



Psychological Distress, Interpersonal Sensitivity, and Trait-FoMO with Problematic Use of Social Media: The Mediating Roles of Boredom and State-FoMO

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Abstract

Background With the widespread use of social media, the potential for problematic use has increased, making it crucial to understand the factors influencing its development and maintenance. Based on the I-PACE theory (through interaction of predisposing and mediating variables), the present exploratory study investigated the relationships between psychological distress, interpersonal sensitivity, and trait-FoMO with the severity of problematic social media use (PSMU) through boredom and state-FoMO as serial mediating variables.

Method Using an online survey, 1033 participants (71% females; $M_{age} = 28.74$ years [$SD \pm 9.2$]) completed the Social Networking Addiction Questionnaire, Depression, Anxiety and Stress Scale (DASS-21), Interpersonal Sensitivity Measure, Fear of Missing Out Questionnaire, and Short Boredom Proneness Scale.

Results Analysis using structural equation modeling showed significant associations between PSMU and depression, stress, and interpersonal sensitivity, with the serial mediation of boredom and state-FoMO playing a significant role in these associations. However, anxiety did not demonstrate a significant direct association with PSMU, nor did it play a significant role through the serial mediation of boredom and state-FoMO.

Conclusion The present study suggests that trait-FoMO as a predisposing variable and state-FoMO as mediating variable have a significant relationship with PSMU and other variables, and is the first study to examine the serial mediating roles of boredom and state-FoMO in PSMU.

Keywords Anxiety · Boredom · Depression · Interpersonal sensitivity · Problematic social media use · Psychological distress · State-FoMO · Stress · Trait-FoMO

Introduction

The use of social media and online communication apps have become an integral part of many individuals' daily lives (Seabrook, Kern, & Rickard, 2016). The average person spends about two and a half hours a day on social media and almost 62.3% of the world's population has one or more social media accounts (Statista, 2024). In addition to entertaining users (Chen, Chen, O'Brien, Latner, & Lin, 2021) and despite its many positive benefits, social media is sometimes used to reduce negative emotions and avoid them (Elhai, Levine, O'Brien, & Armour, 2018) which may lead to problematic social media use (PSMU) (Wegmann, Müller, Turel, & Brand, 2020). PSMU is often experienced more by females than males (Z. Wang, Yang, & Elhai, 2022), and adolescents often feel compelled to check their social media accounts to keep up to date on their friends' activities (Oberst, Wegmann, Stodt, Brand, & Chamarro, 2017). When users lose control of their use, they experience symptoms of behavioral addictions such as withdrawal symptoms,

tolerance, and clinical impairment of their day-to-day lives (De-Sola Gutiérrez, Rodríguez de Fonseca, & Rubio, 2016). Given the potential adverse consequences of PSMU in personal, social, occupational and/or educational areas of life (World Health Organization, 2019), there is a need to consider factors that contribute to PSMU.

According to the Interaction of Person-Affect-Cognition-Execution (I-PACE) model, it is assumed that individual characteristics and psychopathological symptoms affect the acquisition, development, and maintenance of PSMU, and that it can be mediated by specific cognitions (Brand et al., 2019; Brand, Young, Laier, Wölfling, & Potenza, 2016). The I-PACE model considers addictive behaviors occur as a consequence of interaction of the main personal characteristics (P component) with the A-C-E variables that are considered as moderating and/or mediating variables. These interactions can act as protective or risk factors and cause reduced or increased addictive behavior (such as PSMU). Personal predisposing variables such as genetic, biological, psychopathological, and psychosocial characteristics interact with affective, cognitive, and executive response variables (e.g., cognitive bias and attention, coping strategies, internet use expectations, lack of inhibition and craving) can lead to PSMU. This experience of satisfaction and compensation leads to a reinforcement loop of user motivations and predisposing and mediating factors that maintain PSMU (Brand et al., 2019).

Recent studies have shown that one of the factors affecting the use of social media is psychological distress, including depression, anxiety, and stress. Research has shown that there is a positive relationship between depression and anxiety with PSMU (Elhai, Dvorak, Levine, & Hall, 2017; Elhai, Gallinari, Rozgonjuk, & Yang, 2020; Hussain, Wegmann, Yang, & Montag, 2020; Piteo & Ward, 2020; Yan Wang, Yang, Montag, & Elhai, 2022; Wolniewicz, Rozgonjuk, & Elhai, 2020), although some studies have reported mixed findings (Elhai, Dvorak, et al., 2017). Studies have also shown that stress is associated in problematic online gaming (Yang Wang, Liu, Zhang, & Zhang, 2022) and PSMU (Fabris, Marengo, Longobardi, & Settanni, 2020; Wolfers & Utz, 2022). A recent systematic review found that long-term use of social media platforms such as *Facebook* may be linked to anxiety and stress (Karim, Oyewande, Abdalla, Ehsanullah, & Khan, 2020). It should also be noted that in the field of social media, more research has focused on specific platforms (e.g., *Facebook* and *Instagram*), and it is therefore necessary to simultaneously examine the association of all three aspects of psychological distress on all social media platforms.

Another factor influencing PSMU is interpersonal sensitivity, which is a psychosocial trait where individuals show constant concern over negative social evaluations. This causes general sensitivity to social feedback, increased concern for others, fear of incompetence, criticism, and repeated misunderstanding of interpersonal behavior of others (Boyce & Parker, 1989). Individuals try to reduce their negative emotions by using social media to compensate for the lack of real-life social connections (Wegmann & Brand, 2019). Individuals who are not socially motivated enough in real life may increasingly engage in social media use to mask the lack of social interactions in face-to-face situations (J. Kim, 2019; Lin et al., 2021). Two studies have shown that interpersonal sensitivity plays a role in problematic smartphone use and problematic *Facebook* use (Eraslan-Capan, 2015; Lin et al., 2021). However, interpersonal sensitivity as a predisposing factor has not yet been adequately considered in studies of social media use more generally. Therefore, it is necessary to investigate the relationship between interpersonal sensitivity with PSMU and other mediating variables.

One variable that is associated with PSMU is the fear of missing out (FoMO). Until recently, FoMO was conceptualized as a one-dimensional (cognitive) variable. However, recent studies have shown that FoMO has a two-dimensional structure (i.e., trait-FoMO and state-FoMO). Trait-FoMO is a relatively stable characteristic of the individual (a general fear of missing out), and state-FoMO is the fusion of online communication and subsequent interaction to cope with the feeling of being overwhelmed by ongoing communication and information about the activities of others (Wegmann, Oberst, Stodt, & Brand, 2017). In the constant updates of social media users worry about losing information related to important topics and communication with people, which leads to an increase in trait-FoMO and the general fear of missing out. This may create or increase the feeling of online disconnection and displacement. In the framework of the I-PACE model, trait-FoMO is one of these predisposing factors for the development of PSMU (Wegmann et al., 2017) which by increasing the motivation to use social media leads to reduced anxiety caused by fear of missing out (Brand et al., 2019). Moreover, one study reported that trait-FoMO was a predisposing factor associated with problematic *Instagram* use (Balta, Emirtekin, Kircaburun, & Griffiths, 2018), but is an area requiring further research.

According to the I-PACE model, boredom is a mediating variable, and is a pervasive state of mind in which a person experiences a deep lack of interest, participation or stimulation in their current situation. This condition is characterized by dissatisfaction and inability to achieve satisfactory activities or experiences (Goetz et al., 2014). Boredom is directly related to mental health disorders such as anxiety and depression (Elhai, Vasquez, Lustgarten, Levine, & Hall, 2018; Wolniewicz et al., 2020), and can lead to experiencing negative emotions (Isacescu, Struk, & Danckert, 2017). Research has indicated that feeling disconnected from one's environment can result in experiencing negative affects, which can be viewed as a key factor contributing to the experience of boredom (Isacescu et al., 2017; Wolniewicz et al., 2020). Individuals may seek to reduce unpleasant mood states through PSMU (Chou, Chang, & Yen, 2018; Wegmann, Ostendorf, & Brand, 2018; Wolniewicz et al., 2020). Therefore, boredom may be a mediator in the relationship between symptoms of depression/anxiety and PSMU (Elhai, Vasquez, et al., 2018; Liang et al., 2022). To date, no research has simultaneously examined the association between boredom, psychological distress, interpersonal sensitivity, and trait-FoMO specifically in relation to PSMU.

Another mediating variable noted in recent studies is state-FoMO. In the I-PACE model, state-FoMO represents a specific cognition that acts as a mediator between an individual's core characteristics and PSMU (Wegmann et al., 2017). Past studies have shown that FoMO is associated with the severity of depression, anxiety, boredom, as well as the negative consequences of social media use (Elhai, Gallinari, et al., 2020; Holte & Ferraro, 2020; Wolniewicz et al., 2020). Also, FoMO is an important mediator between predisposing variables and boredom using social media, and between interpersonal sensitivity using social media (J. Kim, 2019; Liang et al., 2022; Malik et al., 2023). Previous studies have reported a significant positive association between FoMO and boredom (Dempsey, O'Brien, Tihamiyu, & Elhai, 2019; Elhai, Gallinari, et al., 2020; Hussain et al., 2020). However, in a recent study, Wegmann et al. (Wegmann et al., 2017) noted the two-dimensional nature of FoMO and investigated the role of trait-FoMO as a predisposing variable and state-FoMO as a mediator in internet communication disorder. However, the model did not have proper fit, and in the modified model, trait-FoMO was removed. Another study reported that trait-FoMO was a predisposing factor and the state-FoMO was a mediator for

problematic Instagram use (Balta et al., 2018). A recent study by Hussain et al. (Hussain, Elhai, Montag, Wegmann, & Rozgonjuk, 2024) found that state-FoMO was significantly more associated with the intensity of social media use and smartphone use. The number of existing studies that examined the two-dimensional use of FoMO in internet communication, problematic Instagram use, and problematic social media/smartphone are limited, and there is a need to replicate these studies with larger sample sizes among users of all social media. It is also necessary to investigate the role of FoMO as a two-dimensional structure in development and maintenance problematic use of social media in light of other variables related to the I-PACE model such as psychopathology, psychosocial and personality characteristics in interaction with response variables.

In general, the results of previous studies (Balta et al., 2018; Elhai, Dvorak, et al., 2017; Elhai, Gallinari, et al., 2020; Elhai, Levine, Dvorak, & Hall, 2016; Elhai, Vasquez, et al., 2018; Eraslan-Capan, 2015; Hussain et al., 2024; Lin et al., 2021; Seabrook et al., 2016; Wolniewicz et al., 2020) in line with the I-PACE model, and show that these variables (i.e., psychological distress, interpersonal sensitivity, trait-FoMO, boredom and state-FoMO with the severity of problematic use of social media) are associated. However, there have been criticisms for some studies. For example, many studies have examined the direct association between depression, anxiety, and stress in relation to internet use, smartphone use and social media use, but conflicting results have been reported. Therefore, it is important to investigate mediating variables and their effects. Also, studies examining the simultaneous effect of depression, anxiety and stress on social media with the mediation of cognitive and emotional variables have not been conducted. In some studies, depression and anxiety have been examined with the mediation of boredom and FoMO (Elhai, Gallinari, et al., 2020; Elhai et al., 2016; Hussain et al., 2020; Yan Wang et al., 2022; Wolniewicz et al., 2020), and some other studies have evaluated depression, anxiety and stress without the mediation of boredom and FoMO (Brailovskaia, Truskauskaitė-Kuneviciene, Kazlauskas, & Margraf, 2021; Hussain & Griffiths, 2019). Moreover, the effect of interpersonal sensitivity as a predisposing variable with mediating variables on the use of social media has not previously been studied. In addition, some studies have not considered FoMO as a two-dimensional construct, where trait-FoMO is examined as a predisposing variable alongside other predisposing variables such as psychological distress and interpersonal sensitivity. Finally, no previous study has examined the serially mediating role of boredom and state-FoMO.

The present study

In the present exploratory study, the main objective was to investigate the relationships between psychological distress, interpersonal sensitivity, and trait-FoMO with the severity of PSMU, through boredom and state-FoMO as serial mediating variables. The present study is one of the first to investigate the interaction between the main characteristics of the individual and cognitive and affective responses. In the study, cognitive and affective responses are considered as chain mediators (state-FoMO predictor of boredom) (Dempsey et al., 2019; Yan Wang et al., 2022; Wolniewicz et al., 2020). In addition, according to some recent studies, FoMO was investigated as two-dimensional variable (i.e., state-FoMO and trait-FoMO) (Balta et al., 2018; Hussain et al., 2024; Wegmann et al., 2017) where trait-FoMO was considered as a personal variable and state-FoMO was the response variable. Demographic variables of PSMU were included as covariates. A structural model was tested to examine these relationships (Figure 1). Based on this model, it was hypothesized that:

- Psychological distress, interpersonal sensitivity, and trait-FoMO would be positively associated with the severity of PSMU (H_1).
- State-FoMO would mediate the relationships between trait-FoMO and the severity of PSMU (H_2).
- Boredom would mediate the relationships between psychological distress, interpersonal sensitivity, trait-FoMO and the severity of PSMU (H_3).
- Boredom and state-FoMO would serially mediate the relationships between the predisposing variables (psychological distress, interpersonal sensitivity, trait-FoMO) and the severity of PSMU (H_4).

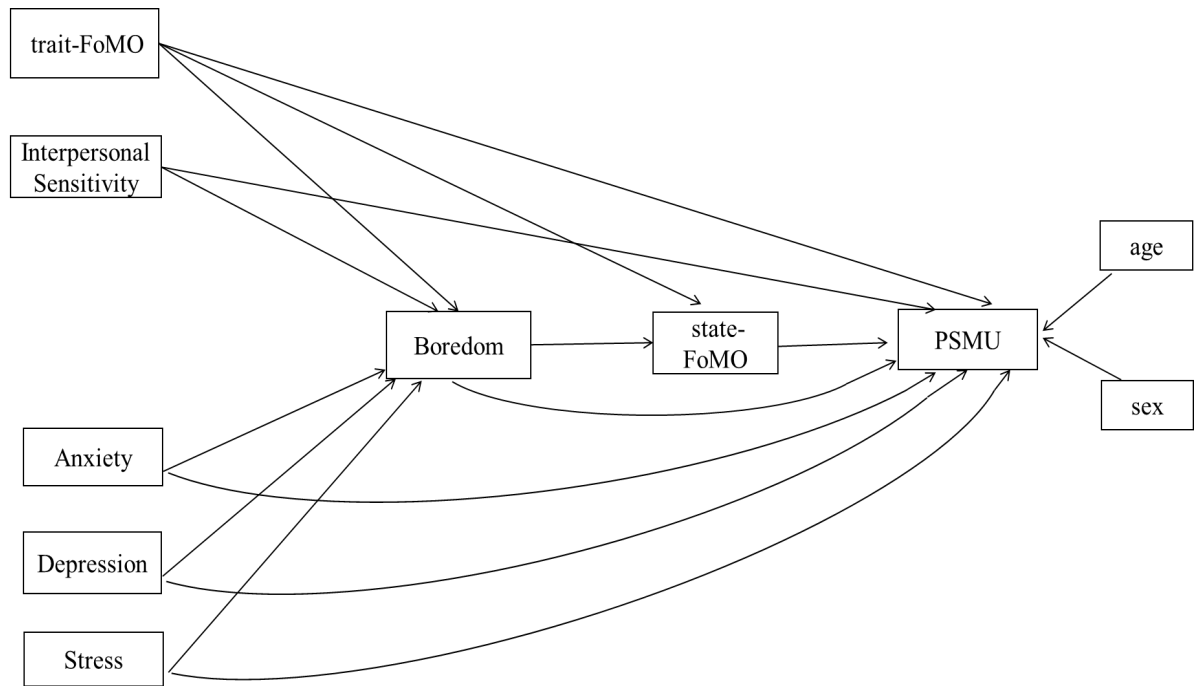


Figure 1. Hypothesized model

Method

Participants

The sample comprised 1033 individuals (752 females and 304 males), aged between 18 and 70 years (mean = 28.74 years, [$SD = 9.2$]) from various regions in Iran. Participants completed an online survey. To participate in the study, the inclusion criteria were (i) being at least 18 years old, (ii) having active engagement with at least one social media platform every day, and (iii) providing informed consent before the study began. The exclusion criteria were (i) being a minor, and (ii) being a non-user or infrequent user of social media platforms.

Measures

In addition to gathering demographic data (i.e., age, gender, highest educational grade, marital status, occupational status), the following instruments were used:

Social Networking Addiction Questionnaire

The 18-item Social Networking Addiction Questionnaire [SNAQ (Andreassen, Torsheim, Brunborg, & Pallesen, 2012); Persian version (Hosseini, Momeni, Vatanparast, Hosseinzadeh, & Rabani, 2020)] is an adapted version of the Bergen Facebook Addiction Scale (BFAS) and was used to assess PSMU. The scale includes subscales of withdrawal, relapse, salience, conflict, tolerance and mood modification. Items (“*Felt an urge to use social media more and more?*”, “*Have you tried to use social media less frequently, but not manage to do so?*”) are rated on a five-point scale from 1 (*very rarely*) to 5 (*often*). The total score can range from 18 to 90, and higher scores indicate an increased risk of social media addiction. In the present study, the Cronbach’s alpha was 0.93.

Depression, Anxiety, and Stress Questionnaire

The 21-item Depression, Anxiety, and Stress Scale [DASS-21 (Lovibond, S. H., & Lovibond, 1995); Persian version (Sahebi, Asghari, & Salari, 2005)] and was used to assess psychological distress (i.e., depression, anxiety, and stress) over the preceding week. Each subscale consists of seven items (e.g., “*I couldn't seem to experience any positive feeling at all*” or “*I found it difficult to relax*”, “*I felt scared without any good reason*”), and items are rated on a four-point scale from 0 (*not applicable to me at all*) to 3 (*completely applicable to me*). The total score can range from 0 to 63 (and 0 to 21 on each subscale). Higher scores indicate greater psychological distress. Symptom severity is classified as normal, mild, moderate, or severe based on the score of each subscale. In the present study, the Cronbach alphas for depression, anxiety, and stress were 0.89, 0.82, and 0.87, respectively. The Cronbach alpha for total scale was 0.94.

Interpersonal Sensitivity Measure

The 36-item Interpersonal Sensitivity Inventory [IPSM (Boyce & Parker, 1989); Persian version (Mohammadian, Mahaki, Lavasani, Dehghani, & Vahid, 2017)] was used to assess sensitivity or social rejection sensitivity. The scale comprised five subscales: interpersonal awareness, need for approval, separation anxiety, timidity, and fragile inner-self. Items (e.g., “*I worry about being criticized for things I have said or done*”, “*My value as a person depends on enormously on what others think of me*”) are rated on a four-point scale from 1 (*very unlike self*) to 4 (*very like self*). The total score can range from 36 to 144. Higher scores indicate greater interpersonal sensitivity. In the present study, the Cronbach’s alpha was 0.90.

Fear of Missing Out Questionnaire

The 12-item fear of Missing Out [FoMOQ (Wegmann et al., 2017); Persian version (Veysuei, Amini, Fattahi, & Mojarad, 2023)] was used to assess trait-FoMO (five items) and state-FoMO (seven items). This scale was modified from the original 10-item Fear of Missing Out Scale (Przybylski, Murayama, Dehaan, & Gladwell, 2013), Items (“*I fear not to be up-to-date in my social networking sites*”, “*I fear my friends have more rewarding experiences than me*”) are rated on a five-point scale from 1 (*strongly disagree*) to 5 (*strongly agree*). The scores on each subscale can range from 5 to 25 (trait-FoMO) and 7 to 35 (state-FoMO). Higher scores indicate greater FoMO. In the present study, the Cronbach alphas of both state-FoMO and trait-FoMO were 0.84.

Short Boredom Proneness Scale

The eight-item Short Boredom Proneness Scale [SBPS (Struk, Carriere, Cheyne, & Danckert, 2017); Persian version (Yoosefi, 2023)] was used to assess boredom, and is a shorter version of the original 28-item Boredom Proneness Scale (Farmer & Sundberg, 1986). Items (e.g., “*Many things I have to do are repetitive and monotonous*”, “*Much of the time, I just sit around doing nothing*”) are rated on a seven-point Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*).

The total score ranges from 8 to 56. Higher scores indicate greater boredom. In the present study, the Cronbach's alpha was 0.92.

Procedure

Prior to commencing data collection, ethical approval was obtained from the Research Ethics Committee of Social Welfare and Rehabilitation Sciences of the first author's university (Ref. Approval ID: IR.USWR.REC.1400.138). Data were collected using an online self-report survey hosted on the *Porsa* platform. Participants were recruited through social media platforms. This included *Instagram*, where recruitment was conducted through posts and stories, as well as using academic and professional channels and groups on *Telegram* and *WhatsApp*, relevant hashtags on *Twitter*, and various student and professional groups on *Facebook*, along with a link to the survey.

Before the survey questions, information about the study purpose, data confidentiality, and informed consent was provided. Prior to completing the responses, participants were required to provide demographic information, such as whether they had an account on social media, in order to ensure that only individuals meeting the criteria were included in the study. The survey data were automatically stored in the *Porsa* database. The survey completion time was approximately 20-30 minutes. This data collection process was carried out over a six-month period starting from the beginning of February 2023. Surveys could not be submitted unless all questions were answered. Therefore, there were no missing data. After data collection, the initial sample comprised 1059 individuals. However, because three individuals did not specify their gender and 23 individuals did not specify their age, 26 individuals were excluded from the analysis. Therefore, the final sample size was 1033 participants.

Data analysis

For descriptive analysis, Pearson correlation testing, and path analysis, software packages SPSS 24.0 and R were utilized alongside the lavaan 0.6.16 package. To maintain statistical power given the complexity of the model, all variables were measured as observed scale scores. Goodness of fit was assessed using comparative fit index (CFI) ≥ 0.90 , Tucker-Lewis index (TLI) ≥ 0.90 , and root mean square error of approximation (RMSEA) ≤ 0.08 (Hu & Bentler, 1999).

For the structural equation modeling (SEM), all variables were estimated as observed variables (to maintain statistical power with such a complex structural model), and age and sex were used as observed covariates for PSMU. The R package lavaan 0.6.16 was used to assess the direct effect of depression, anxiety, stress, interpersonal sensitivity, and trait-FoMO on problematic social media use. Mediation analysis involved indirect effect testing through the computation of cross-products of direct paths. The combined effects (both direct and indirect) of independent and mediated variables on the dependent variable were determined using the bootstrapping method, with 10,000 samples and a bias-corrected 95% confidence interval. If the confidence interval does not encompass zero, the effect is deemed significant and the mediator for the variable is considered significant; otherwise, it is not significant (Hayes, 2017).

Results

Descriptive findings

Table 1

Demographic characteristics of group

	N (1033)	%
Education		
Diploma≤	304	29.4
Bachelor≤	443	42.8
Master	204	19.7
PhD≥	80	7.7
Marital status		
Single	664	64.3
Married	335	32.4
Divorced	34	3.3
Occupational status Student		
Full-time	376	36.4
Part-time	242	23.4
Retired	97	9.4
Nonjob	20	1.9
Freelance	137	13.3
Others	60	5.8
	100	9.7

The demographic characteristics of the study participants are presented in Table 1. Among the participants, 43% had a bachelor's degree, 64% were single, 36% were students, and 23% were full-time employees. Considering the inclusion criteria, all participants were social media users, with 71% spending between 1 to 5 hours per day on social media. *WhatsApp* and *Telegram* were the most widely used social media applications (98% and 93% of all participants), followed by *Instagram* at 91%. The least used was *Facebook* at 19% (due to restrictions in Iran), while other platforms such as *Twitter*, *YouTube*, *TikTok*, *LinkedIn*, and *Pinterest* were all below 45%. Over half of the participants (52%) reported that their social media use had a negative impact on their relationships with loved ones. To examine the relationships between variables, Pearson correlations were utilized (see Table 2).

Table 2
Descriptive statistics and correlations for the study variable

Variable	M	SD	1	2	3	4	5	6	7	8	9	10
1. PSMU	48.53	14.99	-									
2. Trait-FoMO	11.45	4.94	.50*	-								
3. Interpersonal sensitivity	78.39	15.86	.57*	.59*	-							
4. Anxiety	5.51	4.66	.51*	.38*	.56*	-						
5. Depression	9.15	6.01	.58*	.43*	.58*	.65*	-					
6. Stress	10.54	5.37	.62*	.47*	.59*	.72*	.78*	-				
7. Boredom	27.55	10.97	.60*	.45*	.57*	.54*	.74*	.66*	-			
8. State-FoMO	14.70	6.07	.56*	.51*	.42*	.27*	.32*	.34*	.40*	-		
9. Age	28.74	9.28	-.27*	-.28*	-.15*	-.16*	-.20*	-.23*	-.31*	-.22*	-	
10. Gender	-	-	-.04	-.03	.00	-.03	-.01	-.06*	-.02	.05	.04	-

* $p < .001$

A positive correlation was found between stress and trait-FoMO in PSMU. Additionally, there was (i) a positive association between PSMU and depression, anxiety, interpersonal sensitivity, state-FoMO, and boredom, (ii) a significant negative relationship with age, and (iii) no significant relationship with gender.

SEM results

Figure 2 shows the standard path coefficients. The second-order measurement model of PSMU showed evidence of adequate fit, robust χ^2 (73.22, N = 1033) = 2210.72, $p < .001$, CFI = .97, TLI = .91, RMSEA = .08 (90% CI: .071 to .108).

Mediation results

The results indicate that state-FoMO had a mediating role in the relationship between boredom and PSMU, with a significant $\beta = .06$, $SE = .01$, $p < .001$. Similarly, state-FoMO also mediated the relationship between trait-FoMO and PSMU, with a $\beta = .13$, $SE = .01$, $p < .001$. Moreover, boredom mediated the relationship between trait-FoMO and PSMU, with a $\beta = .01$, $SE = .004$, $p < .001$, as well as the relationship between interpersonal sensitivity and PSMU, with a $\beta = .02$, $SE = .007$, $p < .001$. However, boredom did not mediate the relationship between anxiety and PSMU, with a non-significant $\beta = .001$, $SE = .004$, $p < .001$. On the other hand, boredom did mediate the relationships between depression ($\beta = .07$, $SE = .01$, $p < .001$) and stress ($\beta = .01$, $SE = .007$, $p < .001$) with PSMU.

The combined effect of boredom and state-FoMO did not mediate the relationship between anxiety and PSMU, $\beta = .000$, $SE = .002$, $p < .001$. Boredom and state-FoMO serially mediated the relationship between trait-FoMO and PSMU, $\beta = .005$, $SE = .002$, $p < .001$. Boredom and state-FoMO serially mediated the relationship between interpersonal sensitivity and PSMU, $\beta = .010$, $SE = .003$, $p < .001$. Boredom and state-FoMO serially mediated the relationship between depression and PSMU, $\beta = .03$, $SE = .006$, $p < .001$. Boredom and state-FoMO serially mediated the relationship between stress and PSMU, $\beta = .008$, $SE = .003$, $p < .001$.

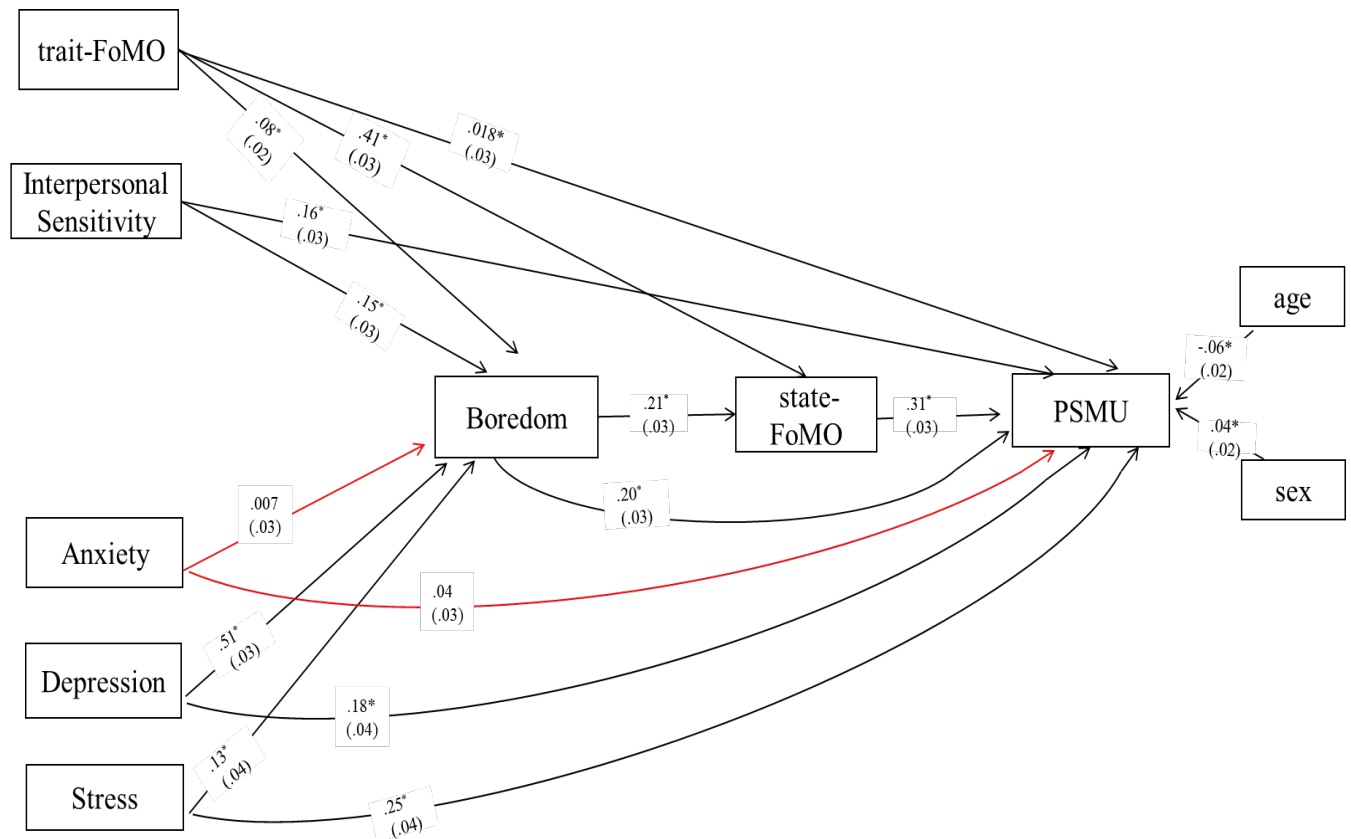


Figure 2. A hypothetical model with path standard coefficients and SE (in parentheses).
 Note: Red color indicates non-significant findings

Discussion

The present study investigated the role of boredom and state-FoMO as serial mediators in the relationship between psychological distress, interpersonal sensitivity, and trait-FoMO with the severity of problematic use of social media (PSMU). The results showed that the model had a good fit, and there was a positive and significant relationship between the severity of PSMU and depression, stress, interpersonal sensitivity and trait-FoMO (supporting H_1). The results also showed that state-FoMO (as a mediator) played an important role in the relationship between trait-FoMO and the severity of PSMU (supporting H_2). Moreover, boredom acted as a mediator in the relationship between predisposing factors (psychological distress, interpersonal sensitivity, and trait-FoMO) and PSMU (supporting H_3). In general, the results indicated that boredom and state-FoMO serially mediated the relationship between psychological distress, interpersonal sensitivity, and trait-FoMO with the severity of PSMU, except for the predisposing variable of anxiety (partially supporting H_4).

In terms of the significant relationship between depression, stress and PSMU, the results of the present study were consistent with previous studies that have shown that PSMU and problematic smartphone use are associated with higher levels of depressive symptoms, with stress being somewhat consistently associated with problematic smartphone use (Elhai, Dvorak, et al., 2017; Elhai, Gallinari, et al., 2020; Elhai, Levine, Dvorak, & Hall, 2017; Hussain et al., 2020; Piteo & Ward, 2020; Yang Wang et al., 2022; Wolniewicz et al., 2020). The results of the present study

were not consistent with studies showing that PSMU and problematic smartphone use having a significant relationship with higher levels of anxiety symptoms (Piteo & Ward, 2020; Yan Wang et al., 2022; Wolniewicz et al., 2020). On the other hand, the present study's findings are consistent with Elhai et al. (Elhai, Dvorak, et al., 2017), who suggested that anxiety is not always associated with problematic smartphone use and internet addiction.

According to the I-PACE theory, individuals use maladaptive coping strategies to regulate their emotions when experiencing a negative mood or stress, one of which is PSMU to manage mood or cope with stress (Dhir, Yossatorn, Kaur, & Chen, 2018; Wegmann & Brand, 2019; Wolfers & Utz, 2022). This experience of feeling satisfied or freed from negative mood (i.e., negative reinforcement), leads to changes in subjective reward expectations associated with social media use, and each time creates more craving for it where accessing social media is easy to do (Brand et al., 2019). According to I-PACE theory, anxiety is a predisposing variable to specific internet-use disorders. Moreover, in studies examining smartphone use (Elhai, Levine, et al., 2017; Yan Wang et al., 2022), there is a significant relationship between anxiety and both smartphone addiction and internet addiction. However, in the context of social media use, its relationship with social anxiety has been mentioned more than general anxiety (S. S. Kim & Bae, 2022; Peterka-Bonetta, Sindermann, Elhai, & Montag, 2019; Wegmann & Brand, 2019).

In regards to the association between interpersonal sensitivity and PSMU (Wegmann & Brand, 2019), the results of the present study are consistent with studies by Lin et al. (Lin et al., 2021), Eraslan-Capan (Eraslan-Capan, 2015), and Kim (J. Kim, 2019), which showed that interpersonal sensitivity plays an important role in relation to smartphone addiction and problematic *Facebook* use. Based on the I-PACE model, psychosocial characteristics associated with psychopathology can predict PSMU. Individuals who have high levels of interpersonal sensitivity may encounter difficulty initiating social interactions due to feelings of shyness and fear of isolation. Additionally, they may experience separation anxiety and the need for interpersonal affirmation and awareness in face-to-face situations. Through social media, individuals try to continue their social activities online. This reduces negative emotions and compensates for the lack of social connections in real life. They tend to be online to feel a sense of social belonging and to compensate for their social deficits. This tendency for being online also helps in avoiding negative emotions which ultimately leads to a positively rewarding experience (Brand et al., 2019; J. Kim, 2019; Wegmann & Brand, 2019).

In the present study, there was a significant relationship between trait-FoMO and PSMU, which is consistent with studies by Hussain et al. (Hussain et al., 2024), Balta et al. (Balta et al., 2018), and Wegmann et al. (Wegmann, Brandtner, & Brand, 2021), which showed that a significant relationship between trait-FoMO and PSMU. Within the framework of the I-PACE model, trait-FoMO is considered as one of the predisposing factors for the development of PSMU (Wegmann et al., 2017) because individuals with high levels of trait-FoMO tend to constantly worry about losing the rewarding experiences or social interactions that others might be having (Holte, 2023). This fear drives individuals to regularly check social media platforms to stay updated and connected with others. As a result, they may spend a lot of time on social media seeking reassurance and approval through their online interactions. This constant need to stay connected and fear of missing out can lead to the development of PSMU (Wegmann et al., 2017).

In the present study, state-FoMO mediated the relationship between trait-FoMO and PSMU, which is consistent with studies by Balta et al. (Balta et al., 2018) and Holte (Holte, 2023) which found that the state-FoMO mediated the relationship between trait-FoMO and problematic use of *Instagram*, the internet, and social media. Based on the I-PACE model, state-FoMO as a specific cognitive response may play a mediating role between trait-FoMO and PSMU (Brand et al., 2019; Wegmann & Brand, 2019). Trait-FoMO, which is one of the core characteristics of an individual, and may lead individuals to experience more state-FoMO which in turn could lead to PSMU.

In the present study, the results concerning the mediating role of boredom in the relationship between depression and stress, interpersonal sensitivity, and trait-FoMO with the severity of PSMU, were consistent with previous studies that have reported a significant relationship between boredom and social media use (Malik et al., 2023; Yan Wang et al., 2022; Whelan, Najmul Islam, & Brooks, 2020; Wolniewicz et al., 2020). Boredom has been reported as an important mediator in the relationship between depression and stress with problematic internet use (Elhai, Vasquez, et al., 2018; Liang et al., 2022). A significant relationship between FoMO and boredom has also been found in problematic smartphone use (Wolniewicz et al., 2020). The role of boredom in mediating the relationship between interpersonal sensitivity and PSMU has not been directly addressed in the literature. Therefore, further research is needed to explore this potential relationship. In the I-PACE model, boredom is considered a cognitive component in the inner circle that is involved in interaction with personal variables including psychopathology, psychosocial traits, and individual characteristics. These interactions with a negative reinforcement mechanism can lead to an increased social media use (Brand et al., 2019; Wegmann & Brand, 2019). When individuals experience symptoms of depression, stress, and problems in interpersonal relationships, or feel they are missing out on other people's experiences, they typically experience a state of boredom, fatigue and/or dissatisfaction. To get rid of these unpleasant feelings, they look for a solution (such as using social media due to its convenience and mood modifying properties). This negative reinforcement may lead to excessive or problematic social media use (Brand et al., 2019; Przybylski et al., 2013).

The results of the present study indicated that boredom and state-FoMO played a role as serial mediators in the relationship between depression, stress, interpersonal sensitivity and trait-FoMO with PSMU. Importantly, these variables were found to have significant associations at different ages as well as between male and female participants. Contrary to the other variables examined, anxiety was not found to be a significant predictor of the serial mediating role of boredom and state-FoMO in relation to PSMU. While factors such as depression, stress, and trait-FoMO demonstrated significant serial mediation through boredom and state-FoMO leading to PSMU, anxiety did not play a similar predictive role in this serial mediation pathway. In sum, the present study found that boredom mediated the relationships between depression, stress, interpersonal sensitivity, and trait-FoMO with PSMU, and there are studies that support these findings (Brand et al., 2019; Dhir et al., 2018; Elhai, Vasquez, et al., 2018; Holte & Ferraro, 2020; Liang et al., 2022; Przybylski et al., 2013; Yan Wang et al., 2022; Whelan et al., 2020; Wolniewicz et al., 2020).

Boredom positively correlated with FoMO (Elhai, Yang, Fang, Bai, & BJ, 2020; Malik et al., 2023; Wolniewicz et al., 2020; Zarei, 2020). Individuals who are more prone to boredom tended to also experience higher levels of FoMO. This is because boredom and FoMO share underlying negative

affectivity in common (Malik et al., 2023; Wolniewicz et al., 2020). According to the I-PACE model, boredom represents a core personality or psychopathology characteristic that can drive the cognitive bias of FoMO (Brand et al., 2019). Given that FoMO in this context is the feeling that an individual is missing out on rewarding online experiences, it can only be fulfilled by constantly using social media sites (Holte, 2023). Previous studies have also shown that FoMO mediates the relationship between boredom and problematic smartphone use (Al-Saggaf, 2021; Ding & Si, 2024; Wolniewicz et al., 2020). Boredom leads to higher FoMO, which in turn predicts greater problematic smartphone use because individuals try to alleviate their negative emotions through excessive digital engagement (Al-Saggaf, 2021; Ding & Si, 2024; Wolniewicz et al., 2020). In summary, the evidence indicates that boredom and FoMO are positively correlated, and FoMO serves as a mediating mechanism through which boredom contributes to problematic technology use behaviors (Brand et al., 2016; Wegmann & Brand, 2019).

Given that predisposing factors such as depression, stress, and interpersonal sensitivity are predictors of boredom (Elhai, Vasquez, et al., 2018; Holte & Ferraro, 2020; Liang et al., 2022; Yan Wang et al., 2022; Whelan et al., 2020), and on the other hand, boredom is also a predictor of the level of state-FoMO (Al-Saggaf, 2021; Ding & Si, 2024), it can be concluded that boredom and state-FoMO play a serial mediating role in the relationship between the predisposing variables (i.e., depression, anxiety, stress, interpersonal sensitivity, and trait-FoMO) and problematic social media use. These findings are consistent with the I-PACE model (Brand et al., 2019, 2016). According to the I-PACE model, core personality traits (such as trait-FoMO), psychopathological factors (such as depression, anxiety, and stress), and psychosocial characteristics (such as interpersonal sensitivity) are associated with specific cognitive biases (such as boredom and state-FoMO), and these associations lead to problematic social media use (Brand et al., 2019, 2016). Therefore, individuals can experience negative affect as a consequence of symptoms like depression, anxiety, stress, external pressures, and interpersonal issues. This may make individuals more prone to feelings of boredom. This sense of boredom may also cause them to have greater motivation to avoid fear of missing out of online information and interactions (state-FoMO). Ultimately, this negative cycle leads some to experience PSMU (Balta et al., 2018; Elhai, Gallinari, et al., 2020; Elhai, Vasquez, et al., 2018; Holte & Ferraro, 2020; Hussain et al., 2024; J. Kim, 2019; Liang et al., 2022; Malik et al., 2023; Yang Wang et al., 2022; Wolniewicz et al., 2020).

On the other hand, boredom and state-FoMO serially mediated the trait-FoMO route with PSMU. Although two dimensions of FoMO have been investigated in recent studies, there is a lack of research concerning the relationship between boredom and the state and trait of fear of missing out. As far as the present authors are aware, there are no previous studies. However, boredom and fear of missing out are related (Wolniewicz et al., 2020). Now that one FoMO dimension is a person component and the other is a cognitive component (according to I-PACE model), it can be argued that personal factors (like trait-FoMO) that cause cognitive bias (such as boredom and state-FoMO) may lead to PSMU.

The present study found a significant relationship between gender and age with PSMU. Moreover, as age rose, the negative association between age and PSMU intensified, indicating a decline in PSMU use among older age groups. PSMU was significantly different between males and females, with females exhibiting higher levels of PSMU. Also, PSMU had a significant inverse relationship with age (i.e., PSMU was higher among younger individuals) (Gavurova, Ivankova, Rigelsky, &

Mudarri, 2022; Wu et al., 2016) and young individuals and students are particularly vulnerable, and their youth is a significant risk factor for PSMU (Ioannidis et al., 2018). A study in Iran also showed that the mediating role of boredom and FoMO in the relationship between depression symptoms and problematic mobile phone use among adolescents was significant (Zarei, 2020). Also, girls and adolescents with more severe depression and anxiety are more inclined to use social media problematically (Keles, McCrae, & Grealish, 2020). To avoid experiencing the fear of missing out of friends, the compulsion to use social media is greater (Elhai, Levine, Alghraibeh, et al., 2018; Elhai et al., 2016). Also, studies have shown that being of younger age is associated with higher levels of PSMU. In general, younger individuals are more likely to experience PSMU (Chidiac, Ross, Marston, & Freeman, 2022). Also, females are more likely than males to use social media for social purposes, comparing themselves to others and seeking information, whereas males are more likely to use social media to make new friends (Liu, Zhang, Tian, Xu, & Wu, 2023). Most studies have mentioned the high prevalence of PSMU issues in female (Jeong, Kim, Yum, & Hwang, 2016; Wolniewicz et al., 2020).

Limitations and future research directions

The results of the present study should be considered alongside some limitations. The study used convenience sampling. Therefore, the findings may not be generalizable at a population level. Also, the use of self-report measures for the variables evaluated may be subject to biases, inaccuracies and fatigue in the responses of the participants. One of the limitations of this study is the use of a self-report measurement scale to assess social media use, rather than employing more objective and clinical measurement methods. It would have been preferable to utilize clinical interviews to evaluate the extent of PSMU. In addition, due to the cross-sectional nature and correlational design of the study, the study does not have the ability to infer causal relationships between variables studied.

The study should be replicated with more nationally representative samples to increase the generalizability of the findings. It is suggested that future studies employ a combination of self-report measures and clinical interviews to assess PSMU, in order to improve measurement precision and reduce the potential for reporting biases, such as social desirability, recall errors, and respondent distortion. A longitudinal study could also be conducted to examine the dynamic relationships between variables over time, which would allow stronger inferences about the direction and causality of the observed effects. Future research should also examine alternative models for relationships between variables to gain a more comprehensive understanding of the underlying mechanisms.

Considering the non-significance of predicting anxiety for PSMU and whether this finding is consistent or inconsistent with other studies, it is suggested that alternative measurement tools or social anxiety variables, be used instead of general anxiety in future studies. Considering the lack of research studies examining the role of interpersonal sensitivity as a predictor of PSMU, it is necessary to investigate the direct and indirect relationships of this variable with PSMU in future studies. The importance of understanding and addressing state-FoMO as mediating variable the relationship between boredom and PSMU based on two-dimensional consideration of FoMO requires further studies among different individuals and different communities.

Implications

Given the pervasiveness of social media use in today's culture, it is important to understand ways in which this can positively or negatively affect individuals' mental health. Studies have shown that depression, stress, interpersonal sensitivity, and trait FoMO are associated with PSMU. Accordingly, in order to reduce PSMU, it is important to implement interventions to reduce symptoms of depression and stress, as well as fear of missing out and interpersonal issues. The findings also showed that state-FoMO and boredom played an important role in serially mediating between depression, stress, interpersonal sensitivity, and trait-FoMO with PSMU. In particular, higher levels of depression, stress, interpersonal sensitivity, and trait-FoMO appear to be associated with PSMU most likely via a negative reinforcement mechanism. These results highlight the importance of making mental health professionals aware of state-FoMO and boredom as a response to predisposing variables such as depression, stress, interpersonal sensitivity, and trait-FoMO in interventions that target PSMU. By doing so, it is possible to develop more effective prevention and treatment approaches to reduce the negative consequences of PSMU.

The findings highlight the importance of recognizing predisposing characteristics specifically for different groups of social media users in designing therapeutic interventions and preventive programs. For example, interventions that address reducing fears related to missing out on online experiences, especially among individuals with trait-FoMO, and providing therapeutic solutions to cope with feelings of boredom among individuals with a background of depression, may be effective in treating and preventing problematic use of social media.

The present study also found that women and younger age groups are more at risk of problematic social media use. Therefore, it is important that educational and preventive programs pay more attention to these cohorts. Further studies are needed that address the role of gender and age differences in problematic social media use. It should also be noted (unlike previous studies), no relationship was observed between anxiety and problematic social media use, either alone or alongside mediating factors. Therefore, further studies to examine the relationship between anxiety and problematic social media use are warranted.

Conclusion

The findings suggested that personality traits such as trait-FoMO and interpersonal sensitivity, along with psychological distress, may be risk factors for problematic use of social media. In addition, the presence of state-FoMO, which is a state associated with the fear of missing out in online experiences, may increase the likelihood of problematic use of social media. Additionally, the experience of boredom as a mediator appears to strengthen the relationship between predisposing variables and problematic social media use. Among individuals who have depressive symptoms, the experience of boredom may result in problematic use of social media.

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Conflict of Interest

All other authors declare that they have no conflicts of interest.

Data availability

Data will be made available on request.

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