



FoMO and Psychological Distress Mediate the Relationship Between Life Satisfaction, Problematic Smartphone Use, and Problematic Social Media Use

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Accepted: 9 December 2024
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Abstract

Low life satisfaction has often been associated with problematic social media use (PSMU), problematic smartphone use (PSU), FoMO and psychological distress. However, no studies have analyzed the relationship between life satisfaction, PSMU, PSU, FoMO, and psychological distress, in an integrated model. The present study hypothesized that life satisfaction may influence PSMU and PSU through the role of FoMO and psychological distress. A cross-sectional survey completed by 537 Italians (82.9% females [$n=445$] and 17.1% males [$n=92$], mean age = 35.35 years [$SD \pm 12.14$]), included the Satisfaction With Life Scale, Bergen Social Media Addiction Scale, Smartphone Application-Based Addiction Scale, Depression Anxiety and Stress Scale, and Fear of Missing Out Scale. The results indicated direct negative associations between life satisfaction and both PSMU and PSU. Additionally, the findings indicated that both FoMO and psychological distress acted as full mediators in this complex relationship, suggesting that problematic technology use may be driven by emotional vulnerabilities such as fear of social exclusion and heightened levels of psychological distress. The present study contributes to understanding the psychological mechanisms underlying the relationship between life satisfaction, fear of missing out, psychological distress, and problematic technology use, offering insights for potential interventions aimed at reducing the negative impact of technology on well-being.

Keywords Problematic social media use · Problematic smartphone use · Fear of missing out · Life satisfaction · Psychological distress

Problematic social media use (PSMU) and problematic smartphone use (PSU) represent emerging issues tied to technological developments. This is evidenced by the growing interest in this phenomenon within the psychological literature (e.g., Kuss & Griffiths, 2011, 2017; Soraci et al., 2020a, b, 2021, 2023; Servidio et al., 2021, 2024), and the increasing number of studies that seek to identify the underlying factors and consequences of these behaviors (e.g., Elhai et al., 2017a, b, 2018a, b, 2020a, b; Servidio et al., 2024; Soraci et al., 2023).

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Existing literature indicates that personal and affective variables, including life satisfaction, exert a significant influence on the adoption of problematic behaviors associated with social media use and smartphone use (Andreassen et al., 2016a, b; Beyens et al., 2016; Kuss & Griffiths, 2017; Kuss et al., 2013; Montag et al., 2015; Samaha & Hawi, 2016; Satici & Uysal, 2015; Wang et al., 2019; Xanidis & Brignell, 2016). For instance, individuals with low levels of life satisfaction may be more vulnerable to developing problematic use of such technologies. This can manifest as excessive or dysfunctional use, which may serve as a means of compensation or escape from reality (Demirci et al., 2015; Elhai et al., 2017a, b).

Moreover, psychological variables such as fear of missing out (FoMO) (e.g., Abel et al., 2016; Elhai et al., 2016, 2017a, b, 2020a, b; Przybylski et al., 2013; Servidio, 2023; Servidio et al., 2024) and psychological distress (e.g., anxiety, stress, and depression) may play an important role in the risk of developing problematic behaviors related to both social media use and smartphone use (e.g., Dempsey et al., 2019; Elhai et al., 2017a, b; Soraci et al., 2023).

The phenomenon of FoMO (i.e., the fear of missing out on rewarding or meaningful online social experiences) is particularly relevant in this context (Przybylski et al., 2013). Individuals with greater levels of FoMO tend to experience a persistent need to remain connected to their digital devices in order to monitor their online social activities (Przybylski et al., 2013). Smartphone use further accentuates this because it provides users with continuous access to social media sites and other communication platforms (e.g., Elhai et al., 2020a, b; Servidio et al., 2021). It can therefore be argued that FoMO contributes to both PSMU and PSU, thereby creating a vicious cycle of technological dependence for some individuals (e.g., Oberst et al., 2017).

General psychological distress can also exacerbate problematic behaviors associated with technology use (Dempsey et al., 2019; Elhai et al., 2017a, b). Social media and smartphones may be used as coping mechanisms or a means of escaping from reality to seek relief from emotional distress (Jouhki et al., 2022). Nevertheless, compensatory use has been demonstrated to be counterproductive for some individuals, because it may exacerbate anxiety, stress, and depression (Soares et al., 2023; Zhou et al., 2023). Consequently, psychological distress can further amplify PSMU and PSU, creating a self-perpetuating cycle that ultimately leads to a further deterioration in life satisfaction (e.g., Elhai et al., 2017a, b). Both FoMO and psychological distress are pivotal variables that exert a significant influence on PSMU and PSU, thereby increasing the probability of the emergence of maladaptive behaviors associated with these technologies and intensifying their adverse effects on overall life satisfaction (Elhai et al., 2020a, b; Oberst et al., 2017; Przybylski et al., 2013).

Life Satisfaction

Life satisfaction constitutes an essential dimension of social and subjective well-being, representing an individual's overall assessment of their existence based on a synthesis of experiences, aspirations, and accomplishments (Diener et al., 1985, 1999, 2000; Proctor et al., 2009). Life satisfaction is inherently subjective, deriving from a comparison between personal expectations and perceived reality and influenced by several factors, such as social relationships, physical and mental health, and the ability to find meaning in everyday life (Joshanloo et al., 2019; Lyubomirsky et al., 2005). Higher life satisfaction is associated

with a range of positive outcomes, including enhanced mental and physical health, an extended life expectancy, more fulfilling interpersonal relationships, and greater resilience in the face of life stresses (e.g., Diener & Chan, 2011; Zeng & Pang, 2023).

Life satisfaction is regarded as a principal indicator of both individual and collective well-being, and therefore, it is inextricably linked to and shaped by these dimensions (e.g., Helliwell & Putnam, 2004). It provides valuable information for policymakers and mental health professionals, enabling a more nuanced understanding of the needs of the population and facilitating the development of interventions aimed at improving quality of life. In a clinical context, the monitoring of life satisfaction can be beneficial for the early identification of potential risks of psychological distress and for the guidance of targeted therapeutic interventions (Pavot & Diener, 2008).

Problematic Smartphone Use

The arrival of the smartphone has had a profound impact on the way individuals live their lives, offering a plethora of functionalities that have become indispensable in people's daily routines. Such applications include gaming and social networking, among others (Busch & McCarthy, 2021; Montag et al., 2021; Wilcockson et al., 2018). Smartphones facilitate uninterrupted social connectivity through platforms such as *Instagram* and *Snapchat* and coordination of daily activities (Elhai et al., 2017a, b; Sha et al., 2019).

The pervasive use of smartphones has led to the emergence of problematic smartphone use (PSU), which is characterized by excessive and problematic use of the device. This causes dysfunction in various areas of life, including personal, family, social, educational, and work domains (Kun et al., 2024; Paterna et al., 2024; Tao et al., 2024; Yin et al., 2024). Additionally, PSU can manifest as withdrawal symptoms and behaviors similar to substance addiction (Kwon et al., 2013; Panova & Carbonell, 2018; Sohn et al., 2019).

Problematic Smartphone Use, Psychological Distress, FoMO and Life Satisfaction

The increasing prevalence of PSU raises concerns regarding its psychological, physical, and social effects (Busch & McCarthy, 2021; Elhai et al., 2017a, b; Montag et al., 2021; Soraci et al., 2024). Evidence has demonstrated negative associations between PSU and adverse psychological outcomes, including greater psychological distress and reduced life satisfaction (Elhai et al., 2017a, b; Sha et al., 2019; Sohn et al., 2019; Thomée et al., 2011; Vahedi & Saiphoo, 2018).

Moreover, disengagement from smartphones can result in withdrawal-like symptoms, such as anxiety and physiological discomfort, highlighting the addictive potential of smartphones. The compulsive nature of PSU can be attributed, at least in part, to the design of smartphone apps (Montag et al., 2021). Popular apps are designed with the objective of maximizing user engagement through techniques such as intermittent variable rewards (Billieux et al., 2015; Montag et al., 2021). This mechanism exploits users' susceptibility to PSU by linking actions such as checking notifications to unpredictable rewards, thereby reinforcing repetitive behavior and making disengagement from the device challenging (Wilcockson et al., 2018).

Consequently, FoMO or not receiving approval drives users to maintain a high level of engagement with social media, making it challenging to disconnect and reduce time spent

on devices (Gul et al., 2022). Research on PSU indicates that it can cause significant harm to multiple dimensions of physical and mental health and well-being (Elhai et al., 2017a, b; Montag et al., 2021) and has an addictive nature similar to behavioral addictions (Panova & Carbonell, 2018). For example, more serious complications, including cervical disc degeneration and cervical spondylosis, have been documented in cases of prolonged smartphone use (Maayah et al., 2023).

Sohn et al. (2019) conducted a systematic review and meta-analysis and reported that approximately 23.3% of young people met the criteria for PSU. The study highlighted the need for further research to gain a deeper understanding of the underlying factors associated with this condition and to develop effective prevention and treatment strategies.

Social Media Use

Initially, social media was developed to facilitate communication between individuals by enabling users to create and share personal content and interact with the contributions of others within their networks (Boyd & Ellison, 2007; Donath & Boyd, 2004; Ellison et al., 2007). Over time, these platforms have evolved, expanding their functions beyond the domain of simple interpersonal communication to encompass a range of professional applications, including self-promotion (Kessling et al., 2023; Kietzmann et al., 2011; Kolas & von Mühlennen, 2024; Samra et al., 2022). Presently, social media applications provide users with multiple avenues for connection, encompassing a diverse range of communication modalities, including phone and video calls, text messaging, and content creation and sharing (Nesi et al., 2018).

Problematic Social Media Use and Psychological Well-Being

Research demonstrates that engagement with social media can enhance human interactions and psychological well-being (Baker & Moore, 2008; Ellison et al., 2007). However, an increasing body of scientific evidence also highlights the negative aspects of PSMU, including harmful psychological, physiological, and social consequences (e.g., Andreasen et al., 2017; Kuss & Griffiths, 2011; Marino et al., 2018). There are numerous adverse effects of PSMU, such as elevated levels of depression, anxiety, stress, diminished overall life satisfaction, and insomnia (Błachnio et al., 2016; Twenge et al., 2018a).

Problematic Social Media Use and Life Satisfaction

Although some studies indicate that PSMU's influence on life satisfaction is limited (e.g., Orben & Przybylski, 2019), a comprehensive review found that the association is evident across all age groups, including the elderly (Seabrook et al., 2016), with a notable prevalence among younger individuals. It has been proposed by researchers that low life satisfaction may either contribute to the development of PSMU or result from it, with some suggesting a bidirectional relationship (e.g., Marino et al., 2018; Odgers & Jensen, 2020). Meta-analyses (e.g., Marino et al., 2018) have consistently found an association between PSMU and adverse mental health outcomes, including greater levels of depression and anxiety across a range of different social media platforms (Aalbers et al., 2019; Boers et al.,

2019; Keles et al., 2020; Kross et al., 2013; Shensa et al., 2018; Twenge et al., 2018a; Vanucci et al., 2017).

Low levels of life satisfaction may serve to exacerbate PSMU, with scientific literature indicating that individuals who are dissatisfied with their lives are more likely to engage in PSMU, seeking online content as a form of compensation or escapism (Kross et al., 2013; Orben & Przybylski, 2019). This dynamic can intensify the symptoms of psychological distress, creating a vicious cycle of PSMU and a further deterioration in life satisfaction (Błachnio et al., 2016; Shensa et al., 2018; Tromholt, 2016). Conversely, other studies suggest that PSMU may also be a contributing factor in reducing life satisfaction (Shakya & Christakis, 2017; Twenge et al., 2018b). This relationship remains an open topic of investigation in the scientific community, similar to other forms of behavioural addiction (Andreassen et al., 2017).

Problematic Social Media Use and FoMO

The concept of FoMO has consistently been associated with problematic digital technology use in many studies on internet and smartphone use disorders (e.g., Dempsey et al., 2019; Elhai et al., 2020b; Wegmann et al., 2017). Those with elevated levels of FoMO are more likely to react to ‘push notifications’, whereas those with lower levels may demonstrate greater resistance to such stimuli (Dempsey et al., 2019; Elhai et al., 2020b).

It has been proposed that high FoMO may result in greater utilization of social media, which could potentially contribute to the development of PSMU (Blackwell et al., 2017). Moreover, psychological distress, may exacerbate PSMU, reinforcing it as a form of emotional avoidance or regulation (Elhai et al., 2017a, b; Wegmann et al., 2017).

The six-component model of behavioral addiction, as proposed by Griffiths (1996, 2005), indicates that PSMU exhibits fundamental characteristics analogous to those observed in substance addiction. The aforementioned components include salience (obsessive thinking and constant planning of using social networking sites), tolerance (the need to spend more and more time on social networking sites), mood modification (use of social networking sites to escape emotional problems), relapse (inability to reduce use on social networking sites), withdrawal (discomfort when social networking sites cannot be accessed), and conflict (negative life consequences due to overuse of social networking sites).

A meta-analysis conducted by Cheng et al. (2021), encompassing 32 countries (63 studies, $N=34,798$), showed a global prevalence of 24% for PSMU. However, it is important to note that these rates may vary depending on the population sample and screening tools used (e.g., Servidio et al., 2024), which underscores the necessity for further research on the risk factors associated with PSMU (Keles et al., 2020; Marino et al., 2018).

Fear of Missing Out

The phenomenon of FoMO (fear of missing out), is becoming increasingly prevalent in psychological discourse, particularly in light of the growing use of social media and the pervasiveness of smartphones (Przybylski et al., 2013; Elhai et al., 2016; Servidio, 2023; Tao et al., 2024; Wang et al., 2024). Smartphones provide users with constant and immediate access to social platforms, facilitating continuous monitoring of others’ activities. The

capacity to remain connected via smartphones at all times and locations gives rise to an addictive urge to remain logged on to social media platforms. This can readily result in problematic technology use (e.g., PSU and PSMU), and may contribute to a vicious cycle of anxiety and frustration (Elhai et al., 2017a, b; Gezgin, 2018) and feelings of inadequacy and discontent (Fox & Moreland, 2015).

FoMO and Life Satisfaction

A low level of life satisfaction may serve to exacerbate the phenomenon of FoMO. Those experiencing dissatisfaction or emotional distress are more susceptible to social comparison, because they tend to perceive themselves as excluded or inferior to others, particularly when they observe images of ostensibly perfect lives characterized by success on social media (Appel et al., 2016; Baker et al., 2016). Moreover, it may intensify the urge to remain perpetually abreast of the activities of others, in an effort to assuage the sense of emptiness or deficiency they experience (Alt, 2015; Milyavskaya et al., 2018).

Moreover, the pervasive use of social media has been observed to exacerbate these sentiments, rather than providing respite (Tandoc et al., 2015). Consequently, a vicious circle is created: personal dissatisfaction, associated with an inability to fulfil fundamental needs for autonomy, competence, and relationships, encourages individuals to seek solace in social media use. However, this transient solace rapidly evolves into intensified distress and exasperation, further exacerbating the sensation of exclusion or isolation, resulting in further deterioration in life satisfaction (Beyens et al., 2016; Elhai et al., 2016; Kross et al., 2013).

The I-PACE and CIUT Models

The I-PACE (Interaction of Person-Affect-Cognition-Execution) model and CIUT (Compensatory Internet Use Theory) provide theoretical frameworks for the analysis of the underlying dynamics of internet-related disorders (e.g., problematic social media and smartphone use). The I-PACE model (Brand et al., 2016, 2019) provides a comprehensive framework for the analysis of behavioral addictions, including problematic social media and smartphone use. The I-PACE model identifies life satisfaction as a key personal factor that can impact problematic social media and smartphone behavior (e.g., Xanidis & Brignell, 2016). In particular, low life satisfaction may act as a catalyst for individuals to seek immediate gratification through social media and smartphone use, which may subsequently evolve into problematic use (e.g., Wang et al., 2019).

CIUT (Karddefelt-Winther, 2014) proposes that excessive internet use may serve as a compensatory strategy to cope with negative experiences or dissatisfaction in real life. Those with low levels of life satisfaction may utilize social media and smartphones as a means of compensating for perceived deficiencies in their offline lives, such as low mental well-being and general life dissatisfaction (Satici & Uysal, 2015).

Empirical research provides substantiation for the theoretical associations of CIUT and the I-PACE model. For example, studies conducted by Elhai et al., (2017a, b) demonstrated that symptoms of anxiety and depression are significant predictors of problematic smartphone use, suggesting that mobile devices may be used as a coping mechanism to manage psychological distress (e.g., Yoo, 2024).

Casale and Fioravanti (2015) found a positive association between PSMU and elevated anxiety levels, and Błachnio et al. (2016) identified an association between problematic *Facebook* use and diminished levels of life satisfaction. Moreover, Keles et al. (2020) reported associations between PSU and depressive and anxiety symptoms, indicating that problematic technology use may serve as a coping mechanism for psychological distress.

The Mediating Roles of FoMO and Psychological Distress

Previous studies suggest that in the relationship between life satisfaction and the problematic use of smartphones (PSU) and social networking sites (PSMU), FoMO and general psychological distress are central mediating variables (e.g., Alshakhsi et al., 2023; Blackwell et al., 2017; Chen et al., 2022; Oberst et al., 2017; Przybylski et al., 2013; Wegmann et al., 2017). It is noteworthy that both PSU and PSMU can be influenced by FoMO and psychological distress, which may serve as coping or escape mechanisms from reality, particularly when life satisfaction is reduced (Casale & Fioravanti, 2015; Dhir et al., 2015, 2018; Elhai et al., 2018a, b, 2020a, b; Li et al., 2017, 2020; Stead & Bibby, 2017).

A high level of FoMO can lead individuals to engage in compulsive checking of their smartphones and social media, motivated by the desire to remain constantly updated and connected, in an attempt to avoid feelings of social exclusion (Przybylski et al., 2013). A reduction in life satisfaction can lead to an increase in FoMO, which in turn may result in the problematic overuse of these technologies as a coping mechanism or a means of escapism from an unsatisfactory reality (Stead & Bibby, 2017).

Concurrently, psychological distress serves as an additional factor that may exacerbate problematic utilization of digital technologies (Elhai et al., 2018a, b). In a state of psychological distress, individuals may seek solace in smartphones and social media as a means of escapism from reality or as a form of temporary self-care. These activities provide an immediate distraction and a sense of apparent social connection that can temporarily alleviate symptoms of psychological distress (Kross et al., 2013). For instance, during periods of anxiety, an individual may engage in repetitive scrolling through social media feeds with the intention of finding content that will distract them or improve their mood.

The compensatory use of these technologies may provide a temporary alleviation of emotional and psychological distress, resulting in a transient improvement in life satisfaction. Nevertheless, over time, this can result in problematic use, characterized by an inability to disengage from technological devices (e.g., smartphones) and interference with daily activities and interpersonal relationships (Elhai et al., 2018a, b; van Deursen et al., 2015; Wegmann & Brand, 2016). For instance, the continual disruption of daily routines to respond to notifications can result in poor sleep quality and diminished productivity at work.

It can be reasonably assumed that FoMO may precipitate excessive and compulsive use of social media. However, anxiety, stress and depression may also drive individuals to utilize these platforms as coping mechanisms or as a means of evading reality (Elhai et al., 2017a, b; Oberst et al., 2017). Recurrent thoughts about the lack of updates and perceived exclusion may contribute to problematic technology use (Roberts & David, 2020). Moreover, established behavioral patterns, such as checking notifications immediately upon waking, and difficulties in impulse control, such as the temptation to continuously check notifications, may serve to exacerbate the problem, thereby rendering it challenging

for individuals to regulate their use of social networking sites and smartphones (Billieux et al., 2015).

The Present Study

Despite the existence of evidence regarding the associations between the variables in the present study (i.e., life satisfaction, FoMO, PSU, PSMU, psychological distress) (e.g., Casale & Fioravanti, 2015; de Hesselde & Montag, 2024; Dempsey et al., 2019; Elhai et al., 2020a, b; Gugushvili et al., 2020; Hawi & Samaha, 2017; O'Brien et al., 2022; Przybylski et al., 2013; Servidio et al., 2022, 2024; Soraci et al., 2020a, b; Wang et al., 2018), none of these studies have analyzed these variables in an integrated model. The present study addressed this gap in the literature by exploring the potential association of life satisfaction on PSMU and PSU through the mediating roles of FoMO and psychological distress (anxiety, stress, and depression) by designing an inclusive model.

The present study's proposed model is based on evidence and theoretical frameworks, and incorporates personal factors (e.g., life satisfaction) with affective mediators (e.g., FoMO and psychological distress) to explore the associations between these factors and PSMU and PSU. This integration is supported by the I-PACE and CIUT theoretical frameworks, which elucidate the manner in which interactions between personal, affective, and cognitive factors may result in addictive behavior or problematic use of social networking sites and smartphones.

While previous research has predominantly examined FoMO and psychological distress as antecedent variables of PSMU and PSU (e.g., Elhai et al., 2016, 2020a, b), the present study uniquely integrated life satisfaction as a key variable, exploring its indirect effects through affective mediators. In doing so, the study provides a more nuanced perspective on how subjective well-being interacts with emotional and cognitive processes to influence problematic technology use. In particular, life satisfaction may be associated with affective states such as FoMO and psychological distress, which in turn may act as mediators in the relationship between these variables and problematic use of technological devices (e.g., PSMU and PSU).

An examination of the relationship between life satisfaction and PSU/PSMU facilitates a more comprehensive understanding of the psychological processes involved, particularly in light of the potential influence of mediators such as FoMO and general psychological distress. The integration of these variables into a broader model will facilitate the identification of risk factors and the refinement of measurement and intervention instruments. Moreover, addressing this gap will foster awareness among communities and professionals about the intricate interrelationships between life satisfaction and the utilization of social media, promoting a more informed approach.

Based on the literature it was hypothesized that: (i) life satisfaction would be negatively associated with PSU and PSMU through the mediating effect of FoMO (H_1), (ii) life satisfaction would be negatively associated with PSU and PSMU through the mediating effect of psychological distress (anxiety, stress and depression) (H_2), (iii) FoMO would be positively associated with PSU and PSMU (H_3), and (iv) psychological distress (anxiety, stress and depression) would be positively associated with PSU and PSMU (H_4). Considering the inconsistent findings in the literature regarding the role of gender and age in the association with PSMU and PSU, gender and age were accounted for as covariates in the structural equation modeling (SEM) analysis. For instance, some research suggests that females are

more prone to PSMU due to higher engagement in social media and greater sensitivity to social feedback (e.g., Huang, 2022). Comparatively, other studies have found that males may be more susceptible to PSU, potentially due to different use patterns, such as a higher likelihood of engaging in gaming and other smartphone-based activities that can lead to problematic use (Wang et al., 2022). Some studies have indicated that younger individuals may exhibit a higher prevalence of PSMU and PSU than their older counterparts (Bianchi & Phillips, 2005; Lee et al., 2014). However, other studies have either not identified these relationships (Lortie & Guitton, 2013) or yielded conflicting results (Haug et al., 2015). These discrepancies underscore the need for a nuanced understanding of how gender and age interact with PSMU and PSU (e.g., Stănculescu & Griffiths, 2024). The hypothesized model is presented in Fig. 1.

Methods

Participants and Procedure

The participants were recruited through a number of online platforms in Italy, including *Facebook*, *WhatsApp*, *Telegram*, and *Instagram*. The research team distributed the survey link, inviting participation on a voluntary and anonymous basis without compensation. Individuals were required to meet the following eligibility criteria: (i) being aged 18 years or older, (ii) owning a smartphone, (iii) being an active social media user (i.e., use social media platforms at least once a week), and (iv) being an Italian-speaking citizen. After providing informed consent, participants completed the survey. Over the course of a three-month period (from May to July 2024), 537 individuals completed the survey, which took

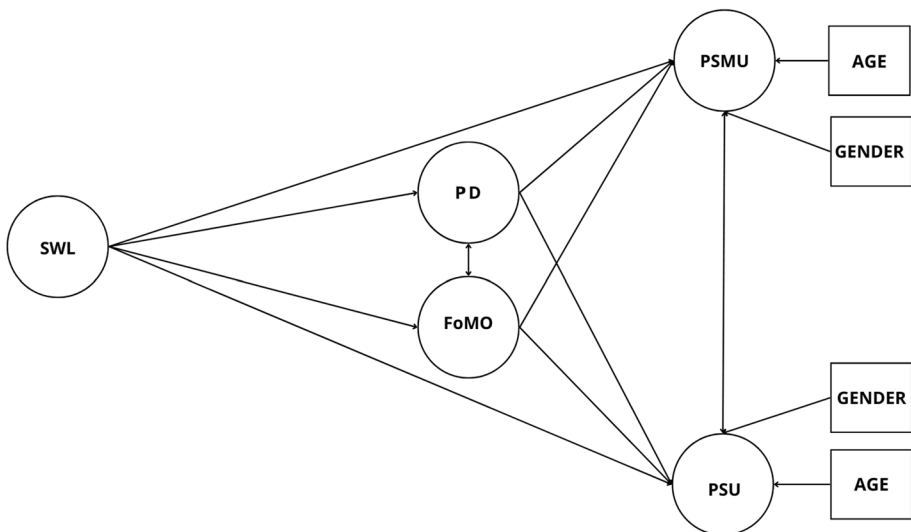


Fig. 1 Hypothesized research model. SWL=satisfaction with life. PD=psychological distress (anxiety, stress and depression). FoMO=fear of missing out. PSU=problematic smartphone use. PSMU=problematic social media use

approximately 20–25 minutes to complete. The sample comprised 82.9% females ($n=445$) and 17.1% males ($n=92$), with an average age of 35.35 years ($SD \pm 12.14$). Regarding education levels, 44.5% of the participants held a university degree or higher ($n=239$), 55.1% had a high school diploma ($n=296$), and 0.4% had completed secondary education ($n=2$). Additionally, 75.6% of participants were both a student and a worker ($n=406$), while the remaining 24.4% were employed ($n=131$). With regards to relationship status, 37.8% were married ($n=203$), 28.5% were in a relationship ($n=153$), 28.5% were single ($n=139$), and 8.8% did not specify ($n=42$).

Ethics

This study adhered to the Declaration of Helsinki guidelines for medical investigations involving human participants and received clearance from the Ethical Committee of Niccolò Cusano University, Rome (01/24–2024). Prior to participation, all participants provided informed online consent. Participant identities remained undisclosed, and data were securely stored in an encrypted online repository, accessible solely to the researchers involved in the present study.

Measures

Socio-demographic factors: Data were collected including participants' gender, age, educational attainment, and employment status.

Bergen Social Media Addiction Scale (BSMAS; Andreassen et al., 2016a; Italian version: Monacis et al., 2017): Consisting of six items, the BSMAS assesses the risk of problematic social media use (PSMU) over the past 12 months. A sample item is “*During the past year, have you spent a lot of time thinking about social media or planning how to use it?*” Participants respond to items on a Likert scale ranging from 1 (*never*) to 5 (*very often*), with total scores ranging from 6 to 30. Higher scores indicate an increased risk of PSMU. In the present study, the BSMAS demonstrated very good internal consistency (Cronbach's $\alpha=0.84$; McDonald's $\omega=0.84$).

Smartphone Application-Based Addiction Scale (SABAS; Csibi et al., 2018; Italian version: Soraci et al., 2020b): Consisting of six items, the SABAS assesses the risk of problematic smartphone use (PSU). A sample item is “*When I can't use or access my smartphone when I want to, I feel sad, irritable, or moody.*” Participants respond to items on a Likert scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*), with total scores ranging from 6 to 36. Higher scores indicate a greater risk of PSU. In the present study, the SABAS showed very good internal consistency (Cronbach's $\alpha=0.85$; McDonald's $\omega=0.86$).

Depression Anxiety Stress Scale-21 (DASS-21, Henry & Crawford, 2005; Italian version: Bottesi et al., 2015): Consisting of 21 items, the DASS-21 assesses the levels of psychological distress across three domains: depression (e.g., lack of interest in activities), anxiety (e.g., feelings of panic), and stress (e.g., difficulty relaxing). Participants respond to items on a scale from 0 (*not at all*) to 3 (*very much*). The total score, representing overall psychological distress, is calculated by summing the scores from the three domains, resulting in a range from 0 to 63. Higher scores indicate greater levels of psychological distress. In the present study, the DASS-21 showed excellent internal consistency (Cronbach's $\alpha=0.96$; McDonald's $\omega=0.96$).

Satisfaction With Life Scale (SWLS, Diener et al., 1985; Italian version: di Fabio & Palazzeschi, 2012): Consisting of five items, the SWLS assesses life satisfaction. A sample item is “*Most aspects of my life are close to my ideal.*” Participants respond to items on a Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*), with total scores ranging from 5 to 35. Higher scores indicate greater satisfaction with life. In the present study, the SWLS showed very good internal consistency (Cronbach’s $\alpha=0.89$; McDonald’s $\omega=0.90$).

Fear of Missing Out Scale (FoMOS, Przybylski et al., 2013; Italian version: Casale & Fioravanti, 2020): Consisting of 10 items, the FoMOS assesses FoMO. A sample item is “*I worry that others are having more rewarding experiences than me.*” Participants respond to items on Likert scale from 1 (*Not at all true of me*) and 5 (*Extremely true of me*), with total scores ranging from 10 to 50. Higher scores indicate a greater tendency to experience FoMO. In the present study, the FoMOS showed very good internal consistency (Cronbach’s $\alpha=0.82$; McDonald’s $\omega=0.83$).

Sample Size

There is no academic agreement on which rules to follow to determine an adequate sample size (e.g., Wolf et al., 2013). The literature suggests that a minimum sample size of 200 participants is often considered adequate for most standard SEM models (e.g., Kline, 2016). However, for more complex models, a larger sample size (e.g., 500 or more participants) may be necessary to ensure stable and reliable estimates (e.g., Westland, 2010). One common guideline suggests having 5–10 participants per observed variable to ensure stable parameter estimates (Bentler & Chou, 1987; Nunnally, 1978). In the present study, with 48 observed variables (10 from the FoMOS, 21 from the DASS-21, five from the SWL, six from the BSMAS, and six from the SABAS), a minimum number of participants in the range of 240 to 480 is recommended.

Data Analysis

The data analysis comprised four principal phases. First, the descriptive statistics for the examined variables were calculated using SPSS version 26 (IBM Corp., 2019). In particular, mean scores, standard deviations, and correlation were calculated (correlations are considered to be low in intensity for coefficients between 0.1 and 0.3, medium in intensity between 0.3 and 0.5, and high in intensity for values above 0.5; Cohen, 1988). These values demonstrate the strength of the relationships between the studied variables and help assess their practical relevance, not only in statistical terms but also in relation to their applicability. For example, a high correlation (>0.5) between problematic smartphone use (PSU) and fear of missing out (FoMO) may indicate a strong connection, suggesting that targeted interventions to reduce FoMO could significantly decrease problematic smartphone behaviors. Conversely, low correlations (<0.3) may reflect weaker relationships that require less immediate focus.

In the context of structural equation modeling (SEM), the normality of the data was assessed by examining the skewness and kurtosis values of the observed variables. The Mardia’s test (1970) was used to assess multivariate normality. In addition, for a distribution to be considered approximately normal, skewness and kurtosis values should generally fall within the range of ± 3 . However, a distribution is typically not considered to deviate severely from normality if the skewness is within ± 2 and the kurtosis does not exceed ± 7

(Kline, 2016). These metrics were analyzed to detect significant deviations from normality. Severe violations can adversely affect parameter estimation and the validity of model results (Kline, 2016).

Mardia's test yielded the following results: skewness ($K = 351.63$, $p < 0.001$), and kurtosis ($K = 91.08$, $p < 0.001$), indicating a deviation from multivariate normality. However, none of the instruments used violated the univariate normality assumptions excessively (i.e., all fell within the ± 1 range for both skewness and kurtosis; see Table 1 for details). Given these results, the models were estimated using the diagonally weighted least squares (DWLS). DWLS method is particularly suited for non-normal data because it offers more robust estimates compared to maximum likelihood under such conditions (e.g., Li, 2016).

To test the study's hypotheses, structural equation modeling (SEM) was conducted using the 'lavaan' package in R (Rosseel, 2012) with a 95% confidence interval (CI) for standard errors (bootstrap = 5000; MacKinnon et al., 2004; Preacher & Hayes, 2004). All analyses included gender and age as control variables (Reer et al., 2019).

Given the correlational nature of the research, an alternative model was also estimated. The objective was to ascertain whether the model presented in Fig. 1 provided a superior fit to an unmediated model, in which mental well-being and life satisfaction were independently associated with problematic smartphone use (PSU) and social media use (PSMU), without the mediation of psychological distress and FoMO. A model comparison was conducted to determine the most appropriate approach, namely a mediated or unmediated one. This was achieved by calculating the robust difference of χ^2 ($\Delta\chi^2$) using the ANOVA function.

The fit of the model was evaluated using the following multiple fit indices (Kline, 2016): (i) comparative fit index (CFI) ≥ 0.95 (minimum recommended ≥ 0.90), (ii) Tucker-Lewis index (TLI) ≥ 0.95 (minimum recommended ≥ 0.90), (iii) root mean square error of approximation (RMSEA) ≤ 0.06 (minimum recommended ≤ 0.08) and (iv) standardized root mean square residual (SRMR) < 0.08 (minimum recommended < 0.10). The internal consistency of the psychometric instruments was evaluated using Cronbach's alpha (Cronbach, 1951) and McDonald's omega (McDonald, 1999), which are among the most commonly used indices in the literature (e.g., Dunn et al., 2014). The ideal threshold for both indices is a value ≥ 0.70 .

Regarding standardized beta values, these were interpreted as follows: values between 0.1 and 0.3 are considered small, between 0.3 and 0.5 moderate, and above 0.5 large (Cohen, 1988). For example, a moderate beta value (≥ 0.30) between FoMO and PSU might indicate that, while the relationship is meaningful, it is likely influenced by other

Table 1 Descriptive statistics of the main scale measures

	Mean	SD	Skewness	SE	Kurtosis	SE
SWLS	23.15	6.72	-0.32	0.10	-0.50	0.21
DASS-21	24.79	14.87	0.42	0.10	-0.59	0.21
FoMOS	20.57	6.86	0.85	0.10	0.65	0.21
SABAS	10.22	4.44	1.02	0.10	0.90	0.21
BSMAS	27.20	6.02	0.09	0.10	0.52	0.21

SWLS Satisfaction With Life Scale, DASS-21 Depression, Anxiety and Stress Scale, FoMOS Fear of Missing Out Scale, SABAS Smartphone Application-Based Addiction Scale, BSMAS Bergen Social Media Addiction Scale, SE standard error, SD standard deviation

factors, such as stress or social support. In contrast, a high beta value (>0.50) between daily average smartphone use and PSU could suggest that time spent on smartphones is a critical determinant of problematic behavior. These values not only reflect the statistical strength of the relationships between variables but also allow the evaluation of their practical significance (i.e., the extent to which these associations could have a meaningful impact on clinical or educational interventions). For instance, a moderate or high beta value may suggest that a specific variable, such as time spent on smartphones or emotional regulation, should be prioritized in therapeutic interventions or educational programs aimed at reducing problematic smartphone use.

Missing data were handled using the pairwise technique (Little & Rubin, 2019), which allows the use of all available information for each pair of variables without completely eliminating cases with missing values. This approach was selected because the missing data represented less than 5% of the total, thereby ensuring that the handling of missing data did not introduce significant bias into the analyses (Little & Rubin, 2019). Finally, the gender variable was coded as a dummy variable with the values 0 (male) and 1 (female) to be analyzed within the model.

Results

Descriptive Statistics

The descriptive statistics indicated that the mean of the (i) SWL was 23.15 out of 35 ($SD = \pm 6.72$), (ii) DASS-21 was 24.79 out of 63 ($SD = \pm 14.88$), (iii) FoMOS was 20.57 out of 50 ($SD = \pm 6.87$), (iv) SABAS was 10.23 out of 36 ($SD = \pm 4.45$), and (v) BSMAS was 27.20 out of 30 ($SD = \pm 6.02$). See Table 1 for further details.

Results of Correlation Analysis

Satisfaction with life had a strong negative correlation with psychological distress and FoMO, suggesting that lower life satisfaction was associated with higher levels of psychological distress and FoMO (Table 2). Problematic smartphone use (PSU) had moderate positive correlations with both PSMU and FoMO, suggesting that increased smartphone use was associated with PSMU and FoMO (Table 2). FoMO had the strongest correlation with psychological distress, suggesting that FoMO was closely associated with higher psychological distress (Table 2). Age was negatively correlated with PSU, PSMU, FoMO, and psychological distress, suggesting that younger individuals were more prone to these issues, while life satisfaction tended to be higher among older individuals (Table 2). Gender only showed a small negative relationship with psychological distress, suggesting minimal gender differences in these associations (Table 2).

Structural Equation Modeling

The hypothesized model (Fig. 2) provided a good fit to the data: $\chi^2(143, N=537) = 240.13$, $p = 0.001$, CFI = 0.99, TLI = 0.97, RMSEA = 0.04, 95% CI [0.03, 0.05], SRMR = 0.06. PSU accounted for 24% of the variance while PSMU accounted for 21% of the variance. The results from the SEM analysis suggested that FoMO and psychological distress had a

Table 2 Spearman's rho correlation among the main study variables

	1	2	3	4	5	6	7
1 SABAS	—						
2 BSMAS	0.24***	—					
3 FoMOS	0.43***	0.45***	—				
4 DASS-21	0.31***	0.28***	0.42***	—			
5 SWLS	-0.25***	-0.11*	-0.31***	-0.48***	—		
6 Sex	0.01	-0.03	-0.05	-0.14**	-0.00	—	
7 Age	-0.28***	-0.12**	-0.32***	-0.31***	0.24***	0.08	—

Nota. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Sex dummy coded 0 = Male, 1 = Female. DASS-21 Depression, Anxiety and Stress Scale, FoMOS Fear of Missing Out Scale, SABAS Smartphone Application-Based Addiction Scale, BSMAS Bergen Social Media Addiction Scale, SWLS Satisfaction With Life Scale

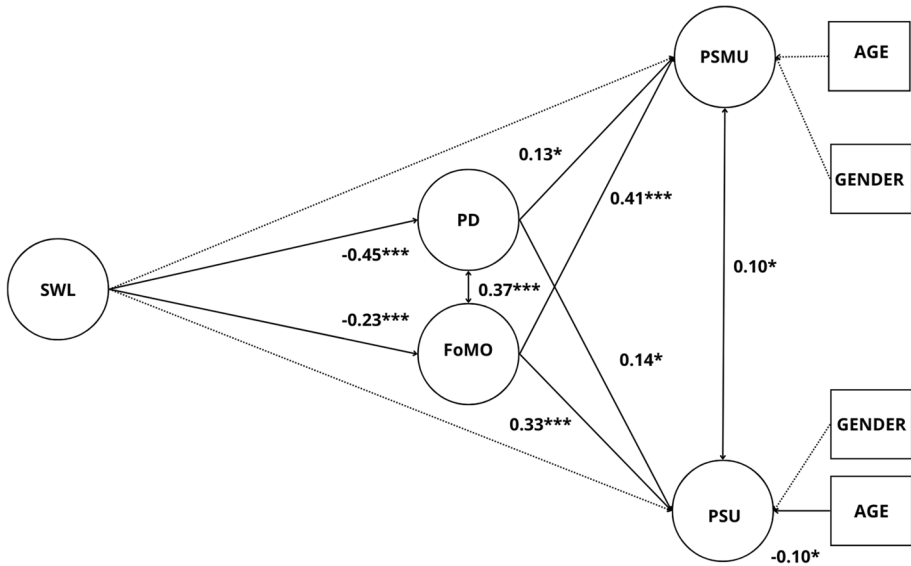


Fig. 2 Standardized results of the hypothesized model. *** $p < 0.001$, * $p < 0.05$. The dashed lines indicate non-significant paths. Latent factors are in the circle. Item factor loadings significant at $p < 0.001$, are omitted. PD=psychological distress (anxiety, stress and depression). FoMO=fear of missing out. PSU=problematic smartphone use. PSMU=problematic social media use. SWL=satisfaction with life

Table 3 Estimates of total, direct, and indirect effects of the model

Pathway	B	SE	Z	p	β
SWL \Rightarrow PSMU					
Direct effect	0.08	0.11	0.77	0.44	0.08
Total effect	-0.24	0.04	-5.52	0.00	-0.21
SWL \Rightarrow PSU					
Direct effect	0.09	0.09	1.00	0.31	0.07
Total effect	-0.19	0.04	-4.75	0.00	-0.16
SWL \Rightarrow PD \Rightarrow PSMU					
Indirect effect	-0.07	0.03	-2.58	0.01	-0.05
SWL \Rightarrow PD \Rightarrow PSU					
Indirect effect	-0.12	0.03	-4.00	0.00	-0.11
SWL \Rightarrow FoMO \Rightarrow PSMU					
Indirect effect	-0.18	0.04	-4.22	0.00	-0.14
SWL \Rightarrow FoMO \Rightarrow PSU					
Indirect effect	-0.25	0.07	-3.57	0.00	-0.21
<i>Covariate</i>					
Gender \Rightarrow PSU	0.49	0.47	1.04	0.29	0.04
Gender \Rightarrow PSMU	0.05	0.68	0.08	0.93	0.00
Age \Rightarrow PSU	-0.03	0.01	-2.43	0.01	-0.10
Age \Rightarrow PSMU	0.00	0.02	0.18	0.85	0.00

β standardized beta coefficient, PD psychological distress (anxiety, stress and depression), FoMO fear of missing out, PSU problematic smartphone use, PSMU problematic social media use, SWL satisfaction with life, Gender was dummy coded 0= male, 1= female

total mediating effect between life satisfaction, PSMU and PSU. The direct, indirect total effects, and covariates are explained in detail below (see Table 3 for summarized results):

Direct Effects

Life satisfaction was not significantly directly associated with either PSU or PSMU (Table 3). However, life satisfaction was significantly negatively associated with psychological distress and FoMO (Table 3). FoMO was significantly positively associated with both PSU and PSMU. Similarly, psychological distress was significantly positively associated with both PSU and PSMU (Table 3).

Indirect Effects

Life satisfaction had a significant negative indirect effect on PSU as part of the total effect, and on PSMU as part of the total effect, via FoMO (Table 3). The results also indicated that life satisfaction had a significant negative indirect effect on PSU as part of the total effect, and on PSMU as part of the total effect via psychological distress (Table 3).

Gender and Age (covariates)

As can be seen (Fig. 2), there was no association with gender for either PSMU or PSU. Moreover, there was no association with age for PSMU, but there was a significant negative association for PSU.

Alternative Model

The alternative unmediated model was then tested which showed a sufficient model fit (albeit lower than the mediated model): $\chi^2=766$ ($df=246$, $p<0.001$), CFI=0.95, RMSEA=0.07 (95% CI 0.06-0.07), TLI=0.95, SRMR=0.08. The robust chi-squared difference ($\Delta\chi^2=525.87$ ($\Delta df=103$, $p<0.001$)) indicated a significant difference between the models. This suggests that the mediated model explained the data significantly better than the unmediated model. Therefore, the mediated model was considered a better interpretation of the results compared to the unmediated model.

Discussion

The primary aim of the present study was to investigate the mediating roles of psychological distress and fear of missing out (FoMO) in the relationship between life satisfaction, problematic social media use (PSMU), and problematic smartphone use (PSU). The present study provided evidence to support the hypothesis that fear of missing out (FoMO) and psychological distress act as mediators in the relationship between life satisfaction, problematic social media use (PSMU) and problematic smartphone use (PSU). The goodness-of-fit indices of the structural equation model (SEM) indicated an excellent fit to the data, reinforcing the validity of the model in interpreting the results. In particular, it was found that FoMO and psychological distress fully mediated the association between life satisfaction, PSMU and PSU (supporting H_1 and H_2).

The findings aligned with established theoretical models such as the I-PACE (Interaction of Person-Affect-Cognition-Execution) model, which offers a comprehensive framework for understanding the dynamics underlying problematic use of online technologies (Brand et al., 2019). This model posits that problematic behaviors, such as problematic smartphone use (PSU) and problematic social media use (PSMU), arise from the complex interplay between personal predispositions, emotional responses, cognitive processing, and behavioral outcomes (Brand et al., 2016). In this context, individual characteristics (person-related factors) interact with situational factors, generating affective and cognitive responses that manifest as problematic behaviors (Brand et al., 2016).

In addition to supporting the I-PACE model, the study's findings are consistent with the Compensatory Internet Use Theory (CIUT). This model highlights that problematic internet use can be seen as a compensatory response to experiences of dissatisfaction or psychological distress (Kardefelt-Winther, 2014). Empirical evidence has shown that emotional dysregulation and fear of exclusion can significantly amplify the risk of maladaptive online behaviors (Arrivillaga et al., 2023; Röttinger, et al., 2021, Stănculescu & Griffiths, 2023). Therefore, the CIUT expands upon the interpretation provided by the I-PACE model, suggesting that compensatory use of online technologies may be driven by the search for gratification or escape from negative emotions, rather than solely by an imbalance between personal and situational factors.

Previous research suggests how affective and cognitive dynamics can drive dysfunctional coping strategies, such as problematic use of smartphones or social media (Elhai et al., 2020a; Li et al., 2020; Montag et al., 2019; Servidio et al., 2021; Servidio, 2023). For instance, studies have shown that higher levels of emotional dysregulation (e.g., difficulties in managing positive and negative emotions) are directly associated with increased tendencies for problematic gaming and online activities (Schettler et al., 2023; Stănculescu & Griffiths, 2023). The present study's findings appear to support the mediating roles of emotional factors (psychological distress) and cognitive factors (FoMO) in the relationship between life satisfaction and problematic online behaviors. The results suggest that individuals with lower life satisfaction exhibit greater vulnerability to psychological distress and FoMO, which in turn, are associated with problematic online use, as evidenced in previous research (e.g., Rozgonjuk et al., 2020; Servidio et al., 2021, Servidio, 2023). Therefore, CIUT provides a complementary lens, showing that individuals may engage in problematic online use as an attempt to compensate for feelings of dissatisfaction or isolation.

The I-PACE model further explains how reduced life satisfaction does not directly lead to problematic behaviors but operates through emotional and cognitive mediators such as psychological distress and FoMO. These mediators contribute to the development of maladaptive coping strategies, such as problematic immersion in online activities, which in turn reinforce negative dynamics. This is particularly evident among young adults, who may exhibit heightened impulsivity and reactivity to social pressures, therefore increasing their vulnerability to problematic online use (e.g., Gori et al., 2023). CIUT also supports the idea that problematic use of technology may serve as a compensatory response to manage negative emotions (Griffiths et al., 2014).

Executive processes, which in the I-PACE model represent the final stage in which affective and cognitive responses are expressed as behaviors, are fundamental for understanding how maladaptive online use may take shape (Brand et al., 2016). Supported by previous evidence, the present study's findings confirm that psychological distress and FoMO appeared to play a significant role in the onset of problematic behaviors (Elhai et al., 2020a, b; Wegmann & Brand, 2016, 2020). CIUT further adds to this perspective, showing

that online activities are often used as ways to alleviate distress, perpetuating problematic use patterns.

Finally, the results of the present study provide further empirical support for the validity of both the I-PACE model and CIUT in the context of problematic online activities. Both models emphasize the need for interventions that address not only behavioral symptoms but also the underlying emotional and cognitive processes. Therefore, reducing psychological distress and FoMO could represent an effective strategy for preventing maladaptive online use. A holistic approach reinforces the importance of theoretical integration between the I-PACE model and CIUT in fully understanding the complexities of problematic online use, while also suggesting potential areas of intervention to mitigate its negative effects.

In addition to the mediating roles, it is important to note that both FoMO and psychological distress both exerted direct effects on PSMU and PSU. The constant worry of being excluded from important social experiences, as reflected by FoMO, appears to have a significant impact on the increase of PSMU and PSU. The direct effect is most likely continuously monitoring social media to avoid the perception of being excluded, which can result in excessive use of online platforms (Elhai et al., 2020a, b; Röttinger et al., 2021; Rozgonjuk et al., 2020). Similar dynamics have been observed in studies examining anxious attachment, where anxious attachment indirectly influences social media addiction through factors such as desiring a sense of belonging and low self-esteem (Stănculescu & Griffiths, 2023).

Similarly, psychological distress had a direct relationship with problematic use of online social applications. This may be because individuals use them as a coping mechanism to avoid negative emotions or stress (Elhai et al., 2016; Wegmann & Brand, 2020). Although temporarily effective, this emotional regulation strategy ultimately results in the problematic use of social media and smartphones, thereby reinforcing the vicious cycle of addiction and problematic use (Griffiths et al., 2014). These direct effects demonstrate that FoMO and psychological distress are two variables that are significantly and positively associated with problematic technology use, highlighting the necessity for interventions that are specifically designed to reduce the effect of these psychological factors (supporting H₂ and H₄) (Brand et al., 2016; Elhai et al., 2020a, b).

Confirming previous studies' findings, gender and age were not found to exert a significant influence on PSMU in the present study (Mihara et al., 2016). However, the literature on these aspects remains inconclusive. Some studies have indicated that gender may influence problematic social media use, with females tending to spend more time on social media, while others have not identified any significant differences between the sexes (Andreassen et al., 2017; Bányai et al., 2017). Similarly, the evidence regarding the impact of age on PSMU is inconclusive with some studies indicating a negative correlation between age and problematic use, whereas others have not identified a significant association (Kuss et al., 2013).

In relation to PSU, the present study's findings indicated that age was negatively associated with problematic smartphone use, suggesting that younger individuals may be more susceptible to developing PSU, which is in line with the findings of previous studies (Elhai et al., 2020a, b). This finding is consistent with research identifying young people as being more vulnerable to the negative effects of excessive smartphone use, particularly due to the greater integration of technology into their daily and social lives (Montag et al., 2015; Sohn et al., 2019). However, other studies have not found this relationship (Elhai et al., 2016). This shows there are mixed results in the context of PSU. Some research indicates greater vulnerability among young people, while other studies have reported no age-related differences (Wegmann & Brand, 2020). In the present study, the results were non-significant.

Clearly, further research is required to gain a deeper understanding of the impact of age and gender on both PSU and PSMU.

Limitations and Future Directions

The present study is subject to several limitations that warrant consideration. More specifically, the cross-sectional design, along with the relatively small convenience sample and the reliance on self-report data, may introduce potential biases (e.g., response bias influenced by social desirability). Although the survey was conducted anonymously, participants may have been reluctant to disclose personal issues due to possible feelings of guilt or shame. Moreover, the non-random and self-selecting nature of the sample means it cannot be considered representative of the broader population, which limits the generalizability of the findings.

While the hypothesized direct, indirect, and total effects proposed in the present study are plausible within the theoretical framework, the cross-sectional design restricts the ability to establish causal relationships between the study variables. Although mediation analyses using cross-sectional data are widely accepted and have been utilized internationally in studies with well-established theoretical foundations (e.g., Hu & Zhao, 2024), this approach has been met with some criticism within the research community (e.g., Maxwell & Cole, 2007; O'Laughlin et al., 2018). Therefore, the findings should be interpreted with caution. Future research employing longitudinal designs would better establish causality and provide insights into the dynamic relationships between life satisfaction, psychological distress, FoMO, and problematic technology use.

Moreover, although the role of the present variables is plausible, the scientific literature suggests they may be studied differently, because the concept is not always well defined and depends on the theoretical framework used (i.e., FoMO in some studies is considered a predictor of low life satisfaction [Agarwal & Solanki, 2024]). Therefore, further research is needed to better define frameworks of interrelationships of the constructs adopted in the present study. Additionally, the gender imbalance in the sample, characterized by a much higher proportion of female participants, may have influenced the results, underscoring the importance of obtaining more balanced and diverse samples in future research. This approach would improve generalizability and enhance the ability to account for gender-related differences in analyses. Incorporating formal clinical assessments of anxiety, stress, and depression would further enhance the validity of the findings by ensuring that participants' psychological states are accurately diagnosed and accounted for in the analyses.

Future studies should also consider investigating potential moderating factors, such as gender, to provide further insight into the nuanced mechanisms that may influence these associations. To determine whether relationships vary across different subgroups, demographic variables, such as age and education, could be used as moderating factors, especially using structural equation modeling (SEM) and multi-group analyses. Future research could explore potential mediators and moderators such as social support, digital self-efficacy, and social dependence, as these factors could provide a deeper understanding of problematic technology use and its psychosocial correlates.

Additionally, mixed-methods approaches that integrate quantitative techniques (e.g., SEM) with qualitative methods (e.g., interviews, focus groups) may offer richer insights into the context-specific factors influencing these dynamics. Such methods would enable researchers to capture the complex interplay of psychological, social, and technological factors that contribute to FoMO and related outcomes. Exploring the long-term effects of

interventions targeting these mediators would also provide insight on their sustainability and efficacy in improving psychological and digital well-being.

Finally, future studies could investigate the implications of recent legislation designed to limit child and adolescent use of social media and smartphones. Assessing the effectiveness of such policies, alongside tailored interventions that involve parents, schools, and communities, may provide actionable insights into mitigating problematic technology use.

Practical Implications

The practical implications of these findings indicate that interventions should extend beyond the simple reduction of time spent on social media or smartphones, but to address the underlying causes of such behavior. Such initiatives could encompass the implementation of emotional education programs within academic institutions, the introduction of targeted therapeutic interventions for the management of psychological distress, and the dissemination of information regarding FoMO, particularly among younger demographic groups, who appear to be particularly susceptible. Parents and teachers could play a key role in fostering digital literacy, modeling balanced technology use, and engaging in shared offline activities with their students. Family-based interventions aimed at improving communication and relationships may indirectly reduce technology reliance as a coping mechanism. Additionally, public health campaigns could educate parents about their critical role in shaping their children's digital habits and emotional resilience.

Recent legislative efforts to limit adolescent's screen time offer a promising avenue for research and application. Evaluating the impact of such policies alongside tailored interventions could provide insights into their effectiveness and the conditions necessary for their success. Additionally, interventions should consider the broader social and cultural contexts that influence behavior. For example, educational institutions could foster environments that reduce social pressures associated with constant connectivity, while public policies could promote offline activities that encourage face-to-face interactions and social engagement. Moreover, recognizing the diversity among individuals is essential.

Susceptibility to FoMO varies based on factors such as age, gender, and personality traits. Therefore, interventions should be tailored to address these individual differences. For instance, younger individuals might benefit from peer-led workshops, whereas adults could be supported through workplace programs addressing digital well-being. Finally, technology itself can be leveraged to support behavior change. Digital tools and apps that are designed to monitor and manage screen time, provide real-time feedback, or encourage mindful usage patterns could serve as valuable complements to educational and therapeutic initiatives. This dual approach, combining personalized interventions and technological solutions, offers a more comprehensive strategy for addressing the multifaceted nature of FoMO and related behaviors.

Conclusions

The present study provides substantial evidence that FoMO and psychological distress serve as important mediators in the relationship between life satisfaction, problematic social media use (PSMU), and problematic smartphone use (PSU). In particular, the findings indicate that individuals with a low levels of life satisfaction may be more prone to developing higher levels of psychological distress and FoMO, which may in turn contribute to problematic over-engagement

with social media and smartphones. This suggests that the pathway leading to problematic online behaviors may not be direct, but rather mediated by emotional and cognitive factors.

The findings indicate that interventions aimed at reducing problematic online use should focus on two main fronts. Firstly, it is essential to enhance the general well-being of individuals by improving their life satisfaction through the implementation of strategies that promote psychological well-being, and emotion management. Secondly, it is imperative to address emotional vulnerabilities, such as psychological distress and FoMO, which appear to act as catalysts for the excessive and problematic use of online technologies. This could entail the creation of anxiety and depression management techniques, in addition to mindfulness strategies designed to mitigate the fear of being excluded from online social experiences.

The incorporation of the I-PACE and CIUT models into the findings of the present study enhances the theoretical comprehension of the underlying mechanisms of problematic online behavior. The I-PACE model offers a comprehensive framework for elucidating the complex interplay between individual factors, emotions, and cognitions in shaping technology-related behavior. The CIUT model, on the other hand, provides insight into how the utilization of online technologies can serve as a compensatory mechanism for coping with emotional distress and dissatisfaction in real-life contexts. This dual theoretical perspective offers a robust foundation for both understanding the phenomenon of problematic use and developing targeted interventions.

Acknowledgements Paolo Soraci would like to thank Dr. Carmela Giambelluca, Dr. Alberto Astrologo, and Dr. Caterina D'Ascola for their support.

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All authors reviewed the manuscript.

Funding None.

Data Availability Research data are available upon reasonable request to the corresponding author.

Declarations

Ethics The current study was approved by the University Niccolò Cusano.

Informed Consent Informed consent was obtained from all participants involved in the study.

Conflict of Interest This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. The authors declare that there are no conflicts of interest.

Preregistration None.

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Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

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