Fear of missing out and problematic social media use: A serial mediation model of social comparison and self-esteem

Rocco Servidio [a,*], Paolo Soraci [b], Mark D. Griffiths [c], Stefano Boca [d], Zsolt Demetrovics [e,f]

[a] Department of Culture, Education and Society, University of Calabria, Via Pietro Bucci, Building Cube 20/B, 87036 Arcavacata di Rende, Cosenza, Italy
[b] Università Niccolo Cusano, Via Don Carlo Gnocchi, n.3, Roma, Italy
[c] International Gaming Research Unit, Psychology Department, Nottingham Trent University, Nottingham, United Kingdom
[d] Department of Psychology, Educational Science and Human Movement, University of Palermo, 90128 Palermo, Italy
[e] Centre of Excellence in Responsible Gaming, University of Gibraltar, Gibraltar, Gibraltar, Spain
[f] Institute of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary

ARTICLE INFO

ABSTRACT

Background and aim: Fear of Missing Out (FoMO) is consistently associated with problematic social media use (PSMU). Moreover, previous studies have shown a significant association between FoMO, self-esteem, and social comparison. However, there is a lack of studies that have investigated the relationship between, FoMO, social comparison, self-esteem, and PSMU in an integrated model. The present study hypothesized that FoMO may influence PSMU through the serial mediating role of social comparison and self-esteem.
Method: A cross-sectional survey study was conducted comprising 256 Italian university students (74.4% female), aged 18 to 38 years ($M = 23.05$ years; $SD = 3.58$). The participants completed an online survey assessing the variables of the study.
Results: Controlling for age and gender, the results showed positive associations between FoMO, social comparison, and PSMU, and a negative association between FoMO and self-esteem. Self-esteem was also negatively associated with PSMU. It was also found that social comparison and self-esteem sequentially mediated the association between FoMO and PSMU.
Conclusions: The present study contributes to understanding the mechanisms that underline the complex effects of FoMO on PSMU.

1. Introduction

Social networking sites, such as *Facebook, TikTok*, and *Instagram*, are web-based platforms that provide not only social interaction but also information and entertainment (Kircaburun, Demetrovics, & Tosuntaş, 2019; Kwak & Kim, 2023). The results of recent meta-analyses suggest a strong association between problematic social media use (PSMU) among young people and adverse mental health effects, notably increased symptoms of depression, anxiety, and stress (Huang, 2022; Shannon, Bush, Villeneuve, Hellemans, & Guimond, 2022). Neither of these meta-analyses found gender or age differences in PSMU prevalence. However, results from other studies have noted that being female might be a risk factor for developing PSMU (e.g., Aparicio-Martínez et al., 2020; Hylkilä et al., 2023), whereas other findings have indicated that males have a

higher prevalence of internet addiction and gaming addiction than females (Meng et al., 2022; Su, Han, Jin, Yan, & Potenza, 2019). Another recent meta-analysis, which included a sample of 27 independent cross-sectional studies with a total of 67,407 adolescents ($M_{age} = 15.5$ years, 51.7% females), indicated positive, small-to-medium correlations between PSMU and engagement in risky behaviors generally, substance use, and risky sexual behaviors (Vannucci, Simpson, Gagnon, & Ohannessian, 2020).

A systematic review and meta-analysis on the global prevalence of multiple subtypes of online addiction (e.g., smartphone addiction, internet addiction, cybersex, and gaming addiction) in the general population reported that individuals in lower-income countries, particularly from the South-East Asia region, reported higher levels of PSMU (Meng et al., 2022). Another meta-analysis of 63 samples from 32

countries (Cheng, Lau, Chan, & Luk, 2021) showed a pooled overall prevalence of 24% worldwide, ranging from 14% in individualistic nations to 31% in collectivistic cultures. However, the overall prevalence was 5% when strict (monothetic) criteria were used. Another issue related to online addictions concerns which age group might be more susceptible to developing PSMU. According to the meta-analysis by Cheng and et al. (2021), adolescent samples showed a notably higher prevalence of PSMU (35%) compared to both university students (23%) and adults from the community (19%). According to Casale, Akbari, Seydavi, Bocci Benucci, and Fioravanti (2023), the recent increase in social media use could be considered a temporary compensatory coping strategy to face the negative effects of loneliness and social distance during the COVID-19 pandemic lockdown period. Based on these results, it is evident that PSMU deserves further scientific attention.

The dynamic evolution of social networking has made it challenging to establish a formal definition (Bányai et al., 2017; Rhee, Bayer, Lee, & Kuru, 2021). Empirical research now supports the idea that social media interaction is a way of being and relating to others (Kuss & Griffiths, 2017). Congruent with the progression of social media use, several studies have suggested that involvement with social media, if taken to excess, can be considered problematic and (in a minority of cases) lead to behavioral addiction, especially in connection with the perceived need for some users to be constantly online (e.g., Akbari et al., 2023; Foroughi, Griffiths, Iranmanesh, & Salamzadeh, 2022; Soraci et al., 2023). Furthermore, as argued by compensatory internet use theory (Kardefelt-Winther, 2014), many individuals go online to escape real-life problems or alleviate dysphoric moods, and this sometimes leads to negative outcomes for the individual. Therefore, the aim of the present study was to explore the relationships between social comparison and self-esteem in the association between fear of missing out (FoMO) and problematic social media use (PSMU). Findings regarding FoMO's associations with these variables have previously suggested mixed findings. According to Tandon, Dhir, Almugren, AlNemer, and Mäntymäki (2021), the extant literature on FoMO offers a fragmented view of this phenomenon. Indeed, little empirical research has explored the serial mediating role of social comparison and self-esteem in the relationship between FoMO and PSMU in an integrated model. Therefore, the present study utilized a sample of Italian university students to examine whether FoMO can significantly predict university students' PSMU and explored whether social comparison and self-esteem would significantly mediate this serial relationship. By exploring the mechanisms through which FoMO affects social media behavior, the study sought to provide additional insights regarding the development of intervention and prevention programs aimed at promoting healthier online habits and improving the overall psychological well-being of individuals.

1.1. Fear of missing out and problematic social media use

In an online context, FoMO is defined as the anxiety stemming from the possibility of not participating in rewarding online experiences, leading individuals to feel compelled to constantly monitor their online social interactions (Przybylski, Murayama, DeHaan, & Gladwell, 2013). This social phenomenon is also linked to the need-to-belong theory (Baumeister, 2012), suggesting that FoMO is driven by uncertainty about social belonging (Dogan, 2019). According to the compensatory motivation perspective of self-determination theory (Ryan & Deci, 2000), basic psychological needs satisfaction is a key motivational mechanism that drives individuals to engage in behavioral compensation when their needs are not satisfied. Therefore, the stronger the desire to belong, the greater the likelihood of experiencing FoMO (Alutaybi, Al-Thani, McAlaney, & Ali, 2020). Previous research has established direct and indirect associations between FoMO and PSMU (e.g., Franchina, Vanden Abeele, Van Rooij, Lo Coco, & De Marez, 2018).

In recent years, FoMO has been the subject of increasing empirical research regarding social media use since social platforms are

considered ideal tools for satisfying the desire to remain constantly connected to what others are doing (e.g., Przybylski et al., 2013; Servidio, Koronczai, Griffiths, & Demetrovics, 2022). Individuals who experience FoMO about social interaction or rewarding experiences within their real online social networks show a greater propensity for poor self-regulation in their use of social media (Brailovskaia, Truskauskaite-Kuneviciene, Kazlauskas, & Margraf, 2023). This behavior is driven by the need to remain constantly connected to the activities of their friends and to alleviate anxiety related to the perception of being socially excluded (Baker, Krieger, & LeRoy, 2016; Fioravanti et al., 2021).

Prior studies have also shown a positive association between FoMO and problematic use of several social media platforms such as *Facebook* (Błachnio, Przepiórka, Wołońciej, Bassam Mahmoud, Holdoš, & Yafi, 2018), *Instagram* (Balta, Emirtekin, Kircaburun, & Griffiths, 2020), *WhatsApp*, and *Snapchat* (Rozgonjuk, Sindermann, Elhai, & Montag, 2020), as well as nonspecific problematic social networking use (Fang, Wang, Wen, & Zhou, 2020). Researchers have also explored whether FoMO might selectively predict the relationship between individual differences and PSMU. For example, Blackwell, Leaman, Tramposch, Osborne, and Liss (2017) found that, even after accounting for the influence of extraversion, neuroticism, and attachment orientations, FoMO uniquely predicted PSMU. Moreover, the results of a recent literature review suggested the importance of identifying the influence of FoMO on personality variables such as the need for affiliation, among others (Tandon et al., 2021). Although previous studies note that FoMO may increase the development of negative emotions and affectivity associated with social deficiencies, such as rumination (Dempsey, O'Brien, Tiamiyu, & Elhai, 2019), research has yet to investigate the sequential relationships between FoMO, social comparison orientation, self-esteem, and PSMU. Therefore, the present study examined the relationships between these variables, to offer insights and practical implications for future studies.

1.2. Social comparison, self-esteem, and problematic social media use

Social comparison generally serves the purpose of self-assessment by individuals comparing themselves with the abilities and opinions of others (Festinger, 1954). Individuals strive to belong to a group of similar others (Baumeister, 2012). It has been proposed that the visually-oriented nature of social media makes it easy for individuals to quickly compare themselves to strangers and individuals they know (Chae, 2017). Existing literature has shown that engagement in social comparisons is positively associated with greater social media use (Ozimek & Bierhoff, 2016). Previous findings have also shown that social comparison, especially when individuals compare social skills and/or performance abilities (Yang & Robinson, 2018) is related to FoMO and social media use, and negatively associated with poor well-being (Burnell, George, Vollet, Ehrenreich, & Underwood, 2019; Reer, Tang, & Quandt, 2019). When individuals believe that most of their friends differ from them, they may think that they have limited social support.

The relationship between frequent social comparison, especially when individuals perceive themselves as disadvantaged and less able than others, and negative well-being outcomes (e.g., such as decreased self-esteem), can be understood through basic psychological mechanisms. This type of unfavorable comparison induces a selective focus on personal weaknesses in comparison to others, generating feelings of insecurity and inferiority. Additionally, constant unfavorable comparison can cause a state of chronic stress because individuals constantly feel under pressure to meet unrealistic standards or to compete with others. This can contribute to a decrease in self-esteem because individuals may internalize negative perceptions about themselves and doubt their abilities and personal worth (e.g., Samra, Warburton, & Collins, 2022). Therefore, it appears that social comparison works as a mediating variable in studying FoMO and PSMU.

FoMO can be a significant antecedent that can shape social

comparison dynamics (Tandon et al., 2021). Indeed, the constant worry of missing out on key events or social moments on online platforms may trigger a more frequent and intense social comparison process (Eitan & Gazit, 2023; Servidio, Sinatra, Griffiths, & Monacis, 2021). FoMO can fuel the desire to align with perceived social standards, leading individuals to examine and compare their lives with those of others actively. Here, FoMO and social comparison can lead to more frequent use of social media sites because individuals seek to bridge the perceived gap between their experiences and those of others (Burnell et al., 2019; Reer et al., 2019; Servidio et al., 2021). Therefore, FoMO can be a precursor that contributes to creating a more intensive comparative perspective, prompting individuals to seek confirmation and validation through online interaction (Eitan & Gazit, 2023).

Moreover, research indicates that engaging in more social comparisons on social media is linked to lower self-esteem (Jiang & Ngien, 2020; Lee, 2022; Yang & Robinson, 2018). How individuals compare themselves to their friends can also affect their self-esteem and the amount of editing they do to their photos and posts to try to attract more attention (Chae, 2017; Gioia, McLean, Griffiths, & Boursier, 2023). Results from past studies underline that there is a negative relationship between social comparison and self-esteem (Jiang & Ngien, 2020). In another study conducted by Wang et al. (2017), it was found that when people saw their social media friends as more popular, their levels of self-esteem were lower. It has been found that social media use may increase self-esteem and as well as reduce it (Vogel, Rose, Roberts, & Eckles, 2014). Some have reported that high levels of self-esteem may protect users from negative psychological consequences such as maladaptive use of social media applications (Oberst, Wegmann, Stodt, Brand, & Chamarro, 2017). Moreover, self-esteem could serve as a motivation for individuals to use social media in particular ways. Research exploring the association between social media use and self-esteem indicates that individuals with lower self-esteem often exhibit higher levels of social media activity (Bergagna & Tartaglia, 2018; Błachnio, Przepiorka, & Pantic, 2016; Mann & Blumberg, 2022). However, other studies have also suggested a negative association between self-esteem and PSMU (Andreassen, Pallesen, & Griffiths, 2017; Lee, 2022). According to Rosenberg (1965), self-esteem represents the positive or negative orientation that individuals have toward themselves, encompassing the general evaluation of individuals' thoughts and feelings toward themselves. Moreover, individuals with robust self-esteem usually adopt a balanced approach to the use of technology, deal with stressful situations constructively, and develop an optimistic outlook on life (Servidio, Gentile, & Boca, 2018).

Findings from other studies have highlighted an association between individuals with low self-esteem and an increased inclination to utilize social media platforms (Ahmed, Nayeem Siddiqua, Alam, & Griffiths, 2021; Andreassen et al., 2017; Jan, Soomro, & Ahmad, 2017; Mann & Blumberg, 2022). The results of these studies indicate that engaging in social media activities supports individuals not only validating their self-esteem but can also lead to a temporary boost in self-esteem. Self-esteem plays a mediating role in the complex interplay between FoMO and PSMU (Gori, Topino, & Griffiths, 2023). FoMO, as a constant fear of not living up to the experiences of others, can further erode self-esteem (Sommantico, Ramaglia, & Lacatena, 2023). This feeling of inferiority may drive individuals to seek refuge in compulsive social media use, seeking approval and reinforcing their self-esteem through online social feedback (Liu et al., 2017).

Consequently, it seems reasonable to posit that individuals who are active on social media for immediate enhancements in self-esteem may exhibit lower baseline levels of self-perception. Given that FoMO appears to be a predictor of PSMU (Franchina et al., 2018; Gori et al., 2023), previous studies have shown a significant negative association between FoMO and self-esteem (Vogel et al., 2014), and social comparison (Servidio et al., 2021; Yang & Robinson, 2018). Therefore, the present authors believe that FoMO may influence PSMU through the serial mediating role of social comparison and self-esteem.

Consequently, for the present study, it was hypothesized that (i) FoMO would have a positive association with social comparison ability, a negative relationship with self-esteem, and a direct positive effect on PSMU (H_1), (ii) social comparison ability would mediate the relationship between FoMO and PSMU (H_2), (iii) self-esteem would mediate the relationship between FoMO and PSMU (H_3), and (iv) social comparison ability and self-esteem would serially mediate the relationship between FoMO and PSMU (H_4). The model based on these specific hypotheses is presented in Fig. 1.

2. Materials and methods

2.1. Participants and procedures

The study comprised 256 participants who were daily social media users. The age of the participants ranged from 18 to 38 years ($M = 23.05$ years; $SD = 3.58$). Three-quarters of the participants were female (74.4%). They were all undergraduate students enrolled in humanistic, psychological, and social sciences degrees. Participants were enrolled through online recruitment by distributing a link to the survey hosted on the *LimeSurvey* platform via the authors' social media accounts. Before answering the questions, participants were briefed on the study's objective, and each participant provided informed consent. The present study was conducted according to the ethical standards of the Italian Psychological Association and approved by the first author's university ethics committee (2022-UCALPRG-0039494).

2.2. Measures

2.2.1. Demographics characteristics

Participants provided demographic information including gender, age, education level, and daily time spent on social media (e.g., *Facebook, Instagram*).

2.2.2. Fear of Missing Out Scale (FoMOS)

The 10-item FoMOS (Przybylski et al., 2013; Italian version: Casale & Fioravanti, 2020) was used to assess FoMO. Items (e.g., "*I fear others have more rewarding experiences than me*") are rated on a five-point scale ranging from 1 (*Not at all true of me*) to 5 (*Extremely true of me*). The total score ranges from 10 to 50 and a higher score indicates greater FoMO. Cronbach's alpha in the present study was adequate ($\alpha = 0.67$).

2.2.3. Rosenberg Self-Esteem Scale (RSES)

The 10-item RSES (Rosenberg, 1965; Italian version: Prezza, Trombaccia, & Armento, 1997) was used to assess self-esteem. Items (e.g., "*On the whole, I am satisfied with myself*") are rated on a four-point scale from 0 (*strongly disagree*) to 3 (*strongly agree*). The total score ranges from 0 to 30, and higher scores indicate greater self-esteem. Cronbach's alpha in the present study was very good ($\alpha = 0.83$).
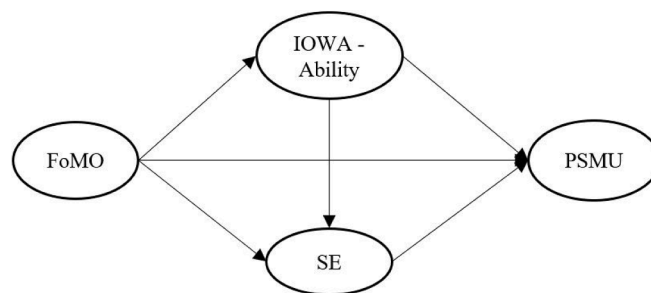
Fig. 1. The proposed research model. *Note.* FoMO = Fear of Missing Out. IOWA = Iowa–Netherlands Comparison Orientation Measure. SE = Self-esteem. PSMU = Problematic Social Media Use.

2.2.4. Iowa–Netherlands Comparison Orientation Measure (INCOM)

The INCOM (Gibbons & Buunk, 1999; Italian version: Ruggieri, Ingoglia, Bonfanti, & Lo Coco, 2021) is an 11-item scale measure of an individual's tendency to make social comparisons. However, for the present study, only the six-item 'ability' sub-scale which concerns performance was used. Items (e.g., "*I often compare myself with others with respect to what I have accomplished in life*") are rated on a five-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The total score ranges from 6 to 30, and higher scores indicate a greater tendency to make social comparisons. Cronbach's alpha in the present study was good ($\alpha = 0.78$).

2.2.5. Bergen Social Media Addiction Scale (BSMAS)

The six-item BSMAS (adapted from Andreassen, Torsheim, Brunborg, & Pallesen, 2012; Italian version: Monacis, de Palo, Griffiths, & Sinatra, 2017) was used to assess PSMU. Items (e.g., "*Over the past 12 months, have you spent a lot of time thinking about social media or have you planned to use them*?") are rated on a five-point Likert scale, ranging from 1 (*never*) to 5 (*very often*). The total score ranges from 6 to 30, and higher scores indicate a greater risk of PSMU. Cronbach's alpha in the present study was good ($\alpha = 0.77$).

2.3. Data analysis

The data analysis comprised four steps. First, descriptive statistics for the study variables were calculated using SPSS v.28. More specifically, mean scores, standard deviations, normality statistics, and Pearson bivariate correlations were calculated. All the analyses controlled for age and gender (Reer et al., 2019). Second, a solution based on item parceling was derived by applying a balanced procedure to combine high and low inter-correlations values (Little, Cunningham, Shahar, & Widaman, 2002; Sterba & Rights, 2016). Therefore, three items parceling for each of the constructs (i.e., FoMO, and Rosenberg self-esteem) were generated. Third, to test the study's hypotheses, structural equation modeling (SEM) was conducted using the *lavaan* R package (Rosseel, 2012). Fourth, an alternative model was estimated because of the study's correlational nature.

The χ^2 test of difference was further used to determine whether the model presented in Fig. 1 provided a better model fit than a non-mediated model in which FoMO independently predicted, social comparison, self-esteem, and PSMU, without social comparison and self-esteem mediating PSMU. All the models were estimated with the maximum-likelihood parameter with robust standard errors (MLR). The fit of the tested models was assessed using the following multiple fit indices (Kline, 2016): (a) comparative fit index (CFI) $\geq$ 0.95, (b) Tucker-Lewis Index (TLI) $\geq$ 0.95, (c) root mean square error of approximation (RMSEA) $\leq$ 0.06, and (d) standardized root mean square residual (SRMR) < 0.08. The comparison with the models was conducted by computing robust χ^2 difference statistic ($\Delta\chi^2$) using the ANOVA function. Before estimating path coefficients with SEM, and following the study conducted by Lee (2020), an independent sample *t*-test was conducted to control for gender effects, since no significant gender differences were found in social comparison and self-esteem.

3. Results

3.1. Preliminary analyses

Participants indicated that, on average, they spent a daily amount of 2.65 h on *Facebook* (SD = 2.53), 3.93 h on *Instagram* (SD = 2.96), and 5.19 h on *WhatsApp* (SD = 3.60). Moreover, there were no gender differences except for PSMU in which females scored significantly higher than males on the BSMAS (Table 1). The correlation analysis indicated that PSMU was positively and significantly associated with FoMO and social comparison (supporting H$_1$). On the other hand, self-esteem was negatively and significantly associated with FoMO, social comparison,

Table 1
Difference between males and females in relation to the study variables.

	Male		Female		
	M	SD	M	SD	*t*-test
Fear of missing out	1.95	0.45	1.93	0.48	ns
Social comparison ability	2.84	0.71	2.87	0.85	ns
Self-esteem	3.06	0.43	2.98	0.44	ns
Problematic social media use	2.04	0.58	2.38	0.76	−3.32***

Note. ***p < 0.001.

and PSMU (Table 2).

3.2. Mediation analyses

The SEM model fit the data adequately, robust χ^2 (153, N = 256) = 214.35, $p = 0.001$, CFI = 0.95, TLI = 0.94, RMSEA = 0.04, 90% CI [0.03, 0.05], SRMR = 0.05 (Fig. 2). The model accounted for 30% of the variance in participants' PSMU. The results partially confirmed the hypothesized indirect effects of FoMO on PSMU (Table 3). More specifically, it was found that FoMO was indirectly related to PSMU through the mediating role of social comparison (supporting H$_2$). Self-esteem did not mediate the association between FoMO and excessive social media use, therefore, H$_3$ was not supported. Moreover, the direct path of FoMO on PSMU was not significant. On the other hand, FoMO was indirectly associated with problematic social media engagement through the sequential mediation effects of social comparison and self-esteem (supporting H$_4$). Overall, the result of the mediation analysis indicated a fully mediated effect.

Based on the results of the SEM analysis, FoMO had a significant positive and direct effect on social comparison ($\beta = 0.54$, SE = 0.16, $t = 3.21$, $p < 0.001$). Social comparison was significantly positively associated with PSMU ($\beta = 0.23$, SE = 0.12, $t = 1.94$, $p < 0.05$). A significant negative association was found between social comparison and self-esteem ($\beta = -0.32$, SE = 0.08, $t = -2.44$, $p < 0.05$). Finally, self-esteem was significantly negatively associated with PSMU ($\beta = -0.29$, SE = 0.15, $t = -3.08$, $p < 0.01$). Moreover, an alternative non-mediated model was tested. Although the non-mediated model provided sufficient fit to the data (robust χ^2 (158, N = 256) = 232.42, $p < 0.001$, CFI = 0.94, TLI = 0.93, RMSEA = 0.04, 90% CI [0.03, 0.05], SRMR = 0.06), after comparing the two models, the results showed that the non-mediated model fitted the data worse ($\Delta\chi^2$(5) = 17.84, $p < 0.01$). Therefore, the first model was selected as the final model.

4. Discussion

The present study examined the serial mediation effect of social comparison and self-esteem in the relationship between FoMO and PSMU. The results supported H$_1$, H$_2$ and H$_4$ (but not H$_3$). The results of the SEM analysis, in line with previous literature (e.g., Ozimek & Bierhoff, 2016; Reer et al., 2019; Servidio et al., 2021), showed that FoMO was a positive and significant predictor of social comparison, supporting H$_1$. The constant anxiety of missing interesting online social events can trigger a more frequent and intense process of social comparison. FoMO fuels the desire to conform to perceived social standards, prompting individuals to actively evaluate and compare their own lives with those of others. This reciprocal relationship between FoMO and social comparison often leads to more frequent use of social media because individuals seek to bridge the perceived gap between their own experiences and those of others. The results of the SEM, supporting H$_2$, suggested that social comparison mediated the relationship between FoMO and PSMU. The present study's result pertained to the mediation effect of social comparison since it explained 32% of the variance. FoMO emerged as a precursor that contributed to a more intense comparative perspective, prompting individuals to seek confirmation and validation through online social interactions (Eitan & Gazit, 2023). In other words,

Table 2
Pearson correlations and descriptive statistics of the study variables.

	M	*SD*	1	2	3	4	5
Fear of missing out	1.93	0.47	1.00				
Social comparison ability	2.85	0.82	0.37***	1.00			
Self-esteem	3.00	0.44	−0.17***	−0.26***	1.00		
Problematic social media use	2.29	0.73	0.22***	0.30***	−0.21***	1.00	
Age	23.5	3.58	−0.05	0.11*	0.10	−0.00	1.00
Gender	–	–	−0.02	0.01	−0.08	0.20**	−0.11

Note. Gender is a point bi-serial correlation (1 = male, 2 = female). *$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.
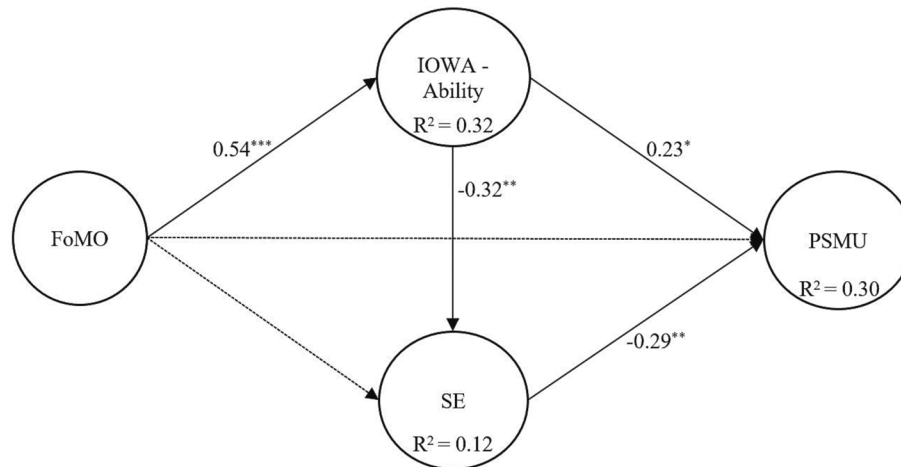
Fig. 2. Standardized results of the hypothesized model. The dashed lines indicate non-significant paths. Latent factors are presented in the circle. For clarity, item factor loadings, which were significant at $p < 0.001$, are omitted. *Note.* FoMO = Fear of Missing Out. IOWA = Iowa–Netherlands Comparison Orientation Measure. SE = Self-esteem. PSMU = Problematic Social Media Use. *$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Table 3
Estimates of total, direct, and indirect effects on problematic social media use.

Pathway	*B*	*SE*	*z*	*P*	*β*
FoMO –> PSMU					
Total	0.34	0.13	2.52	0.012	0.35
Direct effect	0.16	0.12	1.31	0.19	0.17
FoMO –> IOWA –> SE –>PSMU					
Indirect effect	0.05	0.02	1.99	0.047	0.05
FoMO –> IOWA –>PSMU					
Indirect effect	0.12	0.06	1.99	0.046	0.13
FoMO –> SE –> PSMU					
Indirect effect	0.01	0.02	0.38	0.704	0.01

Note. FoMO = Fear of Missing Out. PSMU = Problematic Social Media Use. IOWA = Iowa–Netherlands Comparison Orientation Measure. SE = Self-esteem.

people high in FoMO were associated with a higher level of social comparison. Therefore, in line with previous studies, individuals who are inclined to compare themselves with others are more likely to frequently encounter information shared by others, including positively skewed details about their recent rewarding experiences and activities (Przybylski et al., 2013; Reer et al., 2019). Consequently, they may more frequently perceive that others are faring better or enjoying more fulfilling experiences, which constitutes a fundamental aspect of the FoMO.

The results of the SEM analysis indicated that self-esteem was negatively associated with PSMU. Previous studies (e.g., Andreassen et al., 2017; Jan et al., 2017) have reported a significant association between low self-esteem and increased social media use. These findings suggest that individuals use social media to cope with personal issues,

serving to compensate for personal deficiencies, particularly low self-esteem. This behavior is perceived as a quick-fix strategy, temporarily boosting individuals' moods by allowing them to adopt an alternate social identity, distinct from their real-life selves. For instance, some individuals could experience feelings of inferiority and may turn to social media as a refuge, seeking approval and fortifying their self-esteem through online social feedback. Therefore, when individuals have low self-esteem, they may engage in excessive social media use to compensate for these deficiencies.

However, the results of the mediation analysis indicated that self-esteem did not appear to play a mediating role in the relationship between FoMO and PSMU when taken individually. This finding did not support H$_3$, which is inconsistent with previous studies (Gori et al., 2023; Sommantico et al., 2023). This result could be due to several factors, including the type of sample recruited (i.e., university students), socio-cultural factors of the participants, as well as the effects of different variables. For example, FoMO and boredom proneness have been found to partially mediate the relationship between psychological distress and PSMU (Malik et al., 2023). Overall, these mixed findings suggest the importance that future research should explore the longitudinal association between FoMO, personality variables and PSMU. Moreover, the present study's findings provide evidence to support the social comparison theory (Festinger, 1954) which has implications for how people use social media applications. Additionally, the results of a recent study (Li, Koning, Finkenauer, Boer, & Van Den Eijnden, 2024) indicated that FoMO was not associated with life satisfaction. This suggests that the potential effects of FoMO could be relatively narrow in scope when other variables are present. Indeed, one approach to reducing FoMO and its social consequences might be to consider the role of social comparison in relation to self-esteem, which could affect how individuals engage in the use of social media applications.

Furthermore, as seen in other studies (e.g., Yang & Robinson, 2018),

social comparison is a negative predictor of self-esteem. When evaluating individual competence and comparing skills in a social context, the likelihood of experiencing a competitive mindset is significantly high. Consequently, friends (or other signifiers) on social media can be perceived as a stress factor, representing a potential threat to an individual's self-esteem. Indeed, in the serial mediation model, when self-esteem was taken together with the social comparison ability, it contributed to mediating the relationship between FoMO and PSMU, supporting H_4. Previous studies have found that individuals who are prone to engage in online social comparison by using social media applications report low levels of self-esteem (Jiang & Ngien, 2020; Lee, 2022; Yang & Robinson, 2018). According to Tesser's (1988) theory of self-evaluation maintenance, engaging in upward social comparisons on social media applications may trigger negative emotions, subsequently reducing individuals' self-esteem. As outlined in previous research (e.g., Vogel et al., 2014), how an individual compares their abilities can affect their self-esteem. Individuals with a balanced approach to the use of technology maintain robust self-esteem (e.g., by using social comparison in a positive way to improve themselves), whereas individuals who use social media in an unbalanced way, such as excessive, frenzied, and constant social comparison, may inhibit self-esteem (Mann & Blumberg, 2022; Yang & Robinson, 2018).

Finally, the results of the present study indicated a non-significant direct association between FoMO and PSMU. When social comparison and self-esteem were included in the mediation model, the direct effect of FoMO on PSMU was not significant. Although this outcome is inconsistent with previous findings (see Fioravanti et al. [2021] for a review), a recent longitudinal study suggested a unidirectional association whereby FoMO increased PSMU during mid-adolescence, but not vice versa (Li et al., 2024). Additionally, the results of another prior study did not find support for a longitudinal association between problematic smartphone use and FoMO one year later (Lo Coco et al., 2020). The present study's findings suggest that FoMO does not necessarily have a direct influence on the PSMU, but appears to act serially through social comparison and individuals' self-esteem. This could imply that the way people perceive themselves in relation to others and their self-esteem may influence PSMU in response to the fear of losing social events or connections (Steinberger & Kim, 2023). Moreover, in other studies (Lee, 2022; Sekścińska & Jaworska, 2022; Servidio et al., 2021) which have explored the relationship between FoMO, social comparison, and self-esteem, it has been observed that individuals who are exposed to the viewing of social content regarding events in which they were not active participants (e.g., being an non-invited individual), manifest increased levels of FoMO.

These feelings by individuals who believe they have been left out and are missing something important, are associated with an increase in social comparisons, in which individuals compare themselves to the experiences posted by their friends, fueling feelings of self-inadequacy and personal discomfort (Steinberger & Kim, 2023). Therefore, social comparison has been shown to negatively influence individuals' self-esteem, leading to a decrease in positive self-perception. Therefore, some individuals with low self-esteem tend to seek gratification and validation through social media interaction (Uram & Skalski, 2022). This behavior, fueled by the combination of FoMO and low self-esteem, can lead to PSMU, which is characterized by increased time spent online and compulsive behaviors, such as constantly updating the feed and seeking external approval (Kim, Schlicht, Schardt, & Florack, 2021). This interpretation is supported by the observation that FoMO can trigger a series of emotional and behavioral reactions (e.g., anxiety), which in turn influence the individual's interaction with social media, particularly in relation to self-perception and self-esteem (Tandon et al., 2021). Therefore, it is also plausible that, in some cases, FoMO may not directly affect PSMU, but rather, may influence self-esteem and social comparisons, which in turn may lead to PSMU.

The findings of the present study must be considered in the context of specific limitations. Firstly, the participant sample consisted exclusively of a small convenience sample of the Italian student population and was predominantly female. Secondly, all data were self-report, and are therefore subject to the potential influence of social desirability factors on participants' responses to the survey items. To validate the initial results, further research involving larger and more representative samples of Italian participants is essential. This could include a nationally representative sample with a more balanced gender distribution to provide a more comprehensive understanding of the variables under investigation. Thirdly, the cross-sectional nature of this study limits the understanding of any inference regarding the cause-effect relationship among the study variables. Future studies could examine possible differences in social comparison strategies and different ways of using social media. Furthermore, the serial mediation model could also be replicated in other 'technological addictions', such as addiction to smartphones and videogames.

5. Conclusions

The present study expands the current literature relating fear of missing out use by examining the mediating role of social comparison and self-esteem in predicting PSMU. The analysis showed that FoMO was associated with increased levels of social comparison, and in turn with PSMU. Moreover, self-esteem was negatively related to PSMU, but it did not mediate the relationship between FoMO and problematic use of social media. However, these results are to be taken cautiously due to the study's inherent limitations. Overall, the findings highlight the importance of examining the associations between various aspects of FoMO and PSMU alongside the mediating effects of social comparison and self-esteem among Italian university students.

CRediT authorship contribution statement

Rocco Servidio: Conceptualization, Project administration, Data curation, Formal analysis, Methodology, Writing – original draft. **Paolo Soraci:** Writing – original draft. **Mark D. Griffiths:** Writing - review & editing, supervision. **Stefano Boca:** Investigation, Methodology. **Zsolt Demetrovics:** Review & editing, Supervision.

Declaration of competing interest

Given their role as Editorial Board members, Griffiths M.D. and Demetrovics Z., had no involvement in the peer-review of this article and had no access to information regarding its peer-review. All other authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available upon request from the corresponding author.

References

Ahmed, O., Nayeem Siddiqua, S. J., Alam, N., & Griffiths, M. D. (2021). The mediating role of problematic social media use in the relationship between social avoidance/distress and self-esteem. *Technology in Society, 64*, Article 101485. https://doi.org/10.1016/j.techsoc.2020.101485

Akbari, M., Bahadori, M. H., Khanbabaei, S., Milan, B. B., Horvath, Z., Griffiths, M. D., & Demetrovics, Z. (2023). Psychological predictors of the co-occurrence of problematic gaming, gambling, and social media use among adolescents. *Computers in Human Behavior, 140*, Article 107589. https://doi.org/10.1016/j.chb.2022.107589

Alutaybi, A., Al-Thani, D., McAlaney, J., & Ali, R. (2020). Combating fear of missing out (FoMO) on social media: The FoMO-R method. *International Journal of Environmental Research and Public Health, 17*(17), 6128. https://doi.org/10.3390/ijerph17176128

Andreassen, C. S., Pallesen, S., & Griffiths, M. D. (2017). The relationship between addictive use of social media, narcissism, and self-esteem: Findings from a large national survey. *Addictive Behaviors, 64*, 287–293. https://doi.org/10.1016/j.addbeh.2016.03.006

Andreassen, C. S., Torsheim, T., Brunborg, G. S., & Pallesen, S. (2012). Development of a Facebook addiction scale. *Psychological Reports, 110*(2), 501–517. https://doi.org/10.2466/02.09.18.PR0.110.2.501-517

Aparicio-Martínez, P., Ruiz-Rubio, M., Perea-Moreno, A.-J., Martínez-Jiménez, M. P., Pagliari, C., Redel-Macías, M. D., & Vaquero-Abellán, M. (2020). Gender differences in the addiction to social networks in the Southern Spanish university students. *Telematics and Informatics, 46*, Article 101304. https://doi.org/10.1016/j.tele.2019.101304

Baker, Z. G., Krieger, H., & LeRoy, A. S. (2016). Fear of missing out: Relationships with depression, mindfulness, and physical symptoms. *Translational Issues in Psychological Science, 2*(3), 275–282. https://doi.org/10.1037/tps0000075

Balta, S., Emirtekin, E., Kircaburun, K., & Griffiths, M. D. (2020). Neuroticism, trait fear of missing out, and phubbing: The mediating role of state fear of missing out and problematic Instagram use. *International Journal of Mental Health and Addiction, 18* (3), 628–639. https://doi.org/10.1007/s11469-018-9959-8

Bányai, F., Zsila, Á., Király, O., Maraz, A., Elekes, Z., Griffiths, M. D., Andreassen, C. S., & Demetrovics, Z. (2017). Problematic social media use: Results from a large-scale nationally representative adolescent sample. *PloS One, 12*(1), e0169839.

Baumeister, R. F. (2012). Need-to-belong theory. In P. Van Lange, A. Kruglanski, & E. Higgins (Eds.), *Handbook of theories of social psychology* (pp. 121–140). SAGE Publications Ltd.. https://doi.org/10.4135/9781446249222.n32

Bergagna, E., & Tartaglia, S. (2018). Self-esteem, social comparison, and Facebook use. *Europe's Journal of Psychology, 14*(4), 831–845. https://doi.org/10.5964/ejop.v14i4.1592

Błachnio, A., Przepiorka, A., & Pantic, I. (2016). Association between Facebook addiction, self-esteem and life satisfaction: A cross-sectional study. *Computers in Human Behavior, 55*, 701–705. https://doi.org/10.1016/j.chb.2015.10.026

Błachnio, A., Przepiórka, A., Wołońciej, M., Bassam Mahmoud, A., Holdoš, J., & Yafi, E. (2018). Loneliness, friendship, and Facebook intrusion. A study in Poland, Slovakia, Syria, Malaysia, and Ecuador. *Studia Psychologica, 60*(3), 183–194. https://doi.org/10.21909/sp.2018.03.761.

Blackwell, D., Leaman, C., Tramposch, R., Osborne, C., & Liss, M. (2017). Extraversion, neuroticism, attachment style and fear of missing out as predictors of social media use and addiction. *Personality and Individual Differences, 116*, 69–72. https://doi.org/10.1016/j.paid.2017.04.039

Brailovskaia, J., Truskauskaite-Kuneviciene, I., Kazlauskas, E., & Margraf, J. (2023). The patterns of problematic social media use (SMU) and their relationship with online flow, life satisfaction, depression, anxiety and stress symptoms in Lithuania and in Germany. *Current Psychology, 42*(5), 3713–3724. https://doi.org/10.1007/s12144-021-01711-w

Burnell, K., George, M. J., Vollet, J. W., Ehrenreich, S. E., & Underwood, M. K. (2019). Passive social networking site use and well-being: The mediating roles of social comparison and the fear of missing out. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace, 13*(3). https://doi.org/10.5817/CP2019-3-5

Casale, S., Akbari, M., Seydavi, M., Bocci Benucci, S., & Fioravanti, G. (2023). Has the prevalence of problematic social media use increased over the past seven years and since the start of the COVID-19 pandemic? A meta-analysis of the studies published since the development of the Bergen social media addiction scale. *Addictive Behaviors, 147*, Article 107838. https://doi.org/10.1016/j.addbeh.2023.107838

Casale, S., & Fioravanti, G. (2020). Factor structure and psychometric properties of the Italian version of the fear of missing out scale in emerging adults and adolescents. *Addictive Behaviors, 102*, Article 106179. https://doi.org/10.1016/j.addbeh.2019.106179

Chae, J. (2017). Virtual makeover: Selfie-taking and social media use increase selfie-editing frequency through social comparison. *Computers in Human Behavior, 66*, 370–376. https://doi.org/10.1016/j.chb.2016.10.007

Cheng, C., Lau, Y., Chan, L., & Luk, J. W. (2021). Prevalence of social media addiction across 32 nations: Meta-analysis with subgroup analysis of classification schemes and cultural values. *Addictive Behaviors, 117*, Article 106845. https://doi.org/10.1016/j.addbeh.2021.106845

Dempsey, A. E., O'Brien, K. D., Tiamiyu, M. F., & Elhai, J. D. (2019). Fear of missing out (FoMO) and rumination mediate relations between social anxiety and problematic Facebook use. *Addictive Behaviors Reports, 9*, Article 100150. https://doi.org/10.1016/j.abrep.2018.100150

Dogan, V. (2019). Why do people experience the fear of missing out (FoMO)? Exposing the link between the self and the FoMO through self-construal. *Journal of Cross-Cultural Psychology, 50*(4), 524–538. https://doi.org/10.1177/0022022119839145

Eitan, T., & Gazit, T. (2023). No social media for six hours? The emotional experience of Meta's global outage according to FoMO, JoMO and internet intensity. *Computers in Human Behavior, 138*, Article 107474. https://doi.org/10.1016/j.chb.2022.107474

Fang, J., Wang, X., Wen, Z., & Zhou, J. (2020). Fear of missing out and problematic social media use as mediators between emotional support from social media and phubbing behavior. *Addictive Behaviors, 107*, Article 106430. https://doi.org/10.1016/j.addbeh.2020.106430

Festinger, L. (1954). A theory of social comparison processes. *Human Relations, 7*(2), 117–140. https://doi.org/10.1177/001872675400700202

Fioravanti, G., Casale, S., Benucci, S. B., Prostamo, A., Falone, A., Ricca, V., & Rotella, F. (2021). Fear of missing out and social networking sites use and abuse: A meta-analysis. *Computers in Human Behavior, 122*, Article 106839. https://doi.org/10.1016/j.chb.2021.106839

Foroughi, B., Griffiths, M. D., Iranmanesh, M., & Salamzadeh, Y. (2022). Associations between Instagram addiction, academic performance, social anxiety, depression, and life satisfaction among university students. *International Journal of Mental Health and Addiction, 20*(4), 2221–2242. https://doi.org/10.1007/s11469-021-00510-5

Franchina, V., Vanden Abeele, M., Van Rooij, A., Lo Coco, G., & De Marez, L. (2018). Fear of missing out as a predictor of problematic social media use and phubbing behavior among Flemish adolescents. *International Journal of Environmental Research and Public Health, 15*(10), 2319. https://doi.org/10.3390/ijerph15102319

Gibbons, F. X., & Buunk, B. P. (1999). Individual differences in social comparison: Development of a scale of social comparison orientation. *Journal of Personality and Social Psychology, 76*(1), 129–142. https://doi.org/10.1037/0022-3514.76.1.129

Gioia, F., McLean, S., Griffiths, M. D., & Boursier, V. (2023). Adolescents' selfie-taking and selfie-editing: A revision of the photo manipulation scale and a moderated mediation model. *Current Psychology, 42*(5), 3460–3476. https://doi.org/10.1007/s12144-021-01702-x

Gori, A., Topino, E., & Griffiths, M. D. (2023). The associations between attachment, self-esteem, fear of missing out, daily time expenditure, and problematic social media use: A path analysis model. *Addictive Behaviors, 141*, Article 107633. https://doi.org/10.1016/j.addbeh.2023.107633

Huang, C. (2022). A meta-analysis of the problematic social media use and mental health. *International Journal of Social Psychiatry, 68*(1), 12–33. https://doi.org/10.1177/0020764020978434

Hylkilä, K., Männikkö, N., Castrén, S., Mustonen, T., Peltonen, A., Konttila, J., Männistö, M., & Kääriäinen, M. (2023). Association between psychosocial well-being and problematic social media use among Finnish young adults: A cross-sectional study. *Telematics and Informatics, 81*, Article 101996. https://doi.org/10.1016/j.tele.2023.101996

Jan, M., Soomro, S. A., & Ahmad, N. (2017). Impact of social media on self-esteem. *European Scientific Journal, 13*(23), 329. https://doi.org/10.19044/esj.2017.v13n23p329.

Jiang, S., & Ngien, A. (2020). The effects of Instagram use, social comparison, and self-esteem on social anxiety: A survey study in Singapore. *Social Media + Society, 6*(2), 205630512091248. https://doi.org/10.1177/2056305120912488.

Kardefelt-Winther, D. (2014). A conceptual and methodological critique of internet addiction research: Towards a model of compensatory internet use. *Computers in Human Behavior, 31*, 351–354. https://doi.org/10.1016/j.chb.2013.10.059

Kim, H., Schlicht, R., Schardt, M., & Florack, A. (2021). The contributions of social comparison to social network site addiction. *PloS One, 16*(10), e0257795.

Kircaburun, K., Demetrovics, Z., & Tosuntaş, Ş. B. (2019). Analyzing the links between problematic social media use, dark triad traits, and self-esteem. *International Journal of Mental Health and Addiction, 17*(6), 1496–1507. https://doi.org/10.1007/s11469-018-9900-1

Kline, R. B. (2016). *Principles and practice of structural equation modeling (Fourth edition)*. The Guilford Press.

Kuss, D., & Griffiths, M. (2017). Social networking sites and addiction: Ten lessons learned. *International Journal of Environmental Research and Public Health, 14*(3), 311. https://doi.org/10.3390/ijerph14030311

Kwak, M.-J., & Kim, D.-J. (2023). Investigating psychological and motivational predictors of problematic smartphone use among Smartphone-based social networking service (SNS) users. *Addictive Behaviors Reports, 18*, Article 100506. https://doi.org/10.1016/j.abrep.2023.100506

Lee, J. K. (2020). The effects of social comparison orientation on psychological well-being in social networking sites: Serial mediation of perceived social support and self-esteem. *Current Psychology*. https://doi.org/10.1007/s12144-020-01114-3

Lee, J. K. (2022). The effects of social comparison orientation on psychological well-being in social networking sites: Serial mediation of perceived social support and self-esteem. *Current Psychology, 41*(9), 6247–6259. https://doi.org/10.1007/s12144-020-01114-3

Li, Y.-Y., Koning, I. M., Finkenauer, C., Boer, M., & Van Den Eijnden, R. J. J. M. (2024). The bidirectional relationships between fear of missing out, problematic social media use and adolescents' well-being: A random intercept cross-lagged panel model. *Computers in Human Behavior, 154*, Article 108160. https://doi.org/10.1016/j.chb.2024.108160

Little, T. D., Cunningham, W. A., Shahar, G., & Widaman, K. F. (2002). To parcel or not to parcel: Exploring the question, weighing the merits. *Structural Equation Modeling, 9* (2), 151–173. https://doi.org/10.1207/S15328007SEM0902_1

Liu, Q.-Q., Zhou, Z.-K., Yang, X.-J., Niu, G.-F., Tian, Y., & Fan, C.-Y. (2017). Upward social comparison on social network sites and depressive symptoms: A moderated mediation model of self-esteem and optimism. *Personality and Individual Differences, 113*, 223–228. https://doi.org/10.1016/j.paid.2017.03.037

Lo Coco, G., Salerno, L., Franchina, V., La Tona, A., Di Blasi, M., & Giordano, C. (2020). Examining bi-directionality between Fear of Missing Out and problematic smartphone use. A two-wave panel study among adolescents. *Addictive Behaviors, 106*, Article 106360. https://doi.org/10.1016/j.addbeh.2020.106360

Malik, L., Shahnawaz, M. G., Rehman, U., Pragyendu, U., Uniyal, R., & Griffiths, M. D. (2023). Mediating roles of fear of missing out and boredom proneness on psychological distress and social media addiction among Indian adolescents. *Journal of Technology in Behavioral Science. Advance Online Publication*. https://doi.org/10.1007/s41347-023-00323-4

Mann, R. B., & Blumberg, F. (2022). Adolescents and social media: The effects of frequency of use, self-presentation, social comparison, and self esteem on possible self imagery. *Acta Psychologica, 228*, Article 103629. https://doi.org/10.1016/j.actpsy.2022.103629

Meng, S.-Q., Cheng, J.-L., Li, Y.-Y., Yang, X.-Q., Zheng, J.-W., Chang, X.-W., Shi, Y., Chen, Y., Lu, L., Sun, Y., Bao, Y.-P., & Shi, J. (2022). Global prevalence of digital addiction in general population: A systematic review and meta-analysis. *Clinical Psychology Review, 92*, Article 102128. https://doi.org/10.1016/j.cpr.2022.102128

Monacis, L., de Palo, V., Griffiths, M. D., & Sinatra, M. (2017). Social networking addiction, attachment style, and validation of the Italian version of the Bergen Social Media Addiction Scale. *Journal of Behavioral Addictions, 6*(2), 178–186. https://doi.org/10.1556/2006.6.2017.023

Oberst, U., Wegmann, E., Stodt, B., Brand, M., & Chamarro, A. (2017). Negative consequences from heavy social networking in adolescents: The mediating role of fear of missing out. *Journal of Adolescence, 55*, 51–60. https://doi.org/10.1016/j.adolescence.2016.12.008

Ozimek, P., & Bierhoff, H.-W. (2016). Facebook use depending on age: The influence of social comparisons. *Computers in Human Behavior, 61*, 271–279. https://doi.org/10.1016/j.chb.2016.03.034

Prezza, M., Trombaccia, F. R., & Armento, L. (1997). La scala dell'autostima di Rosenberg: Traduzione e validazione Italiana. *Bollettino di Psicologia Applicata, 223*, 35–44.

Przybylski, A. K., Murayama, K., DeHaan, C. R., & Gladwell, V. (2013). Motivational, emotional, and behavioral correlates of fear of missing out. *Computers in Human Behavior, 29*(4), 1841–1848. https://doi.org/10.1016/j.chb.2013.02.014

Reer, F., Tang, W. Y., & Quandt, T. (2019). Psychosocial well-being and social media engagement: The mediating roles of social comparison orientation and fear of missing out. *New Media & Society.* https://doi.org/10.1177/1461444818823719

Rhee, L., Bayer, J. B., Lee, D. S., & Kuru, O. (2021). Social by definition: How users define social platforms and why it matters. *Telematics and Informatics, 59*, Article 101538. https://doi.org/10.1016/j.tele.2020.101538

Rosenberg, M. (1965). *Society and the adolescent self-image.* Princeton University Press.

Rosseel, Y. (2012). lavaan: An *R* package for structural equation modeling. *Journal of Statistical Software, 48*(2), 1–36. https://doi.org/10.18637/jss.v048.i02

Rozgonjuk, D., Sindermann, C., Elhai, J. D., & Montag, C. (2020). Fear of missing out (FoMO) and social media's impact on daily-life and productivity at work: Do WhatsApp, Facebook, Instagram, and Snapchat usedDisorders mediate that association? *Addictive Behaviors, 110*, Article 106487. https://doi.org/10.1016/j.addbeh.2020.106487

Ruggieri, S., Ingoglia, S., Bonfanti, R. C., & Lo Coco, G. (2021). The role of online social comparison as a protective factor for psychological wellbeing: A longitudinal study during the COVID-19 quarantine. *Personality and Individual Differences, 171*, Article 110486. https://doi.org/10.1016/j.paid.2020.110486

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

Samra, A., Warburton, W. A., & Collins, A. M. (2022). Social comparisons: A potential mechanism linking problematic social media use with depression. *Journal of Behavioral Addictions, 11*(2), 607–614. https://doi.org/10.1556/2006.2022.00023

Sekścińska, K., & Jaworska, D. (2022). Who felt blue when Facebook went down? - The role of self-esteem and FoMO in explaining people's mood in reaction to social media outage. *Personality and Individual Differences, 188*, Article 111460. https://doi.org/10.1016/j.paid.2021.111460

Servidio, R., Gentile, A., & Boca, S. (2018). The mediational role of coping strategies in the relationship between self-esteem and risk of Internet addiction. *Europe's Journal of Psychology, 14*(1), 176–187. https://doi.org/10.5964/ejop.v14i1.1449

Servidio, R., Koronczai, B., Griffiths, M. D., & Demetrovics, Z. (2022). Problematic smartphone use and problematic social media use: The predictive role of self-construal and the mediating effect of fear missing out. *Frontiers in Public Health, 10*, Article 814468. https://doi.org/10.3389/fpubh.2022.814468

Servidio, R., Sinatra, M., Griffiths, M. D., & Monacis, L. (2021). Social comparison orientation and fear of missing out as mediators between self-concept clarity and problematic smartphone use. *Addictive Behaviors, 122*, Article 107014. https://doi.org/10.1016/j.addbeh.2021.107014

Shannon, H., Bush, K., Villeneuve, P. J., Hellemans, K. G., & Guimond, S. (2022). Problematic social media use in adolescents and young adults: Systematic review and meta-analysis. *JMIR Mental Health, 9*(4), e33450.

Sommantico, M., Ramaglia, F., & Lacatena, M. (2023). Relationships between depression, fear of missing out and social media addiction: The mediating role of self-esteem. *Healthcare, 11*(12), 1667. https://doi.org/10.3390/healthcare11121667

Soraci, P., Ferrari, A., Barberis, N., Luvarà, G., Urso, A., Del Fante, E., & Griffiths, M. D. (2023). Psychometric analysis and validation of the Italian Bergen Facebook Addiction Scale. *International Journal of Mental Health and Addiction, 21*(1), 451–467. https://doi.org/10.1007/s11469-020-00346-5

Steinberger, P., & Kim, H. (2023). Social comparison of ability and fear of missing out mediate the relationship between subjective well-being and social network site addiction. *Frontiers in Psychology, 14*, 1157489. https://doi.org/10.3389/fpsyg.2023.1157489

Sterba, S. K., & Rights, J. D. (2016). Accounting for parcel-allocation variability in practice: Combining sources of uncertainty and choosing the number of allocations. *Multivariate Behavioral Research, 51*(2–3), 296–313. https://doi.org/10.1080/00273171.2016.1144502

Su, W., Han, X., Jin, C., Yan, Y., & Potenza, M. N. (2019). Are males more likely to be addicted to the internet than females? A meta-analysis involving 34 global jurisdictions. *Computers in Human Behavior, 99*, 86–100. https://doi.org/10.1016/j.chb.2019.04.021

Tandon, A., Dhir, A., Almugren, I., AlNemer, G. N., & Mäntymäki, M. (2021). Fear of missing out (FoMO) among social media users: A systematic literature review, synthesis and framework for future research. *Internet Research, 31*(3), 782–821. https://doi.org/10.1108/INTR-11-2019-0455

Tesser, A. (1988). Toward a self-evaluation maintenance model of social behavior. *Advances in Experimental Social Psychology, 21*, 181–227. https://doi.org/10.1016/S0065-2601(08)60227-0

Uram, P., & Skalski, S. (2022). Still logged in? The link between Facebook addiction, FoMO, self-esteem, Life satisfaction and loneliness in social media users. *Psychological Reports, 125*(1), 218–231. https://doi.org/10.1177/0033294120980970

Vannucci, A., Simpson, E. G., Gagnon, S., & Ohannessian, C. M. (2020). Social media use and risky behaviors in adolescents: A meta-analysis. *Journal of Adolescence, 79*(1), 258–274. https://doi.org/10.1016/j.adolescence.2020.01.014

Vogel, E. A., Rose, J. P., Roberts, L. R., & Eckles, K. (2014). Social comparison, social media, and self-esteem. *Psychology of Popular Media Culture, 3*(4), 206–222. https://doi.org/10.1037/ppm0000047

Wang, P., Zhao, M., Wang, X., Xie, X., Wang, Y., & Lei, L. (2017). Peer relationship and adolescent smartphone addiction: The mediating role of self-esteem and the moderating role of the need to belong. *Journal of Behavioral Addictions, 6*(4), 708–717. https://doi.org/10.1556/2006.6.2017.079

Yang, C., & Robinson, A. (2018). Not necessarily detrimental: Two social comparison orientations and their associations with social media use and college social adjustment. *Computers in Human Behavior, 84*, 49–57. https://doi.org/10.1016/j.chb.2018.02.020