relatedness cannot be met. When parents are always on their smartphones when they are with their children, it cuts off the children's positive

connection with parents and their need for relatedness will not be met, ultimately leading to their FoMO. This finding builds on previous studies (i.e., Geng et al., 2021; Xiao, 2022) by providing evidence for the direct impact of parental phubbing upon adolescent FoMO. This enriches the existing studies in this field through the innovation of a cross-lagged panel research design. In light of this finding, parents should be advised to minimize their smartphone use when spending time with their children, thereby lessening children's negative psychological experiences, such as FoMO.

Notably, the present study showed that adolescent FoMO was not a significant predictor of subsequent parental phubbing. The limited nature of cognitive resources may be a potential explanation. As aforementioned, FoMO is an aversive state of negative emotion (Elhai et al., 2018). What is more likely to happen when individuals experience FoMO is to alleviate it through SNS or smartphone use, as noted by the compensatory model of internet use (Kardefelt-Winther, 2014). For example, a relatively large body of previous research has found that FoMO positively predicts individuals' phubbing (e.g., Fang et al., 2020; Franchina et al., 2018; Tandon et al., 2022). That is, individuals with high levels of FoMO allocate large amounts of cognitive resources to constantly checking their digital devices or SNSs (Rozgonjuk et al., 2019), resulting in less cognitive resources being attributed to the offline behaviors of those around them. Consequently, adolescents in such cases may be less sensitive and attentive to offline parental behaviors (e.g., parental phubbing). That is, adolescents with high levels of FoMO may not report perceiving much parental phubbing.

4.3 FoMO and adolescent SNS addiction

As expected, adolescent FoMO positively and significantly predicted their

subsequent SNS addiction (supporting H₃). This finding is congruent with the compensatory model of internet use (Kardefelt-Winther, 2014). In particular, adolescents with higher levels of FoMO tend to develop greater addiction to SNSs, probably because FoMO stems from the unmet need for relatedness. Therefore, experiencing FoMO results in negative emotional experiences (Elhai et al., 2018). Such negative emotions drive adolescents to use SNSs excessively, leading to a greater risk of SNS addiction. This finding is congruent with prior cross-sectional studies (e.g., Fabris et al., 2020; Franchina et al., 2018; Oberst et al., 2017) and provides evidence for the association between FoMO and SNS addiction from longitudinal data. Thus, it is recommended that clinical practitioners consider the impact of FoMO when designing intervention programs targeting SNS addiction in adolescents.

However, the present study did not find that adolescent SNS addiction predicted subsequent FoMO, which diverges from previous findings (Buglass et al., 2017). One possible explanation for this discrepancy could be the age group differences within the samples. Specifically, the sample in the present study was school-aged adolescents, whereas the study by Buglass et al. (2017) comprised participants from three different age groups. The unique characteristics of adolescents' daily lives may have contributed to such differences. For instance, compared to populations from other age groups, adolescents spend a significant amount of time at school, interacting with their classmates and friends. This frequent offline interaction may lead to a greater awareness of others' experiences and a stronger sense of shared life experiences. Additionally, spending substantial time together in face-to-face interactions provides ample opportunities for adolescents to share their experiences directly. That is, the social surveillance through SNSs noted by Buglass et al. (2017)

may not be as pronounced among the adolescent population. This finding suggests the link between FoMO and SNS addiction should be explored in different populations.

4.4 The mediating role of FoMO

The present study innovatively examined the essential role of FoMO in explaining the relationship between parental phubbing and adolescent SNS addiction. As expected, FoMO mediated the relationship between parental phubbing and adolescent SNS addiction (supporting H4). As posited by the compensatory model of internet use (Kardefelt-Winther, 2014), experiencing parental phubbing leading adolescents to develop greater FoMO (Przybylski et al., 2013; Xiao, 2022). As a negative emotional experience (Elhai et al., 2018), FoMO may drive adolescents to become addicted to SNSs (Kardefelt-Winther, 2014). Consequently, FoMO is one of the mediating mechanisms accounting for why adolescents are more prone to SNS addiction when perceiving high levels of parental phubbing. To the best of the authors' knowledge, the present investigation is the first longitudinal study to examine FoMO as a potential mechanism mediating the association between parental phubbing and adolescent SNS addiction. This expands on previous research and provides a more specific direction for intervention and treatment of SNS addiction among adolescents.

4.5 Gender differences

The present study also examined the moderating role of adolescent gender in the relationships between the study variables. The finding that the effect of T1 FoMO on T2 FoMO was stronger among females than among males is roughly congruent with the results of prior cross-sectional studies (e.g., Beyens et al., 2016; Elhai et al., 2018; Franchina et al., 2018; Stead & Bibby, 2017). Moreover, the present study provides evidence from longitudinal research design for the gender differences in

FoMO. One possible interpretation is that compared to males, interpersonal relationships are relatively more significant for females (Buss, 2015) and that relatedness needs are also more significant for females (Tian et al., 2016). Therefore, females are more likely to develop FoMO in fear of losing these social connections. Given that there is still no consensus on the findings regarding gender differences in FoMO, future research is needed to examine this issue.

The finding that T1 FoMO only positively predicted female adolescents' T2 SNS addiction is not congruent with previous research indicating that the prediction of FoMO on SNS addiction is stronger among males than females (Brailovskaia et al., 2023). Gender differences in motivation for SNS use might offer an explanation for this finding. Specifically, females mainly gain social information through SNSs, while males mainly access general information (Krasnova et al., 2017). Therefore, induced by FoMO, an emotion provoked by unfulfilled social relatedness needs, females are more likely to keep checking SNSs to compensate for their social relatedness needs and subsequently more prone to develop SNS addiction (Dempsey et al., 2019). Therefore, the impacts of FoMO on SNS addiction may be more significant among female adolescents than males. The present study supports gender differences regarding the effects of FoMO on SNS addiction through the longitudinal research design. It highlights the significance of considering gender in future counseling and intervention programs for SNS addiction.

Additionally, this study found that T1 adolescent SNS addiction positively predicted T2 parental phubbing among females (but not males). This finding is roughly concurrent with previous research suggesting that female adolescents' externalizing problem behaviors could lead to reduced parental support (e.g., Huh et al., 2006). Power-control theory (Hagan, 1989; Hagan et al., 1985) maybe an

explanation. In particular, parents often display greater tolerance towards boys' behavioral issues compared to girls, resulting in fewer actions taken to address boys' problem behaviors (Yang et al., 2022). In the case of daughters' SNS addiction, parents may be more likely to adopt certain coping strategies, such as using smartphones instead of communicating with their children during parent-child time to express decreased involvement in children's socialization and decreased warmth and support. On the basis of this finding, professionals practicing interventions of family relationships and adolescent SNS addiction should take into account the role of adolescent gender.

4.6 Implications

The present study makes several significant contributions to the existing literature. Firstly, it provides innovative evidence on the longitudinal and bidirectional relationship between parental phubbing and adolescent SNS addiction, thereby enriching the existing literature in this field. These findings not only enhance our understanding of the impact of parental phubbing on adolescent SNS addiction, which has primarily been explored through cross-sectional studies, but also reveal the dynamic interplay between parental phubbing and adolescent SNS addiction over time, adding depth to the literature. Additionally, this study provides innovative support for the impact of FoMO on adolescent SNS addiction through longitudinal research, which expands upon the predominantly cross-sectional nature of prior studies in this field. This longitudinal approach allows for the exploration of the temporal dynamics and causal pathways between FoMO and SNS addiction over time, providing valuable insights into the developmental processes and underlying mechanisms involved. Furthermore, to the authors' knowledge, the present study is the first to adopt a cross-lagged design to investigate the association between parental

phubbing and adolescent SNS addiction and the mediating effect of FoMO. This enriches the existing literature regarding the temporal sequences among the three variables by providing evidence from longitudinal research for their associations. Moreover, the findings extend prior research by evidencing the mediating role of FoMO and therefore contribute to a deeper insight into the underlying mechanisms by which parental phubbing increases adolescent SNS addiction. These findings advance the existing knowledge in the field and have theoretical implications for understanding the complex dynamics between parental phubbing, FoMO, and adolescent SNS addiction.

On a practical level, the link observed between parental phubbing, adolescent FoMO, and SNS addiction highlights the significance of parental phubbing in impacting adolescents' mental health and reducing their problematic behaviors. The findings provide insight for developing programs designed to decrease parental phubbing (Liu et al., 2020). Specifically, when providing family education or guidance, it is essential to raise parents' awareness regarding the negative consequences of parental phubbing on adolescents' mental health and problematic behaviors (Niu et al., 2020). Moreover, parents should be instructed on the appropriate use of smartphones to minimize any detrimental effects on adolescents' overall well-being (Bai et al., 2020). Simultaneously, government education agencies and the country may consider raising awareness of the detrimental effects of parental phubbing on children and enforce home education laws accordingly to encourage parents put down the smartphones during parenting time (Xu & Xie, 2023).

In addition, the impact of parental phubbing on adolescent SNS addiction highlights the significance of family-based interventions (e.g., multi-family group therapy) in addressing adolescent SNS addiction (Hong et al., 2019; Liu et al., 2015).

Reducing parental phubbing would be an effective approach to prevent and intervene in adolescent SNS addiction. Educators and psychotherapists should actively encourage parents to exercise caution in smartphone usage and minimize phubbing behaviors during interactions with their children (Cemiloglu et al., 2022; Tang et al., 2024). Establishing mutually agreed-upon rules for technology use during family time, along with promoting mutual reminders among family members, would be beneficial (McDaniel, 2015). Furthermore, implementing community and school programs, such as UP2U, which aim to increase public awareness of cellphone-related concerns, can effectively encourage parents to prioritize quality parent-child time by minimizing cellphone usage (Zhou et al., 2022). These initiatives would contribute to reducing the risk of adolescent SNS addiction.

Furthermore, the mediating role of FoMO in this relationship suggests the importance of FoMO reduction in the interventions and treatment of adolescent SNS addiction induced by parental phubbing. Psychological and mental health services should be developed to reduce fear of missing out in the digital age and alleviate adolescent reliance on social networking sites (Zhang et al., 2023). Furthermore, an emerging method combating FoMO, i.e., the FoMO-R method, could be taken into account to address adolescent SNS addiction (Alutaybi et al., 2020). Specifically, educators should guide youth about how FoMO occurs and its potentially harmful effects (Alutaybi et al., 2020). Moreover, educators could train adolescents in the ability to establish good parent-child and peer relationships and promote adolescents' good communication with others to fulfill their social needs, to potentially reduce the adverse impacts of FoMO.

Last, the findings regarding the prediction of T1 FoMO on T2 FoMO, the prediction of T1 FoMO on T2 SNS addiction, and the prediction of T1 SNS addiction

on T2 parental phubbing being more pronounced among adolescent girls indicate the need for educators and practitioners to take into account the influences of the adolescent gender when formulating interventions and providing help. For example, attention should be paid to the potential stabilization of girls' FoMO and its more significant influence on girls' SNS addiction. It also needs to take into account the fact that the reciprocal influence of parental phubbing and SNS addiction may be more likely to perpetuate a vicious cycle among girls.

4.7 Limitations and future directions

Several limitations of the present study should be noted and addressed. First, all the research data were self-report, which may introduce potential biases such as social desirability and recall bias (Ahmed et al., 2021; Li et al., 2021). To address these limitations, future research could consider utilizing research designs that provide objective indicators of SNS addiction, such as functional MRI research design (Wadsley & Ihssen, 2023). Additionally, employing research designs that facilitate the acquisition of objective indicators of phubbing behavior, such as exploratory observational research design, can help mitigate these biases (Rozgonjuk et al., 2018; Vanden Abeele et al., 2019). Additionally, although adolescents' subjective perceptions of caregiver behaviors are more influential than caregivers' own perceptions of their behaviors (Steinberg et al., 1992), relying on a single informant may be susceptible to bias as children's perception of parental phubbing may differ from parents' actual behavior (Wang et al., 2023). Future studies may consider combining data collected from multiple informants (e.g., parents themselves) to reduce these potential biases.

Second, although a longitudinal research design was utilized to explore the reciprocal relationships among the variables and the potential mediating effects, data

were only collected at two time-points. This may not provide enough data points to examine the cyclical effect adequately. Future research could consider conducting cross-lagged panel analyses based on the data collected at three or more time-points to fully explore the cycle potential and better examine the mediating effects.

Third, the sample comprised middle school students recruited through convenience sampling in China. Therefore, the findings might not be generalizable across other populations, such as college student populations. Moreover, evidence suggests that phubbing behavior varies across countries, with cultural factors playing a central role (Błachnio et al., 2021). Previous studies have also indicated cross-national and cross-cultural variations in rates of social media addiction (Cemiloglu et al., 2022; Laconi et al., 2018). For instance, collectivist countries exhibit higher prevalence of social media addiction compared to individualist countries (Cheng et al., 2021). Therefore, caution should be taken when generalizing the findings to different cultures and countries. Of equal importance, future research should consider investigating how these findings replicate across different cultural contexts (Andreassen, 2015). For instance, future studies may consider recruiting participants from different cultures, countries and populations to examine whether the research model proposed in this study exhibits variations across different countries, cultural backgrounds, and populations.

Fourth, the study only interpreted the longitudinal relationship between parental phubbing and adolescent SNS addiction with FoMO as a mediator. Nevertheless, other possible variables may explain this relationship, such as loneliness. In particular, parental phubbing has been linked to adolescents feeling lonely (Dong et al., 2023), which, in turn, may drive them to seek social connection and reduce loneliness through SNSs (Andreassen, 2015), potentially increasing the

risk of developing SNS addiction. Future research could consider investigate the mediating role of loneliness and other underlying mechanisms.

5. Conclusions

The present study makes a significant contribution to the extant literature by showing the bidirectional and longitudinal relationships and internal mechanisms of parental phubbing and SNS addiction among Chinese adolescents. The finding that higher parental phubbing predicts greater FoMO and greater adolescent SNS addiction, provides initial insight regarding the direction of causality in these relationships. The findings also emphasize the significance of considering the reciprocal relationships between parental phubbing and adolescent SNS addiction, the significance of the mediating role of FoMO in the association between parental phubbing and adolescent SNS addiction, and the moderating role of gender in these relationships. In light of the findings, intervention and treatment programs targeting adolescent SNS addiction should focus on reducing parental smartphone use frequency during parenting time, which will likely reduce the sense of FoMO among adolescents. Moreover, based on the study's findings, the effects of adolescent gender should not be neglected.

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Table 1*Demographic information of the sample.*

Demographic variables	Level	Percentage
Areas	Urban	22.50%
	Rural	77.50%
Only child	Yes	17.82%
	No	81.76%
	Not reported	.42%
Father's education	Master's degree or above	.80%
	Bachelor's degree	4.40%
	Associate's degree	5.90%
	Senior high school	24.70%
	Junior high school	51.90%
	Primary school or below	12.30%
Mother's education	Master's degree or above	.80%
	Bachelor's degree	4.40%
	Associate's degree	7.00%
	Senior high school	20.30%
	Junior high school	49.60%
	Primary school or below	18.00%

Table 2*Descriptive statistics and correlations among research variables.*

Variables	1	2	3	4	5	6
1. T1 Parental phubbing	1					
2. T1 FoMO	.22***	1				
3. T1 SNS addiction	.30***	.49***	1			
4. T2 Parental phubbing	.56***	.16***	.24***	1		
5. T2 FoMO	.20***	.40***	.27***	.29***	1	
6. T2 SNS addiction	.19***	.29***	.44***	.30***	.64***	1
<i>M</i>	2.23	3.12	2.95	2.41	2.89	2.87
<i>SD</i>	.79	1.15	1.24	.94	1.27	1.28

Note. *** $p < .001$

Table 3

Fit statistics for model comparison of cross-lagged associations among all latent variables.

	M1	M2	M3	M4	M5
Chi-square (χ^2)	736.971	757.470	946.803	785.691	737.546
<i>df</i>	145	152	162	151	145
CFI	.968	.967	.958	.966	.968
TLI	.958	.959	.950	.957	.958
RMSEA	.053	.052	.058	.054	.053
SRMR	.041	.043	.051	.057	.039
Δ CFI		.001	.010		
Δ TLI		.001	.008		
Δ RMSEA		.001	.005		

Note. M1 = Configural invariance model, M2 = Metric invariance model, M3 = Scalar invariance model, M4 = Autoregressive model, M5 = Cross-lagged model, *df*: degrees of freedom, CFI: comparative fit index, TLI: Tucker and Lewis Index, RMSEA: root mean square error of approximation, SRMR: standardized root mean residual.

Table 4*Path analysis testing a multiple-group path model.*

Pathways	Male				Female				Test of gender difference	
	Est	SE	LLCI	ULCI	Est	SE	LLCI	ULCI	χ^2	
Direct paths										
T1 PP→ T2 PP	.47	.04	.39	.55	.54	.03	.48	.60	.08	
T1 PP → T2 FoMO	.14	.05	.05	.23	.09	.04	.02	.16	.56	
T1 PP → T2 SNSA	.11	.05	.02	.20	.06	.04	−.01	.13	.72	
T1 FoMO → T2 PP	.03	.05	−.08	.13	−.01	.04	−.09	.07	.35	
T1 FoMO → T2 FoMO	.27	.06	.16	.38	.44	.04	.36	.51	5.19*	
T1 FoMO → T2 SNSA	−.01	.06	−.12	.10	.16	.04	.08	.24	5.35*	
T1 SNSA → T2 PP	−.01	.05	−.11	.09	.15	.04	.07	.23	4.66*	
T1 SNSA → T2 FoMO	.05	.06	−.06	.16	.08	.04	−.01	.16	.16	
T1 SNSA → T2 SNSA	.36	.06	.25	.47	.43	.04	.35	.50	.33	

Note. Est = standardized parameter estimates; *SE* = standard errors; LLCI = lower limit of the 95% confidence interval; ULCI = upper limit of the 95% confidence interval; PP = parental phubbing, FoMO = fear of missing out, SNSA = SNS addiction. * $p < .05$.

Figure 1

The hypothesized research model

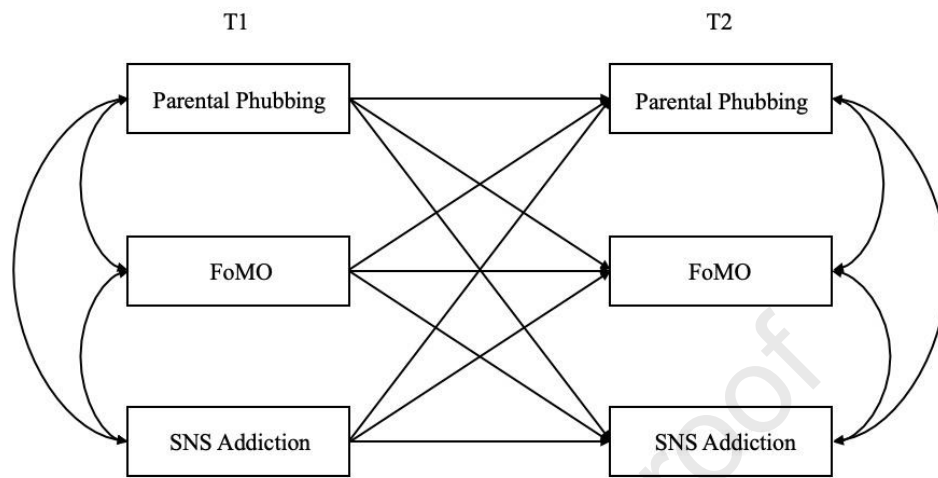
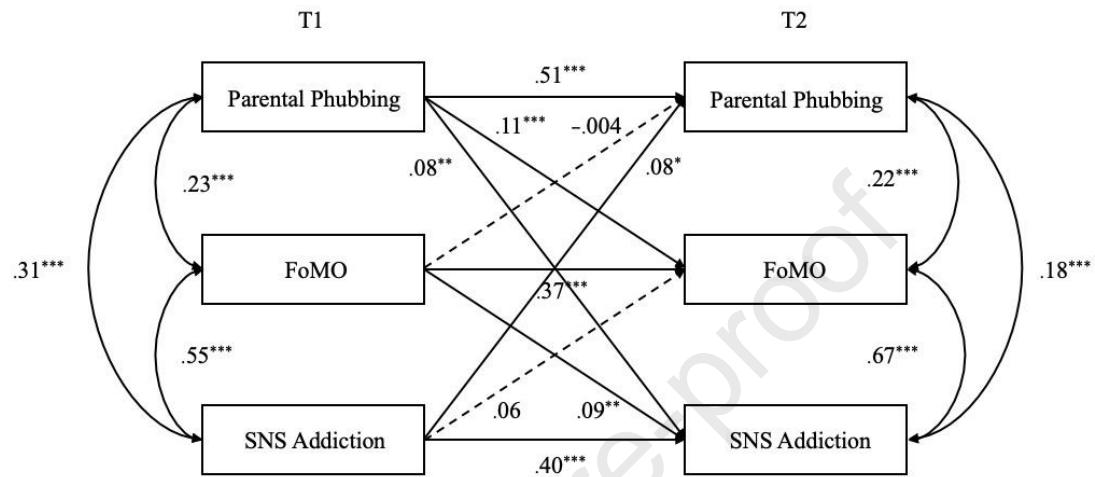


Figure 2

Standardized regression coefficients in a cross-lagged panel model testing the longitudinal associations among parental phubbing, FoMO, and adolescent SNS addiction



Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Highlights

- (a) Parental phubbing and teens' SNS addiction were mutually causal.
- (b) T1 parental phubbing positively predicted T2 FoMO.
- (c) T1 FoMO positively predicted T2 SNS addiction.
- (d) Parental phubbing increased subsequent teens' SNS addiction via FoMO.
- (e) Gender differences existed in the present research model.