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The Impact of Internet and Social Media Use on Young People's Mental Health

Edited by
Amelia Rizzo and Dario Alparone

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The Impact of Internet and Social Media Use on Young People's Mental Health

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Editorial

Surfing Alone: From Internet Addiction to the Era of Smartphone Dependence

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1. Introduction

Technological addiction refers to behavior characterized by excessive and prolonged use of technological devices; reactions of anger, frustration, or panic when unable to use them; and unsuccessful attempts to reduce the time spent on them. The first attempts to define addiction date back to Kimberly Young [1], who focused on Internet addiction, defining it as a “controversial new addiction”. As described in her book “Caught in the Net”, she launched one of the first online research studies by posting questions—which later formed the items of the Internet Addiction Test (IAT)—to network users. She received almost 500 responses, with 80% showing an addicted profile. These users also described relational and adjustment issues stemming from excessive Internet use, namely a compromise in social and work functioning.

Subsequently, Davis [2] felt the need to define a cognitive-behavioral theoretical model of Problematic Internet Use (PIU), focusing on maladaptive cognition associated with PIU rather than on behavioral factors. Particularly, the author distinguished between specific PIU (pathological use of the Internet for a particular purpose, such as online sex or gambling) and generalized PIU (a broader set of behaviors). Almost simultaneously, Shapira and colleagues [3] were working on a more inclusive diagnostic framework, arguing that definitions based solely on addiction or pathological gambling were not inclusive enough to capture the characteristics of the PIU user population and could create clinical and psychodiagnostic problems.

Over time, the label “Internet Addiction”, due to its partial correspondence with pure addiction, was abandoned in favor of the “Problematic Internet Use” model (See Figure 1), defined with the following criteria:

- (a) Maladaptive preoccupation with Internet use, experienced as irresistible for longer periods than intended;
- (b) Significant distress or impairment resulting from the behavior;
- (c) The absence of other Axis I pathology that could explain the behavior, such as mania or hypomania [4].

In subsequent years, studies on Internet addiction and social networks have grown exponentially. The scientific literature began to focus especially on the explosion of Facebook, founded by Mark Zuckerberg in 2004. Particularly in clinical and social psychology, the focus shifted to the relationship between personality and the use of social networks or variables such as anxiety, depression, social anxiety, the ability to establish bonds, and pathological dependence. One of the most interesting studies investigated the underlying motivations for Facebook use [5] also in an Italian sample [6], identifying, to some extent, the psychological needs that it satisfies or seeks to satisfy, summarized in seven main components. According to Joinson’s 2008 study, Facebook use and motivation can be

summarized in 7 factors: (1) Social Connection; (2) Social investigation; (3) Share Identities; (4) Social Network surfing; (5) Status update; (6) Contents; (7) Photographs.

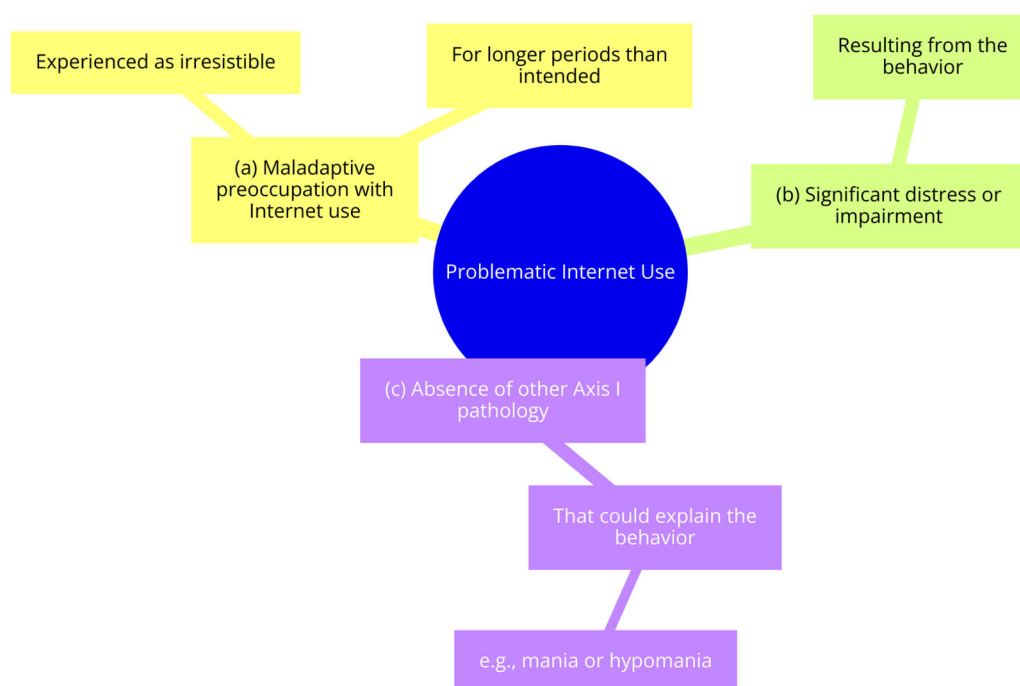


Figure 1. Problematic Internet Use Model.

It is interesting to note how the authors speak of use rather than abuse. In those years, the diffusion of SNS was so explosive that millions of individuals in a short period began to use an online profile: a digital version of themselves where they could rediscover lost contacts, strengthen new bonds, or establish connections with people they do not know in reality. Given the above criteria, it is clear how this could lead some individuals to develop addictive behavior, as “being on Facebook” implied spending a large amount of time, losing track of time, and difficulty reducing its use. Moreover, news reports showed an increase in divorce sentences due to Facebook, with repercussions in the relational and family spheres. All the characteristics of what was defined as Facebook Addiction or Facebook Addiction Disorder seemed to be configured. However, attempts to introduce these terminologies or actual diagnostic criteria in the statistical manuals on mental disorders failed.

The scientific literature showed rather contrasting data, and in the meantime, the spread of the Internet, social networks, online games, and especially smartphones became more and more natural in our routines. The boundary between use and abuse became increasingly blurred, appearing rather as a continuum with different degrees of functioning and/or impairment.

The scientific debate on Problematic Internet Use began to focus on individual vulnerability. Starting from the assumption that the Internet represents an excellent resource to escape daily worries and isolate oneself in an idyllic reality, it was hypothesized that there are subjects particularly exposed to the risk of developing a dependence on the Network, presenting some common aspects: existential problems, low self-esteem, difficulties in social relationships, a tendency to isolate.

2. A Multicomponent Model of Problematic Internet Use

Considering these aspects of vulnerability, Cantelmi and Talli [7] proposed a model in which the subject and their self-perception, how the user perceives reality, and how the user perceives the virtual world are considered. Depending on the quality of representation (good/bad), the authors hypothesized four fundamental positions, distinguishing between

specific PIU (thus focused on a specific function of the Internet such as erotic material, gambling, and auctions) and generalized PIU (referring to a generalized and multicomponent overuse of the Internet, often associated with abuse of chat and email, for example).

In the first possible condition, the subject uses the Network as an expression of autistic withdrawal, to not think about themselves or the surrounding world. Probably, the PIU is generalized; reality is perceived as bad and hostile, the subject perceives themselves as bad, while virtuality is represented as good.

In a second configuration, the subject uses the network as a means of escape or flight from an unsatisfactory reality; in this case, the PIU is potentially generalized, and reality is, thus, perceived negatively, while the subject and virtual reality are good objects.

A third possible configuration is where the subject perceives both reality and virtuality as good and themselves as bad. The use of the network is, thus, motivated by the need to increase self-esteem (self-care) or as a mediator/facilitator of their relations with reality, for which the PIU is plausibly generalized.

Finally, there can be a case where the subject perceives reality as good, as well as themselves and virtuality. In this case, they use the network to increase their level of excitement or to achieve certain goals, and this often manifests with a more specific PIU.

The only case in which a problematic relationship cannot be configured is where the subject perceives themselves, reality as simultaneously good and bad, and virtuality as bad. However, thinking about today's world, it is no longer possible to consider virtual reality only as a threat. In the author's opinion, virtual reality should also be considered as potentially both good and bad. Only this process indicates a low degree of splitting and a high level of integration, as we will see later.

We must remember that scientific literature on network use shows experimental results in stark opposition, probably also the result of a split view and studies that seek to demonstrate harmful effects rather than beneficial ones, reflecting the theoretical beliefs of the experimenters. For a long time, indeed, there has been talk of the damages that the use of the Internet or social networks or video games can cause to the mind, with particular concern to the condition of the adolescent, in a delicate and extremely plastic hormonal, biological, and psychic phase, which can also be defined as physiologically vulnerable. In this phase, from the ashes of pre-existing structures—the infantile mechanisms so far functioning, put in crisis by the environment and the demands of the external and internal world—the Ego must arise through the definition of identity and the discovery of oneself and one's personal traits.

So, how much can the Internet and online video games interfere with this identity structuring process? And to what extent are Internet addiction and pathological abuse of the network responsible for psychopathological drifts?

3. The Problematic Use of the Internet: A Primary or Secondary Disorder?

In the literature, however, the relationship between Problematic Internet Use (PIU) and psychotic disorders has been somewhat neglected. Gibbs [8] emphasized that various types of addiction and heavy Internet use are predictable in patients with specific personality traits, such as narcissists, who use the web as an essentially self-related object, thus serving self-esteem and the need for admiration; the depressed or avoidant, who seek to avoid the risk of relational loss by controlling others through a relationship confined to the virtual world; the 'schizoid or paranoid' who retreat into the cyber world to escape from a persecutory or nonexistent reality, preferring a safe inner world to the catastrophic fears that come from the real world. Despite these theories, there are very few empirical and longitudinal empirical studies dealing with the evolution of Problematic Internet Use in psychotic paths. Specifically, we know from Mittal, Dean, and Pelletier [9] that individuals experiencing psychotic-like experiences (PLEs) can be divided into two subgroups with different outcomes. In the first group, where psychotic-like experiences improved, there was a decrease in Internet use, while in the second group, where psychotic-like experiences worsened, there was a significant increase in the intensity of Internet use as a substitute

for reality at two months. But is it the use of the Internet that induces similar psychotic states or worsens similar psychotic symptoms, or is it rather a premorbid state manifesting itself with pathological addiction to the Internet? A single case study [10] published in the journal *Computers in Human Behavior* examined precisely whether Problematic Internet Use could evolve into a pre-psychotic state or vice versa. The case, diagnosed as a pre-psychotic state, had a history of 4 years of progressive, symptomatic worsening, with relational closure and severe cyber addiction behaviors. The withdrawal corresponded to a high amount of time spent online in an MMOG (Massive Multiplayer Online Game) in the role of an armed policeman. The symptoms were characterized by fears and worries about fantastical and monstrous characters. Moreover, there was a condition of school dropout, with significant consequent impairment of social functioning. Two different explanatory hypotheses were advanced.

Excessive and prolonged use of the Internet may have led to an almost psychotic condition. In other words, the Problem of Internet Use (PIU) manifested first, meeting the three diagnostic criteria defined by Shapira and colleagues in 2003 [4]. Over the years, maintaining dysfunctional behaviors such as procrastination and the experience of immersion in the online world as described by Thatcher, Wretschko, and Fridjhon in 2008 [11], the pre-psychotic condition emerged with its abnormal and worrying characteristics linked to the excessive use of video games and the creation of disturbing images of fantastical and monstrous entities.

Other research identified isolated cases where it seemed that Internet use generated delusional phenomena [12]. However, these authors suggested that media content can integrate into delusional thoughts, indicating that such phenomena might be more related to other psychiatric pathologies rather than being a disorder in itself.

In addition, according to available longitudinal studies, there is no evidence that PIU can evolve into a pre-psychotic condition. Even Mittal and colleagues, in 2013 [9], examined PIU in subjects with previous psychotic experiences, suggesting that a cause-effect relationship is not appropriate in this context.

Thus, the problematic use of the Internet might be more a manifestation of a broader psychopathological disorder rather than an independent disorder.

In the clinical case examined the use of the Internet could be interpreted as an attempt to adapt to a reality experienced as challenging. This emerged from the analysis of the results of the Wartegg projection test, conducted following the method of Alessandro Crisi, head of the Italian Wartegg Institute [13]. During this test, complex patterns were detected. It seems that Roberto integrated various mechanical elements (such as traffic lights, clocks, and gaming consoles) into the symbolic representations linked to his identity, sexuality, and father figure. Both in his behavior and in his deep thoughts, virtual reality was used as a sort of substitute for physical reality, a positive and accessible element to cope with disorganized attachment.

Griffiths [14] suggested that, in most cases, excessive use of the Internet reflects behaviors that provide satisfaction, whereas the network is primarily used to facilitate such behaviors. Consequently, the Internet would act more as a tool rather than as a direct cause of other disorders, as stated by Shaffer, Hall, and Bilt in 2000 [15]. Internet addiction, therefore, could be more an indicator of psychological distress, particularly evident in predisposed individuals, who are more prone both to problematic computer use and to other psychiatric conditions, as observed by Yellowlees and Marks in 2007 [16]. Regarding the field of research, the examined case suggests that, although the diagnostic criteria for PIU have been effective in describing the patient's addictive behavior, in light of the clinical history, they are not sufficient to corroborate the hypothesis of a disease, although some authors argue that so-called Internet should be included as a distinct diagnosis in the Diagnostic and Statistical Manual of Mental Disorders [17].

4. Dependency, Isolation, and Loneliness: A Clinical Perspective

In the clinical context, the case study emphasizes the significance of investigating computer use, especially among younger patients. This is due to the prevalence of computer addiction, notably among MMO (Massively Multiplayer Online) game players [18]. This addiction is quite common during adolescence, occurring in one out of five teenagers between the ages of 12 and 16 [19]. The study also indicates that the Internet might serve as a tool for defense from reality, particularly within the psychopathological spectrum of a psychotic nature. Addiction is known to correlate with certain personality aspects such as shyness [20], difficulties in social interactions and peer relationships [21], as well as depression and loneliness [22].

Loneliness is a distressing sensation stemming from a discrepancy between actual and desired social connections [23]. Many adolescents aged between 12 and 15 years report experiencing loneliness, with approximately 12–20% feeling lonely at least “sometimes” [24]. Feelings of loneliness can remain stable and become chronic from adolescence onwards. From a developmental perspective, loneliness can be associated with a range of negative outcomes in adolescents, including poor physical and mental health.

Measures to contain the spread of COVID-19, such as school closures, led to a nearly 100% reduction in young people’s social contacts outside their families. This significantly contracted their social experiences, likely increasing feelings of loneliness and potentially exacerbating psychological distress [25–28]. International studies conducted in various countries highlighted the association between increased loneliness and distress in the pandemic context. For instance, about a third of Spanish and Italian parents of children aged 3 to 18 years reported their child feeling lonelier following the introduction of quarantine measures [29]. Many parents also reported their children being more nervous, anxious, angry, and exhibiting mood swings. The containment measures might have had even more negative effects on adolescents than on adults or children, as many key developmental tasks of adolescence are achieved through interactions with others [30]. As adolescents move towards independence, they spend less time with family and more with friends and partners [31]. A recent study by Cooper et al. [32] examined the effect of loneliness, social contact, and parent–adolescent relationships on adolescents’ mental health during COVID-19 isolation in the United Kingdom. Approximately 890 adolescents aged between 11 and 16 completed questionnaires on loneliness, social contact, parent–adolescent relationships, and mental health difficulties during the first 11 weeks of lockdown, and about half completed a follow-up one month later.

It emerged that adolescents experiencing greater feelings of loneliness during isolation had poorer mental health quality of life in the initial assessment, yet loneliness did not predict greater mental health difficulties one month later. Additionally, among adolescents, those with closer relationships with their parents reported significantly less severe symptoms of mental health difficulties and lower levels of loneliness. Parental closeness was significantly associated with less psychological stress, even at the follow-up.

Clearly emerging is the notion that loneliness can be a state that is either transient or chronic and that there are factors that can be considered protective. It is important to distinguish between a state of desired loneliness, such as proactive isolation aimed at a goal (e.g., relaxation, taking time off, reading, self-care), and a state of enforced loneliness, as was the case with forced isolation due to extreme confinement and social distancing measures.

The relationship between Internet addiction, loneliness, and the effects of the pandemic is the subject of ongoing studies, as the effects will be observable in the future. However, tracing the history of the conceptualization of Problematic Internet Use, it is evident that new categories are needed with increasing speed and fluidity—as Bauman would argue [33]—to approach the understanding of the phenomena we are experiencing. Currently, the term ‘techno-addiction’ is used to refer to a set of behaviors related to the use of digital devices. It is undeniable that technology had already pervaded our lives before 2020, but the pandemic event certainly further increased overexposure to digital

devices, social media, and the Internet. Millions of workers moved—where possible—their activities to remote working, and many professionals and businesses launched platforms to continue producing in different forms, reaching customers and patients worldwide. At the same time, millions of students from kindergarten to university have become familiar with distance learning for quite an extended period, familiarizing themselves with new or already known platforms, such as Teams.

5. From Internet Addiction to Smartphone Addiction

The criterion of time spent online diminished in significance as a measure of addiction. In our daily experience, it is common to keep smartphones on even at night, to be always connected, and to return home if forgotten, as it has become inconceivable to face a day without a mobile phone.

Consequently, a new category emerged, proposed by Lin and colleagues [34] as early as 2016: Smartphone Addiction (see Figure 2). This refers to the dependency on a digital device that allows 24 h Internet access, fueling the need to be constantly connected. This addiction is not solely based on the amount of time spent online but also on the psychological and behavioral aspects associated with smartphone use.

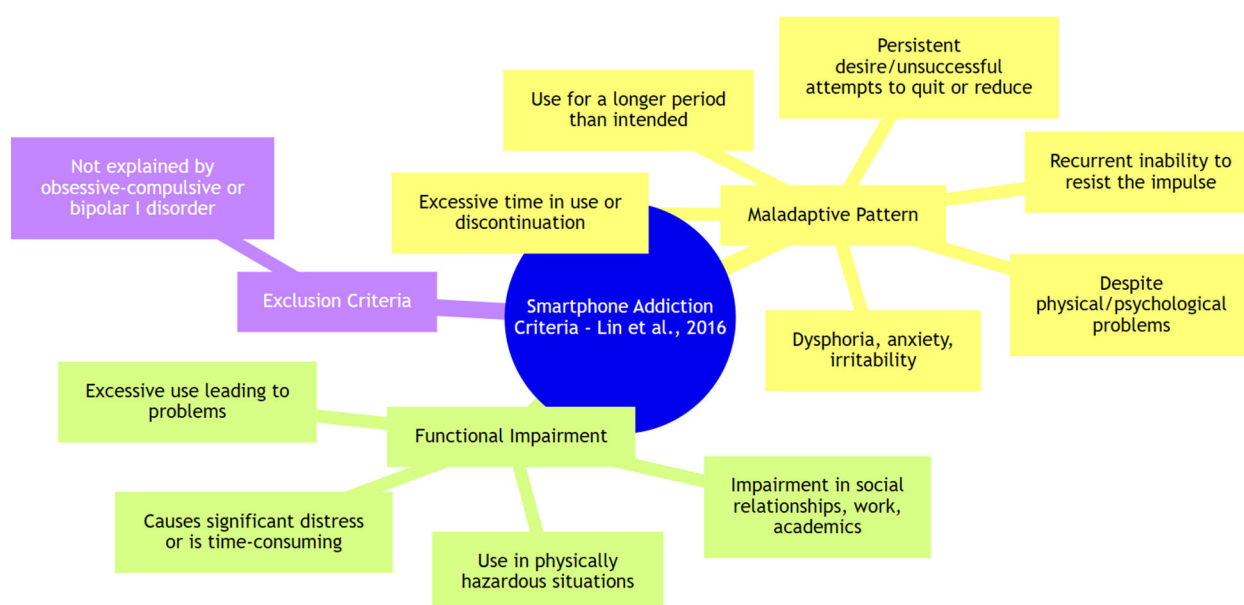


Figure 2. Smartphone addiction criteria [34].

Smartphone addiction encompasses various dimensions, including the compulsive checking of messages and notifications, the inability to limit usage time, withdrawal symptoms when not using the device, and the use of the smartphone to escape from problems or regulate mood.

This phenomenon reflects the broader impact of digital technology on everyday life, where smartphones have become integral to social interactions, information access, and even professional activities. The ubiquitous nature of smartphones makes them more than just a tool for communication; they are now a central part of personal identity and social existence. As with any form of addiction, smartphone addiction can have detrimental effects on mental and physical health, social relationships, and overall well-being. It is crucial to recognize and address this growing issue, especially considering the increasing reliance on digital technology in various aspects of life.

According to the proposal of these researchers from Taiwan, at least three of the criteria describing maladaptive behavior and significant impairment of social or academic functioning must be presented to diagnose smartphone addiction. Therefore, not only the

time spent online but also attempts to resist use, time spent trying to reduce smartphone use, and withdrawal reactions play a crucial role in this model.

However, it should be noted that these criteria constitute a diagnostic proposal that, like its predecessors such as Internet addiction, Facebook Addiction, and Problematic Internet Use described in this chapter, has not been considered for inclusion in diagnostic manuals, such as the DSM-V [35].

6. Conclusions

Not only adolescents but all of us are immersed in the Network. The concepts of addiction to it, as we have seen, have seen many attempts to describe pathological situations and discriminate them from healthy use [36–41]. However, clinical observations on the events we are experiencing, on the acceleration of technological development, digital natives, the evolution of connection potential, and lastly, the pandemic with smart working and distance learning push for both theoretical and practical reflections [42–47].

In conclusion, it is observable how the models of conceptualization of Internet addiction, social media, Problematic Internet Use, and finally, smartphone addiction never achieved diagnostic independence. One must ask whether they are not the apex of deeper issues, the tip of an iceberg. In pathological situations, they often consist of the reason for seeking help or parents' concern. But in everyday life, they raise issues of a relational, developmental, and public health nature, which deserve all the attention of studies and clinical practice.

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Article

Beyond the Screen: A Comprehensive Analysis of Emotional Skills and Social Networking in French Young Adults

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Abstract: (1) Background: This study investigates the influence of social networks on young adults, focusing on both positive and negative impacts. It considers problematic social networking site use (PSNSU), emotional intelligence, empathy, and the phenomenon of Fear of Missing Out (FoMO). (2) Methods: A comprehensive online survey was conducted with 442 participants aged 18 to 30 years that used various psychometric tools to assess emotional intelligence, empathy, internet and social media use, and FoMO. (3) Results: The study revealed that young adults display low competencies in emotional intelligence and empathy, with a tendency towards problematic internet and social media use. High FoMO scores were observed, correlating with negative internet use outcomes. Gender differences in these aspects were also explored. (4) Conclusions: The findings suggest a complex interaction between social network use, emotional skills, and FoMO that impacts young adults' mental health and social behaviors. This study highlights the need for a nuanced understanding of these relationships and their implications for well-being and social interaction in the digital age.

Keywords: social networking; young adults; emotional intelligence; empathy; internet use; fear of missing out; mental health

1. Introduction

In recent years, social networks have become increasingly popular as an online activity. In 2020, social networking sites (SNSs) were used by 49% of the global population, tripling their total user base over the last decade [1]. This trend is particularly pronounced among young adults aged 18 to 24 years, with approximately 75% to 88% reporting at least one profile [2]. Social networking has emerged as a prevalent 'media habit' for many internet users [3], dominating modern life and influencing intergroup interactions and communication patterns [4], with positive impacts on well-being and social connection [5–7]. People in the post-modern world satisfy basic psychological needs through social network presence, including the need for belonging, social interaction, fulfillment, competence, and personal identity [8–11].

However, an increase in SNS use can lead to problematic social networking site use (PSNSU), affecting between 1.6% and 34% of various populations [12]. This issue is of particular concern for adolescents and young adults, with terms like abuse, addiction, or compulsion used to describe their use profiles, potentially leading to life-threatening consequences [13,14]. Findings on the impact of social networks on the physical and mental health of young adults are mixed, with some authors highlighting negative effects [15–19] while others emphasize positive aspects in terms of prevention and health promotion [20–22], especially during the COVID-19 pandemic years [23,24].

A variety of studies have identified several predictors of different social network use styles, including attachment [25,26], self-esteem [27,28], emotion recognition [29], as well as socio-emotional skills and executive functions in general [30,31]. Marín-López et al. [32] explored the relationships between social and emotional competencies, online emotional

content, cybervictimization, and cyberperpetration among adolescents, finding that high levels of social and emotional competencies were negatively related to cybervictimization and cyberperpetration, and that excessive use of online emotional content was a risk factor for cyberbullying.

The relationship between emotional intelligence and problematic social network use has also been investigated, with some studies finding a significant association [33–35] and others suggesting more heterogeneous relationships indicating a moderating or mediating role of emotional intelligence [36–38]. Authors including Abu-Shanab and Abu-Shanab [39], Newness [40], Miller [41], and Morelli et al. [42] have found negative associations between emotional intelligence and PSNSU, predicting behaviors on social networks such as inappropriate posting, disclosure, and sexting.

Empathy has been studied as a factor impacting the style and quality of social network use [43–45]. Guan et al. [46] noted in their meta-analysis that social media use was positively related to affective empathy, but only marginally related to cognitive empathy, highlighting a ‘media-empathy paradox’, where a tool created for social connection may reduce connective capacities [46–48]. Researchers have emphasized the role of social media in increasing focus on oneself rather than others, potentially decreasing empathy and increasing more self-oriented personality traits (narcissism, self-satisfaction, etc.), with results varying depending on the type of online activity [49–52].

Special attention has been given to the innovative construct of FoMO (*Fear of Missing Out*). Defined as the ‘desire to stay continually connected with what others are doing’ [53], FoMO has been associated with a range of negative life experiences and feelings and found to be inversely proportional to life satisfaction [53–55]. It is linked to social media use and addiction [54,56–58]. Fioravanti et al. [59] conducted a meta-analysis confirming the robust association between FoMO levels and SNS use and PSNSU. Aliverdi et al. [60] studied the effect of social networks and online emotional relationships on students’ mental health and quality of life, finding that internet use, virtual networks, online emotional relationships, and unfavorable socioeconomic status were associated with mental disorders and reduced quality of life in students. Hunt and Krishnan [61] assessed how attitudes towards social networks and their use influence emotional well-being, discovering that social network use negatively impacted users’ emotional well-being.

A recent study [62] on university students in Türkiye revealed that procrastination mediates the relationship between the Fear of Missing Out (FoMO) and internet addiction. FoMO directly increases both procrastination and internet addiction, with procrastination further exacerbating internet addiction. Addressing procrastination behaviors can thus be crucial in interventions aimed at reducing internet addiction driven by FoMO. A study among Italian adolescents found that females reported higher levels of compulsive internet use and alexithymia compared to males, while dissociation levels were similar [63]. Dissociation significantly mediated the relationship between alexithymia and compulsive internet use, particularly in females. Another line of research has investigated the link between social network use (and problematic use) and antisocial behaviors, particularly in younger generations [64–66]. FoMO appears to be an additional risk factor for (especially cyber) victimization in adolescence [67–69].

This study examines the intricate relationship between socio-emotional competencies and behaviors of aggression and victimization among young adults. Focusing on emotional intelligence, empathy, FoMO, and PSNSU, it aims to explore how these factors interrelate with the risk of becoming a perpetrator or victim. We hypothesize that in our sample of young adults, problematic behaviors in internet and social network usage are associated with lower social-emotional competencies (such as emotional intelligence and empathy) in “offline” life (H1). Additionally, the study investigates whether FoMO mediates this relationship (H2), considering various aspects such as gender differences and the impact of socio-emotional skills on online behaviors. This research seeks to offer a comprehensive understanding of these dynamics and their implications for mental health and digital interaction among youth.

2. Materials and Methods

2.1. Participants and Procedures

Participants were recruited via online panels using CrowdPanel. Our target sample size was 500 participants, but, anticipating exclusions, we committed to recruiting 600 participants. The only inclusion criteria were nationality (French) and age (between 18 and 25 years). Recruitment took place between 11 July 2023 and 30 June 2024. The study was published online via Limesurvey (Version 5.6.11+230320) and distributed by CrowdPanel. It took approximately 15 min to complete. In accordance with ethical and deontological rules (see Ethics Statement at the end), participants in our research were volunteers and gave their informed consent. The data were processed anonymously.

In total, 549 participants completed our questionnaire. A total of 15 participants were excluded based on an attention check, 80 participants were excluded for partial and incomplete answers, and 12 participants were excluded because they were underage. This left us with 442 participants: 302 (68.3%) identified as female, 131 (29.6%) identified as male, and 9 (2%) identified as non-binary gender (other). The age range was from 18 to 30 years, and the average age of the participants was 22 years ($M = 22.6$, $SD = 4.73$).

In terms of participants' level of education, 7.7% of the sample had obtained a secondary school leaving certificate, 36% of the sample had two years of higher education, 33.5% had three years of higher education, and 22.6% had five years of higher education. With regard to occupation, 61.66% ($N = 271$) of the sample were students, followed by 18.1% ($N = 80$) employees and, to a lesser extent, other occupations.

2.2. Measures

The Profile of Emotional Competence (PEC, [70]) was used to measure Emotional Intelligence (EI). The PEC questionnaire, in the original French form (50 items), measures intrapersonal and interpersonal EI separately by five core emotional competences distinctly for one's emotions and others' emotions. The questionnaire encompasses 10 subscales (intrapersonal identification, intrapersonal expression, intrapersonal comprehension, intrapersonal regulation, intrapersonal utilization, interpersonal identification, interpersonal expression, interpersonal comprehension, interpersonal regulation, and interpersonal utilization) of 5 items each (with 2 or 3 reverse items) grouped into two factors (intrapersonal EC and interpersonal EC) and one total score.

The instructions ask participants to answer questions "to better understand how they live with their emotions" (example of an item: "*My emotions appear without me understanding where they come from*"; "*It's difficult for me to explain to others what I'm feeling even if I want to*"). Each participant rates their degree of agreement with the proposed statements on a Likert scale from 1 to 5 (1 means that the statement does not correspond to you at all or that you never react in this way; on the contrary, 5 means that you recognize yourself completely in what is described or that it happens to you very often).

The validation study suggests that the questionnaire has good psychometric properties with a good internal consistency for the two global scores (interpersonal EC and intrapersonal EC) as well as the total score. In our study, we obtained excellent Cronbach alpha values ($\alpha = 0.90$ for the total scale, $\alpha = 0.87$ for the interpersonal EC scale, and $\alpha = 0.86$ for the intrapersonal EC scale), thus confirming the good internal consistency of the instrument for our data.

The Interpersonal Reactivity Index (IRI, [71,72]), a 28-item self-report questionnaire, was used to measure four different dimensions of dispositional empathy. These subscales (each made up of 7 different items) are Empathic Empathy (emotional empathy), Perspective Taking (cognitive empathy), Fantasy (empathy for fictional characters), and Personal Distress (self-focused responses to others' suffering). In this study, we used the French short version from Brown et al. [73] which consists of 15 items. It uses a 5-item Likert scale with two anchors (A = Does not describe me well; E = Describes me very well) that can be summed (using 1 to 5 endpoints). The IRI is a continuous measure of empathy in normal populations and not a categorical measure ("high empathy" versus "low empathy");

each subscale should be used separately since the instrument is not intended to measure global empathy. The psychometric properties of the IRI are attested by several studies; in our sample, we found good internal consistency values for all subscales (Cronbach alpha between 0.62 and 0.80).

The Generalized Problematic Internet Use Scale 2 (GPIUS2, [74]; French version [75]) was used to assess problematic internet use. The GPIUS2 is a self-administered questionnaire that evaluates problematic internet use (PIU) from a multidimensional perspective based on Davis and Caplan's cognitive-behavioral model of generalized PIU [76,77]. The GPIUS2 measures four constructs linked to PIU: (1) Preference for Online Social Interaction (POSI), (2) mood regulation, (3) deficient self-regulation (consisting of a compulsive use subscale and a cognitive preoccupation subscale), and (4) negative outcomes. Participants were instructed to rate the extent to which they agreed with each of the 15 GPIUS2 items on a scale ranging from 1 ("definitely disagree") to 8 ("definitely agree"). In the original validation study, the overall reliability of the composite GPIUS2 (where all 15 scale items are included) was $\alpha = 0.91$ and 0.88 for the French version (ranging between 0.66 and 0.83 for the subscales); in our study we found a good internal consistency with an overall $\alpha = 0.84$.

The Bergen Social Media Addiction Scale (BSMAS, [78], French version by [79]) was used to specifically assess the problematic use of social media. The 6-item scale is adapted from the Bergen Facebook Addiction Scale [78] and measures addiction behaviors, and is rated on a five-point Likert scale ranging from 1 (very rarely) to 5 (very often). The items/indicators assess specific addiction facets: (1) salience, (2) tolerance, (3) mood modification, (4) relapse/loss of control, (5) withdrawal, and (6) conflict/functional impairment.

Previous studies have proposed a cut-off of 19 [80] or 24 [81] to classify an adolescent as suffering from Problematic Use of Social Media (based on DSM 5 criteria); however, these studies are always based on samples of a younger age than our study. We also consider here the criterion initially proposed by Andreassen et al. [78], indicating that a score above 3 for at least 4 out of 6 items can be considered as an indicator of addiction. Internal consistency of the scale was very good both in the validation sample ($\alpha = 0.84$) and in our sample ($\alpha = 0.82$).

The Fear of Missing Out scale (FoMOs, [53]) was used to assess the degree to which one fears missing out on social events, in particular involving their friends, and often using social media to stay (hyper) connected. As reported by Bowman and Gordon [82], the fear of missing out has been cited as a motivation for using Facebook [83] as well as a reason for the emergence of separation anxieties between smartphone users and their smartphones [84]; consequently, the FoMO scale may be useful across many technologically mediated communication contexts.

The final version of this tool is a 10-item unidimensional scale set on 5-point Likert-type responses. Individual scores can be computed by averaging responses to all ten items with good internal consistency ($\alpha = 0.87$ in the validation study and 0.76 in our sample).

We also questioned the participants about their experiences of violence, either as perpetrators or as victims. The experience of perpetration was questioned by means of a question on insulting behavior (sexist, racist, homophobic, etc.), moral harassment, assault, and physical or sexual violence that the person may have committed in the last 12 months. The victim's experience was addressed by means of a question asking them to specify experiences of insults or threats (sexist, homophobic, etc.), stalking, and physical and sexual aggression in the last 12 months. For the most intense experience (or for the last one in chronological order), the person could specify some elements related to his or her experience (behaviors, emotions, etc.) and the solutions he or she had chosen to resort to in order to react to the situation.

Finally, we asked the participants for some socio-demographic information (gender, age, level of education, and employment status).

2.3. Data Analysis

We conducted a correlational and cross-sectional study. Data analysis was carried out using Jamovi (version 2.3.17) software. We tested the normality of the distribution of all our variables by calculating the skewness and kurtosis coefficients. The internal coefficient of the measures used was tested by calculating the Cronbach's alpha coefficient. We carried out descriptive statistics and tested the differences between independent groups to assess the distribution of the variables in our sample. Correlation analyses (Pearson's R) were carried out to calculate the associations between variables in our sample. In order to test the hypothesized mediation effect, we used bootstrapping with 5000 randomly generated samples to test the significance of indirect effects [85]. Standardized coefficients (β) and statistical significance are reported for each regression equation. Because our model was a just-identified model with zero degrees of freedom, we did not compute model fit indices [86].

3. Results

3.1. Socio-Emotional Competences

In the first section of the questionnaire, participants answered questions from the PEC and the IRI with the aim of assessing their social-emotional skills in Emotional Intelligence and Empathy.

With respect to Emotional Intelligence, the results show (Table 1) a sufficiently good profile, albeit with significantly lower averages than the authors found in the validation study (with a total score mean of 3.29 compared with a mean of 3.37, $t = -3.55$, $p < 0.001$). The participants in our study have low scores in all the above variables measuring interpersonal skills, and, in particular, men appear to perform poorer in interpersonal emotional intelligence, indicating that they are less skilled in understanding and expressing emotions in relationships with others. On the other hand, women appear to be less skilled in the internal regulation of their emotions.

Table 1. Gender differences in Emotional Intelligence and Empathy among young adults.

	Gender	N	Mean	SD	F	p	Post Hoc Games–Howell Test
PEC—Intrapersonal identification of emotions	Women	302	3.23	0.852	3.585	0.045	Women < Men
	Men	131	3.42	0.683			
	Other	9	2.98	0.919			
PEC—Interpersonal identification of emotions	Women	302	3.83	0.729	18.323	<0.001	Men < Women
	Men	131	3.35	0.751			
	Other	9	3.78	1.074			
PEC—Intrapersonal comprehension of emotions	Women	302	2.98	0.897	2.993	0.071	-
	Men	131	3.18	0.698			
	Other	9	3.18	1.007			
PEC—Interpersonal comprehension of emotions	Women	302	3.72	0.674	18.356	<0.001	Men < Women
	Men	131	3.27	0.724			
	Other	9	3.96	0.979			
PEC—Intrapersonal expression of emotions	Women	302	3.02	0.863	0.818	0.455	-
	Men	131	3.04	0.726			
	Other	9	2.67	0.831			
PEC—Interpersonal expression of emotions	Women	302	4.06	0.732	27.982	<0.001	Men < Women
	Men	131	3.44	0.811			
	Other	9	3.89	0.889			
PEC—Intrapersonal regulation of emotions	Women	302	2.65	0.853	15.449	<0.001	Women < Men
	Men	131	3.11	0.787			
	Other	9	2.40	0.775			

Table 1. Cont.

	Gender	N	Mean	SD	F	p	Post Hoc Games–Howell Test
PEC—Interpersonal regulation of emotions	Women	302	3.25	0.670	1.765	0.195	-
	Men	131	3.11	0.754			
	Other	9	3.38	0.644			
PEC—Intrapersonal utilization of emotions	Women	302	3.56	0.729	6.935	0.005	Men < Women
	Men	131	3.29	0.696			
	Other	9	3.69	0.679			
PEC—Interpersonal utilization of emotions	Women	302	2.91	0.824	0.514	0.605	-
	Men	131	2.93	0.862			
	Other	9	3.33	1.261			
PEC—Intrapersonal emotional competence	Women	302	3.09	0.615	2.601	0.097	-
	Men	131	3.21	0.493			
	Other	9	2.98	0.493			
PEC—Interpersonal emotional competence	Women	302	3.55	0.495	15.923	<0.001	Men < Women
	Men	131	3.22	0.585			
	Other	9	3.67	0.752			
PEC total score	Women	302	3.32	0.466	2.260	0.129	-
	Men	131	3.21	0.480			
	Other	9	3.32	0.608			
IRI Fantasy	Women	302	15.81	3.681	14.587	<0.001	Men < Women
	Men	131	13.70	3.689			
	Other	9	14.44	4.927			
IRI Perspective Taking	Women	302	14.85	3.293	1.031	0.374	-
	Men	131	14.43	3.194			
	Other	9	15.56	3.358			
IRI Personal Distress	Women	302	11.65	1.954	2.143	0.141	-
	Men	131	12.08	2.012			
	Other	9	11.78	1.302			
IRI Empathic Concern	Women	302	11.69	2.277	11.471	<0.001	Men < Women
	Men	131	10.47	2.447			
	Other	9	11.56	2.789			

With respect to empathy, the participants in our study obtained lower scores than the validation study; in particular, significantly lower scores were found with respect to the Fantasy (mean of 15.2 compared to a normative value of 17.04, $t = -10.3$, $p < 0.001$), Perspective Taking (mean of 14.7 compared to a normative value of 16.77, $t = -13.1$, $p < 0.001$), Personal Distress (mean of 11.8 compared to a normative value of 12.08, $t = -3.22$, $p = 0.001$), and Empathic Concern subscales (mean of 11.3 compared to a normative value of 19.07, $t = -67.9$, $p < 0.001$). Furthermore, in our sample (Table 1), men scored significantly lower than women on the Fantasy and Empathic Concern subscales.

3.2. Internet and Social Media Use

In the second part of this study, we attempted to measure the participants' habits with regard to the use of social networking sites, with the aim of identifying any problematic use and to understand what patterns were most frequent among the young participants in the study. For this purpose, we administered the GPIUS2 and the BSMAS scales.

The results show (Table 2) that the Mood Regulation and the Deficient Self-Regulation subscales obtained the highest scores, highlighting the presence of problematic behaviors with respect to the use of the internet as a tool to regulate emotions in relationships with others (e.g., using the internet to talk to others when feeling lonely, angry, or down), with the presence of a deficient self-regulation, and with cognitive preoccupation and compulsive internet use (with obsessive thoughts, difficulty in controlling the time spent online, and the urgency to connect when offline). The mean score obtained on the BSMAS (Table 2) does not indicate addictive behavior in relation to the use of social media according to the cut-offs used for the instrument. However, 117 participants (26.47% of our sample)

scored above the cut-off of 19 and exceeded the threshold of four items with a score above 3; therefore, we can consider that they exhibit addictive behavior with respect to their social media use. No significant gender differences were found in our sample concerning these behaviors.

Table 2. Means and standard deviations of internet and social media use among young adults.

	Mean	SD
GPIUS2 Preference for Online Social Interaction	2.27	1.18
GPIUS2 Mood Regulation	3.43	1.10
GPIUS2 Deficient Self-Regulation	2.86	0.981
GPIUS2 Negative Outcomes	2.04	0.996
BSMAS	15.0	5.66

3.3. Fear of Missing Out

Finally, we measured the Fear of Missing Out levels of the participants in our study by means of the FoMO scale. Compared to the sample used in study 3 of the validation article (similar in age to ours), our participants obtained significantly higher FoMO scores (mean of 2.77 compared to 2.37, $t = 10.8$, $p < 0.001$). We did not detect any gender differences with respect to this variable.

3.4. Victimization or Perpetration Experiences

Among the questions asked, our participants were asked whether in the last twelve months they had been victims of (1) insults, threats of a sexist, racist, or homophobic nature, etc.; (2) harassment in a training, work, or leisure context; (3) physical aggression; and (4) sexual aggression. The testimonies obtained highlight the complexity and variability of the impact of aggression or victimization on individuals in different social and personal contexts (Tables 3 and 4).

Table 3. Prevalence of Victim Experiences Among Participants by Gender.

Gender	Insult Victim	Harassment Victim	Physical Aggression Victim	Sexual Aggression Victim
Other	1.5%	0.5%	0	0.2%
Women	33.5%	8.8%	7.2%	7.2%
Men	15.6%	5.7%	5%	2.5%

Table 4. Incidence of Perpetrator Behaviors Among Participants by Gender.

Gender	Insult Perpetrator	Harassment Perpetrator	Physical Aggression Perpetrator	Sexual Aggression Perpetrator
Other	0.2%	0	0	0
Women	16.3%	7.2%	4.3%	3.8%
Men	7.9%	4.3%	3.2%	1.4%

Some participants reported having encountered none of the events listed, while others were unable to recall specific incidents. This phenomenon could be attributed to psychological defense mechanisms such as repression, or to a genuine absence of victimization experience. Table 3 shows the percentage of participants by gender who had at least one experience of victimization. While insults and threats are the most common, it should be noted that all forms of victimization are present in our sample.

Verbal abuse was predominant in the accounts, with incidents ranging from family arguments where shouting was exchanged to misogynistic insults at public events. For example, one individual described an episode of verbal abuse during a conflict with a relative, characterized by extreme alertness and ongoing stress as consequences. Another

testimony mentions, *“I think the last time it happened was when I was at school, when I was often the target of gratuitous insults from my classmates.”* Online harassment was also mentioned, illustrated by a case where a person received derogatory comments on dating apps, suggesting unsolicited and degrading hypersexualization. The experience was particularly humiliating.

Incidents of physical harassment were reported in public spaces, such as bars and streets, where individuals were inappropriately touched or prevented from leaving. One victim recounted a situation in which she was forcibly restrained by a man who refused to let her leave despite her repeated protests, an experience that seems to have resulted in an oppressive sense of helplessness and danger. A respondent shares, *“I was assaulted in a bar, a drunken man grabbed me and wouldn’t let me go despite my repeated protests.”* School harassment is another facet of victimization, with accounts of severe verbal abuse, racial insults, and mockery, often accompanied by physical assaults. One testimonial reveals the painful reality of a participant who, at 15 years old, was subjected to degrading insults and physical violence, culminating in an act in which his clothes were torn.

Experiences of physical violence include assaults in public places, with victims reporting being beaten by intoxicated individuals, snatched, or sexually assaulted. For example, one person described being followed and physically assaulted, leading to a persistent fear of frequenting certain urban areas. A participant narrates, *“In the days that followed, I was afraid of running into them again and I avoided certain places for fear of reliving the attack.”* Examples of mobbing at work were also reported, where individuals were confronted with insults and threats, often from disgruntled customers or colleagues. One particularly troubling case involved an individual harassed by a customer, resulting in a chronic sense of insecurity and a generalized distrust of certain professional interactions. Another account states, *“I was the victim of harassment at work, repeated insults from a disgruntled customer, which made me very suspicious in my professional interactions.”*

The collected responses highlight the adverse consequences of victimization, which range from anxiety and fear to changes in daily behaviors, such as avoiding certain places or adopting increased safety measures. Coping strategies mentioned include ignoring the incidents, support from family and friends, psychological counselling, and, in some cases, the mobilization of legal or administrative recourses. These stories underline the urgency of approaching victimization prevention and support from a holistic, multidimensional perspective.

A recent study among Italian high school students revealed that high levels of emotional regulation, attention impulsiveness, online vigilance, and multitasking are significantly linked to increased internet addiction [87]. Adolescents with emotional and behavioral problems, especially those exhibiting ADHD symptoms, are particularly vulnerable to problematic smartphone use. These findings emphasize the need for targeted screening and intervention strategies.

In the experiences of victims, stories also reveal varying degrees of emotional impact, from those who experienced no noticeable trauma to individuals who seem deeply affected by their experiences. A significant example is that of a person who had been harassed in the street who described a lasting feeling of oppression and insecurity. Recourse varies according to the severity of the incident and the individual’s resilience. Some chose not to respond or to ignore the aggression, while others sought support from family, friends, or professionals. An illustrative case is that of a person who called on security to resolve a confrontation, demonstrating a proactive approach in the face of adversity. While some testimonies reflect an ability to overcome the experience, others underline the need for external recourse to ensure the victim’s recovery and safety. Another respondent reflects, *“I was aware that my fear was irrational, but it led me to avoid certain situations and to be more vigilant”*.

3.5. Correlations

An analysis of the correlations between our different variables (see Figure 1) yielded some interesting results. There was obviously a strong significant positive correlation ($r = 0.407$, $p < 0.001$) between the two skill domains (interpersonal and intrapersonal). This means that individuals with good emotional skills in one domain tend to have good emotional skills in the other domain. With regard to empathy, the ability to adopt the perspective of others seems to be associated with the tendency to identify with fictional characters ($r = 0.356$, $p < 0.001$). There was a significant positive correlation between the interpersonal emotional competences and most of the IRI's subscales (Fantasy: $r = 0.375$, $p < 0.001$; Perspective Taking: $r = 0.385$, $p < 0.001$; Empathic Concern: $r = 0.363$, $p < 0.001$).

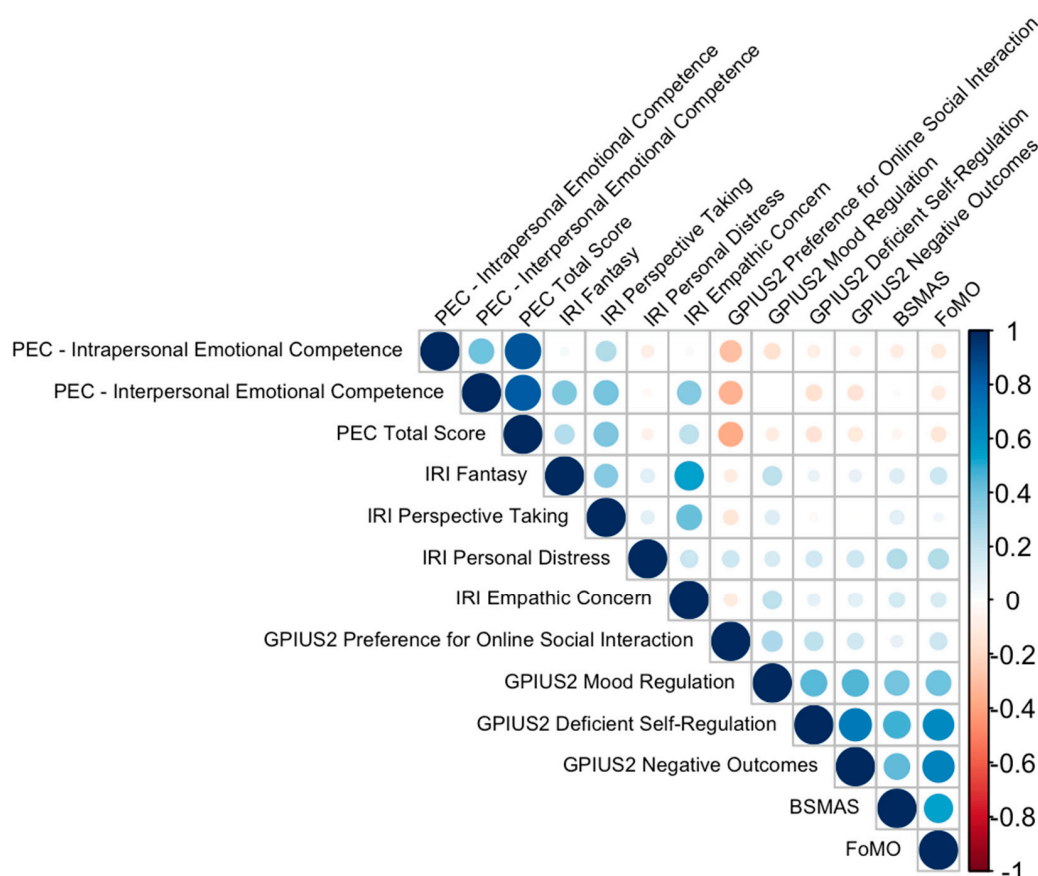


Figure 1. Correlation matrix.

Finally, with regard to problematic internet use, significant relationships were observed between different problematic aspects, including a preference for online social interaction, deficient self-regulation, and negative outcomes. Firstly, there was a significant correlation ($r = 0.263$, $p < 0.001$) between a preference for online social interaction and mood regulation. In other words, people who tend to prefer online social interaction tend to have less effective mood regulation. Secondly, there was a highly significant positive correlation ($r = 0.493$, $p < 0.001$) between deficient self-regulation with internet use and mood regulation. This suggests that these aspects of problematic internet use are closely related. Thirdly, and even more interestingly, there was a highly significant positive correlation between problematic internet use scores (all GPIUS subscales and BSMAS score) and fear of missing out (FoMO) on social events. This suggests that those with negative internet use outcomes also tend to experience more fear of missing out on social events.

3.6. Mediation Model

Consistent with the correlation analysis and according to the articulation of our research, we tested our last hypothesis by using a mediation model to explore the relationships between the Deficient Self-Regulation subscale of GPIUS, FoMO, and Interpersonal Emotional Competence. Analysis of the mediation model showed that the effect of Deficient Self-Regulation in Generalized Problematic Internet Use on Interpersonal Emotional Competence (offline) was mediated by FoMO. As the standardized regression coefficients for the direct effects of the variables show (Table 5, Figure 2), the GPIUS Deficient Self-Regulation was significantly related to FoMO and Interpersonal Emotional Competence. FoMO was also significantly linked to Interpersonal Emotional Competence.

Table 5. The Mediating Role of FoMO in Internet Use and Social Skills.

Effect	Estimate	SE	Bootstrapping Bias 95% Confidence Interval		Z	p
			Lower	Upper		
Indirect	0.035	0.017	0.002	0.0694	2.08	0.038
Direct	−0.2126	0.032	−0.189	−0.061	−3.87	<0.001
Total	−0.091	0.026	−0.141	−0.038	−3.46	<0.001

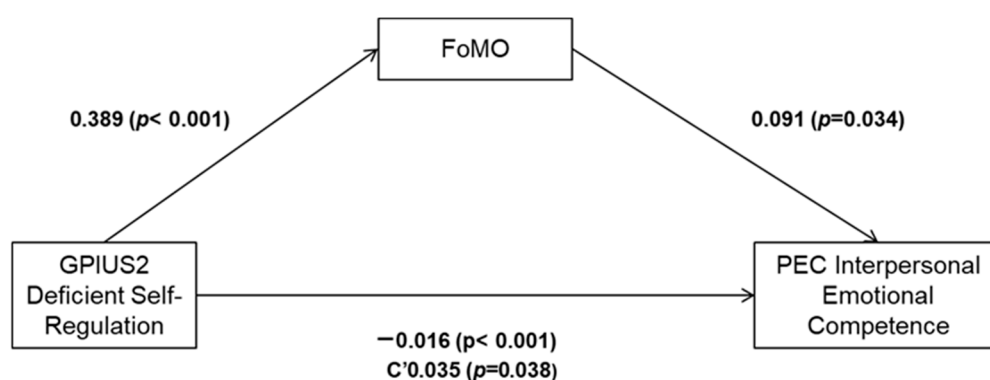


Figure 2. Mediation Model.

Results of the bootstrapping analysis (Table 6) showed that FoMO partially mediated the effect of Deficient Self-Regulation in Generalized Problematic Internet Use on Interpersonal Emotional Competence via significant direct and indirect effects.

Table 6. Bootstrapping Analysis of Emotional Competence, FoMO, and Internet Use.

			Estimate	SE	95% Confidence Interval			<i>p</i>
					Lower	Upper	Z	
GPIUS2 Deficient Self-Regulation	→	FOMO_TOT	0.389	0.033	0.324	0.454	11.71	<0.001
FOMO_TOT	→	PEC—Interpersonal Emotional Competence	0.091	0.0432	0.005	0.175	2.12	0.034
GPIUS2 Deficient Self-Regulation	→	PEC—Interpersonal Emotional Competence	−0.126	0.326	−0.189	−0.0617	−3.87	<0.001

4. Discussion

The main aim of this cross-sectional study was to investigate emotional intelligence, empathy, FoMO, and PSNSU, and also to explore how these factors interrelate with the risk of becoming a perpetrator or victim in young adults. Our results showed several aspects that, although they need further investigation, seem interesting to emphasize.

Firstly, in line with the literature on the topic, we found low levels of Emotional Intelligence [88,89] and Empathy [46,90,91] in our sample of young French adults. Young people, especially men, displayed poor interpersonal skills and low levels of empathy, and seemed to experience particular difficulties in their relationships with others. This appears to be a source of vulnerability during a developmental phase where, having overcome adolescence and its identity reorganizations, there should be a focus on consolidating a healthy relational style. Their low levels of empathy, both emotional and cognitive, expose them to the risk of not truly ‘meeting’ the other in a relationship but ‘experiencing’ relationships where the other is merely a means to fulfill their own needs.

Rather than stabilizing their identity, they seem to navigate in what Ferraro calls ‘disidentity’, a phenomenon characterizing the existential condition of young adults struggling to realize their existential project and themselves. In more detail, the neologism disidentity [92,93] highlights the condition of indefiniteness, emptiness, lack of plans, etc., corresponding to the breakdown of existential and cultural matrices observed in the post-modern world, thereby presiding over the emergence of new forms of identity, sociality, and potentially psychological suffering [94]. In this context of vulnerability, young people in our sample appear to use the internet as an ‘appendix to the Self’, regulating their emotions and interacting with others in a way perceived as safer than offline relationships. Moreover, we observed high levels of FoMO, identified in the literature as a significant predictor of problematic social media use [59,60,95]. In this context, the frequencies of violent experiences as victims or perpetrators are particularly worrying, suggesting a link between poor emotional skills, the use of ‘relationship mediators’ such as social networks [25,29], and the risk of violent behavior [64–66].

The mediation analysis in our study sheds light on the intricate relationships between emotional competencies, FoMO, and problematic internet use. Notably, the findings indicate a partial mediation effect of FoMO on the link between emotional competencies and internet use behaviors. This suggests a complex interdependency where lower emotional skills may increase FoMO, potentially leading to more problematic internet use. These insights contribute to the understanding of young adults’ digital engagement, highlighting the nuanced role of emotional competencies in the context of digital communication. Our results, in line with those reported in [96], emphasize the importance of interventions focusing on social–emotional skills to prevent problematic behavior related to the use of social networking sites.

This study, while contributing valuable insights into the socio-emotional dynamics of young adults in digital environments, presents certain limitations that merit consideration. The sample size, although statistically sufficient, may not encompass the wide array of socio-demographic backgrounds necessary for a more comprehensive understanding of the studied phenomena. This limitation restricts the generalizability of the findings to a broader population. Additionally, the cross-sectional design of the study precludes the ability to draw causal inferences or observe the evolution of behaviors and attitudes over time, which could be pivotal in understanding the progression of emotional intelligence and social media use. Furthermore, the analysis of victimization experiences requires a more nuanced approach. The current methodology does not delve deeply into the complexities and varied contexts of these experiences, potentially overlooking critical aspects of victimization in digital spaces. Future research, ideally employing longitudinal designs and a more diverse sample, could significantly enhance our understanding by providing a more detailed and dynamic picture of these interactions.

5. Conclusions

In conclusion, this study underscores the vulnerability of young adults in a digital context, particularly highlighting the risks of isolation and entrapment in virtual environments. It draws attention to the necessity of understanding online relationships as reflections and extensions of real-life social interactions. The findings suggest a potential heightened risk of resorting to violence due to emotional and empathetic deficits, especially among males who are part of a generation where emotions are central yet poorly managed. This research points towards the importance of fostering genuine, reciprocal relationships in digital spaces, countering tendencies towards narcissistic needs fulfillment. These insights call for further exploration, possibly extending to adult samples, and also examining other variables such as attachment styles in digital interactions to better understand and mitigate these vulnerabilities.

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Informed Consent Statement: Participants were informed about the purpose of the study in a cover letter and were assured that their data would remain confidential. Participants had to give explicit written consent to access the study.

Data Availability Statement: All study materials, data, and analysis codes are available on OSF (https://osf.io/7d4fa/?view_only=3ee110d120f9420a9965d7b30f8913a1, accessed on 31 August 2024).

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Review

Adolescent Social Media Use through a Self-Determination Theory Lens: A Systematic Scoping Review

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Abstract: Background: Social media is an integral part of adolescents' lives and has a strong influence on development and wellbeing. Research examining adolescent social media use and wellbeing is confusing as findings are inconsistent, inconclusive and contradictory. To address this issue, digital wellbeing scholars recommend that researchers adopt a theoretical approach with the aim of increasing meaningfulness and applicability of findings. Hence, this review applies self-determination theory to investigate how adolescent social media use supports and thwarts the basic psychological needs of relatedness, autonomy and competence. Satisfaction of all three psychological needs is essential for optimal development and wellbeing. Methods: A scoping review was conducted using a systematic search of five databases relating to adolescent social media use. The preferred items for systematic review and meta-analysis protocols (extension for scoping reviews) was applied resulting in 86 included studies. Results: Adolescent social media use both supports and thwarts relatedness, autonomy and competence. The findings highlighted how different aspects of adolescent social media use (including intra-personal, inter-personal, situational and environmental factors) contribute to the satisfaction and frustration of basic psychological needs. Conclusions: This review illustrates how social media can be both beneficial and detrimental to satisfying the basic psychological needs of relatedness, autonomy and competence. This is important when considering that if psychological needs are satisfied or frustrated in adolescence, the repercussions can have a cascading effect throughout adulthood. This review identifies gaps in the literature and provides suggestions for future research.

Keywords: social media; wellbeing; adolescence; self-determination theory

1. Introduction

The global uptake and pervasive integration of social media within adolescents' everyday lives raises questions as to how social media impacts their wellbeing [1–3]. An extensive body of research has accumulated including reviews and meta-analyses (e.g., [3,4]). However, conflicting and contradictory findings make it difficult to draw conclusions from the literature [3–5]. The rapidly-evolving and dynamic nature of social media, coupled with the multifarious behaviours and experiences of social media users, creates challenges when endeavouring to compare results. Prominent digital wellbeing scholars have identified approaches to advance the field [3,6,7]. One recommendation is that researchers apply a theoretical framework to generate increasingly meaningful insights and applicability of findings [5,8]. A further suggestion is to adopt a developmental approach to capture the complexity and nuance of social media use at different life stages [3,4,6–8].

Consistent with these recommendations, the present review provides an overview of the current literature focusing specifically on *adolescent* social media use, and analyses findings through a self-determination theory (SDT) framework [9]. It includes a comprehensive

examination of both positive and negative implications of adolescent social media use with regards to the basic psychological needs identified within SDT: relatedness, autonomy and competence. This systematic scoping review also highlights gaps in the literature and identifies focus areas that warrant attention within future research.

1.1. Social Media and Wellbeing

Wellbeing is a complex construct; consequently, within social media research, scholars often adopt different conceptualisations and measurements of wellbeing [10]. Some studies have focused on broad wellbeing definitions including happiness, psychological wellbeing or life satisfaction [11–14]. Others focus on specific indicators of wellbeing such as positive and negative affect, loneliness, self-esteem and social-connectedness [15–18]. Meta-analyses have aggregated wellbeing or illbeing outcomes [19–21] with some studies combining wellbeing and illbeing domains to determine an overall wellbeing score [10,22]. Such diverse approaches to defining and measuring wellbeing create ambiguity when endeavouring to interpret and draw conclusions from the literature, which may help explain ongoing controversies and confusion surrounding social media use implications for wellbeing.

Historically, research in this field has predominantly focused on the negative consequences of social media [1,5]. As such, there is a large body of work that adopts a deficit-based wellbeing approach. A common line of inquiry examines the relationship between social media use and mental health concerns including self-harm, suicidal ideation, negative body image, depression and anxiety [23–27]. Extensive literature explores a broad range of risk experiences such as exposure to harmful content (e.g., cyberbullying, hate speech, incivility or misinformation) [28–30], experiences of FOMO (fear of missing out) [31], and the detrimental effects of social media fatigue and digital stress [32,33]. Moreover, an increasingly growing field of research investigates pathological social media use including social media addiction and dependency [34,35]. This body of work has provided valuable findings; however, caution needs to be taken to “avoid over-pathologising everyday behaviour” [2] (p. 5).

It has been long recognised that wellbeing and illbeing are independent constructs that can have different correlates, causations and consequences [36]. The two domains can co-exist; thus, experiences of illbeing may coincide with experiences of wellbeing. For example, a person may experience considerable stress from their job yet also find their job rewarding as it fulfils a sense of purpose. Furthermore, it cannot be assumed that high scores of illbeing reflect low levels of wellbeing and vice versa. Consistent with this notion, scholars have recognised the need to adopt a balanced approach that considers both the positive and negative implications of social media use for wellbeing [1,37–39].

To combat the disproportionate focus on negative aspects of social media use, there has been a recent shift in scholarly attention towards the positive implications [1,37,40]. This is exemplified by the emergence of the new field of research—*Digital wellbeing*—which while in its infancy has rapidly increased over the past few years [41]. Rather than medicalising digital technology use, Vanden Abeele’s [39] concept of digital wellbeing acknowledges that digital media can promote wellbeing through facilitating hedonic and eudaimonic experiences. *Positive media psychology* is another new field that adopts a positive psychology paradigm to better understand how media technologies (including traditional and digital forms) can support wellbeing [42]. Scholars within this field stress that, due to the permanence and wide-spread adoption of social media, research should draw attention to how social media can be optimised to foster wellbeing and help people to flourish [42]. The recent development of the Digital Flourishing Scale further substantiates the growing interest in positive aspects of social media use. The Digital Flourishing Scale assesses users’ positive perceptions as to the benefits of digital communication, capturing both hedonic and eudaimonic experiences [37]. The Digital Flourishing Scale conceptualises digital flourishing through an SDT framework. Each subscale of the Digital Flourishing Scale corresponds with the basic psychological needs of relatedness, competence and autonomy.

1.2. Why Self-Determination Theory?

Ryan and Deci [43] note that facts without theoretical extension have little prescriptive value. Hence, this review applies an SDT framework with the aim of translating findings into practical and actionable agendas. SDT is a well-established, evidence-based theory that has been widely used within diverse fields of research including education, health care, parenting and organisational psychology [43]. SDT has been extensively verified as a theory of development, motivation and wellbeing that is universally applicable, with strong translational value [43]. A key tenet of SDT is that relatedness, autonomy and competence are innate basic psychological needs that are essential for optimal development and wellbeing [44]. *Relatedness* refers to having a sense of belonging and social connectedness, *autonomy* encapsulates the will or volition to drive actions, and *competence* reflects an individual's capacity and ability to effectively achieve desired goals [9]. SDT also provides a comprehensive taxonomy of motives that explain regulatory styles and drivers that underlie human behaviour [44]. In recent years, scholars have recognised that SDT can be useful towards gaining meaningful insights into how social media use impacts wellbeing [1,8,37,42]. This is evidenced by the adoption of SDT as the underpinning framework for the Digital Flourishing Scale [37]. The value and utility of SDT is also reflected in a recent systematic review by Gudka et al. [1] that applied a positive psychology framework (including SDT) to investigate how social media can promote flourishing for people across a broad age range.

The scholarly interest in SDT is understandable when considering its credibility as a well-established and robust theory that is universal across cultures and domains [43]. However, there are further reasons why SDT is particularly suitable for examining social media use and wellbeing. Firstly, rather than focusing on individual indicators of wellbeing, there is a call for research to adopt a more holistic and multidimensional approach [1,2,8]. Thus, SDT provides a broad theoretical and empirical framework that allows the connection and convergence of heterogeneous findings. Secondly, according to SDT, wellbeing is supported when the basic psychological needs of relatedness, autonomy and competence are satisfied, yet stifled when these needs are frustrated [44]. Therefore, consistent with recommendations for researchers to consider beneficial *and* detrimental aspects of social media use [1,17], SDT offers a framework to explore both the positive and negative implications for wellbeing. Thirdly, a fundamental tenet of SDT is that “our propensities toward autonomy competence and relatedness and the flourishing associated with them require specific social nourishments and supports” [43] (p. 105). Thus, SDT's emphasis on the significant contribution social environments play towards wellbeing outcomes makes SDT particularly fitting when considering how social media has become a pervasive social context.

1.3. Adopting a Developmental Lens

The popularity of social media amongst adolescents has exponentially increased and is firmly embedded within youth culture worldwide [45]. Although cross-country differences exist with regards to young people's social media adoption and use [46], the eager uptake of social media and the pervasiveness within adolescents' lives appears universal. For example, in the USA, 54% of adolescents aged 13 to 17 report it would be hard to give up social media [47]. In China, approximately 183 million teenagers use instant messaging [48]. More than 90% of young people aged 16 to 24 use social networking sites in Germany, Denmark and Sweden [49]. Adolescents invest a considerable amount of time using social media. In the USA, 46% of adolescents aged 13 to 17 are reportedly online “almost constantly” and 36% say they spend too much time on social media [47]. In the UK, approximately 95% of 15-year-old adolescents use social media before and after school [50] and a fifth of adolescents aged 13 to 15 report spending at least five hours per day on social media [51]. Similarly, Australians aged 14 to 17 spend more than two hours on social media per day [52].

Digital wellbeing scholars acknowledge that research examining social media use and wellbeing should differentiate adolescent and adult experiences [7,53]. Unlike many adults who have adopted social media later in life, today's adolescents have typically joined social media from a young age and are considered "the most digitally connected generation" [54] (p. 143). Social media has been omnipresent and seamlessly integrated within many domains of adolescents' lives. It has drastically transformed the way young people navigate their everyday activities and social worlds [45]. For example, there have been shifts in the way adolescents maintain and develop relationships, seek and share information, regulate their moods, and spend their leisure time [45,55,56]. A range of more nuanced consequences of growing up with social media have been identified. For example, adolescent social media use is associated with greater materialism [57], increased social comparison [58], and heightened civic engagement [59]. Furthermore, older generations' experiences with social media differ from adolescents [53,60]. Compared with adults, adolescents engage with social media more frequently, are more prone to using multiple platforms, have different motives for use, and access and share different content [53,61,62]. Subsequently, young people are experiencing adolescence very differently compared with older generations [53]. Their online and offline worlds are intricately interconnected; the distinction between 'real world' and 'online world' has dissipated [53]. Thus, when considering how entrenched social media is within many aspects of adolescents' lives, it has the potential to profoundly impact their development.

Applying a developmental lens is critical when endeavouring to understand the implications of adolescent social media use [7,45]. During adolescence, young people experience rapid and substantial changes across multiple domains including biological, cognitive, psychosocial and emotional [63]. These changes do not occur independently; they are inter-related and strongly impacted by socio-contextual factors [64]. Furthermore, adolescence is characterised by heightened neural plasticity and malleability with unique sensitivity to environmental influences [64]. This positions adolescence as a critical window of opportunity where experiences and exposures have the potential to impact the developmental trajectory [65]. The recent development of the Digital Flourishing Scale for Adolescents reinforces this view [66]. The developers stressed that an adolescent version of the Digital Flourishing Scale was necessary as developmental changes unique to adolescence are "expressed in adolescents' differential uses of digital communication" [66] (p. 3).

Positive development in adolescence can have a cascading effect into future life stages; unfortunately, negative development can do the same [67]. Social media can be both deleterious and beneficial for key developmental tasks that occur during adolescence such as identity formation, individuation, the acquisition of social skills and expansion of social worlds [54,56,68]. Therefore, research focusing specifically on adolescent social media use could reveal valuable information to help guide adolescents towards using social media in ways that promote positive development.

In recent years, there has been a growing number of literature reviews investigating adolescent experiences of using social media and the potential impact on wellbeing [69–71]. For example, a scoping review by Schønning et al. [70] sought to explain the complex relationship between adolescent social media use, mental health and wellbeing. They found that most studies adopted a deficit-based wellbeing approach and used time-based measurements of social media use. The authors suggested that future research should consider positive aspects of social media use and apply qualitative methods to capture in-depth insights. A recent systematic review by Senekal et al. [71] investigated adolescent social media use with relation to psychosocial development. Findings were based on quantitative studies and highlighted both detrimental (e.g., cyberbullying) and protective implications (e.g., interpersonal support) for wellbeing. In line with Schønning et al.'s recommendation to use qualitative approaches, Popat et al. [69] conducted a qualitative narrative review of adolescent perceptions of how social media impacts wellbeing. Findings aligned with that of Senekal et al., demonstrating both positive and negative implications

for wellbeing. These reviews contribute to the current knowledge in the field emphasising the complex relationship between adolescent social media use and wellbeing.

1.4. The Present Review

Despite the growing interest in adolescent social media use and wellbeing, the lack of reviews adopting a theoretical framework is notable. This current review addresses this gap and uses SDT as a structured framework to conceptually and empirically connect findings from the diverse and disparate literature. An SDT perspective is particularly suitable for exploring a social phenomenon and lends itself to adopting a balanced approach that investigates both the positive and negative implications of social media use. Applying SDT as a guiding framework also provides a transparent and conciliant format allowing for ease of replicability for future research [43]. Furthermore, consistent with recommendations to apply a developmental perspective when exploring the impact of social media [7,45,53], this review focuses on *adolescent* social media use. Given that social contexts play a central role in adolescent development, and that social media is intricately woven within adolescents' lives, exploring the literature that specifically pertains to adolescents is crucial [7,53]. Moreover, as the social media landscape is constantly evolving and research in this field rapidly accumulates, on-going and up-to date reviews are needed.

Scholars recognise that scoping reviews are a more suitable alternative to systematic reviews when addressing certain research aims [72–74]. The general purpose of a scoping review is to identify and map literature on a broad research topic which in turn will generate foundational evidence for further research [72]. As such, scoping reviews are particularly suitable for examining emergent research from heterogenous fields [74]. Conversely, systematic reviews focus on specific research questions and assess risk of bias and quality of evidence with the aim of producing statements that guide clinical decision making [75]. Scholars note that applying a systematic approach when conducting a scoping review ensures the process is thorough, rigorous and replicable [72,73]. The aims of the current study align with the indications and purposes of scoping reviews [72]. Systematic scoping review guidelines outlined by Peters et al. [73] were applied throughout the review process. The current review had two key aims. The first aim was to provide an overall picture of the current state of evidence with regards to how adolescent social media use thwarts and supports the psychological needs of relatedness, autonomy and competence. The second aim was to identify gaps in the literature that can be addressed within future research to increase understanding on how adolescent social media use impacts the psychological needs identified within SDT.

2. Methods

Literature Search Strategy

A systematic search of electronic databases including Scopus, PsycINFO, Communication and Mass Media Complete, SocINDEX and Cumulated Index to Nursing and Allied Health Literature was conducted in March 2023. Literature was identified using combinations of search terms that specifically relate to the basic psychological needs identified within SDT: relatedness, autonomy and competence. Adolescents use a suite of social media platforms and applications [76]. Hence, within this review, social media refers to social networking sites, content sharing, and social online gaming. To capture a wide range of platforms/applications and activities associated with adolescent social media use, each term for social media included individual platforms as well as broad terminology (e.g., social media and online social network). The specific social media platforms and applications applied within the search were guided by search terms used within previously published systematic reviews in peer-reviewed journals that examined adolescent social media use and mental health and wellbeing [25,77]. In addition, a specialist librarian with expertise in this field provided guidance with search term refinement and development. The inclusion of librarians in the literature search process can improve the quality of literature reviews

and increase rigour and reproducibility [78]. Table 1 provides an example of the search terms and descriptors used.

Table 1. Literature search terms and descriptors.

Terms	Descriptors
#1 social media	("social media" OR "social network*" OR "online social network" OR Facebook OR TikTok OR Instagram OR Insta OR "online gaming" OR Pinterest OR Snapchat OR "instant messag*")
#2 self-determination theory	("self-determination theory" OR self-determin* OR SDT OR "basic psychological need" OR relatedness OR relationship OR "social connect*" OR belong* OR "fit in" OR autonomy OR volition OR independen* OR "intrinsic motivat*" OR "extrinsic motivat*" OR "psychological empowerment" OR mastery OR self-efficacy OR efficacy OR competen* OR goal attainment OR "goal achievement" OR (need* N2 fulfil*) OR (need* N2 satisf*) OR (need* N2 frustrat*) OR (need* N2 thwart*) OR (need* N2 psychological))
#3 adolescents	(teen* OR tween* OR minor* OR adolescen* OR "young people" OR "young person" OR youth OR "generation z" OR "gen z" OR "digital native" OR "school student")
combination	#1 AND #2 AND #3

This scoping review drew on the preferred items for systematic review and meta-analysis protocols extension for scoping reviews (PRISMA-ScR) [74]. Covidence software program was used for screening and extraction of relevant studies. As can be seen in Figure 1, the literature search identified a total of 4137 potentially relevant studies, excluding duplicates. A standardised data extraction template was devised, piloted and refined. Eligibility criteria are displayed in Table 2. The age criteria was based on the World Health Organisation [79] definition of adolescence (10–19 years). The first author independently conducted initial screening of abstracts and titles which resulted in a shortlist of 139 studies. She then inspected the full texts against the inclusion and exclusion criteria. Studies that were questionable with regards to whether they satisfied the criteria were discussed with the third author and discrepancies were resolved. In contrast to PRISMA systematic review protocols, the PRISMA-ScR checklist considers assessing risk of bias an optional step for scoping reviews [74]. Accordingly, the current review did not include quality assessment of individual studies. However, one of the inclusion criteria was that studies must be published in academic peer-reviewed journals (as seen in Table 2). Therefore, each study has undergone a rigorous vetting process with the aim of upholding academic standards expected within scholarly journals. Eighty-six studies were included in the review. The first author categorised and analysed each study in line with the three basic psychological needs identified within SDT.

Table 2. Eligibility criteria.

Inclusion Criteria	Exclusion Criteria
- Studies published in academic peer-reviewed journals with full text available in English - Studies that focus on adolescents aged between 10 and 19 years - Studies published between 2006 to current (it was not until 2006 that social media permeated popular culture)	- Studies that focus on screen time or internet use rather than social media - Studies based on clinical populations or outcomes - Studies that aggregate findings across age groups beyond adolescence (10–19 years) - Manuscripts that do not present research data based on original research

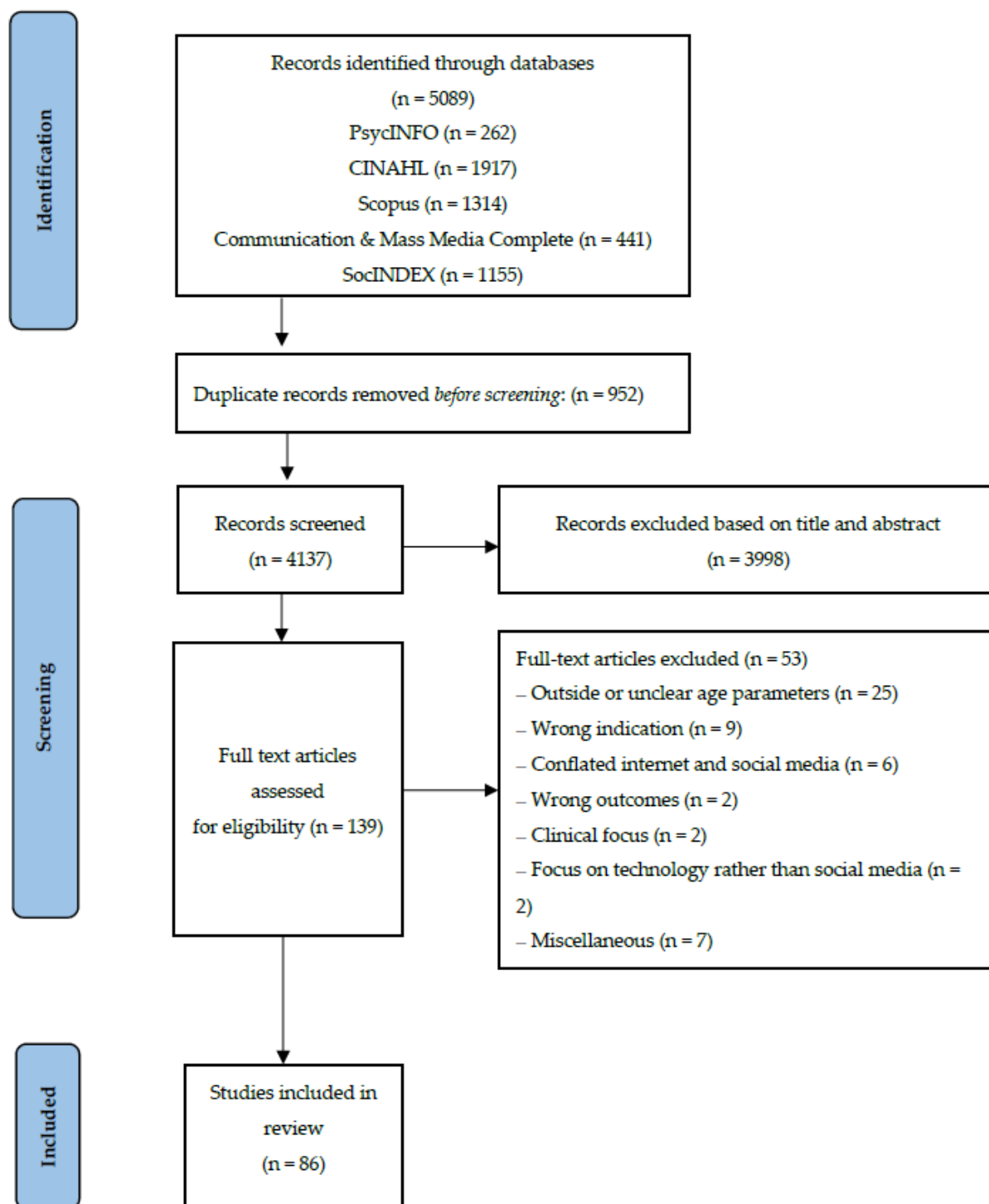


Figure 1. PRISMA flowchart illustrating literature search results.

3. Results and Discussion

3.1. Characteristics of Included Studies

Of the 86 studies, 4 applied mixed-methods designs (representing approximately 4% of the total number), 29 (34%) adopted qualitative methods and 53 (62%) used quantitative approaches (see Table 3). Findings suggest that there has been growing interest in this topic with an increase in publications since 2019 (see Table 3). Among the included studies, very few focused on specific developmental stages of adolescence. Approximately two percent of studies focused specifically on early adolescence, nine percent on mid-

adolescence and none of the studies focused solely on late adolescence. Most of the studies aggregated results across adolescent developmental stages (e.g., findings were commonly based on a broad age range such as 11–18 or 15–19 years). Three studies did not provide sufficient detail to determine the specific stages of adolescence from which they based their findings (e.g., the sample age was described as teenagers). The studies within this review encompass a diverse range of geographic regions reflecting how adolescent social media use on wellbeing is a global concern (refer to Figure 2). However, much of the research was concentrated in a few countries.

Table 3. Publication year and study designs for the identified studies.

Publication Year	Studies per Year	Qualitative Studies	Quantitative Studies	Mixed-Method Studies
2007	1	-	1	-
2008	1	1	-	-
2009	1	-	1	-
2010	1	-	1	-
2011	1	-	1	-
2012	3	-	3	-
2013	4	-	4	-
2014	7	4	3	-
2015	6	2	3	1
2016	9	3	5	1
2017	7	2	5	-
2018	4	2	1	1
2019	10	4	5	1
2020	8	-	8	-
2021	12	6	6	-
2022	8	3	5	-
2023 (up to March)	3	2	1	-

The Appendix A presents a summary of the 86 articles within this review and outlines which of the psychological needs (relatedness, autonomy and competence) each article addresses. It should be noted that some studies address more than one psychological need. Findings demonstrated that 68 studies correspond with relatedness (79%), 37 with autonomy (43%) and 43 with competence (50%). Furthermore, findings showed that adolescent social media use may simultaneously thwart and support the same psychological need. Three studies [80,81] specifically used SDT as the guiding framework for assessing and interpreting data. Chiang and Lin [80] examined whether adolescents' psychological needs were satisfied following online gaming. Yang et al. [81] explored how social media multitasking is associated with the fulfilment of each of the basic psychological needs. Finally, a study published by the current authors focused specifically on adolescents' social media use with regards to the psychological need for relatedness [56]. Although the remaining studies did not directly apply SDT, the constructs they explored reflect the psychological needs as conceptualised within an SDT framework (e.g., a sense of belonging and connectedness reflects relatedness and volitional actions, control over aspects of daily life reflects autonomy, and feeling capable and accomplishing meaningful goals reflects competence).

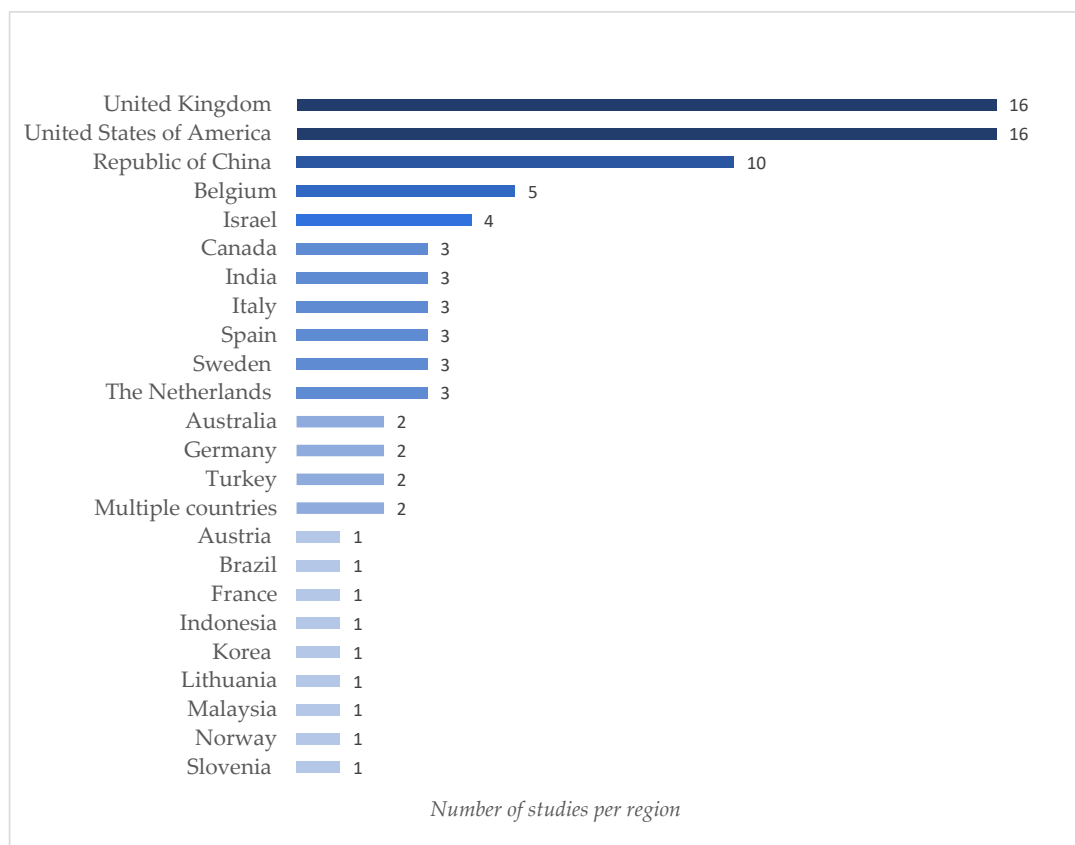


Figure 2. Geographic regions where studies were conducted and number of studies per region.

3.2. Findings through an SDT Lens

The following section discusses the literature with reference to each of the basic psychological needs identified within SDT: relatedness, autonomy and competence.

3.2.1. Adolescent Social Media Use and Relatedness

The literature suggested that social media can play a central role in both supporting and thwarting relatedness. A key finding was that social media may support relatedness by facilitating bonding and bridging social capital acquisition. Many of the studies (e.g., [19,56,81–87]) note that adolescent social media use can deepen relationships and improve friendship quality which reflects bonding social capital. The reviewed literature demonstrated that social media can promote open communication and self-disclosure [87,88], encourage a greater degree of closeness with others [17,56,84,89] and can provide a valued context for meeting romantic partners [90,91]. Moreover, Riley et al. [92] found a positive association between adolescent social media use and empathic concern and perspective taking, which may contribute to accumulation of bonding social capital.

The literature also demonstrated that adolescents often use social media to expand their social networks which reflects bridging social capital [93–95]. Findings showed that a common reason adolescents use social media is to develop new friendships with people outside their usual peer groups [19,56]. For example, social media can encourage dissimilar people to connect via shared interests [56,96] and it defies physical barriers facilitating interaction between people from different geographical regions [56,86]. Social media can also prompt initiation of offline friendships that may not be pursued otherwise [56,97].

In addition to acquiring social capital, the literature demonstrated that adolescents may use social media to experience a sense of belonging and acceptance [18,56,98–106]. Findings showed that social media can allow adolescents to create social connections via shared identities [95]. When interviewed, adolescents discussed how social media can enhance

their sense of community with peers at school [107]. Shepherd and Lane [108] found that social integration within school was related to adolescents' social media adoption. Social media was commonly associated with or identified as a tool that facilitates social engagement and promotes reciprocal support and caring [88,89,109,110]. The literature highlighted that adolescent social media use may combat social isolation and feelings of loneliness [93,111] and help adolescents avoid social exclusion [51,102]. Furthermore, findings revealed that adolescents consider social media useful for gaining popularity and social stature [100,109,112].

The reviewed literature reinforces how the line between online and offline worlds is increasingly blurred due to social media [53]. Adolescents consider interactions on social media to be an extension of real-world relationships [110]. Evidence illustrates how social media enhances relational ties [33,84,112–115], allowing adolescents to develop, maintain and strengthen offline relationships [85,113–115]. Social media is also considered a valued tool for resolving social issues that transpire offline [116].

However, this review demonstrates that adolescent social media use is complicated with regards to how the psychological need for relatedness is supported. Anthuneis et al. [83] found that although adolescent social media use was associated with increased bridging and bonding social capital, adolescents who engaged with social media for more than 40 h per week did not report these benefits. The complex nature of adolescent social media use is further emphasised when considering findings by Lee et al. [94] who found that social media use can differ for adolescents from different countries. Their study showed that Korean adolescents use social media more for monitoring and acquiring bridging social capital, whereas Australian adolescents use social media more for group activities and bonding social capital.

Despite the potential social media offers to support relatedness, the literature suggests that social media use may also be linked with factors that are detrimental. Dredge and Chen [117] found that adolescents who were heavy social media users experienced increased negative social interactions. Similarly, Legkauskas and Steponavičiūtė-Kupčinskė [118] demonstrated that the more time adolescents spent using social media during school classes, rather than engaging with the set activities, the poorer their relationships were with peers. Stresses associated with social media use were shown to create problems for friendships [108,119,120]. For example, the unrealistic pressures and expectations that some adolescents place on their peers to be available on social media causes strain on friendships and diminishes friendship closeness [56,120]. Findings demonstrated that adolescent social media use is linked with relational aggression [121], peer conflict [108], and may encourage poor behaviours compared with face-to-face social interactions [56,103] and incite offline confrontation amongst peers [121]. Furthermore, some studies demonstrated that social media use may contribute to adolescents feeling socially disconnected [17,22,122]. For example, Timeo et al. [122] illustrated how receiving fewer likes poses threats to adolescents' sense of belonging and elicits feelings of being ignored and excluded.

3.2.2. Adolescent Social Media Use and Autonomy

The literature highlights how adolescent social media use can potentially satisfy and frustrate the need for autonomy [80,81]. Findings demonstrated that social media may support autonomy by helping adolescents to experience a sense of control, self-governance and personal agency [98,110,111,115,123]. It allows adolescents to regulate their public life on their own terms [108]. It also provides a vehicle through which adolescents can actively acquire and disseminate information that is important to them, which contributes to a sense of empowerment [56,123]. Social media offers considerable choice, including opportunities to engage with a broad range of people, activities and apps that are particularly appealing to adolescents' interests and support developmental needs [17,98].

One common theme within the literature was the potential for social media to influence autonomy regarding identity development. The research revealed that social media fosters a sense of liberty by providing opportunities for self-expression and identity con-

struction [17,84,98]. For example, adolescents can control their online image, exert their creativity and curate personal profiles or posts, which reflect a version of the self that they choose to portray [19,86,123,124]. Furthermore, social media offers the flexibility to refine and revise online self-presentations as adolescents explore and experiment with different identities [124].

However, the literature also emphasised how adolescent social media use can challenge autonomy. Adolescents develop a sense of reliance on social media within many aspects of daily life. This was evident with regards to relying on social media to maintain and nurture relationships [84] and feeling emotionally dependent on social media [125]. The strong pull of social media was illustrated further in studies that highlighted how adolescents often experience FOMO (fear of missing out) when unable to access their social media [56,100,126,127].

Findings also suggested that other peoples' actions and expectations may threaten adolescents' autonomy when using social media. Similar to offline social systems, normative pressure and power-play exists on social media [98,102]. Adolescents sometimes feel limited and constrained with regards to their choices and actions on social media [98,128]. They often modify and edit their online behaviours, posts and comments to avoid negative repercussions from others [51,98,105,119,123,124]. Moreover, norms and peer practices create a sense of obligation (through fear of negative consequences) to be readily available, to reply promptly to posts and to leave positive feedback for friends [51,119,124,129,130].

Findings demonstrate that autonomy may be stifled by the lack of agency adolescents experience due to other peoples' actions on social media. For example, adolescents sometimes feel embarrassed or hurt by unfavourable images or comments that other people post [86,99]. They are also impacted by a range of controlling behaviours including intrusive monitoring, location checking, and demands for photos [90,130,131]. In addition, at times adolescents feel threatened by unsolicited contact from strangers that pose a risk to privacy [130] or exposed to sexting abuse, coercion, blackmail, revenge distribution and bullying [110,131].

3.2.3. Adolescent Social Media Use and Competence

Consistent with findings pertaining to relatedness and autonomy, the literature demonstrated how social media may potentially support and thwart competence. One topic of interest was how adolescents' social media use can impact competence with regards to academic performance. On the one hand, research suggests that social media may be beneficial for adolescents' educational outcomes. For example, Kasperski and Blau [88] interviewed adolescents and found that using social media for learning facilitation (e.g., administrative purposes, disseminating resources and learning support) extends the learning experience beyond the boundaries of school and promotes peer teaching. Alloway et al. [132] found that adolescents who had used social media for over 12 months had significantly higher scores in working memory, verbal ability and spelling compared to those who had used it for less time. Further studies showed that information seeking, peer-to-peer knowledge sharing, and accessing and disseminating learning-related resources via social media may enhance learning, improve academic achievement and positively predict academic performance [12,109,111]. In addition, critical thinking skills may be improved through seeking news via social media for informational purposes [133]. These studies are cross-sectional; therefore, it is unclear whether social media use enhances cognitive capacities or whether adolescents with greater levels of cognitive skills happen to use social media. However, it has been suggested that the opportunity to practice these skills via social media may potentially lead to a training effect offering positive cognitive benefits [132]. Furthermore, learning support from teachers and peers via social media may be especially helpful for introverted students enabling them to overcome learning barriers [88].

Nonetheless, the literature also demonstrates that adolescent social media use has the potential to hinder learning. Numerous studies showed an association between social media use and lower academic performance [12,19,134–136]. For example, adolescents who

use social media for more than two hours a day reported lower academic achievement [135]. More time spent using social media during class was linked with an increase in missed classes and lower grade point average [118]. Poor time management associated with social media use was shown to be linked with reduced academic performance [19]. Tanrikulu and Mouratidis [126] found that checking social media during class creates distraction and study interference which may lead to lower grades and poor study efforts. Social media also distracts from activities that contribute to competence such as homework and sleep [111,137]. For example, Evers et al. [138] found an association between disturbed sleep (due to social media use) and lower academic achievement for Taiwanese middle school students.

Beyond the academic realm, the literature also highlighted that social media use can influence competence with regards to adolescents' sense of self. The research demonstrated that social media can foster positive self-perceptions [85,93,109,113,139]. Studies showed that adolescents' social media interactions can provide a form of affirmation, inspiration and ego validation [17,127]. It can increase confidence and self-esteem thus cultivating a positive self-concept [85,109,113,139,140]. A few studies discussed how positive perceptions are often prompted by feedback from others (e.g., receiving likes, peer attention or positive comments) that elicit feelings of affirmation and a sense of being valued [113,128,141]. Social approval and social competence is particularly important during adolescence as it is a stage of development where friendships have heightened importance and a strong influence on self-construction [63]. The literature outlined a variety of ways social competence is fostered by social media use such as strengthening communication, increasing empathic concern and perspective taking, encouraging friendship initiation and facilitating interaction between diverse people [85,92,111,142].

In contrast, detrimental consequences for adolescents' sense of self were also evidenced within the literature. Studies revealed that adolescent social media use is associated with decreased self-esteem and confidence [113,128]. A broad range of potential threats to positive self-concept were identified including peer comparison, receiving fewer likes, stereotyping, insults, judgement, distress and cyberbullying [17,91,122,130]. Adolescents who check their social media more often reported increased emotional difficulties, worry, nervousness and fear [100]. Studies suggested that the constant gaze by others and scrutiny on social media may threaten a sense of competence by increasing self-consciousness [86]. A further finding was that adolescents with lower self-esteem felt more inclined to edit their posts due to fear of negative peer evaluation [128]. However, Chua and Chang [128] found that older adolescents tended to refrain from heavy editing and immense self-presentation efforts. Furthermore, Tsitsika et al. [136] found that heavy social media use by older adolescents was associated with increased social competence, yet this was not the case for younger adolescents. These findings align with recommendations by Orben et al. [4] who highlight the need to address the different stages of adolescence when investigating the impact of social media use.

A few studies identified the potential social media has to influence adolescents' digital competence [71,128,142,143]. Overall, the research suggests that digital competence can be enhanced by social media use [128,143]. For example, using social media allows adolescents to increase their information and communication technology skills and knowledge [142]. Frequent social media use enables adolescents to hone their content editing skills [128] and supports gaming competence [80]. Furthermore, through watching other people make mistakes on social media, adolescents gain useful knowledge regarding peer normative expectations when using social media [128]. Adolescents who use social media also demonstrate a high level of digital safety competence (e.g., protection within devices and potential physical and psychological health risks) [143]. Despite the benefits for digital competence, heavy social media use may displace time spent on other activities thus challenging competence in different areas. For example, Tsitsika et al. [131] found an association between social media use and reduced competence in sporting activities and hobbies.

3.3. Limitations, Implications and Future Research

When interpreting the current findings, it is important to consider how exclusion criteria and database selection can limit review findings. As scholarly interest in social media spans diverse fields of research (e.g., media studies, developmental science and computer studies), many databases were suitable for this review. Nonetheless, despite the potential for some fields to be under-represented, the chosen databases were particularly relevant to both social media and wellbeing research and offered a comprehensive body of literature. Another point to consider is that studies within this review were published in English within academic peer-reviewed journals. Thus, some potentially relevant articles within grey literature or written in different languages may have been overlooked. Another consideration is that screening and data charting were conducted by a single author. As such, there is potential for error that may have been avoided if multiple reviewers were employed. Furthermore, due to the vast array of social media applications and platforms available globally, it is not plausible to include every option within the search descriptors. Taking this into account, broad search terms were applied (including social media and social networking sites) to capture a range of platforms. However, inevitably some platforms would have been missed or under-represented within the current search. Furthermore, many of the studies included in the review were cross-sectional which needs to be considered when interpreting findings. There was a notable lack of longitudinal studies which highlights a gap in the literature that warrants future research attention. Another consideration is that most studies within the digital wellbeing realm are based on clinical populations or outcomes [1,45]. It should be acknowledged that this review excluded research with a clinical focus to capture results that represent typical social media use amongst the general adolescent population. Nonetheless, to take into account the complexity of the social media phenomenon, further reviews could examine studies that are associated with clinical populations and/or problematic social media use and the potential association with basic psychological needs. This is important when considering the growing evidence demonstrating how social media behaviours (e.g., pre-occupation with using social media, excessive time spent on devices, multitasking, distraction from important tasks) and psychological vulnerabilities (e.g., emotion dysregulation, attention impulsiveness, FOMO, and alexithymia) are associated with problematic social media use amongst young people [144–147]. These factors can play a key role in whether basic psychological needs are thwarted or supported.

One of the inclusion criteria for the current review was that articles were based on adolescents aged 10–19 which is consistent with the WHO definition of adolescence [79]. However, developmental scientists stress that adolescence does not represent a single development phase [63]. Young peoples' experiences at different stages of adolescence can vary greatly and should be considered when conducting research. Most of the studies within the current review reported results based on a broad age range within adolescence. Nonetheless, a few studies did apply narrow age perimeters. Approximately two percent focused on early adolescence, and nine percent on mid-adolescence; however, no studies focused solely on late adolescence. Therefore, future research could examine the behaviours and effects of social media use during early, mid and late adolescence. Delineating developmental stages could yield more nuanced insights and capture important information in relation to the different experiences with social media and wellbeing outcomes across adolescence [148].

A further consideration is that the current review presented findings for each basic psychological need separately. This approach provided a clear structure for synthesising and interpreting a wide range of papers. It also allowed each psychological need to be analysed and discussed in depth. However, it should be noted that the implications of social media use on psychological needs are often interconnected [44]. For example, when adolescents reach out to peers on social media, they can simultaneously deepen friendships, enhance social skills and elicit a sense of control. Considering the inherent 'social' underpinnings of social media, it is not surprising that most studies within the review corresponded with the

basic psychological need of relatedness (79%) whilst fewer studies aligned with autonomy (43%) and competence (50%). Given that all three psychological needs are important for wellbeing [116], further investigation into the implications of adolescent social media use for autonomy and competence is warranted.

The current findings draw attention to the complexity of adolescent social media use and the need for scholarly research to further unpack the multiple layers at play. Notably, most of the studies identified within this review used quantitative approaches (refer to Figure 2). However, for the field of adolescent digital wellbeing to move forward, scholars recommend that researchers apply a greater diversity of methods; they note that qualitative approaches would be especially useful to capture in-depth and nuanced information. Furthermore, there is a strong call for research that champions adolescent voice, as consulting directly with adolescents is critical in research that aims to understand a social phenomenon through an adolescent developmental perspective [6,7,71].

Findings highlighted that scholarly attention focusing on this topic has increased over the past few years (see Table 3). This is not surprising considering the exponential uptake of social media amongst adolescents globally [45] and the worldwide prevalence of youth mental health issues [149]. Given that SDT is recognised as a universal theory that is applicable and relevant across cultures and countries [44], scholars from around the globe could benefit from applying an SDT framework within their work. Adopting an SDT perspective could generate important information on different experiences for adolescents from varying countries and cultures with regards to how social media impacts the fulfilment of basic psychological needs.

4. Conclusions

This systematic scoping review provides unique contributions to the current literature exploring adolescent social media use and wellbeing. Consistent with recommendations by digital wellbeing scholars, this review specifically captured experiences during adolescence which is a critical stage where social contexts have a strong influence on wellbeing and development [7,45,53]. This is the first review to examine adolescent social media use and wellbeing through an SDT framework providing a structured format to make sense of the disparate and divergent existing literature. It illustrated how the application of a multi-dimensional wellbeing framework can generate meaningful insights that have relevance and practical applicability. Findings provided examples of how adolescent social media use both supports and thwarts the psychological needs of relatedness, autonomy and competence. Future research should build upon this foundational evidence by further investigating the interactional and nuanced aspects of adolescent social media use and their potential to support and thwart the basic psychological needs. Using qualitative methods, championing adolescent voice and delineating the different experiences of early, mid and late adolescents could help towards gaining deeper insights. As social media is constantly evolving, prevalent within adolescents' lives, and has the potential to strongly influence development and wellbeing, a continued research agenda within the field is critical.

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Appendix A

Summary of studies and how they map onto the SDT basic psychological needs.

Table A1. Summary of studies and how they map onto the SDT basic psychological need.

Article Number, Author and Date of Publication	Sample Age and Gender	Country of Origin	Study Design and Analyses	Social Media Type/Activity	Links between Social Media Use and Psychological Needs		
					Relatedness Total Number of Studies = 68	Autonomy Total Number of Studies = 37	Competence Total Number of Studies = 43
1	Ahn, 2012 [82]	852 adolescents aged 12–18 years mean age 15.2 years 52% female	United States	Self-report measures Cross-sectional Regression analysis	Facebook MySpace	Increased bridging and bonding social capital	
2	Alloway et al., 2013 [132]	103 adolescents aged 12–18 years mean age 15.9 years 51.5% female	United Kingdom	Self-report/test battery Cross-sectional Independent <i>t</i> tests	Facebook Twitter YouTube		Increased and decreased academic competencies
3	Antheunis, Theunis, and Krahmer, 2016 [83]	3068 adolescents aged 11–14 years mean age 13.46 years 53.7% female	The Netherlands	Self-report measures Cross-sectional Regression analysis	Hyves	Positive relationship with bridging and bonding social capital and increased friendship quality	
4	Apaolaza, Hartmann, Medina, Barrutia and Echebarria, 2013 [93]	344 adolescents aged 12–17 years 52% female	Spain	Self-report measures Cross-sectional Structural equation analysis	Tuenti	Increased socialising and decreased loneliness and social isolation	Increased self-esteem
5	Appel, 2012 [142]	200 adolescents aged 16–19 years mean age 17.34 years 58% female	Austria	Self-report measures Cross-sectional Regression analysis	Online gaming		Increased digital competencies
6	Armstrong-Carter, Garrett, Nick, Prinstein and Telzer, 2022 [150]	212 adolescents aged 14–17 years mean age 15 years 56.2% female	United States	Ecological Momentary Assessments Longitudinal Regression analysis	Social media (unspecified)	Reduced social- connectedness and increased social craving	
7	Asterhan and Bouton, 2017 [109]	Study 1 206 adolescents aged 15–17 years 49.8% female Study 2 291 adolescents aged 15–17 years 56.3% female	Israel	Mixed method Study 1 Open-ended questions Content analysis Study 2 Self-report measures Cross-sectional Independent <i>t</i> tests	Facebook WhatsApp	Increased popularity Increased reciprocal helping	Increased academic competencies Increased positive self-concept

Table A1. Cont.

Article Number, Author and Date of Publication	Sample Age and Gender	Country of Origin	Study Design and Analyses	Social Media Type/Activity	Links between Social Media Use and Psychological Needs		
					Relatedness Total Number of Studies = 68	Autonomy Total Number of Studies = 37	Competence Total Number of Studies = 43
8	Barak-Brandes, 2014 [98]	Israel	Focus group interviews Qualitative thematic analysis	Facebook	Fosters social-connectedness Increases sense of belonging	Opportunities to exercise control, power, choice and agency Facilitates self-expression Social structures inherent in social media constrain and restrict choices and actions A lack of privacy	
9	Barcelos and Rossi, 2014 [84]	Brazil	Focus groups and in-depth one-on-one interviews Qualitative thematic analysis	Social media (unspecified)	Aids face-to-face communication Enables relationship maintenance Enables social identity construction	Facilitates self-expression Dependency on social media Conforming behaviour	
10	Bell, 2019 [113]	United Kingdom	Focus groups Inductive thematic analysis	Image sharing via social media (e.g., Facebook and Instagram)	Facilitates relationship maintenance Experiences of social approval		Decreases self-esteem and confidence Increases confidence and self-esteem
11	Belotti et al., 2022 [130]	Italy	Focus groups Thematic analysis	Social media		Subjected to controlling behaviours Pressure to behave in certain ways	
12	Best et al., 2015 [99]	Northern Ireland	Mixed method Study 1 Self-report measures Independent samples <i>t</i> test Study 2 Focus groups Thematic analysis	Social networking sites	Sense of belonging Social support	Inability to control what others post	

Table A1. Cont.

Article Number, Author and Date of Publication	Sample Age and Gender	Country of Origin	Study Design and Analyses	Social Media Type/Activity	Links between Social Media Use and Psychological Needs		
					Relatedness Total Number of Studies = 68	Autonomy Total Number of Studies = 37	Competence Total Number of Studies = 43
13	Beyens, Frison and Eggermont, 2016 [100] 402 adolescents mean age 16.41 years 57% female	Belgium	Self-report measures Cross-sectional Structural equation modeling	Facebook	Seeking belonging and popularity	Social media use driven by fear of missing out	
14	Bourgeois et al., 2014 [101] 1037 adolescents aged 11–18 years 49% female	Australia	Self-report measures Cross-sectional Factor analysis, MANOVA, ANOVA	Facebook	Increased social connections and sense of belonging/fitting in		Prompts worry, nervousness and fear
15	Cabezas-González et al., 2021 [151] 807 adolescents aged 12–16 years 51.4% female	Spain	Problem-solving test Cross-sectional Kruskal–Wallis H test analysis	Online social networking sites			Decreased digital competence
16	Chiang and Lin, 2010 [80] 105 adolescents aged 11–12 years 51% female	Taiwan	Self-report measures Cross-sectional Regression analysis	Online gaming	Supports relatedness	Supports autonomy	Supports competence
17	Chua and Chang, 2016 [128] 24 adolescents aged 12–16 years mean age 14.5 years 100% female	Singapore	In-depth one-on-one interviews Thematic analysis	Instagram	Facilitates peer attention	Pressure to conform to peer norms	Facilitates peer validation Fosters digital competencies Threatens self-confidence and self-esteem
18	De Groote and Ouytsel, 2022 [119] 51 adolescents aged 13–16 years mean age 14.35 years 53% female	Belgium	Focus group interviews Thematic inductive analysis	Social media (unspecified)	Creates stress within friendships	Pressure due to social expectations	
19	Dhir et al., 2018 [152] 780 adolescents aged 12–18 years mean age 14.54 years 34.5% female	India	Self-report measures Cross-sectional Structural equation modeling	Facebook		Habitual automatic behaviours	
20	Dhir et al., 2019 [153] 728 adolescents aged 12–18 years mean age 14.54 years 34.5% female	India	Self-report measures Cross-sectional Structural equation modeling	Facebook	Increases social presence	Promotes habitual automatic behaviours	

Table A1. Cont.

Article Number, Author and Date of Publication	Sample Age and Gender	Country of Origin	Study Design and Analyses	Social Media Type/Activity	Links between Social Media Use and Psychological Needs		
					Relatedness Total Number of Studies = 68	Autonomy Total Number of Studies = 37	Competence Total Number of Studies = 43
21	Diwakar, 2016 [123] 8 adolescents aged 13–17 years gender not reported	India	Interviews and focus groups Social media posts Thematic analysis	Social network sites (including Facebook, Instagram, WhatsApp, Google +, Snapchat, Hike, Viber, Whatpad)		Enables active goal pursuit, self-expression and choice Traditional values lead to stifled self-expression on social media	
22	Dredge and Chen, 2020 [117] 320 adolescents aged 12–17 years mean age 13.98 years 47.3% female	China	Self-report measures Cross-sectional MANOVA	Online gaming	Negative social interactions take place		
23	Dumas et al., 2023 [120] Time 1—345 adolescents mean age 17.29 years 80.6% female Time 2—512 adolescents mean age 17.67 years 80.3% female Time 3 493 adolescents mean age 17.96 years 79.1% female aged 14–18 years	Canada	Self-report measures Latent curve model with structural residuals	Social media (including Instagram, Snapchat, TikTok and Facebook)	Threatens friendship closeness		
24	Edwards and Wang, 2018 [116] 42 adolescents aged 13–15 years 61.9% female	England	Focus groups Grounded theory analysis	Social media (unspecified)	Strengthens relational ties	Supports self-governance and personal agency	
25	Eek-Karlsson, 2021 [102] 32 adolescents aged 14–15 years 59.3% female	Sweden	Pair interviews Thematic analysis	Social media (unspecified)	Promotes social acceptance Prevents social exclusion	Places constraints via social norms Challenges personal power	
26	Eklund and Roman 2017 [95] 115 adolescents aged 16–19 years 59% female	Sweden	Self-report measures Stochastic actor-oriented model	Online gaming	Promotes friendships through shared identities		

Table A1. Cont.

Article Number, Author and Date of Publication	Sample Age and Gender	Country of Origin	Study Design and Analyses	Social Media Type/Activity	Links between Social Media Use and Psychological Needs		
					Relatedness Total Number of Studies = 68	Autonomy Total Number of Studies = 37	Competence Total Number of Studies = 43
27	Phase 1 Quantitative 115 adolescents aged 16–19 years 59% female	Sweden	Mixed-method Phase 1 Self-report measures Stochastic actor-oriented model Phase 2 Focus groups and individual interviews Iterative thematic analysis	Online gaming	Strengthens existing relationships Contributes to a sense of community	Creates pressure to be online Provides opportunities to control leisure time	Provides opportunities to practise strategies for balancing time
	Phase 2 Qualitative 10 adolescents aged 17–19 50% female						
28	268 adolescents 6,7 and 8th graders (approx. 11–13 years) 51% female	United States	Self-report measures Cross-sectional Independent sample <i>t</i> tests	Social networking sites (unspecified)	Facilitates connection with friends outside of school		Negatively impacts schoolwork and sleep
29	2462 adolescents aged 13.9 years 47.5% female	Taiwan	Self-report measures and academic scores Longitudinal design Pearson's Correlation Cross-lagged models	Social media (unspecified)			Disturbed sleep Lower academic achievement
30	1508 adolescents aged 11–18 years mean age 14 years 66% female	Germany	Self-report measures Cross-sectional Exploratory and confirmatory factor analysis	Social media (unspecified)			Challenges social competencies
31	36 adolescents Teenagers—specific ages are not reported 100% female	England	Guided discussions Discourse analysis	Sexting	Influences intergroup and interindividual relations	Promotes a sense of personal agency Creates feelings of pressure and coercion	Fosters positive sense of self
32	116 adolescents aged 14–17 years 100% female	Ireland	Self-report measures One-on-one interviews Thematic analysis	Facebook	Promotes perceived popularity Creates opportunities for online rifts		

Table A1. Cont.

Article Number, Author and Date of Publication	Sample Age and Gender	Country of Origin	Study Design and Analyses	Social Media Type/Activity	Links between Social Media Use and Psychological Needs		
					Relatedness Total Number of Studies = 68	Autonomy Total Number of Studies = 37	Competence Total Number of Studies = 43
33	Hjetland et al., 2021 [101]	27 adolescents aged 15–18 years mean age 16.8 years 53% female	Norway	Focus group interviews Reflexive thematic analysis	Facilitates social connectedness Incites a sense of belonging Fosters social support Encourages poor social behaviours		Negatively impacts sleep and study
34	Huang et al., 2015 [19]	886 adolescents aged 11–18 years 53.27% female	Taiwan	Self-report measures Cross-sectional MANOVA	Social gratification Friendship maintenance Greater friendship quality	Incites a sense of control over content production	Adverse links with academic achievement
35	Kasperski and Blau, 2023 [88]	10 adolescents aged 15–18 years 60% female	Israel	One-on-one interviews Thematic analysis	Helps shy students increase social capital Encourages trust with teachers Strengthens relationships	Incites feelings of empowerment Encourages self-expression	Fosters learning Helps introverted students overcome learning barriers Provides opportunities for peer teaching
36	Kim et al., 2022 [96]	403 adolescents aged 14–16 years Time 1—49% female Time 2—50.5% female Time 3—49.9% female	South Korea	Self-report measures Longitudinal Structural equation modeling Repeated measures analysis (general linear model)	Increases social capital		
37	Košir et al., 2016 [85]	404 adolescents aged 11–15 years mean age 13.17 years 52.7% female	Slovenia	Self-report measures Cross-sectional ANCOVA Regression analysis	Promotes friendship quality Increased peer relation self-concept		Positively linked with self-concept and self-esteem
38	Koutamanis et al., 2013 [97]	690 adolescents aged 10–17 years 50% female	The Nether- lands	Self-report measures Longitudinal Auto regressive cross-lagged models	Increases initiation of offline friendships Promotes bridging social capital		Increases social competence

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Article Number, Author and Date of Publication	Sample Age and Gender	Country of Origin	Study Design and Analyses	Social Media Type/Activity	Links between Social Media Use and Psychological Needs		
					Relatedness Total Number of Studies = 68	Autonomy Total Number of Studies = 37	Competence Total Number of Studies = 43
39	Ku et al., 2019 [133] 1505 adolescents aged 12–18 years mean age 14.91 years 33.5% female	Hong Kong	Self-report measures Performance test Cross-sectional Pearson's correlation analysis MANOVA	Social media (unspecified)	News seeking on social media fulfils social purposes		Seeking news for informational purposes fosters critical thinking
40	Langlais et al., 2020 [114] 138 adolescents aged 14–18 years mean age 16.43 years 65.9% female	United States	Self-report measures Cross-sectional Independent <i>t</i> tests Multilevel regression analysis	Facebook	Facilitates relationship maintenance	Monitoring hinders autonomy	Monitoring via social media diminishes self-esteem
41	Lee et al., 2016 [94] 1045 adolescents 401 from Australia 644 from Korea aged 12–15 years 51.1% female in Australia 48.6% female in Korea	Australia and Korea	Self-report measures <i>t</i> tests Factor analysis	Social networking sites (unspecified)	Increases bridging and bonding social capital		
42	Legkauskas and Steponavičiūtė- Kupčinskė, 2021 [118] 319 adolescents aged 14–17 years mean age 15.6 years 67.7% female	Lithuania	Self-report measures Cross-sectional ANOVA	Instagram Snapchat Discord Twitter YouTube Facebook	Poorer relationships with peers		Negatively impacts academic achievement
43	Hernandez-Martin et al., 2021 [155] 595 adolescents aged 11–13 years 51.4% female	Spain	Self-report measures Cross-sectional Kruskal–Wallis test for <i>k</i> independence and Mann–Whitney <i>U</i> tests	Social media (unspecified)			Promotes acquisition and development of digital safety competence
44	Kara, 2020 [156] 584 adolescents aged 14–18 years 56.2% female	Turkey	Self-report measures Cross-sectional Correlation analysis Multiple mediation analysis	Social media (unspecified)		Opportunities to control activities Creates feelings of nomophobia	

Table A1. Cont.

Article Number, Author and Date of Publication	Sample Age and Gender	Country of Origin	Study Design and Analyses	Social Media Type/Activity	Links between Social Media Use and Psychological Needs		
					Relatedness Total Number of Studies = 68	Autonomy Total Number of Studies = 37	Competence Total Number of Studies = 43
45	Len-Rios et al., 2016 [157]	44 adolescents aged 16–18 years mean age 16.39 years 59% female	United States Focus groups Thematic analysis	Social media	Beneficial for romantic relationships One-to-many communication has negative implications for relationships		
46	Lenzi et al., 2015 [158]	114 adolescents aged 14–17 years mean age 15.37 43% female	Italy Self-report measures Cross-sectional Structural equation modeling	Facebook		Fosters independence Social expectations on social media can constrain authenticity and dictate acceptable behaviours Can feel addictive	Supports civic competencies
47	Levin and Barak-Brandes, 2014 [159]	35 adolescents aged 12–18 years 100% female	Israel Focus groups Thematic analysis	Facebook	Helps to define shared values and group boundaries Can create feelings of social exclusion		
48	Lin et al., 2007 [160]	369 adolescents aged 13–16 years 49.3% female	Taiwan Self-report measures Cross-sectional Factor analysis Structural equation modeling	Instant messaging	Nurturing interpersonal relationships		
49	Livingstone, 2008 [124]	16 adolescents aged 13–16 years 50% female	England One-on-one interviews Thematic analysis	Social networking sites (including MySpace, Facebook, Bebi and Piczo)	Choice and agency over self-portrayal Constraints from norms and peer practices		Increased confidence via positive reinforcement

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Article Number, Author and Date of Publication	Sample Age and Gender	Country of Origin	Study Design and Analyses	Social Media Type/Activity	Links between Social Media Use and Psychological Needs		
					Relatedness Total Number of Studies = 68	Autonomy Total Number of Studies = 37	Competence Total Number of Studies = 43
50	Luo, Liang and Li, 2020 [161] 560 adolescents aged 14–18 years 47% female	Hong Kong	Self-report measures and grade level scores Linear regression analysis Structural equation modeling	Social media (including Instagram, Twitter and Facebook)			Negatively impacts academic performance Positively impacts academic performance
51	Macedo-Rouet et al., 2020 [162] 146 adolescents aged 13–17 years mean age 14.7 years 53.4% female	France	Self-report measures and skills assessment tasks Cross-sectional Correlations Linear regression analysis Factor analysis Binomial logistic regression	Social networking sites (unspecified)			Poorer critical appraisal abilities of online sources
52	MacIsaac et al., 2018 [86] 41 adolescents aged 11–18 years 53.6% female	Scotland	Interviews and ethnographic observations Iterative thematic analysis	Online social interactions	Promotes social connection Facilitates communication across geographic boundaries Promotes bonding Popularity	Experience a lack of control over other people's posts Opportunity to control their online image	Instills self-consciousness
53	Marwick and Boyd, 2014 [121] 166 adolescents aged 13–19 years 56.6% female	United States	Interviews, focus groups and observations Iterative coding and theorising	Social media (unspecified)	Experiences of relational aggression Online drama creates offline confrontation		
54	Metzler and Scheithauer, 2017 [141] 217 adolescents aged 14–17 years mean age 16.7 years 68.2% female	Germany	Self-report measures Cross-sectional Longitudinal path analysis	Facebook	Fosters social acceptance		Feelings of affirmation and value
55	Mulawarman et al., 2020 [163] 226 adolescents aged 15–18 years gender not reported	Indonesia	Self-report measures Cross-sectional Product moment analysis	Social media (unspecified)			Negatively associated with emotional intelligence

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56	Naeemi and Tamam, 2017 [125] 401 adolescents aged 13–16 years 48% female	Malaysia	Self-report measures Cross-sectional Structural equation modeling	Facebook	Emotional dependence on social media negatively impacts social relationships	Emotional dependence on social media negatively impacts autonomy	
57	O'Reilly et al., 2021 [110] 54 adolescents aged 11–18 years 44.4% female	United Kingdom	Focus groups Thematic analysis	Social media (unspecified)	Facilitates social interaction and caring Encourages face-to-face social interaction Strengthens and promotes communication and support	Allows active online engagement and instills a sense of responsibility Triggers a lack of agency with regards to perpetrators who post negative comments Creates a feeling of compulsion to check	Diminishes sleep impinging on functioning the following day
58	O'Reilly et al., 2022 [111] 54 adolescents aged 11–18 years 44.4% female	United Kingdom	Focus groups Thematic analysis	Social media (unspecified)	Promotes friendships Reduces social isolation Encourages communication	Allows experimentation with an emerging sense of agency	Promotes social competence Fosters learning Creates a distraction from tasks
59	Quinn and Oldmeadow, 2013 [104] 337 adolescents aged 11–13 years mean age 12.28 years 48.5% female	England	Self-report measures Cross-sectional Correlational analysis Regression analysis	Social networking sites (unspecified)	Increases a sense of belonging		
60	Reich et al., 2012 [115] 251 adolescents aged 13–19 years mean age 16.3 years 59% female	United States	Self-report measures Cross-sectional Regression analysis	Social networking sites/instant messaging instant messaging	Strengthens offline relationships		
61	Riley et al., 2022 [92] 4592 adolescents aged 12–17 years 48% female	United States	Self-report measures Cross-sectional Factor analysis Bivariate correlations Regression analysis	Social media (unspecified)	Facilitates social connection		

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62	Rousseau et al., 2019 [89] 1621 adolescents aged 12–18 years 48% female	Belgium	Self-report measures Longitudinal Structural equation modeling	Facebook	Creates closeness with friends Encourages reciprocal relations		
63	Rubin and McClelland, 2015 [105] 8 adolescents aged 16–19 years 100% female	United States	One-on-one interviews Thematic analysis	Facebook	Helps to establish social relationships and avoid social exclusion Creates peer pressure	Creates laboured choices due to peer pressure Creates constraints with regards to presenting authentic self-portrayals	
64	Rueda and Lindsay, 2015 [90] 64 adolescents aged 15–17 years 62.55 female	United States	Focus groups Self-report for descriptive data Inductive content analysis	Social media sites (including Facebook and MySpace)	Creates opportunities to meet romantic partners	Facilitates harassment, monitoring Creates feelings of being controlled	
65	Sampasa-Kanyinga et al., 2019 [134] 10,076 adolescents aged 11–17 years mean age 15.2 48.4% female	Canada	Self-report measures Cross-sectional Regression analysis	Social media (including Facebook, Twitter, Instagram and MySpace)	Increases social connectedness Negatively impacts school connectedness		Negatively influences academic performance
66	Scott et al., 2019 [51] 24 adolescents aged 11–17 years 50% female	Scotland	Focus groups Inductive reflexive thematic analysis	Social media (including Twitter, WhatsApp, Facebook, Instagram and Snapchat)	Necessary for social inclusion	Creates a sense of obligation to be online Fear of negative consequences drives use	
67	Seo et al., 2014 [106] 280 adolescents aged 13–19 years 67.9% female	USA	Self-report measures Cross-sectional Path analysis Regression analysis	Social media sites (Facebook, Twitter, YouTube, Foursquare and MySpace)	Supports belonging		

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68	Shepherd and Lane, 2019 [108] 21,124 adolescents aged 10–15 years 49% female	United States	Self-report measures Cross-sectional Regression analysis	Facebook Twitter Instagram	Increases peer status and popularity Promotes friendships Promotes social integration at school Creates competition and conflict with others	Helps adolescents regulate public life on their own terms	
69	Tanrikulu and Mouratidis, 2022 [126] 506 adolescents aged 14–18 years mean age 15.84 years 50.8% female	Turkey	Self-report measures Cross-sectional Bivariate correlations Path analysis	Social media (unspecified)		Instills FOMO Aligned with extrinsic goals	Associated with low grades and poor study efforts
70	Throuvala et al., 2019 [127] 42 adolescents aged 12–16 years 48% female	United Kingdom	Focus groups Thematic analysis	Social media (unspecified)	Promotes symbiotic relationships Facilitates communication	Incites a feeling of control Creates experiences of a loss of control	Facilitates emotion regulation Exposes adolescents to peer comparison Creates opportunities for ego validation
71	Timeo, et al., 2020 [122] 167 adolescents aged 11–14 years mean age 11.47 53.3% female	Italy	Experimental Cross-sectional Linear regression analysis	Social media (unspecified)	Threatens belonging Elicits feelings of being ignored and excluded		Threatens self-esteem
72	Tsai and Liu, 2015 [135] 1052 adolescents aged 13–15 years gender not reported	Taiwan	Self-report measures Cross-sectional ANOVA Regression analysis	Facebook	Promotes social interaction		Adversely impacts academic achievement due to poor time management
73	Tsitsika et al., 2014 [136] 10,930 adolescents aged 14–17 years 52.3% female	Greece Spain Poland The Netherlands Romania Iceland	Self-report measures Cross-sectional Chi-squared tests of independence Regression analysis	Social networking sites (unspecified)	Associated with higher social competence		Reduces academic performance Associated with higher social competence Reduces competence in sporting activities and hobbies

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74	Valkenburg and Jochen, 2009 [87] 812 adolescents aged 10–17 years 50% female	The Netherlands	Self-report measures Longitudinal Structural equation modeling Multiple group analysis	Instant messaging	Enhances friendship quality		
75	Valkenburg et al., 2017 [140] 852 adolescents aged 10–15 years 50.7% female	The Netherlands	Self-report measures Longitudinal Cross-lagged model Structural equation modeling	Social networking sites (unspecified)	Enhances social self-esteem		Promotes social self-esteem
76	Van Ouytsel et al., 2017 [131] 57 adolescents aged 15–18 years 66.67% female	Belgium	Focus groups Thematic analysis	Sexting		Feeling pressured to sext Experiences of being coerced and victimized	
77	Van Ouytsel et al., 2019 [164] 55 adolescents aged 15–18 years mean age 16.6 years 51% female	Belgium	Focus groups Thematic analysis	Social media (including Facebook, Snapchat, WhatsApp and Instagram)		Lack of control via monitoring and surveillance Feeling constrained by social norms	
78	Wang and Edwards, 2016 [165] 543 adolescents aged 11–16 years 52.8% female	England	Self-report measures Frequencies	Social media (including Facebook WhatsApp Snapchat, Twitter, Google Hangouts)	Opportunities to practise relationship management strategies		Opportunities to practise relationship management strategies
79	Wang et al., 2021 [166] 473 adolescents aged 12–19 years mean age 14.63 years 38.9% female	China	Self-report measures Cross-sectional Bivariate and mediation analysis	Social media (unspecified)	Increased friendship quality		
80	Weinstein 2018 [17] 568 adolescents mean age 15.26 years 50% female Interviews = Sub-sample of 26 adolescents 61.5% female	United States	Self-report measures <i>t</i> tests Exploratory logistic principal component analysis In-depth interviews Inductive thematic analysis	Social media platforms (including Instagram, Snapchat, Facebook, Twitter, and Tumblr)	Promotes closeness with others Creates feelings of social disconnection	Provides opportunities for self-expression Offers opportunities for interest-driven exploration	Encourages negative evaluation via judgement Provides opportunities to receive affirmation

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81	Weser et al., 2021 [91]	27 adolescents aged 14–18 years mean age 16.22 years 100% female	United States	Focus groups Thematic analysis	Social media (unspecified)	Helps adolescents explore potential partners	Provides a pathway for people to insult others
82	West et al., 2021 [56]	36 adolescents aged 15 years 50% female	Australia	Rich picture mapping, focus groups and one-on-one interviews Reflexive thematic analysis	Social media (including social networking sites, online gaming and content sharing)	Supports and thwarts relatedness	
83	Winstone et al., 2021 [128]	24 adolescents aged 13–14 years 79% female	England	In-depth interviews Thematic analysis	Social media (unspecified)	Promotes communication with family Facilitates socialising amongst peers Fosters a sense of belonging	Feel obligated to be available Feel obligated to leave positive feedback for friends
84	Winstone et al., 2023 [129]	24 adolescents aged 13–14 years 79% female	England	In-depth interviews Thematic analysis	Social media (unspecified)	Threatens privacy Causes pressure to be available Lack of control over unsolicited contact	Exposure to negative evaluation Promotes time wasting
85	Wong et al., 2022 [22]	17, 149 adolescents aged 11–15 years 54.2% female	Canada	Self-report measures Cross-sectional Regression analysis	Social media (unspecified)	Strengthens relationships and connections Creates feelings of social disconnection	
86	Yang, Pham, Ariata, Smith, Foster and Misti, 2021 [81]	517 adolescents aged 12–18 years mean age 14.83 years 50% female	United States	Self-report measures Factor analysis Path analysis	Digital social multitasking	Increases perceived social connection Enhances friendship quality Promotes relatedness satisfaction Reduces friendship quality	Supports autonomy need satisfaction Satisfies the need for competence

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Article

Emotional and Behavioural Factors Predisposing to Internet Addiction: The Smartphone Distraction among Italian High School Students

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Abstract: In a digitally oriented society, smartphones provide continual online accessibility to daily life while simultaneously predisposing adolescents to engage in prolonged connections for various purposes, thus escalating the risk of Internet addiction (IA). Cognitive processes such as multitasking and attentional shifting are frequently associated with smartphone activities. Additionally, online engagements may serve as emotional strategies for regulating negative states (e.g., boredom and distress), redirecting attention towards more gratifying activities, such as social media contents. This study delves into cognitive–emotional processes (i.e., emotion regulation, attention impulsiveness, online vigilance, and multitasking) and emotional/behavioural factors (i.e., emotional problems, conduct problems, hyperactivity/inattention, peer relationships, and prosocial behaviours) that may be implicated in smartphone activities and technology addiction among adolescents. A community sample of Italian high school students ($N = 676$; 42.2% females) completed the Smartphone Distraction Scale (SDS), the Strength and Difficulties Questionnaire (SDQ) for internalising/externalising symptoms and the Internet Addiction Test (IAT) to assess the presence and severity of IA. The scores on the SDS were found to be positively associated with IA levels. Furthermore, students exhibiting higher internalising/externalising symptoms, particularly those with traits of attention deficit hyperactivity disorder (ADHD), are more likely to manifest problematic smartphone usage. The implications for screening adolescents more susceptible to developing IA symptoms and for implementing preventive interventions are discussed.

Keywords: Smartphone Distraction Scale; Internet addiction; adolescents; emotional regulation; hyperactivity/inattention

1. Introduction

Media devices have become integral to the daily activities of young individuals, with the smartphone swiftly supplanting the personal computer as the preferred means of communication (e.g., WhatsApp or Telegram messaging), social interaction (e.g., Facebook, Instagram, TikTok), learning (e.g., homework), and entertainment (such as listening to music or watching videos). It is estimated that nearly all children and adolescents (e.g., 95% in the U.S., 80% in Europe, and 90% in Asia) utilise their smartphones to access the Internet, and they report being “daily” or “almost all the time” connected online through their devices [1–3]. Data from an Italian survey indicate that children estimate spending over 3 h

(41%) or over 2 h (29%) each day on Internet and social networking sites [4]. Nevertheless, they frequently underestimate the duration of on-screen activities, to the extent of losing track of time [5].

1.1. Digital Connectivity and Excessive Smartphone Usage

The increasing prevalence of smartphones, coupled with constant Internet accessibility, has resulted in a heightened incidence of Internet addiction (IA) among adolescents [6]. Montag and Reuter [7] define IA as any online-related behaviour that detrimentally affects various aspects of a user's life, such as family conflicts, loss of friends, and diminished work/school performance. Numerous studies have consistently linked elevated daily smartphone usage to compromised family and peer relationships, challenges in school and learning, and reduced personal well-being [8–10]. Especially during the COVID-19 pandemic, prolonged Internet activities have been observed in young individuals, yielding adverse effects on both physical and psychological health [11,12]. However, adolescents themselves appear cognisant of the negative consequences associated with excessive engagement in online activities [13]. Results from an Italian survey indicate that distractions during homework (24%), eyes burning (21%), neck/back pain (12%), sleep disturbances (10%), and mood alterations (7%) are among the most commonly reported issues by adolescents [4].

Hence, the increasing body of evidence concerning the adverse outcomes associated with widespread smartphone use underscores the imperative to investigate factors linked to problematic engagement among young individuals, despite the current absence of a precise definition for “smartphone addiction”. While some authors characterise excessive smartphone use as a manifestation of Internet use disorder [14], the diagnostic criteria for Internet addiction (IA), mobile addiction, or social media addiction are currently not incorporated into the Diagnostic and Statistical Manual of Mental Disorder—5th Edition (DSM-5) [15]. Nevertheless, certain problematic behavioural patterns have been identified in the use of these devices, encompassing withdrawal (e.g., feeling anxious or irritable when the smartphone is disconnected), tolerance (i.e., escalating smartphone use), and loss of control (e.g., incessant checking or messaging), all of which detrimentally affect daily activities, emotional well-being, and social interactions. These patterns closely resemble those observed in other behavioural or substance addictions [16,17]. Furthermore, a well-established body of scientific literature attests that certain symptoms associated with IA are commonly observed in cases of excessive smartphone use, including impulsiveness, depression, anxiety, mood alterations, low self-esteem, and impaired cognitive functions [18]. Consequently, some scholars frame these symptoms in a conceptual effort to validate models that explain the onset and maintenance of behavioural addiction (e.g., [19,20]); instead, other researchers have increasingly directed their attention toward exploring the consequences of problematic engagement in online activities, rather than toward the classification or diagnostic issues (e.g., [4,21]).

1.2. Smartphone Distraction

Researchers agree that the advent of new technologies has fundamentally altered individuals' interactions with their environment (e.g., [22,23]). As individuals engage in prolonged and diverse online activities, primarily through their smartphones, their attentional systems contend continually with potential overload from external factors (e.g., multitasking or focusing on notifications) and internal stimuli (such as contemplating social networks; [24]). Attention, as a cognitive process enabling individuals to process information in their environment, is inherently a limited resource. The continual use of digital devices places upon users both the demand for prolonged attentional efforts (such as watching videos) and the necessity to distribute cognitive resources among multiple stimuli simultaneously (i.e., attentional shifting). Nevertheless, protracted on-screen engagements or conflicting activities (such as checking notifications while studying or making phone calls while driving) can result in information overload, distraction, and interference with overall performance.

In accordance with Throuvala and colleagues [25], distraction is delineated as “an expression of attentional loss associated with smartphone use” (p. 12). Distraction can be characterised as a response to both external stimuli (e.g., auditory/visual cues like smartphone notifications) and internal stimuli (e.g., boredom, stress, or concerns related to news on social media), diverting the individual’s attentional resources away from ongoing activities. Distraction may also manifest when internal and external cues are conflicting, leading the individual to struggle against interferences and maintain attentional focus on pertinent stimuli (i.e., selective attention) and goal-directed behaviours. Notably, Throuvala and colleagues [25] present a multidimensional model of smartphone distraction, distinguishing its dimensions as emotive, cognitive, and behavioural processes (i.e., emotion regulation, attention impulsiveness, online vigilance, and multitasking). The underlying assumption is that digital mobile technology affords individuals various activities that support and mediate distraction processes. However, the features of smartphones (e.g., portability, connectivity, etc.) facilitate distraction, potentially contributing to problematic smartphone use, such as prolonged online activities [26].

In the model proposed by Throuvala and colleagues [25], distraction functions as a strategy for *emotion regulation* when directed towards smartphone activities that alleviate negative states, primarily boredom, anxiety, and stress. As such, distraction serves as a coping mechanism, providing relief from negative emotions, while also facilitating the experience of positive emotions, such as gratification from gaming or receiving support through social media. Consequently, maintaining a constant connection becomes a strategic approach for managing unpleasant emotions in daily life. However, this may also give rise to a potential vicious circle, sustaining excessive smartphone use [27,28]. Following this conceptual framework, negative internal states may act as precursors to both distraction and smartphone overuse [25]. In alignment with this perspective, research indicates associations between excessive smartphone use and common emotional experiences such as anger, anxiety, depression, and loneliness [18]. Particularly, during the COVID-19 pandemic, adolescents exhibited an increased disposition to use the Internet as a means of managing depressive moods and thoughts, heightening the risk of engaging in Internet abuse behaviours [29]. Additionally, Yildiz [30] found that difficulties in regulating emotions are correlated with Internet addiction (IA) and problematic smartphone use among adolescents. Similarly, in a study involving high school students, Extremera and colleagues [31] discovered that problematic smartphone users reported higher scores on maladaptive emotional regulation strategies (such as rumination, self-blame, etc.) compared to non-problematic users.

The second dimension, *attention impulsivity*, delineates a diminished control over attentive processes and an individual’s proclivity to impulsively engage in activities with the smartphone (e.g., frequent checking of notifications or scrolling through Instagram). Individuals characterised by impulsivity often display a limited ability to control their impulses, compelling them towards the immediate need to interact with the smartphone (e.g., hastily clicking “Likes”). Additionally, the mechanisms of gratification and sensitivity to immediate rewards elucidate how impulsivity predisposes and perpetuates problematic online behaviours [32]. Empirical studies affirm that impulsivity constitutes a robust individual factor correlated with behavioural addiction and excessive smartphone usage [15,26]. Furthermore, heightened attentional impulsivity has been found to be associated with overuse of social media and Facebook among adolescents [33].

Online vigilance is defined as a “cognitive preoccupation and orientation toward social media content” ([25], p. 13) and manifests in behaviours such as incessantly monitoring the smartphone (e.g., interrupting tasks to check messages), being on alert, or contemplating social media content. The inclination towards online vigilance is often associated with the psychological need for reassurance, particularly in maintaining social support and communication through social media channels. This mode of distraction is further heightened by the fear of missing out (FOMO), signifying the apprehension of missing out on important information or experiences within the realm of social media. Adolescents

appear to be notably susceptible to FOMO, leading to a desire to uphold social connectivity, a continuous online presence, and a propensity to routinely check social media [34].

Finally, the *multitasking* dimension manifests when simultaneous activities are conducted on a smartphone (media multitasking, such as using different applications) or when diverse behaviours (e.g., walking or talking) are carried out while utilising the smartphone. Multitasking with smartphones is an exceedingly prevalent and pervasive phenomenon in daily life, to the extent that it is commonly perceived as synonymous with distraction [25], a viewpoint shared by educators and parents alike. Indeed, research demonstrates the adverse effects of media multitasking on the performance of primary tasks (e.g., students' homework). These consequences include increased execution times (due to repeated interruptions) and elevated error rates [35]. However, adopting a more optimistic standpoint [36], not all multitasking behaviours necessarily compromise performance. The impact depends, for instance, on the type of task-switching (e.g., visual and/or verbal) or the nature of attention (i.e., focused versus distributed attention) involved. Nevertheless, given that smartphones encourage multitasking behaviours that are intermittently rewarded, individuals often find themselves engrossed in continuous digital activities, leading to heightened levels of inattention (i.e., the allocation of attentive resources across tasks) and potential performance deterioration.

In conclusion, smartphone distraction emerges as a multifaceted phenomenon [25], comprising various cognitive–emotive and behavioural components that act as precursors or predisposing factors, influencing individuals' engagement with smartphones, while also being an outcome of their usage. Indeed, smartphone distraction is perpetuated over time due to the consequences of digital activities, such as online vigilance leading to preoccupation or constant orientation towards online notifications, interrupting attention. Simultaneously, these behaviours are reinforced by positive outcomes, such as the enjoyment of videos or engaging in friendly social exchanges. Aligned with the literature that delineates trajectories towards smartphone overuse and addiction [6,15], prolonged smartphone use has enduring implications on concentration, cognitive processes, emotional well-being, and overall performance in the long term [18,37]. Consequently, it becomes imperative to explore how the various dimensions of smartphone distraction [25], together with predisposing individual factors, contribute to the risk of developing Internet addiction (IA) among adolescent smartphone users.

1.3. Individual Factors and Vulnerability to IA

It is well established that pre-existing psychological issues contribute to excessive smartphone use and, concurrently, serve as one of the pathways leading to addiction [15]. Adolescents experiencing stress, anxiety, boredom, or loneliness tend to exhibit excessive online activities and are prone to smartphone overuse [18,30,38]. Individuals engage with their mobile devices with the aim of enhancing their well-being: Internet offers immediately many amusing activities alleviating negative emotional states (e.g., anxiety or boredom), but over time, internalising problems, such as social anxiety or depression [18], may persist as a consequence of the addictive nature of the Internet. IA was also associated with impulsivity, a personality trait that can predict low inhibitory control and IA among youths and adults [39,40]. Finally, the correlation between attention deficit hyperactivity disorder (ADHD) and IA has been extensively documented in the literature (for a comprehensive review [10]). Kim and colleagues [41] found a robust link between ADHD symptoms and smartphone addiction in middle and high school students. Furthermore, the inclinations towards delay aversion, sensation-seeking, and heightened sensitivity to stimulating activities among individuals with ADHD symptoms contribute to an increased propensity for technology use, owing to the highly stimulating nature of online activities [42,43]. Therefore, attention to these individual characteristics predisposing to IA is crucial for prevention among young digital users.

2. Aims and Hypothesis

The main scope of this study is to identify the profile of adolescents most susceptible to developing problematic levels of Internet use through smartphones, as well as the primary predictors of their problematic involvement. To the best of our knowledge, there is a dearth of studies investigating the correlation between IA and the dimensions of distraction, as in the conceptual framework proposed by Throuvala and colleagues [25], specifically among adolescents. Accordingly, the study preliminarily seeks to confirm, within a sample of Italian adolescents, the four dimensions—namely, emotion regulation, attention impulsiveness, online vigilance, and multitasking—assessed by the Smartphone Distraction Scale [25]. Secondly, the current study seeks to explore the extent to which these dimensions are associated with IA related to smartphone usage. Finally, building on the existing literature that underscores the elevated incidence of internalising symptoms [18,41] and externalising symptoms [32,41] in problematic smartphone users, this study delves into the relationships between neuropsychological factors in adolescents and IA. To achieve the stated objectives, it is hypothesised that:

- (1) Elevated levels of IA will demonstrate an association with heightened levels of smartphone distraction, encompassing emotion regulation, attention impulsiveness, online vigilance, and multitasking.
- (2) Increased levels of emotional problems and behavioural issues (e.g., hyperactivity/inattention and conduct/interpersonal problems) will exhibit an association with elevated levels of IA.

3. Method

3.1. Participants

The study was undertaken in the metropolitan area of Messina, located in Sicily, Southern Italy, with a community sample comprising 676 adolescents aged between 15 and 19 years (mean age = 16.94, SD = 0.92; 42.2% female). The study was a part of a screening project aimed at identifying the individual factors involved in problematic smartphone use in public high school students. The inclusion criterion mandated obtaining consent from both parents. Exclusion criteria encompassed the presence of conditions that impede the completion of self-report questionnaires, such as severe intellectual disabilities, neurological disorders, or difficulties in comprehending the Italian language by foreign students.

3.2. Measures

A paper-pencil battery comprising self-report questionnaires was administered to the participants.

3.2.1. Descriptive on Internet Use

A set of 14 dichotomous questions formulated based on the existing literature [9,43] collected the reasons for Internet use. Examples of items include inquiries such as “When you are online, do you use Social Networking Sites?” or “When you are online, do you use streaming services?”.

3.2.2. Estimation of the Perceived Time Spent Online

Two open-ended questions were included: as in previous studies [9], participants were asked to provide information regarding the time spent online during the weekdays and weekends. Respondents indicated the perceived number of hours (in minutes) dedicated to online activities.

3.2.3. Internet Addiction Test (IAT)

The Internet Addiction Test (IAT; [44,45]) was utilised to evaluate the presence and severity of Internet and technology addiction. The IAT comprises 20 items, each associated with a 5-point Likert response scale ranging from “Never” to “Always.” Sample items include inquiries such as “Did you stay online longer than you intended?” or “Do you try to

hide how much time you spend online?" A total score is computed by summing the rating for each item, with the maximum possible score being 100 points. Higher scores on the IAT indicate more substantial levels of Internet addiction, with a range of 50 to 79 indicating a moderate level of addiction, and scores from 80 to 100 indicating severe addiction. In this study, the IAT demonstrated commendable internal consistency ($\alpha = 0.86$).

3.2.4. Smartphone Distraction Scale (SDS)

The original questionnaire [25] comprises 16 items, each associated with a 5-point Likert response scale ranging from "Very rarely" to "Very often." The scale is designed to measure the level of distraction related to smartphone use. The items are scored to generate four factors, each consisting of 4 items: emotion regulation (ER; e.g., "Using my phone distracts me when I'm under pressure"), attention impulsiveness (AI; e.g., "I get distracted by my phone even when my full attention is required on other tasks"), online vigilance (OV; e.g., "I get anxious if I don't check messages immediately on my phone"), and multitasking (MT; e.g., "I often talk to others while checking what's on my phone"). To the best of our knowledge, validation in the Italian context has only been conducted on an adult sample [24]; thus, the factor structure was preliminarily verified with an adolescent sample in the present study. The SDS demonstrated an acceptable level of internal consistency for each sub-scale ($\alpha_{ER} = 0.78$; $\alpha_{AI} = 0.83$; $\alpha_{OV} = 0.71$; and $\alpha_{MT} = 0.69$). Higher scores on the scale indicate a greater level of the measured dimensions.

3.2.5. Strengths and Difficulties Questionnaire (SDQ)

The questionnaire by Goodman [46,47] assesses behavioural and emotional difficulties in childhood. Comprising 25 items, the questionnaire employs a 3-point Likert scale (i.e., "Not true," "Partially true," and "Absolutely true") and is structured into five factors: emotional symptoms (ES; e.g., "Complaining of headache, stomach pain, or nausea"), conduct problems (CP; e.g., "Fights with other children or annoys them on purpose"), hyperactivity-inattention (HI; e.g., "Constantly moving or uncomfortable"), peer relationship problems (PRP; e.g., "Have at least one good friend"), and prosocial behaviours (PB; e.g., "Respectful of the feelings of others"). Studies support the original factor structure of the Goodman's questionnaire from early to late adolescence (10–19 years old, [48]), including Italian adolescents (until 18 years old, [49]). In the present study, acceptable reliability was demonstrated for each sub-scale ($\alpha_{ES} = 0.76$; $\alpha_{CP} = 0.50$; $\alpha_{HI} = 0.64$; $\alpha_{PRP} = 0.55$; and $\alpha_{PB} = 0.59$). Higher scores indicate a greater level of problems for all sub-scales, except for PB dimension.

3.2.6. Demographics

Furthermore, gender and age were gathered as demographic characteristics.

3.3. Procedure

The questionnaires were administered in the classroom following the receipt of authorisations from the headmaster and parents. Students individually completed the questionnaires after being provided information about the research's objectives and the assurance of response anonymity. No incentives were provided. The data were collected during the period December 2022–February 2023.

4. Data Analysis

The analysis was conducted in four steps.

1. In the entire sample, a descriptive analysis (frequencies/percentages) was conducted to identify the primary online activities engaged in by adolescents. Additionally, an estimation of the time spent online during weekdays and weekends was performed, providing mean (M) and standard deviation (SD) values as a function of gender.
2. Then, the forms of all quantitative data distribution were examined accordingly the suggestion of [50]: if skewness and kurtosis had indexes from -1 to $+1$, the

distributions might be considered normal. When this condition was not met, a non-parametric test would be chosen. A preliminary data analysis involved the verification of the factorial structure of the SDS scale, based on the Italian validation among adults conducted by Mascia and colleagues [24]. Confirmatory analysis was executed using diagonally weighted least squares (DWLS) estimation with the robust method of estimation, applied to compute ordinated categorical variables (i.e., Likert scales) [51]. Fit indices such as goodness-of-fit index (GFI), comparative fit index (CFI), Tucker–Lewis index (TLI), root-mean-square error of approximation (RMSEA), and standardised root-mean-square residual (SRMR) were considered for evaluating the structural model. These indexes are widely recognised in the literature pertaining to structural equation models (SEMs) [52–54]. Specifically, an acceptable model was considered if GFI, CFI, and TLI values approached 1, while values close to 0 were expected for RMSEA and SRMR [54]. All analyses were conducted using the Jamovi software (2.3.28.0 version) with the SEMML module [55]. Subsequently, IAT and SDQ scores were obtained following the relative scoring procedures proposed by Italian validations and were incorporated into the analysis as standardised measures.

3. Pearson’s correlations were calculated to examine the associations between SDS and SDQ sub-scale scores with the IAT total score.
4. Concerning IA, a problem group (PG; moderate or severe addiction) and a control group (CG; normal users) were identified. The selection of the two groups adhered to the cut-offs proposed by Young [44]. The PG, which constituted a sub-sample of participants reporting moderate or severe IA levels, was equated for gender and age with the CG, which was the group of normal Internet users. Subsequently, a series of analyses of variances (ANOVAs) were conducted to examine differences in the mean standard scores on SDS and SDQ. Finally, a binary logistic regression was executed to discern potential predictors of IA. For steps 3 and 4, standardised total scores were inserted in the analysis. The SPSS 26 software was employed for these stages of data analysis.

5. Results

Descriptively, adolescents report engaging in online activities for a variety of purposes. They are more frequently involved in the use of social networking sites, streaming, and communication services (for each of these activities, 75.1%), followed by the search for information (66%). Furthermore, adolescents converged in choosing the smartphone as the main device to being on the web (94.7%). Females report more hours (estimated in minutes) than males both in ferial days ($M_{Ffd} = 428.45$, $SD_{Ffd} = 252.91$, vs. $M_{Mfd} = 345.00$, $SD_{Mfd} = 253.29$) and during weekend ($M_{Fwe} = 458.07$, $SD_{Fwe} = 279.24$, vs. $M_{Mwe} = 383.56$, $SD_{Mwe} = 324.15$). The Mann–Whitney tests show differences between male and female on time spent online ($U_{fd} = 41701.5$; $p < 0.001$; $U_{we} = 43761.5$; $p < 0.001$).

5.1. Structure of Smartphone Distraction Scale

Building upon the prior validation study of the Italian SDS conducted with adults [24], the factorial structure of the SDS was examined with the adolescents enrolled in this study. The analysis affirms a structure of items organised into four factors, consistent with the original questionnaire [25] and the Italian version [24], and demonstrates acceptable fit indices: RMSEA = 0.07 [95% CI = 0.06/0.08]; SRMR = 0.06; CFI = 0.98; TLI = 0.98.

5.2. Correlations between IA, SDS and SDQ

Table 1 shows the Pearson’s correlation coefficients between IA and the sub-dimensions of the SDS and SDQ. Specifically, higher levels of IA significantly correlate with SDS (i.e., emotional regulation, attentional impulsivity, online vigilance, multitasking), and SDQ subscales (i.e., emotional problems, conduct problems, hyperactivity/inattention, peer relationship problems). Higher levels of IA were correlated with higher levels of SDS and SDQ subscales. Conversely, a negative correlation was found with SDQ prosocial behaviours.

Higher levels of IA were correlated with lower levels of prosocial behaviours. However, the magnitude of the coefficients is low, except for SDQ hyperactivity/inattention.

Table 1. Pearson’s r correlation coefficients between SDS, SDQ, and IAT measures (N = 676).

Variable	Sub-Dimension	Correlation (r) with IAT Total Score
SDS	Emotion Regulation	0.249 **
	Attention Impulsiveness	0.190 **
	Online Vigilance	0.204 **
	Multitasking	0.183 **
SDQ	Emotional Problems	0.327 **
	Conduct Problems	0.356 **
	Hyperactivity/Inattention	0.400 **
	Peer Relationship Problems	0.158 **
	Prosocial Behaviour	−0.130 **

Note: SDS = Smartphone Distraction Scale; SDQ = Strengths and Difficulties Questionnaire; IAT = Internet Addiction Test (total score). ** The correlation is significant at the 0.01 level (two-tailed).

5.3. Problematic Internet Users versus Control

Identification of Problematic and Control Group

Participants were differentiated based on the IAT scores as suggested by Young for the Internet use screening. Based on the proposed cut-off [44], the sample was composed of 12.6% (n = 85) normal, 64.5% (n = 437) middle, 22.5% (n = 152) moderate, and 0.3% (n = 2) severe users. To “extremise” the IA scores, participants belonging to the intermediate level (n = 437) were considered “social users”, therefore, they were excluded. Then, a subsample of 169 participants was formed: the 85 normal users were considered the control group (CG); while the problematic group (PG) was formed randomly by drawing 84 participants among those with moderate and severe levels of addiction. The CG and the PG were balanced by gender and age. CGs constituted 50.3% of the subsample (80.0% male, n = 68, and 20.0% female, n = 17) and PGs were 49.7% of the subsample (77.4% male, n = 65, and 22.6% female, n = 19).

The ANOVAs show the comparisons between sub-groups on SDS and SDQ subscales (Table 2). In contrast to CG, the PG was characterised by higher scores on SDS emotional regulation, attention impulsiveness, online vigilance, and multitasking and SDQ emotional problems, conduct problems, and hyperactivity/inattention, whereas lower SDQ prosocial behaviours.

Table 2. Comparisons of PG versus CG (ANOVAs; means and SDs are expressed in z points).

Variable	Mean (SD)		F	p
	CG	PG		
SDS	Emotion regulation	−0.196 (0.574)	0.158 (0.636)	13.982
	Attention impulsiveness	−0.201 (0.740)	0.160 (0.808)	8.863
	Online vigilance	−0.153 (0.652)	0.160 (0.697)	8.772
	Multitasking	−0.100 (0.535)	0.152 (0.584)	8.278
SDQ	Emotional problems	−0.594 (0.923)	0.101 (0.919)	24.120
	Conduct problems	−0.542 (0.834)	0.467 (1.239)	38.712
	Hyperactivity/inattention	−0.696 (0.848)	0.310 (0.987)	50.534
	Peer relationship problems	−0.222 (0.995)	0.338 (1.044)	12.730
	Prosocial behaviour	0.271 (0.954)	−0.313 (1.060)	14.193

Note: SDS = Smartphone Distraction Scale; SDQ: Strengths and Difficulties Questionnaire; CG = control group; PG = problematic group.

Table 3 presents the parameters of the binary logistic regression analysis. A significant effect of hyperactivity/inattention was identified for problematic online users ($\beta = 0.74$;

$p < 0.01$). This finding indicates that higher scores on the hyperactivity/inattention dimension elevate the probability of belonging to the problematic group (PG), whereas lower scores on the same dimension characterise the control group (CG). Regarding gender, there is a trend toward statistical significance, suggesting that males tend to belong to the problematic group.

Table 3. Regression coefficients (β) and relative statistics for IAT criterion variable.

Independent Variable		β	SE	Wald	df	p Value	Exp (β)
SDS	Emotion regulation	0.831	0.462	3.242	1	0.072	2.296
	Attention impulsiveness	0.001	0.620	0.000	1	0.998	1.001
	Online vigilance	−0.090	0.600	0.023	1	0.880	0.914
	Multitasking	−0.013	0.621	0.000	1	0.983	0.987
SDQ	Emotional problems	0.208	0.248	0.703	1	0.402	1.231
	Conduct problems	0.420	0.242	3.017	1	0.082	1.523
	Hyperactivity/inattention	0.745	0.242	9.490	1	0.002	2.107
	Peer relationship problems	0.179	0.216	0.685	1	0.408	1.196
	Prosocial behaviours	−0.187	0.221	0.720	1	0.396	0.829
Gender		−1.198	0.620	3.730	1	0.053	0.302
Constant		0.245	0.210	1.363	1	0.243	1.277

Note: SDS = Smartphone Distraction Scale; SDQ: Strengths and Difficulties Questionnaire; gender (dummy; 0 = male, 1 = female).

6. Discussion

The study had two main objectives: initially, to verify within an adolescents sample the structure of the SDS (Smartphone Distraction Scale) [25], a questionnaire designed to assess the cognitive-emotional processes involved in problematic smartphone use; secondly, to explore the associations between these cognitive-emotional processes, individual vulnerability factors (i.e., internalising/externalising problems), and elevated levels of Internet addiction (IA) among adolescents. As far as the authors know, no previous studies explored distraction dimensions, as operationalised in the SDS (i.e., emotion regulation, attention impulsiveness, online vigilance, and multitasking) among adolescents. Past studies revealed positive associations between these dimensions of smartphone distraction and problematic mobile use, fear of missing out (FOMO), metacognitions (e.g., advantages of smartphone use as a means to distract oneself from worries), and smartphone addiction among adult users [24,26]. Therefore, a noteworthy strength of the current study lies in its shift of focus towards adolescents, the generation characterised as both the most avid users of digital devices and the most susceptible to pathological involvement and addiction [6,15]. Consequently, recognising the cognitive-emotive and behavioural profile of adolescents potentially at risk of developing various forms of technology addiction becomes imperative for effective prevention and intervention strategies.

The findings provide empirical support for the four-factor dimensions of the Italian SDS when applied to adolescents. Throuvala and colleagues [25] originally developed the SDS with a sample of British university students, identifying 16 items organised into 4 subdimensions (i.e., emotional regulation, attention impulsiveness, online vigilance, and multitasking). In the Italian context, Mascia and colleagues [24] conducted a validation study with adult participants, affirming a four-factor structure identical to that of the original SDS. In our study, we implemented a factorial model, which yielded results consistent with the established structure prevalent in the existing literature. Consequently, while this result allows us to apply the SDS to the adolescent sample in our study, it also underscores the need for more targeted validation research within the adolescent demographic. This dual perspective emphasises the significance of both utilising the SDS in our current investigation and promoting further validation studies tailored to the unique characteristics of adolescent populations in the Italian context.

In accordance with the hypothesis, all SDS dimensions were found to be associated with higher levels of IA, thus substantiating the assertion that adolescents with problematic engagement in online activities exhibit elevated attention interruption (i.e., multitasking), cognitive–emotive preoccupation with the smartphone (i.e., online vigilance), and employ smartphone activities as a coping strategy to alleviate negative emotional states (i.e., emotion regulation). These findings align coherently with the developmental literature regarding the psychological functions of smartphones, such as online chatting, connecting with social media networks, and engaging in activities like gambling, among others, within the context of adolescence. Specifically, adolescents consistently access social media platforms to communicate with peers, share experiences, and receive emotional support, thereby expressing a sense of connection and belongingness [56]. This motivation propels them to engage in frequent online activities. Moreover, as elucidated by Griffiths [57], the habit of using social networking sites can be comprehended by considering the impact on users’ reward systems, which tends to be unpredictable and random. An illustrative example of a reward is the receipt of “Likes” from other users, contributing to an increased “desire for validation” and prompting repeated visits to check for appreciation on social platforms. Nevertheless, intensive use of social media is correlated with adolescents’ smartphone overuse [58], contemplation of social content [59], and apprehension about losing or being excluded from enjoyable online experiences (i.e., FOMO; [60]). Our results are consistent with the studies affirming that the social use of the Internet through smartphones represents a potent source of distraction among adolescents [61].

The utilisation of smartphone distraction as a strategy for emotion regulation is also found to be significantly correlated with adolescents’ IA. In this context, smartphone distraction serves to momentarily alleviate the distress and negative mood perceived by adolescents, yet it functions as a maladaptive coping strategy that perpetuates smartphone overuse. These findings align with prior research indicating the associations between adolescents internalising problems (such as anxiety or boredom) and excessive smartphone overuse [18,30,38]. Furthermore, Marino and colleagues [59] observed that emotional regulation predicts the usage of social networking sites among adolescents. It is noted that young individuals are inclined to spend increased time on social networking sites during periods of negative emotional states. The internet is often compulsively employed with the specific aim of “altering” mood, reflecting a pattern consistent with the present study’s observations.

In the context of this study, elevated levels of attentional impulsivity—manifested as an inability to focus attention or concentrate on a primary task—were found to be associated with IA. During adolescence, a diminished attentional control can be elucidated as a correlate of incomplete brain development, resulting in observed difficulties in various cognitive tasks, including selective attention, working memory, and inhibitory control [62]. Research affirms that adolescents’ immaturity in inhibitory control, self-regulation, and attentional control is linked to smartphone addiction, with higher rates of smartphone addiction observed among children and young people aged 10–20 compared to adults aged 21–30 [63]. Particularly noteworthy, the findings from the current study contribute to existing research on the role of impulsivity [29], in conjunction with disinhibition and susceptibility to boredom (or sensation seeking [39]) as a vulnerability factor for problematic smartphone use during adolescence.

In summary, the outcomes of the current study not only endorse the expansion of the application of Throuvala’s theoretical framework to a younger demographic of smartphone users but also endeavour to delineate a profile of individuals exhibiting problematic usage patterns. Participants of this study were community adolescents living in a hyper-connected world where the use of technological devices is pervasive, therefore a boundary between normal and problematic Internet use is very “fuzzy” [64,65]. However, due the explorative scope of this study, participants who differ with respect to levels of online engagement (lower vs. problematic) were identified according to Young’s screening criteria [44]. Following the identification of non-problematic (lower) users and those manifesting

problematic levels on IAT scores, a comparative analysis of smartphone distraction dimensions and internalising/externalising symptoms was conducted across the two groups. Adolescents categorised within the problematic usage group reported more elevated levels in all dimensions of smartphone distraction, along with heightened emotional issues (e.g., anxiety, negative mood) and disruptive problems (e.g., hyperactivity/inattention and conduct/interpersonal problems). These findings contribute to the existing body of literature elucidating the association between internalising/externalising problems and problematic smartphone use during adolescence [21,41].

However, the paramount outcome of the current study lies in the identification of heightened levels of hyperactivity/inattention as a precursor to IA. These findings are in line with studies underscoring the pivotal role of impulsivity, a core symptom of ADHD, and sensitivity to rewards in the development of IA, including smartphone addiction, social media addiction, and gambling [10,66]. Adolescents exhibiting ADHD traits, particularly those with deficiencies in inhibition and cognitive control [10], may find smartphone activities exceptionally appealing, given the ability to seamlessly switch between multiple functions, respond rapidly, and receive immediate rewards. Additional studies emphasize emotional dysregulation, characterised by an inability to effectively regulate aroused emotions and the stimulation of positive affective states among individuals with ADHD [63]. These findings collectively suggest that emotional dysregulation may contribute to problematic smartphone use among individuals with ADHD.

Collectively, research corroborates the role of ADHD traits as predisposing factors for IA within non-clinical populations [40,67]. The neurodevelopmental nature of ADHD positions these traits at the extreme end of a continuum, where in a subclinical manifestation, they may also be present in the general population. Given the early onset of ADHD symptoms and the decreasing age at which individuals begin using smartphones, it is advisable to conduct further studies aimed at screening children who may be more susceptible to developing technology addiction.

Limitations

The findings of this study are subject to certain limitations that warrant consideration. Firstly, the results are derived from a convenience sample of high school students in a city in southern Italy; therefore, generalisability across the broader Italian youth population is constrained. Secondly, due to the self-reported nature of the data, the possibility of bias in reported online activities cannot be entirely dismissed. Future investigations incorporating objective assessment methods (as exemplified by Coyne and colleagues [68]) could offer a more comprehensive exploration of the associations between smartphone distraction and various online activities (e.g., watching movies, browsing social networking sites) engaged in by adolescents. Similarly, it would be worthwhile to delve into which specific online activities (e.g., shopping, social media networking) may induce higher levels of smartphone distraction. Thirdly, internalising and externalising symptoms were self-reported by participants using the Strengths and Difficulties Questionnaire (SDQ; [46]). Although the SDQ is a widely recognised screening scale and it was employed in studies on behavioural problems associated with adolescents' smartphone overuse (e.g., [21]), its selection aligns with the exploratory nature of the present study. However, future investigations with clinical samples could further explore the reciprocal influences between internalising factors (e.g., depression, anxiety, loneliness) or externalising disorders (e.g., ADHD) and the cognitive-emotive aspects of smartphone distraction. Specifically, the results of this study underscore the significance of high levels of hyperactivity/inattention symptoms compared to other individual characteristics (i.e., conduct problems, emotional issues, poor prosocial behaviours) in predicting Internet addiction (IA) among problematic smartphone users. Subsequent studies with clinical samples may elucidate how core symptoms of ADHD, such as impulsivity [15,69] or hyperactivity/inattention [10,67], contribute to distraction and smartphone overuse.

7. Conclusions

This study carries significant implications for clinical research, as well as for preventive and public health measures. A considerable proportion of adolescents exhibit a pronounced degree of Internet usage through their smartphones. Moreover, cognitive–emotive distraction processes that impede everyday functioning may come into play. As posited by Throuvala and colleagues [25], it is plausible that multiple dimensions simultaneously contribute to problematic Internet use, particularly through smartphones. For instance, a bored student (engaging in emotion regulation) may continually check their smartphone (manifesting online vigilance) while awaiting notifications, thereby interrupting the ongoing homework (engaging in multitasking). Nevertheless, individuals with problematic Internet use demonstrate elevated levels of smartphone distraction, and in the presence of heightened levels of hyperactivity/inattention, a vulnerability towards overusing the Internet via smartphones appears more probable. This holds particular relevance for clinical research objectives.

Moreover, the present study underscores the necessity of conducting screenings using comprehensive instruments (such as SDS and SDQ) to obtain increasingly precise information for subsequent interventions. While more thorough and structured validation studies with adolescents are imperative, the SDS could prove beneficial for screening and interventions within school populations [70]. It can be employed to instruct individuals on effective management of negative emotions, identification of external factors (e.g., notification cues) or internal conditions (i.e., thoughts or emotions) preceding Internet access, and the promotion of self-regulation in smartphone use. As empirically based evidence, a cognitive–behavioural intervention focusing on mindful attention, self-monitoring, and mood self-awareness demonstrated effectiveness in reducing smartphone distraction and daily smartphone usage among university students [71].

Hence, the present study contributes to comprehending Internet addiction as a complex, multidimensional phenomenon linked to various individual (such as impulsivity and emotional states) and contextual factors (including parenting or school learning activities) that play a role in the discomfort experienced by adolescents.

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Article

The Role of Smartphone Use in Sensory Processing: Differences Between Adolescents with ADHD and Typical Development

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Abstract: The use of smartphones is widespread among adolescents and can affect various cognitive processes. However, the effects of smartphone use on sensory processing, particularly among individuals with attention deficit hyperactivity disorder (ADHD), remain largely unknown. The present study investigated the relationship between smartphone use intensity and sensory processing in adolescents with typical development and those with ADHD. The sample included 184 adolescents aged 14 to 18 years ($M = 16.56$; $SD = \pm 1.87$), with 92 diagnosed with ADHD and 92 with typical development, matched for age, gender, and IQ. Participants completed a self-report questionnaire to measure smartphone use intensity, while sensory processing was assessed using the Adolescent Sensory Profile (ASP). The results revealed a significant association between the intensity of smartphone use and heightened sensory responses in adolescents with typical development. However, this relationship was not observed in participants with ADHD. These preliminary findings suggest that smartphone use may influence sensory processing differently depending on neurotypical development or the presence of ADHD, potentially contributing to the promotion or mitigation of sensory dysfunctions. Future studies are needed to further explore the mechanisms underlying these differences and to better understand the impact of digital technologies on sensory functioning.

Keywords: smartphone use; sensory processing; attention deficit hyperactivity disorder

1. Introduction

The daily lives of individuals are increasingly shaped using technological devices [1–3]. Among these, the smartphone is arguably the most widespread worldwide due to the numerous advantages it offers in terms of accessibility, convenience, and multi-functionality [4–6]. Its ability to combine communication, entertainment, information, and productivity into a single tool makes it extremely versatile and indispensable in daily life [7–9]. Although smartphone use provides numerous benefits, several studies have highlighted how excessive use is associated with a range of negative consequences on cognitive functioning [10–12]. Among these, a significant reduction in attention and concentration capacity is observed, as well as an increase in cognitive dependence for memory and information retrieval [13,14]. Prolonged screen exposure is correlated with a decline in sleep quality, which in turn impairs cognitive function [15,16]. Additionally, intensive device use is associated with impaired executive functioning, reduced ability to process complex information, and difficulties in problem-solving [17–20]. Despite the extensive debate on the cognitive effects of smartphone use, studies on the impact of these devices on sensory processing remain limited.

Sensory processing is the process by which the nervous system receives, interprets, and organizes information from the various senses [21–23]. This process allows the brain to transform sensory data into useful responses, enabling an individual to interpret and appropriately react to the surrounding environment, thereby influencing adaptation and overall well-being [24,25]. Dunn's model [26] describes the variability in sensory processing responsiveness through two continua: one related to the neurological threshold

and the other to behavioral self-regulation responses. The neurological threshold can be low (hyper-reactivity) or high (hypo-reactivity), while the behavioral responses can be passive (acceptance of stimuli) or active (management of stimuli). The interaction between these continua generates four sensory processing components: sensation seeking, sensory avoidance, sensory sensitivity, and low registration.

Sensation seeking refers to individuals with a high sensory threshold who seek intense experiences to stimulate their senses. Adolescents with this profile might become distracted by background noise, such as the hum of a fan or the sound of typing, while studying.

Sensory avoidance pertains to those who, despite having a low threshold, avoid intense stimuli to prevent overload. An adolescent who is sensitive to sensory overload might avoid crowded or noisy spaces to maintain comfort.

Sensory sensitivity refers to individuals with a low threshold who perceive even minimal stimuli intensely. Adolescents with this profile might become distracted by background noise, such as the hum of a fan or the sound of typing, while studying.

Finally, low registration involves individuals who do not readily notice stimuli, showing disinterest or distraction. An individual in this category may not notice important sensory stimuli, such as a ringing phone or people talking, even though these stimuli are noticeable to others (Table 1).

Table 1. Schematization of the Dunn’s model.

Neurological Threshold	Passive: Acceptance of Stimuli	Active: Management of Stimuli
Low (Hyper-reactivity)	Sensory Sensitivity: Highly responsive to even minimal stimuli.	Sensory Avoidance: Actively avoids intense stimuli to prevent overload.
High (Hypo-reactivity)	Low Registration: Disinterest or distraction, often missing stimuli.	Sensation Seeking: Actively seeks out intense sensory experiences to engage the senses.

These components influence the perception and reaction to different sensory modalities, including taste, smell, movement, vision, touch, and hearing [27].

Smartphones simultaneously stimulate multiple sensory channels, yet little is known about how this type of stimulation may alter sensory processing and impact adaptive responses, especially in young adolescents [28–30]. Some studies have highlighted how early exposure to digital media may interfere with sensory development, suggesting potential long-term effects [30–32]. Dadson et al. [33] emphasized the relationship between screen time and atypical sensory processing abilities in children. Tekeci et al. [34] underscored the importance of reducing screen time, including smartphone use, to prevent negative outcomes. Only Park and Chang [28] and Hong and Lee [29] have studied smartphone use in university students, finding it to be associated with difficulties in sensory processing, suggesting that intensive use of digital devices may also affect these abilities in younger individuals.

Furthermore, we are unaware of any studies that have investigated this relationship in a sample of individuals with neurocognitive disorders, such as attention deficit hyperactivity disorder (ADHD). ADHD is a clinical condition characterized by persistent and pervasive patterns of inattention, hyperactivity, and impulsivity, which can be categorized into three subtypes based on symptomatology: predominantly inattentive (ADHD-I), predominantly hyperactive/impulsive (ADHD-H), or combined (ADHD-C) [35]. As widely demonstrated in the literature, sensory component parameters are significantly higher in individuals with ADHD [36–39]. Moreover, several studies have highlighted that smartphone use is greater in individuals with ADHD compared to those with typical development [40–43]. However, the factors that may contribute to high smartphone use in ADHD are unclear. One possible explanation may stem from the sensory modulation theory [44], which conceptualizes digital devices as tools for sensory self-regulation. According to this theory, media devices are used to create sensory balance as follows: on one hand, they effectively stimulate the sensory system, and on the other, they offer the ability to modulate

the intensity of sensory input, allowing individuals to manage their perceptual experiences based on the context. This concept is particularly relevant for individuals with ADHD, who often seek more intense and engaging sensory experiences to compensate for the sensory regulation difficulties typical of their condition [45–47]. In the case of smartphone use, the device could offer adaptive solutions capable of meeting the diverse perceptual needs of individuals with ADHD.

The present study aims to explore how smartphone use may be associated with sensory processing in response to stimuli, examining potential differences and similarities in the impact of digital habits among adolescents with different developmental profiles. More specifically, the goal is to investigate the relationship between smartphone usage intensity and sensory processing in adolescents with typical development and those with ADHD. Based on the existing literature, it is expected that (a) adolescents with ADHD will exhibit higher values in the sensory component parameters compared to their typically developing peers; (b) smartphone use will be more intense in adolescents with ADHD than in those with typical development; and (c) among typically developing adolescents, higher smartphone use will be associated with higher values in sensory component parameters, while this relationship remains unclear for adolescents with ADHD. Considering sensory modulation theory [44], it is hypothesized that smartphone use may not have negative effects on sensory processing in individuals with ADHD, suggesting a potential regulatory function of digital device use within this population. In more detail, for individuals with a high sensory threshold, who tend to seek intense stimulation, the smartphone could provide visual, auditory, and tactile stimuli, helping maintain attention and motivation. For those with a low sensory threshold, the device could allow for the modulation of stimulus intensity, such as adjusting screen brightness or volume, thereby preventing sensory overload. Individuals with tendencies toward sensory avoidance might use the smartphone as a self-regulation tool, selecting more controllable and less intrusive stimuli. Finally, for those with low sensory registration, the notifications and vibrations of the device could stimulate attention, enhancing awareness and sensory engagement.

2. Materials and Methods

2.1. Participants

The participants were selected from an initial sample of 1421 adolescents, aged between 14 and 18 years ($M = 16.58$; $SD = \pm 1.86$), including 820 males and 601 females. All participants were Italian and attended public secondary schools in Sicily, a region in southern Italy. Each participant completed the Diagnostic Assessments by filling out the Adult Self-Report Scale (ASRS), which identified 104 participants with scores consistent with ADHD. Of these, 92 were subsequently confirmed as cases of ADHD after a thorough clinical evaluation through a psychological interview. Other potentially conflicting conditions were excluded based on normal scores on the ASRS (0 to 17), normal scores on the Raven Progressive Matrices, and a clinical interview. None of the participants had a history of brain injuries, epilepsy, psychosis, or anxiety disorders.

The control group was selected from the initial sample of 1421 participants who had obtained normal scores on the ASRS (0 to 17) and had no clinical disorders, as confirmed by a clinical interview. It consisted of 92 subjects matched to the ADHD group in terms of gender, age, and IQ, following the guidelines of Kover and Atwood [48], to ensure an adequate match between the two groups.

Descriptive statistics for each variable characterizing the final sample, consisting of 92 subjects with ADHD and 92 subjects with typical development, are presented in Table 2. Each group consisted of 57 males and 35 females; thus, there were no significant gender differences. Similarly, there were no significant differences in age ($t = 0.85$, $p = 0.12$) and intelligence ($t = 0.67$, $p = 0.33$) between the ADHD group and the typical development group. Symptoms of inattention and hyperactivity were significantly more prevalent in the ADHD group compared to the control group ($t = 36.01$, $p < 0.001$; $t = 31.12$, $p < 0.001$).

Table 2. Demographic characteristics of the sample.

	ADHD	Typical Development
N	92 (57m, 35f)	92 (57m, 35f)
Age (years)	16.61 (± 1.82)	16.58 (± 1.69)
IQ	108.97 (± 10.02)	110.35 (± 9.47)
Inattention	28.02 (± 3.54)	3.88 (± 3.61)
Hyperactivity	25.38 (± 5.13)	3.41 (± 3.20)

2.2. Procedure

The study was conducted in accordance with the principles of the Declaration of Helsinki. Each participant voluntarily agreed to participate, and informed consent was obtained from the parents or guardians of minor participants. Participants aged 18 or older provided their own consent before the study commenced. After completing the initial assessment phase, self-report questionnaires were administered. Specifically, the Adolescent Sensory Profile (ASP) was used to examine the sensory experiences of the adolescents, and the smartphone use questionnaire was used to assess the intensity of smartphone usage. All tests were administered in a quiet room during school hours in the morning to ensure standardized conditions and minimize variables that could influence the results.

2.3. Measurement

2.3.1. Diagnostic Assessments

For the assessment of symptoms of inattention, hyperactivity, and impulsivity related to ADHD, in accordance with the diagnostic criteria of the DSM-V [35], the Adult Self-Report Scale [49–51] was used. This scale consists of 18 items evaluates the core symptoms of ADHD, which are divided into two dimensions: inattention and hyperactivity/impulsivity. Responses are given on a 5-point Likert scale, ranging from 0 (never) to 4 (very often). The ASRS has demonstrated good psychometric properties, with validity and reliability supported by studies conducted both on clinical samples and general populations [52,53]. The internal consistency, measured by Cronbach's alpha coefficient, showed a value of $\alpha = 0.88$ [54]. Furthermore, the Italian version of the scale was translated and validated by Somma et al. [55]. In addition, Adler et al. [56] confirmed that the symptom checklists used in the ASRS are internally consistent self-assessment tools for the diagnosis of ADHD even in adolescence.

For the assessment of cognitive abilities, Raven's progressive matrices [57,58] were used. This tool is widely used in psychology, education, and professional settings to measure fluid intelligence, which represents the ability for abstract reasoning, problem-solving, and adapting to new situations. It is based on a series of incomplete visual patterns, where the task is to complete each pattern by selecting from the proposed options the one that correctly completes the logical sequence. The standard version contains a sequence of 60 problems, divided into 5 sets (A, B, C, D, E), with increasing difficulty.

To confirm the diagnosis of ADHD, exclude the presence of other disorders in the ADHD group, and verify the absence of clinical conditions in the control group, a clinical interview was conducted based on the DSM-5 guidelines [35]. The interview, lasting approximately one hour, explored various aspects related to general health, daily functioning, and academic performance, as well as difficulties associated with ADHD [59–61]. Participants were encouraged to express themselves freely in their own words, and when necessary, prompts were used to elicit more detailed responses. Behavioral observations during the interview contributed to the assessment of symptoms and supported the formulation of the diagnoses.

2.3.2. Smartphone Use Questionnaire

To assess the intensity of smartphone use, a questionnaire consisting of 6 items was adapted from Lee et al. [62]. Participants were asked to respond by indicating the frequency

with which certain behaviors occurred, using a 4-point Likert scale. To ensure the reliability of the questionnaire, an internal consistency analysis was conducted, which yielded a Cronbach's α value of 0.87, indicating good consistency among the items. Table 3 presents the full smartphone use questionnaire, including the item descriptions and response options.

Table 3. Smartphone use questionnaire.

1. How much time per day do you spend using smartphone *	☐ 1 ☐ 2 ☐ 3 ☐ 4
2. I feel lost without my smartphone	☐ 1 ☐ 2 ☐ 3 ☐ 4
3. I spend more time on my smartphone than I intend to	☐ 1 ☐ 2 ☐ 3 ☐ 4
4. I check my smartphone frequently throughout the day	☐ 1 ☐ 2 ☐ 3 ☐ 4
5. I use my smartphone during meals or other social events	☐ 1 ☐ 2 ☐ 3 ☐ 4
6. I have trouble putting my smartphone down, even when I know I should	☐ 1 ☐ 2 ☐ 3 ☐ 4

* 1 (never–1 h per day), 2 (2–6 h per day), 3 (7–11 h per day), 4 (more than 12–per day).

2.3.3. Adolescent Sensory Profile

The Adolescent Sensory Profile (ASP) is a diagnostic tool based on Dunn's [26] sensory processing model, used to assess how individuals perceive, interpret, and respond to sensory stimuli from their environment. The model includes four sensory components, which result from the interaction between sensory thresholds and reactivity to stimuli, arranged along a continuum [63]. The extreme points of each scale give rise to four distinct quadrants. Specifically, the low registration quadrant represents a high threshold accompanied by a passive response, while sensation seeking corresponds to a high threshold with an active response to stimuli. In contrast, sensory sensitivity is associated with low thresholds, with a passive response, while sensation avoiding is the quadrant representing low thresholds with an active response. Specifically, sensory avoiding and sensation seeking are distinguished by their active responses to stimuli; while the former focuses on avoiding sensory overload, the latter involves actively seeking out intense sensory experiences. The sensory profile also includes six fundamental sensory modalities that cover various aspects of sensory experience: taste and smell, movement, vision, touch, activity level, and auditory processing. Together, the components and modalities provide a comprehensive overview of the different sensory responses. The questionnaire consists of 60 items, with a 5-point Likert scale response format (from 1 = almost never to 5 = almost always). In the current study, the Cronbach's Alpha values calculated for each sensory component and modality of the questionnaire reflect good internal consistency. For the sensory components, the alpha coefficients were 0.81 for low registration, 0.78 for sensation seeking, 0.84 for sensory sensitivity, and 0.89 for sensation avoiding.

2.4. Statistical Analysis

The statistical analysis was conducted using SPSS software version 26.0 (SPSS Inc., Chicago, IL, USA). The measured parameters included sensory profile components (low registration, sensation seeking, sensory sensitivity, and sensation avoiding) and the intensity of smartphone use across each experimental condition (ADHD participants and typically developing participants).

To address the first hypothesis, a 2 (Group: ADHD, typical development) $\times$ 4 (sensory quadrant: low registration, sensation seeking, sensory sensitivity, sensation avoiding) repeated-measures analysis of variance (ANOVA) was performed to evaluate differences in sensory processing profiles between adolescents with ADHD and those with typical development. Sensory quadrant scores were treated as the within-subjects factor, while group membership served as the between-subjects factor. Mauchly's test confirmed that the assumption of sphericity was met, $\chi^2(5) = 4.89$, $p > 0.05$. For the second hypothesis, an independent-samples t-test was conducted to compare the smartphone use intensity between the ADHD and typical development groups. To address the third hypothesis, Pearson correlation analyses were conducted separately for the typical development and ADHD groups to examine the relationship between smartphone use and the different

components of sensory processing dysfunction. For all tests, the significance level was set at $p < 0.05$.

3. Results

Table 4 presents the means and standard deviations for each of the sensory profile components in the two groups of participants with ADHD and typical development.

Table 4. Descriptive statistics of sensory profile components and smartphone use intensity.

	ADHD	Typical Development
Sensory profile components		
Low Registration	2.84 (± 0.37)	1.98 (± 0.39)
Sensory Sensitivity	3.14 (± 0.71)	2.13 (± 0.69)
Sensation Seeking	3.13 (± 0.69)	2.11 (± 0.74)
Sensation Avoiding	3.09 (± 0.23)	2.15 (± 0.66)
Smartphone use intensity	15.95 (± 3.52)	10.88 (± 2.88)

The first hypothesis predicted differences in the sensory profile quadrants between the ADHD and typical development groups. The analysis revealed a significant main effect of group, $F(1, 182) = 27.12$, $p < 0.001$, $\eta^2 = 0.13$, indicating that participants with ADHD exhibited significantly higher levels across all sensory quadrants compared to the typical development group. A significant main effect of the sensory quadrant was also observed, $F(3, 546) = 22.43$, $p < 0.001$, $\eta^2 = 0.11$, suggesting variability among the different quadrants. Specifically, the first sensory component, low registration, showed a significantly lower mean compared to the other quadrants ($t = 2.88$, $p < 0.05$; $t = 2.31$, $p < 0.001$; $t = 2.95$, $p < 0.01$). This means that both ADHD and TD participants scored lower in low registration and exhibited a reduced sensitivity to sensory stimuli compared to the other quadrants (sensation avoiding, sensation seeking, and sensory sensitivity). Furthermore, no significant interaction was found between group and sensory quadrant, $F(3, 546) = 1.07$, $p = 0.36$, $\eta^2 = 0.09$, indicating that participants with ADHD consistently scored higher across the various quadrants. Post hoc analyses using Bonferroni correction confirmed that adolescents with ADHD scored significantly higher in low registration, sensory sensitivity, sensation seeking, and sensation avoiding compared to the typical development group ($ps < 0.0125$).

Regarding Hypothesis 2, which posited differences in smartphone use intensity between the ADHD and typical development groups, the results of the independent-samples t-test indicated a significant difference, $t(182) = 12.3$, $p < 0.001$, $d = 0.78$. Adolescents with ADHD ($M = 15.95$, $SD = 3.52$) showed significantly more smartphone use intensity compared to the typical development group ($M = 10.88$, $SD = 2.88$).

With reference to the correlation between smartphone use intensity and difficulty in managing sensory stimuli, for the typical development group, the results showed a significant positive, as evidenced by the significant correlations between smartphone use and sensory processing across all sensory components: $r = 0.370$, $p < 0.01$; $r = 0.340$, $p < 0.01$; $r = 0.443$, $p < 0.001$; $r = 0.325$, $p < 0.01$ (Figure 1). This suggests that greater smartphone use is associated with increased difficulties in sensory processing, indicating that adolescents with typical development may experience sensory overload due to intense device interaction.

In the ADHD group, no significant correlation was found between smartphone use intensity and sensory processing across all sensory components: $r = 0.055$, $p = 0.65$; $r = -0.230$, $p = 0.06$; $r = -0.099$, $p = 0.42$; $r = -0.109$, $p = 0.37$ (Figure 2). This suggests that smartphone use does not have a significant impact on sensory processing in adolescents with ADHD, indicating that there may not be a direct relationship between device use and sensory difficulties in this population. It is possible that for adolescents with ADHD, smartphones may serve as a self-regulation tool, helping to modulate sensory input rather than causing overload, as seen in the typical development group.

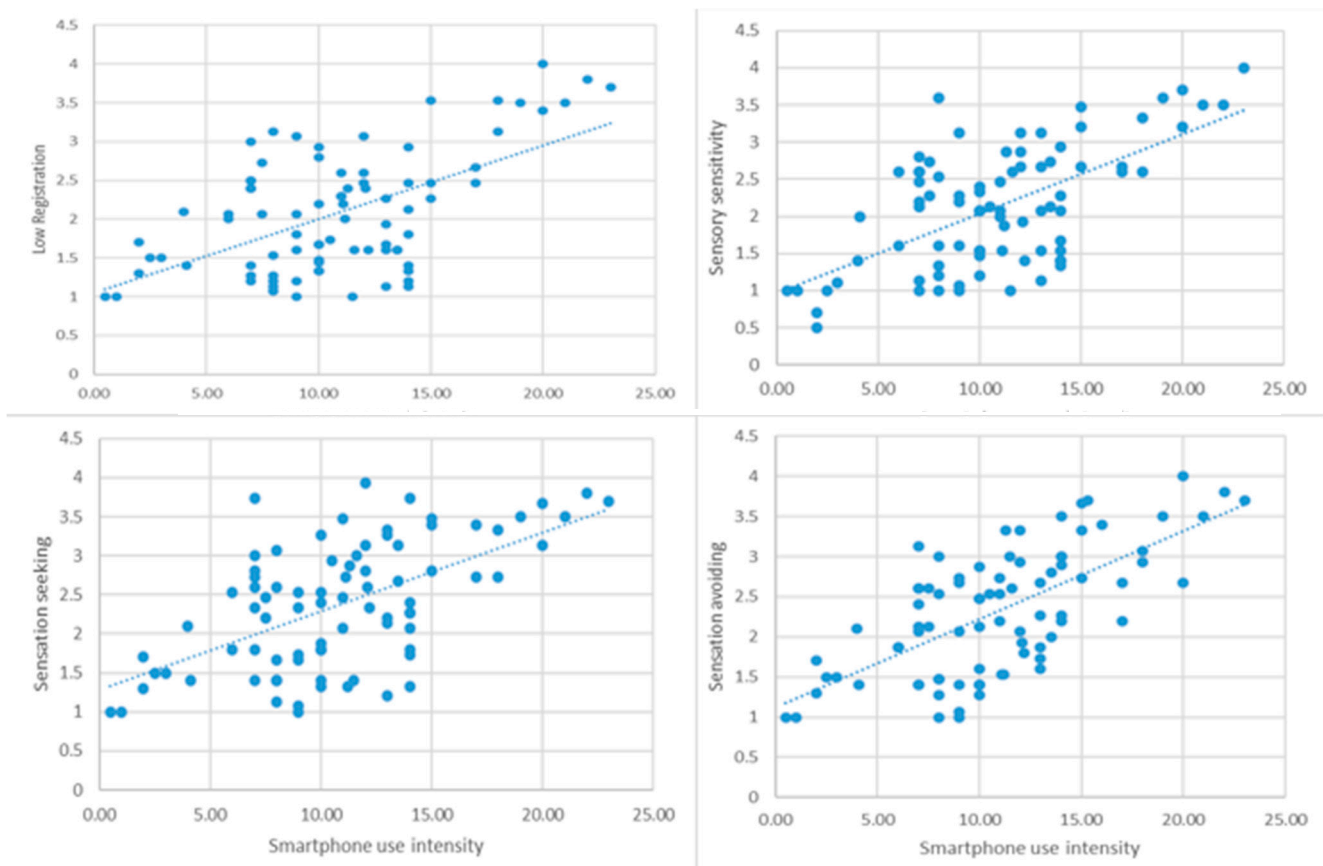


Figure 1. Correlation between smartphone use intensity and the four components of sensory processing in typical development group.

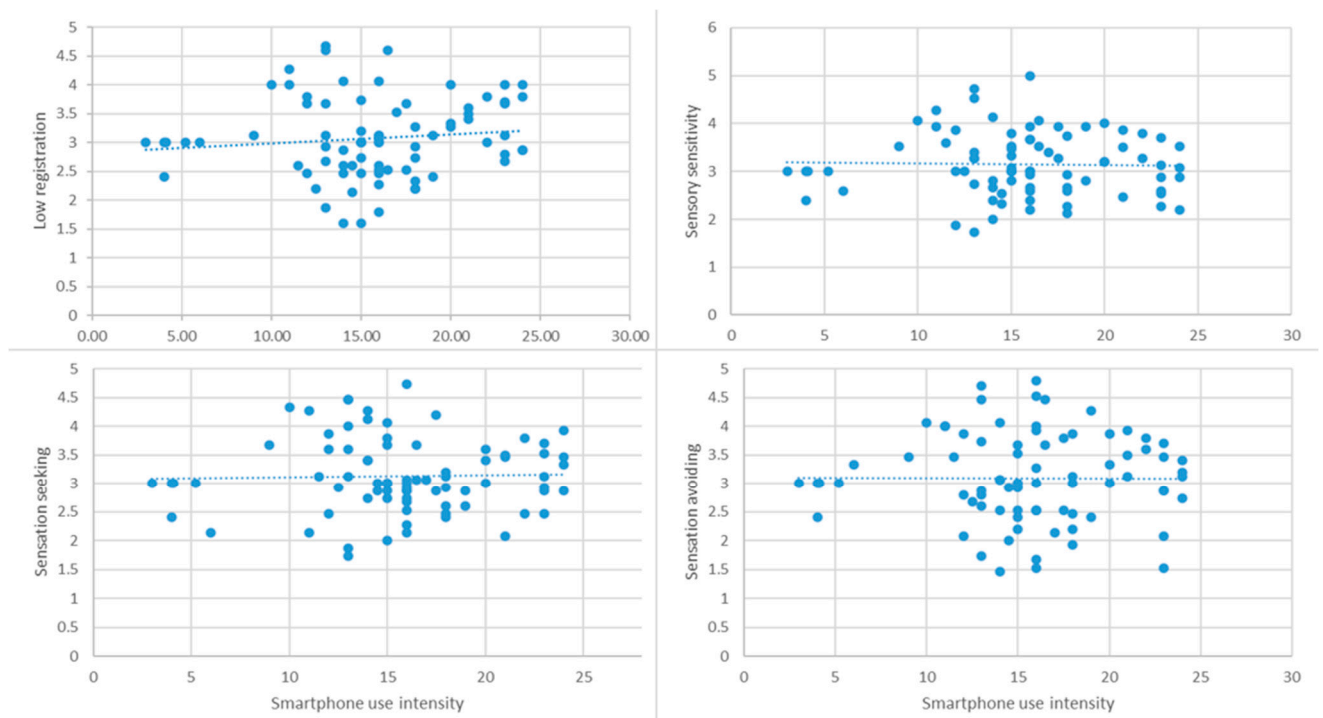


Figure 2. Correlation between smartphone use intensity and the four components of sensory processing in ADHD group.

4. Discussion

The present study explored the relationship between smartphone usage intensity and sensory processing in adolescents with typical development and those with ADHD. The first objective was to examine differences in sensory profiles between the two groups, and the results revealed that adolescents with ADHD scored significantly higher in all components of the sensory profile (low registration, sensory sensitivity, sensation seeking, and sensation avoiding) compared to their typically developing peers. These findings were expected and are consistent with the existing literature, which describes individuals with ADHD as having greater difficulty in sensory processing [64–66]. According to Dunn's sensory processing model [26], individuals with ADHD tend to exhibit more intense and less adaptive responses to sensory stimuli, likely due to a reduced ability to filter sensory information and a less efficient self-regulation system [67–69].

The second hypothesis of the study concerned the intensity of smartphone use in the two groups. The results obtained support the notion that adolescents with ADHD make more intensive use of the smartphone compared to their typically developing peers. This finding aligns with several studies linking ADHD to greater smartphone dependence, likely associated with characteristics such as stimulus-seeking behavior, difficulties in regulating impulsivity, and a tendency to prefer activities that offer rapid and immediate gratification [70–72].

The most innovative aspect of this study lies in the analysis of differences in the relationship between smartphone use and sensory difficulties across the two groups. Among typically developing individuals, a positive correlation was observed between the intensity of smartphone use and sensory difficulties, suggesting that prolonged smartphone use may contribute to sensory overload, resulting in challenges in stimulus regulation. Prolonged exposure to digital stimuli may interfere with sensory self-regulation processes, leading to less adaptive responses to stimuli in the physical environment [73–75]. These findings align with concerns raised in recent studies linking intensive smartphone use to issues of sensory dysregulation and reduced capacity to process external stimuli [76,77]. In contrast, among participants with ADHD, no statistically significant correlation was found between smartphone use intensity and sensory difficulties. This finding may suggest that the use of digital devices does not exacerbate pre-existing sensory issues in these individuals, but rather may serve as a self-regulation tool, allowing them to achieve sensory balance through a controllable and predictable medium [78,79]. The sensory modulation theory proposed by Harrison et al. [44] provides an explanation for this dynamic, suggesting that adolescents with ADHD may use smartphones as a kind of safe space that enables them to modulate their sensory experiences within a context they perceive as comfortable and under control.

Moreover, it is possible that in individuals without ADHD, smartphone use may assist with self-regulation, particularly among those who already exhibit higher sensory profile scores. These individuals may have heightened sensory sensitivity or a lower threshold for sensory input, making them more prone to sensory overload. In such cases, for them as well, smartphones could provide a means of controlling or moderating sensory experiences. For example, adjusting screen brightness, controlling notifications, or choosing specific apps and content could help these individuals manage the intensity of stimuli they encounter throughout the day. Thus, while excessive smartphone use may exacerbate sensory difficulties for some typical development individual, for others, it may function as a tool for regulating sensory input, potentially helping to maintain focus, prevent overstimulation, and facilitate emotional balance. This suggests that smartphone use may serve as a compensatory mechanism, helping individuals with higher sensory sensitivity to better navigate their sensory environment rather than contributing to further sensory overload.

This study represents the first attempt to compare the association between smartphone use and sensory processing in adolescents with typical development and those with ADHD. It contributes to the existing literature by highlighting the importance of considering the

different impacts of digital device use according to the sensory profiles and self-regulation strategies characteristic of each group.

This study has several limitations, including the cross-sectional nature of its design, which prevents drawing causal conclusions about the effect of smartphone use on sensory processing and limits the ability to observe changes over time or explore causal dynamics. Another important limitation concerns the characteristics of the sample, which consisted exclusively of Italian adolescents attending public secondary schools in Sicily. While this provided a homogeneous group for the initial exploration of our research questions, it restricts the generalizability of the findings to adolescents from other cultural, socio-economic, or geographical contexts. Future research should aim to replicate these findings using more diverse samples, including participants from different regions, cultural backgrounds, and socio-economic conditions, to enhance the representativeness and applicability of the results.

The measurement of smartphone use intensity via self-reporting is another critical point. Although the questionnaire used was adapted from validated measures in the literature and demonstrated good internal consistency (Cronbach's $\alpha = 0.87$), self-reported data may be subject to response bias, potentially affecting the accuracy of the results. Future research should aim to integrate objective tools, such as passive monitoring apps, which could provide a more precise and reliable assessment of smartphone usage in terms of time and frequency. These tools should also be further validated within ADHD populations to enhance their applicability and utility in this area of research. Moreover, this study also did not differentiate between specific types of smartphone usage, such as usage for academic purposes (e.g., homework) versus recreational activities (e.g., entertainment). It is possible that these different types of usage have distinct impacts on sensory processing in adolescents with ADHD. Future research should investigate this variable to provide a more nuanced understanding of the relationships between smartphone use and sensory processing, allowing for tailored interventions and recommendations.

In future research, it would be valuable to replicate these findings with a larger sample and include different age groups to assess the generalizability of the observed associations between smartphone use and sensory processing in adolescents with ADHD compared to their typically developing peers. This study highlights interesting correlations based on essentially quantitative data. However, it would be valuable to examine the types of smartphone use; say, for example, an adolescent using it for homework versus one using it for online gaming. Further longitudinal studies could provide a deeper understanding of the temporal dynamics between smartphone use and sensory responses, allowing for the assessment of causal effects and the direction of observed associations. Finally, the use of objective measurements—such as the passive monitoring of usage time and physiological responses, combined with the inclusion of mediating variables such as stress levels, sleep quality, and social skills—could enhance our understanding of the mechanisms underlying the relationship between digital device use and sensory processes. This integrated approach would help clarify the role of smartphones in sensory self-regulation processes, paving the way for targeted interventions to manage digital device use in response to the specific needs of adolescents with ADHD.

5. Conclusions

The current evidence suggests important clinical and educational implications, particularly for adolescents with ADHD and their interactions with smartphone use and sensory processing. While intensive smartphone use is associated with increased sensory processing difficulties in adolescents with typical development, this correlation is not observed in adolescents with ADHD. This may indicate that individuals with ADHD already have a higher baseline of sensory processing, which may leave less room for significant changes as a result of smartphone use. Rather than interpreting this lack of correlation as evidence of a regulatory role for smartphones in ADHD, it is important to consider that the high

baseline levels of sensory processing in individuals with ADHD may limit the potential effects of smartphone use.

Thus, a more nuanced approach to smartphone use and sensory processing in ADHD is necessary. While controlled smartphone use may offer benefits in some cases, such as managing sensory overload, this relationship may not be universal or as straightforward as previously assumed. It is crucial to adopt individualized strategies that consider the unique sensory processing profiles of adolescents with ADHD.

In educational and therapeutic contexts, these findings suggest that rather than focusing solely on the amount of screen time, attention should be given to how smartphone use interacts with individual sensory processing profiles. Mindful use, tailored to the sensory needs of each adolescent, could potentially offer a more effective approach. Overall, these results highlight the importance of considering multiple factors when integrating digital technologies into the daily lives of adolescents with ADHD, without overemphasizing their role in self-regulation processes.

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Article

The Mediating Role of Procrastination in the Relationship between Fear of Missing Out and Internet Addiction in University Students

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Abstract: This study aims to examine the potential mediating role of procrastination in the relationship between fear of missing out and internet addiction. Employing a cross-sectional research design, this study utilized a paper–pencil form to collect data from 315 students (65.4% undergraduate and 66.3% females) between 18 and 32 ($M = 22.43$; $SD = 3.81$) studying at a state university in Türkiye. Data were collected through the convenience sampling method. The study was designed as a survey model. This design was tested via mediation analysis. The participants completed self-report assessments using the Fear of Missing Out Scale (FoMOs), General Procrastination Scale (GPS-9), and Young Internet Addiction Scale (short form). The findings showed that FoMO had a significant positive direct effect on both procrastination ($R^2 = 0.13$) and internet addiction ($R^2 = 0.33$). Procrastination also had a significant positive direct effect on internet addiction ($R^2 = 0.34$). Additionally, procrastination mediated the relationship between the fear of missing out and internet addiction ($\beta = 0.156$, $p < 0.001$). These findings not only extend the scope of existing research but also hold practical implications for the development of sustainable interventions. It is believed that the findings will contribute to the consideration of procrastination when preparing psychoeducation or group guidance programs for internet addiction. These interventions can effectively address the process through which fear of missing out leads to internet addiction by considering the significant role of procrastination in students. Findings typically suggest that procrastination behavior is a key factor in explaining the association between FoMO and internet addiction.

Keywords: fear of missing out; internet addiction; procrastination; university students

1. Introduction

The increasing use of the internet around the world has brought about a number of positive impacts, including increased access to information and educational opportunities and the development of global communication [1]. As of June 2021, the internet penetration rate across the world had climbed to 67.9%, which is approximately 1392% higher than the rate during the last two decades [2]. This increasing rate causes certain problems, such as online security problems and privacy concerns, and especially internet addiction, to emerge more frequently [3]. In addition, the widespread use of electronic devices that provide access to the internet has aroused interest in studies on the impacts of internet use on individuals [4,5]. Due to the widespread use of the internet, constant interaction,

notably through social media platforms, has become an important factor that can deepen individuals' fear of missing out (FoMO).

FoMO is defined as a pervasive concern that others may have rewarding experiences in the absence of oneself [6]. Students' FoMO has led them to use the internet more intensively [7]. Students experiencing FoMO may exhibit behaviors that are likely to pose a risk of addiction due to constantly checking social media with the desire to see what others are doing and to have the same experiences as them [8]. It has been stated that the internet and social media have a large role in FoMO becoming a widespread concern among individuals [9]. Therefore, the internet is considered to be a good distraction and a facilitator of procrastination [10]. In this respect, it can be said that FoMO plays a vital role as a factor that is likely to trigger internet addiction among students along with the increase in the use of the internet.

Internet addiction is characterized by behaviors associated with the use of the internet in an uncontrolled way [4]. As a result, it may lead to problems in individuals' functionality of their daily routines. According to the related literature, in certain studies on internet addiction, the excessive use of the internet has been associated with procrastination behaviors, which is related to pedagogical problems [11–14]. Procrastination behavior is viewed as the tendency to postpone or avoid decisions and tasks to the extent that they cause negative consequences [11]. According to Gong et al., procrastination affects internet addiction [15]. This may lead individuals with a tendency to procrastinate to exhibit behaviors that may increase the risk of addiction due to the use of the internet as an escape mechanism. FoMO, on the other hand, is likely to prevent individuals from using their time efficiently, causing them to postpone their tasks [16]. In this regard, it has been acknowledged that there is a complex relationship between FoMO, internet addiction, and procrastination behavior. To this end, the research provides a framework for understanding the relationship between FoMO, internet addiction, and procrastination behavior.

1.1. Fear of Missing Out

Fear of missing out (FoMO) is a term used to denote the view that when individuals grapple with the feeling that they are missing out, they experience a common concern that other people may be having fun in their absence and a desire for obligation for following what other people are doing [6,17]. FoMO was first conceptualized in the literature as a field of psychopathology since it is associated with the anxiety caused by perceived anxiety related to psychosocial need deficits, such as the need to belong and socialize [8,18]. Although the term was first conceptualized in an offline or real-world context, it has also been dealt with in terms of social media use [6]. Researchers in this field also emphasize that the impact of FoMO on the lives of individuals needs to be further investigated [8,19].

FoMO may exert significant pressure on the internal state of the individual. This pressure can influence individuals' lives by encouraging them to stay continually connected with the information that is constantly being shared through social media [8,20]. In this respect, it has been revealed that the increase in the use of social media triggers the anxiety of users to socialize and to fall behind the new experiences and opportunities [6,21]. The authors defined this term in their previous studies as 'others might be having rewarding experiences from which one is absent'. In addition, with the increased interest in social media, it has been observed that FoMO has gained more power and, therefore, the feeling that individuals' own lives are incomplete has been mediated more easily than ever before [9]. An experimental analysis of the effect of FoMO on individuals found that of all participants who sat with or without a mobile phone in a room alone, the ones without mobile phones experienced a higher level of anxiety during a seven-minute waiting period [22]. Numerous experimental studies in this field similarly prove that FoMO may lead to the overuse of social media [6].

1.2. Internet Addiction

Healthy internet use refers to the use of the internet for a specific purpose at an appropriate time, without any cognitive or behavioral impairment [23]. However, problematic internet use can be defined as the individuals' inability to control the continuous use of the internet due to problems such as family and work experiences [24]. It can be said that the number of problematic internet users is high nowadays [25]. In the related literature, researchers have described this as 'Internet addiction' [26,27], 'pathological Internet use' [28,29], and 'problematic Internet use' [30–32].

Internet addiction is defined as the loss of control over the use of the internet by individuals, and it is stated that this addiction leads to various problems and social incompatibilities in the daily lives of individuals [4,33]. Even though the ease of access to information is seen as an advantage of internet use, researchers have often found that excessive internet usage causes internet addiction, yielding negative outcomes in terms of individuals' personal, financial, and professional lives [4]. There is a growing body of literature studying the addictive use of the internet and the factors resulting in internet addiction [34–39].

The fact that the internet allows a person to easily communicate with other people without assuming any responsibility by hiding one's identity poses a significant risk for addiction [40,41]. Moreover, through the digital transformations that have occurred globally in recent years, individuals use the internet more frequently [42]. As a result, the internet has become a medium that puts many people at risk of developing a behavioral addiction. Additionally, it has been stated that the risk of developing a behavioral addiction is higher during adolescence compared to other age groups [43,44]. Students are one of the main groups most subjected to this addictive impact of the internet [13]. Many studies show that in most countries, students spend more than two hours a day on the internet [45–47]. This intensive use of the internet also has several negative outcomes [13]. Compared to the students who use the internet in a controlled way, the ones using the internet intensively have certain difficulties in their academic performance and daily routines [48]. Nevertheless, the effects of these difficulties may vary depending on how and for what purposes students use the internet, as well as how much control they have in terms of the amount of time they use the internet [49,50].

1.3. Procrastination Behaviour

Individuals occasionally tend to procrastinate in their daily lives, and this happens in a way that the individual focuses on other things instead of a task that needs to be performed immediately or leaves the task for a while [10]. Postponed tasks are often perceived by individuals as less urgent or less enjoyable, and individuals are likely to gravitate towards activities that provide instant gratification or that seem more appealing [51].

There is an accumulated body of literature on the approach in which procrastination behavior and personality traits are evaluated together, suggesting that there is a correlation between procrastination behavior and personality traits of the individual [52]. This approach asserts that personality traits such as extraversion, low conscientiousness, and external locus of control are associated with a tendency to procrastinate [53]. Situational procrastination is a behavior that occurs under the influence of internal or external factors. According to this approach, individuals may be prone to procrastinating as those tasks offer less fun or unpleasant experiences for them [54]. Said differently, provided that a task becomes too difficult or boring, it will be perceived as unpleasant by individuals and avoided as a result. In the same vein, when an individual experiences anxiety as a result of an assessment, s/he feels a lack of control over completing a task, and procrastination behavior may occur [55]. Furthermore, it has been alleged that procrastination is indirectly related to time management issues [10]. It has been observed that those who procrastinate often know exactly what they need to do, yet they postpone this task. The frequent and uncontrolled continuation of procrastination behavior may also adversely affect the functionality of the person in their daily routines [56]. Accumulating evidence provides support

for the fact that procrastination is linked to lower performance and negative business outcomes [53]. These behaviors might increase the stress levels of individuals who have the habit of procrastinating and negatively influence their productivity [57].

1.4. The Effect of FoMO on Internet Addiction

People with high levels of FoMO constantly ask to stay connected with others and keep track of what others are doing [6]. As a platform that allows users to be in constant communication with their peer groups, social media may offer an outlet for individuals to reduce their FoMO levels [8].

Many studies have been conducted to explore the relationship between FoMO and internet addiction [6,19,58]. Studies examining the relationship between the two concepts often address the effect of the use of the internet and social media on FoMO. In [59], the authors carried out a study revealing that internet use increased FoMO and posited that the internet was likely to trigger FoMO in individuals by constantly providing the opportunity to see the activities and experiences of others through social media platforms and other online communication tools. On the contrary, it should be noted that the relationship between FoMO and internet use is bidirectional. In other words, while internet use increases FoMO, FoMO can also lead individuals to greater levels of internet use [19]. This situation can be witnessed in a way that individuals are consistently checking social media and participating in online interactions due to the fear of missing out on the activities of others [60]. Findings from various research fields have indicated that FoMO is associated with internet addiction, including smartphones, social media, and games. In [61,62], the authors concluded that there was a significant relationship between high levels of FoMO and internet addiction.

1.5. The Mediating Role of Procrastination

In the literature, there is a growing number of studies suggesting that there is a robust relationship between FoMO and procrastination [16,63,64]. Individuals with FoMO feel the need to constantly check and participate in social media for FoMO on other people's social activities [6]. This can trigger procrastination behavior by preventing them from diverting their time and attention to other things [65]. In this context, FoMO can lead individuals to postpone tasks that need to be fulfilled [63]. Further research on this topic is thought to provide a deeper insight into the relationship between FoMO and procrastination behavior.

Considering the prevalence of the internet nowadays, internet-based tools are also the most accessible tools for procrastination [51]. Individuals can carry out activities such as maintaining social relationships, communicating with friends, receiving new information, or accessing entertaining content through the internet. These activities may lead individuals to postpone their tasks by offering instant gratification [66]. There are also studies in the literature that argue that there is no significant relationship between procrastination and internet addiction [67,68]. However, several current studies confirm the robust relationship between internet use and procrastination [42,44,69]. In a study by Lavoie and Pychyl [51] examining the associations between internet addiction and procrastination, it was reported that more than half of the participants frequently procrastinated due to the internet. Likewise, Davis et al. noted that procrastination was conceptualized as a key aspect of problematic internet use [30]. Viewed from this perspective, it is stated that there is a positive relationship between procrastination and problematic internet use [13]. Although comprehensive studies have been conducted to investigate this topic in Europe and the United States, little has been said about these concepts in Türkiye. In light of the preceding discussion, the present study is devoted to exploring the linear relationship between FoMO and internet addiction by considering procrastination as the mediating variable.

1.6. Present Study

This study seeks to address an important research gap in the existing literature by investigating the relationship between FoMO, procrastination, and internet addiction

among Turkish young adults. While prior research has explored individual aspects of these phenomena, there remains a distinct lack of understanding regarding how FoMO may contribute to internet addiction and the potential mediating role of procrastination in this relationship. This study aims to fill this knowledge deficiency by employing a regression-based mediation analysis approach [70] to test the mediating role of procrastination in the relationship between FoMO and internet addiction. The findings are anticipated to present scientific evidence about the underlying mechanism between FoMO, procrastination, and internet addiction, providing a foundation for more targeted interventions and strategies to address these issues among the young adult population. The hypotheses tested within the scope of the research were as follows:

H₁. *FoMO would have a significant positive effect on both procrastination and internet addiction. That is, individuals with FoMO are expected to exhibit procrastination behavior, and at the same time, these individuals are expected to view the internet as an escape area and exhibit behaviors that may pose a risk of addiction.*

H₂. *Procrastination would have a significant positive effect on internet addiction. In other words, it is expected that individuals with procrastination behavior tend to engage more in using the internet.*

H₃. *Procrastination would mediate the relationship between FoMO on internet addiction. That is to say, individuals with high levels of FoMO tend to have procrastination behaviors, which in turn has the potential to lead to internet addiction behaviors.*

2. Materials and Methods

2.1. Participants

Using a cross-sectional research design, the present study was conducted on 315 students studying at Batman University in Türkiye. The participants consist of 66.3% females and 33.7% males. Among them, 34.6% are studying at the associate degree level, while 65.4% are at the undergraduate level. The age range of the participants varies between 18 and 32, with a mean age of 22.43 (SD = 3.81).

2.2. Measures

The Fear of Missing Out Scale (FoMOs) was developed by Zhang et al. [71] and validated in Turkish by Çelik and Özkara [72]. The scale aims to measure individuals' levels of FoMO on the developments they perceive on social media. The elevated scores on the scale suggest high levels of FoMO among the participants, while the lower scores indicate a corresponding lower level of FoMO. The scale score ranges from a minimum score of 9 to a maximum of 63. The FoMOs includes 9 items clustered into two subscales: Personal FoMO (5 items) and Social FoMO (4 items). Each item is rated using a 7-point Likert-type scale, ranging from 1 (strongly disagree) to 7 (strongly agree). A sample item is "I feel anxious when I'm not active on social media". Çelik and Özkara's [72] validity and reliability analyses revealed a Cronbach alpha coefficient of 0.90 for Personal FoMO and 0.89 for Social FoMO. Additionally, the model's fit index values were determined as follows: $\chi^2/df = 2.58$, RMSEA = 0.07, SRMR = 0.08, and CFI = 0.90. In this study, Cronbach's alpha coefficient was found to be 0.93.

The General Procrastination Scale (GPS-9) is the short form of Lay's General Procrastination Scale [73] and was developed by Sirois et al. [74]. A validity and reliability study of the Turkish version was conducted by Şimşir Gökalep et al. [75]. The GPS-9 includes 9 items, and each item is answered based on a 5-point Likert-type scale ranging from "strongly agree" to "strongly disagree". A sample item is "I generally delay before starting work I have to do". The scale aims to measure individuals' level of procrastinating responsibilities. Elevated scores on the scale highlight heightened levels of procrastination behaviors among participants, while lower scores indicate a corresponding lower propensity for procrastination. The scale score ranges from a minimum score of 9 to a maximum of 45. In the validity and reliability analyses conducted by Şimşir Gökalep et al. [75], the Cronbach alpha coef-

ficient was established at 0.87. The model's fit index values are as follows: $\chi^2/df = 4.232$, GFI = 0.94, CFI = 0.94, and RMSEA = 0.09. In this study, Cronbach's alpha coefficient was found to be 0.85.

The Young Internet Addiction Scale (short form) was developed by Kimberly Young [76] and adapted into a short form by Pawlikowski et al. [77]. A validity and reliability analysis of the Turkish version was conducted by Kutlu et al. [78]. The scale consists of 12 items rated on a 5-point Likert-type scale ranging from "rarely" to "always". A sample item is "How often do you lose sleep due to being online late at night?" The scale aims to measure the perceived levels of internet addiction of individuals. High scores on the scale suggest heightened levels of internet addiction among participants, while lower scores indicate a corresponding lower susceptibility to internet addiction. Kutlu et al.'s [78] validity and reliability analyses show a Cronbach alpha coefficient of 0.85. The model's fit index values are present as follows: $\chi^2/df = 3.275$, CFI = 0.95, RMSEA = 0.07. In this study, Cronbach's alpha coefficient was found to be 0.89.

2.3. Procedure

Initially, requisite permissions were secured from the researchers through email to employ the scales for this study. Then, approval was received from the Batman University Ethics Committee (E-131160/2023-05-20). Data were gathered using the pencil-and-paper method, and the package of questionnaires contained information text, personal information questions, and scales. Informed consent was obtained from participants before collecting data, and they were assured of confidentiality and anonymity of responses. Participants voluntarily took part in the study without receiving any incentives. The scales were delivered to university students from different departments to maximize sample diversity (18 May–23 June/2023). Data were collected online using a convenience sampling method.

2.4. Data Analysis

The normality assumption of the data was examined by analyzing skewness and kurtosis scores [79]. Based on the skewness and kurtosis normality tests, data distribution was found to be within an acceptable range. Pearson correlation analysis was performed to explore relationships between variables. Then, the proposed mediation model (Model 4) was tested using the PROCESS v4.0 for Windows. Mediation analyses aim to measure the mediating effect of a third variable on the effect of the independent variable on the dependent variable. The results from Model 4 provide information about whether the mediator significantly influences the relationship between the independent variable and the dependent variable. It helps researchers understand whether a third factor (mediator) could explain the relationship between the independent variable and the dependent variable [70]. In this study, a mediating variable (procrastination) was examined in terms of the effect of the independent variable (FoMO) on the dependent variable (internet addiction). In the related body of literature, no research was encountered that empirically investigates these relationships. Therefore, this model (Model 4) was chosen to make inferences about the relationship between FoMO, internet addiction, and procrastination behavior. All statistical analyses were performed by using SPSS version 26.

3. Results

According to the findings, the data are normally distributed based on skewness and kurtosis values [79]. Skewness ranges from 0.267 to 1.668, and kurtosis ranges from −0.165 to 3.451. According to Kim [80], these values are considered to represent a normal distribution. The normal distribution of the data indicates that there is no problem with extreme values, and further analysis can be conducted.

The correlation findings between FoMO, procrastination, and internet addiction are presented in Table 1. FoMO showed a positive correlation with procrastination ($r = 0.365$, $p < 0.001$) and with internet addiction ($r = 0.573$, $p < 0.001$). Procrastination was positively

correlated with internet addiction ($r = 0.580, p < 0.001$). According to the correlation analysis, there are moderate-level significant and positive relationships between FoMO, procrastination, and internet addiction. The correlation analysis results show significant relationships between variables, referring that regression analysis can be performed.

Table 1. Descriptive statistics and correlation analysis.

Variable	Description Statistics					Correlation Coefficients (r)		
	α	Min.	Max.	M	SD	1.	2.	3.
1. Fear of missing out	0.93	1	7	2.05	1.12			
2. Procrastination	0.85	1	5	2.57	0.77	0.37 *		
3. Internet addiction	0.89	1	5	2.14	0.71	0.57 *	0.58 *	

* $p < 0.001$.

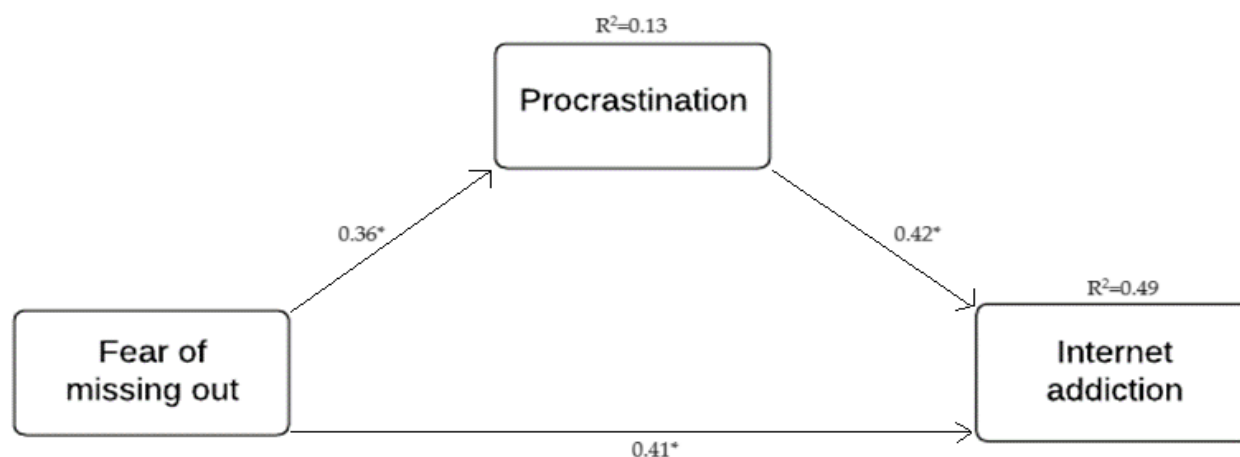
The results of the analysis regarding the mediation role of procrastination in the effect of FoMO on internet addiction are given in Table 2. According to the findings, FoMO directly and significantly affected procrastination ($\beta = 0.250, p < 0.001$) and internet addiction ($\beta = 0.262, p < 0.001$). FoMO explained 13% of the variance in procrastination and 33% of the variance in internet addiction. Additionally, procrastination directly and significantly affected internet addiction ($\beta = 0.394, p < 0.001$). Procrastination explained 34% of the variance in procrastination. Accordingly, all of the direct effects were positive and significant.

Table 2. Testing the pathways of the mediation model.

Path	R^2	F	β	SE	LLCI	ULCI
Unstandardized Direct Effect						
Fear of Missing Out > Procrastination	0.13	48.14	0.250 *	0.03	0.179	0.321
Fear of Missing Out > Internet Addiction	0.33	152.8	0.263 *	0.02	0.208	0.317
Procrastination > Internet Addiction	0.34	158.8	0.394 *	0.04	0.315	0.473
Completely Standardized Indirect Effect(s)					BootLLCI	BootULCI
Fear of Missing Out > Procrastination > Internet Addiction	0.49	148.1	0.156 *	0.024	0.1089	0.2047

* $p < 0.001$, LLCI = The lower limit confidence interval ULCI = The upper limit confidence interval FoMO = Fear of Missing Out, Pro = Procrastination, IA = Internet Addiction.

When the mediation effect of procrastination on the effect of FoMO on internet addiction was examined, it was seen that the level of indirect effect was positive and significant. It was concluded that BootLLCI and BootULCI values did not contain 0. FoMO and procrastination together explain 49% of the variance in internet addiction. As a result, it can be said that procrastination had a mediating role in the effect of FoMO on internet addiction ($\beta = 0.156, p < 0.001$). Results obtained from the study show that higher levels of FoMO and procrastination are indicative of higher levels of internet addiction. Furthermore, procrastination mediated the relationship between the fear of missing out and internet addiction (see Table 2 and Figure 1). As a result, procrastination behavior partially mediated the relationship between FoMO and internet addiction, and it has also been determined that the high level of FoMO and procrastination behavior is related to the high level of internet addiction.



* Correlation value, $p < 0.001$

Figure 1. Proposed model indicating the standardized coefficients between variables.

4. Discussion

Based on the findings obtained within the scope of this research, which aims to examine the mediating role of procrastination in the relationship between FoMO and internet addiction, there is a significant correlation between FoMO, procrastination behavior, and internet addiction. A positive and significant relationship between FoMO and procrastination behavior and internet addiction has been detected. Additionally, there is a positive and significant relationship between procrastination behavior and internet addiction. It has been shown that as the level of one variable of all variables, which are FoMO, procrastination, and internet addiction, increases, the level of other variables also increases. According to the body of related literature, it has been found that procrastination behavior affects internet addiction. In a research conducted by Gong et al., it is stated that procrastination plays a mediating role between perceived stress and internet addiction [15].

The first hypothesis of the research is that “*Fear of missing out in university students would have a significant positive effect on both procrastination and internet addiction*”. In light of the findings, it has been indicated that the FoMO levels of university students have a direct, positive, and significant effect on their procrastination behavior and internet addiction. In other words, as the FoMO levels of university students increase, their tendency to exhibit procrastination behavior also increases. Additionally, as the FoMO levels of university students increase, their internet addiction levels also increase. In the related literature, no study directly investigating the relationship between FoMO and procrastination behavior has been encountered. Some correlations and interactions can be detected between these two variables, yet further research is needed to explain this relationship more precisely. Contrary to this, there are studies designed to explore the relationship between FoMO and internet addiction in the literature. The fear of individuals who follow social media to deal with the negative emotions caused by FoMO and to feel better [81] also increases the use of social media [6]. Accordingly, the non-functional and uncontrolled use of problematic internet may be triggered by the tendency of individuals not to miss potentially better alternatives for social interaction [82]. This can lead to higher levels of problematic social network usage symptoms [83]. The finding that FoMO significantly predicts internet addiction concurs in certain studies, suggesting that the increase in the use of social media tools may result from FoMO [6,7,17,84]. According to the findings of research intended to explore the relationship between internet addiction, FoMO, and psychological factors, it has been observed that individuals who experience higher levels of FoMO are more likely to participate in social media [85]. Nowadays, with the prevalence of social media, students may feel that their own lives are inadequate or incomplete as they see the content shared on social media platforms, thereby leading them to constantly check social media platforms. Persistent exposure to content shared on social media platforms can have negative effects

on students. Most importantly, it can make it difficult for the students to focus on their training. Therefore, it can be stated that it is vital for students to balance between their education and the internet and to use social media consciously.

The second hypothesis of the research is that *“Procrastination would have a significant positive effect on Internet addiction”*. The findings indicated that the procrastination behavior of university students has a direct, positive, and significant effect on their internet addiction. To put it differently, as the procrastination behaviors of university students increase, their internet addiction levels also increase. This finding concurs with the findings of prior studies in the related literature [30], noting that there is a correlation between procrastination and problematic internet use. In this regard, excessive use of the internet may be attributed to some psychological or emotional factors. These behaviors often emerge as an escape mechanism [51]. Similarly, it is emphasized that students who often procrastinate show a tendency to problematic internet use to a greater extent [86]. Students can use the internet in an attempt to avoid or commence challenging tasks, posing a risk of addiction [67]. This situation leads to internet addiction over time for students who use the internet intensively. This addiction, however, may negatively affect students’ academic achievements, social relationships, and physical health, causing them to lose their balance in their daily lives. As a result, it is of great importance for students to manage the duration of their use of the internet in a balanced way and to adopt healthier strategies to deal with challenging tasks.

The third hypothesis of the research is that *“Procrastination would mediate the relationship between fear of missing out on Internet addiction”*. The research findings have demonstrated that procrastination has a mediating role in the effect of FoMO levels of university students on their internet addiction. In other words, it has been observed that the FoMO level of university students is associated with their procrastination behaviors and plays a mediating role in the effect of these procrastination behaviors on internet addiction. It is also reported in the introduction of the study that FoMO has a positive effect on internet addiction. Studies examining the relationship between these variables argue that people’s psychological desire to follow others and FoMO leads them to use social media more frequently [6,19,58]. On the other hand, this poses the risk of developing addiction for individuals [87]. Consequently, FoMO, which is considered a psychological syndrome related to excessive use of the internet, can result in internet addiction [88]. The mediating effect of procrastination on the effect of FoMO on internet addiction can be supported by studies on procrastination behavior. In a study carried out by Wang et al. [63] investigating the relationship between the level of smartphone addiction and thrill-seeking behavior, it was concluded that procrastination influenced the relationship between thrill-seeking and smartphone addiction as a mediating factor. Based on the findings of another study, it was found that procrastination had a mediating role between problematic smartphone use and adolescent depression [89]. In light of the abovementioned studies, it can be said that procrastination has behavioral effects on individuals. Given the fact that FoMO, internet addiction, and procrastination have a mutual effect on one another, it also seems theoretically likely that procrastination might play a mediating role in FoMO’s impact on internet addiction. In this respect, students may tend to spend more time on social media by postponing important tasks when they experience FoMO [90,91]. Therefore, it is thought that procrastination may increase the effect of students’ FoMO levels on their internet addiction by having a mediating role. Students experiencing FoMO may postpone their real-life tasks since they want to participate in online activities and stay up-to-date on the internet. Therefore, FoMO has the potential to cause procrastination behavior by influencing students’ habits of internet use. This is thought to increase the risk of internet addiction in the long run.

5. Implication and Limitations

The internet provides an interactive environment for students and poses the risk of developing addictive behaviors by pulling them toward this environment. Based on the findings of this study, FoMO may lead students to tend towards online environments

offered by the internet, causing them to exhibit an addiction-level use and postpone the tasks that they should initially perform. In addition, since students can use the internet for different purposes, identifying which purpose may be more problematic than others will be interesting for further studies. In recent years, further research has been needed to better understand the antecedents of increasing internet addiction and to develop strategies to combat addiction. In addition, research can be carried out to identify the use of the internet for various purposes such as education, entertainment, and interaction with other individuals and also to detect possible problems. The findings obtained from the study can be useful for educational scientists, psychologists, psychiatrists, and therapists both in preventing behaviors that may cause addiction and in developing online addiction therapies. This has important implications for young individuals [92].

The current study has certain limitations. The findings of the study with cross-sectional design do not reveal causation. The data collection on independent, mediator, and dependent variables from a single source in the research can be shown as another limitation of the research. This may cause the problem of common method variance. In the study, the data were obtained from only one university. Consequently, research data are limited in terms of student profiles and diversity. Considering that the ability of the sample to represent the universe is limited, it is thought that researchers can contribute to the literature by collecting data from different populations for further studies. Considering that the current study is a cross-sectional study, a direct causal relationship between the variables can not be revealed. Internet addiction may have several causes other than FoMO and procrastination behaviors. This research is limited by the effect of these two variables on internet addiction. On the other hand, procrastination was tested as a mediator between FoMO and internet addiction when designing the research. It is also thought that further studies will be useful to test other important variables concerning the relationship between FoMO and internet addiction that may predict this relationship and affect students' academic achievement.

Along with the existing data, the findings yielded by the research are also considered important in terms of the measures to be taken to reduce the internet addiction of students. For this reason, to develop effective and powerful strategies while combating internet addiction, it is important to understand procrastination behavior and to create educational programs that raise awareness of this issue. Such educational programs are thought to play an effective role in combating internet addiction by helping students improve their time management skills and reduce their tendency to procrastinate. To understand students, face-to-face interviews can be conducted individually, or the needs of the students can be determined through psychometric questionnaires. Campaigns, seminars, and workshops to raise awareness can be organized in schools aligned with counseling and guidance services. By carrying out group therapies or support groups, students can be encouraged to share their experiences. Activities can be arranged for teachers, school administrators, and other influential people to be good role models in the use of the internet. In order to ensure that the activities listed above are sustainable, long-term goals can be set, and fundraising strategies can be created in cooperation with institutions. In this regard, it is expected that the findings of the research will contribute to the consideration of procrastination behavior in the design of psychoeducation and group guidance programs in schools. While this research identifies a positive relationship between FoMO, procrastination behavior, and internet addiction, it is also highly important to consider the purposes for which students use the internet since the effects of online activities carried out by students for different purposes on internet addiction may also be different. Further research is needed to distinguish between students' purposes of internet use. This is important to understand the possible risk factors and protective factors depending on the students' intended internet use. In this context, it is thought that the research will shed light on future longitudinal studies. For future research, the mediating role of different variables in the relationship between FoMO and internet addiction can be examined. Internet addiction is a complicated issue that requires researchers from different disciplines, such as education, psychology, and sociology, to come together and study it. For further research, it is recommended to

adopt a multi-disciplinary approach combining the perspectives of different disciplines such as education, psychology, and sociology.

6. Conclusions

This study aims to examine the potential mediating role of procrastination in the relationship between FoMO and internet addiction. This is because there is no research in the literature that tests these relationships empirically. The findings showed that FoMO had a significant positive direct effect on both procrastination and internet addiction. Procrastination also had a significant positive direct effect on internet addiction. Additionally, procrastination mediated the relationship between the fear of missing out and internet addiction. This study is expected to contribute to other studies on FoMO, procrastination behaviour, and internet addiction.

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Article

The Relationships between Compulsive Internet Use, Alexithymia, and Dissociation: Gender Differences among Italian Adolescents

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Abstract: Internet Gaming Disorder, Internet Addiction, Problematic Internet Use and Compulsive Internet Use cause distress and significant impairment in important areas of a person's functioning, in particular among young people. The literature has indicated that males show higher levels of problematic internet use than females. People can use the internet to avoid or alleviate negative affects; in fact, problematic internet use is associated with alexithymia and dissociation. Few studies have focused on the different stages of adolescence, gender differences, and the relationships between the aforementioned variables. This research aims to fill this gap. Five hundred and ninety-four adolescents aged between 13 and 19 filled in the Compulsive Internet Use Scale, the Toronto Alexithymia Scale, the Adolescents Dissociative Experiences Scale, and other ad hoc measures. Surprisingly, females reported higher compulsive internet use compared with males. Moreover, they referred more difficulties/symptoms and greater levels of alexithymia than males. No differences across the stages of adolescence were found. Different strengths in the relationships between variables were found according to gender. Moderated mediation analyses indicated that dissociation is an important mediator in the relation between alexithymia and Compulsive Internet Use only among females. This study shed new light on gender differences around problematic internet use and some related risk factors, in order to identify and develop prevention and treatment programs to face this topical and relevant issue.

Keywords: adolescence; internet; alexithymia; dissociation; age; gender; mediation; moderation

1. Introduction

Internet Gaming Disorder, Internet Addiction, Problematic Internet Use, and Compulsive Internet Use are different terms and concepts used to classify and/or describe conditions of internet use which cause distress and significant impairment in important areas of a person's functioning [1–7]. These conditions relate in particular to young people (adolescents and young/emerging adults) [8].

Young/emerging adults (aged 18–25 years) have the higher prevalence of any mental illness compared to adults (aged 26–49 years) and those aged 50 and older [9,10]. Adolescents (aged 12–19 years) have the highest prevalence of any mental illness compared to other stages of life. It was estimated that about 50% of adolescents have some form of mental disorder, of which about over 20% have severe impairment and/or distress. Overall, the global onset of the first mental disorder has a peak/median age at onset of

14.5/18 years across all mental disorders. Adolescence can be divided into early adolescence (12–14 years), middle adolescence (15–16 years), and late adolescence (17–19 years). Lifetime prevalence of any mental illness increases during these three stages of adolescence [9–11].

Therefore, among young people, adolescents are those who require major attention as to their psychological maladjustment.

In recent years, with the increase in internet use, adolescents are more exposed to the risk of problematic internet use [12]. The literature has indicated that males report a higher level of internet addiction than females [1,2,6], but it is not known if there are differences within the different stages of adolescence. Adolescents can use the internet to avoid or alleviate negative affects, as a tentative way to regulate emotions. In line with this, problematic internet use in young adults and adolescents is associated with alexithymia and dissociation [13–16]. In other words, it seems that Internet Addiction/Compulsive Internet Use can result from and lend itself to dissociative reactions as strategies to alleviate painful emotions, due to a difficulty to regulate emotions (alexithymia). Both alexithymia [17,18] and dissociation [19,20] decrease during adolescence.

Although some studies have compared Internet Addiction/Compulsive Internet Use and/or alexithymia and/or dissociation levels between different stages of adolescence or between males and females, few studies have tested all these variables and differences in the same study.

Furthermore, even though research has found a positive association between alexithymia and dissociation, and their role on addiction, very few studies have tested the potential role of dissociation as a mediator in the relation between alexithymia and Internet Addiction among emerging adults/adults/elderly [16]. No study has focused on adolescents.

Finally, given the above, no studies have investigated if there are different patterns/relationships between alexithymia, dissociation, and problematic internet use between males and females.

This research aims to fill the aforementioned gaps.

In brief, first of all, it is very important to examine in depth gender differences among adolescents in terms of internet use, alexithymia, and dissociation, and those related to the different stages of adolescence. In other words, are there differences in problematic internet use, alexithymia, and dissociation between males and females, as well as between adolescents of different ages? Second, problematic internet use is associated with alexithymia and dissociation, with the latter being able to partially explain the role of alexithymia as a predictor of internet addiction. However, since there are many gender differences around internet use, alexithymia, and dissociation, it is not known if there are differences in the relationships between these variables according to gender. That is to say, do alexithymia and dissociation have the same role in problematic internet use among males and females?

1.1. Problematic Internet Use and Adolescence

1.1.1. Problematic Internet Use

The latest version of the International Statistical Classification of Diseases and Related Health Problems (ICD-11) includes Gaming Disorder, predominantly online (code 6C51.0) [6]. The Gaming Disorder (code 6C51) classified by the ICD-11 “is characterized by a pattern of persistent or recurrent gaming behavior (‘digital gaming’ or ‘video-gaming’), which may be online (i.e., over the internet) or offline, manifested by: 1. impaired control over gaming (e.g., onset, frequency, intensity, duration, termination, context); 2. increasing priority given to gaming to the extent that gaming takes precedence over other life interests and daily activities; and 3. continuation or escalation of gaming despite the occurrence of negative consequences. The pattern of gaming behaviour may be continuous or episodic and recurrent. The pattern of gaming behaviour results in marked distress or significant impairment in personal, family, social, educational, occupational, or other important areas of functioning. The gaming behaviour and other features are normally evident over a period

of at least 12 months in order for a diagnosis to be assigned, although the required duration may be shortened if all diagnostic requirements are met and symptoms are severe” [6]. Gaming disorder predominantly online is different from Gambling disorder predominantly online (6C50.1), Hazardous gambling (QE21), and Hazardous gaming (code QE22), and it cannot be explained by bipolar disorders.

The Diagnostical and Statistical Manual of Mental Disorders (DSM-5 and DSM-5-TR), besides Gambling Disorder (681), includes Internet Gaming Disorder among the conditions which need further studies. More specifically, Internet Gaming Disorder requires the following diagnostic criterion. A significant impairment or distress in several aspects of a person’s life with the presence of five (or more) of the following symptoms: Preoccupation with gaming on the internet; withdrawal symptoms when gaming is taken away or not possible (sadness, anxiety, irritability); tolerance, the need to spend more time gaming to satisfy the urge; inability to reduce playing, unsuccessful attempts to quit gaming; giving up other activities, loss of interest in previously enjoyed activities due to gaming; continuing to game despite psychosocial problems; deceiving family members or others about the amount of time spent on gaming; the use of gaming to avoid or relieve negative moods, such as hopelessness, guilt, anxiety; risk, having jeopardized or lost a job or relationship due to gaming [1,2].

The Second Version of the Psychodynamic Diagnostic Manual (PDM-2), in Section II dedicated to Adolescents, describes Internet Addiction Disorder (code SA94). In this Diagnostic Manual, Internet Addiction Disorder is also called Internet Addiction or Compulsive Internet Use. The PDM-2 includes different behaviors of excessive internet use, such as gaming online, social networking, e-mails, online pornography, and shopping online, which compromise personal functioning and are associated with loss of control, tolerance, and withdrawal [3].

Therefore, while ICD-11 and DSM-5-TR focus on problematic internet use related to gaming online, the PDM-2 considers different behaviors of problematic internet use. All the aforementioned diagnostic systems report that these disorders commonly co-occur with other mental disorders, such as Disorders Due to Substance Use, Mood Disorders, Anxiety or Fear-Related Disorders, Attention Deficit Hyperactivity Disorder, Obsessive Compulsive Disorder, and Sleep–Wake Disorders [1–3,6]. A recent meta-analysis suggested the existence of some risk factors for problematic internet use related to gaming online, such as male gender, loneliness, depression, anxiety, stress, impulsivity, hostility/aggressivity as a trait, gaming time, escape motivation, or excessive use of social networks [21].

Both Gaming Disorder predominantly online (ICD-11) and Internet Gaming Disorder (DSM-5-TR), as well as Internet Addiction Disorder (PDM-2), are classifications subsequent to the description of Internet Addiction made by Young [7], who tried to identify the differences between normal and addicted internet usage (i.e., technological overuse, computer dependency, obsessive video game playing), emphasizing the similarities of the latter condition with Pathological Gambling and substance abuse. In this view, Internet Addiction was defined as an impulse control disorder that does not involve an intoxicant, characterized by thoughts, emotions, and behaviors related to internet use, such as preoccupation; need to use to escape from problems or relieve a dysphoric mood; unsuccessful efforts to control, cut back, or stop with feelings of restlessness, moodiness, depression, and irritation; and problems with relationships, jobs, and education.

Some authors prefer the term Compulsive Internet Use to Internet Addiction, because they believe that one is not addicted to the internet itself, but rather to certain online activities, resulting in compulsive internet use [4]. In defining Compulsive Internet Use, loss of control, preoccupation, feelings of depression, loneliness, and tension, as well as intrapersonal and interpersonal conflict and withdrawal symptoms seem to be crucial. Tolerance and lying about involvement seem to play a secondary role [4,22].

Other authors have argued that the term Problematic Internet Use is better than Internet Addiction and Compulsive Internet Use, which emphasize addiction or impulse control. Problematic Internet Use, instead, is descriptive and non-interpretive [5,15]. Although

there is not agreement on terms, definitions, conceptualizations, etc. [23], to date, as Peter Mitchell wrote some years ago, “Even though there is still disagreement about whether internet addiction is a real diagnosis, there is no doubt that the compulsive use of the internet, like other dependencies, has material as well as psychological dangers” [24].

Available data suggest that adults have lower prevalence rates than adolescents [1,2,8]. Among adolescents, Gaming Disorder has been associated with high levels of externalizing and internalizing problems. Adolescents with Gaming Disorder may be at increased risk for academic underachievement, school failure/drop-out, and psychosocial and sleep problems [1,2,6].

1.1.2. Problematic Internet Use: Age and Gender Differences in Adolescence

Adolescence is characterized by very important changes at the bodily, sexual, emotional, cognitive, interpersonal, and social levels. The development of identity, personality, autonomy, and independence, as well as the capacity to relate, are the core aspects of this stage of life [25].

Overall, to date, the literature suggests that Internet Gaming Disorder appears to be most prevalent among adolescents and young adult males aged 12 to 20 years. In general, males appear to be more frequently affected by Gaming Disorder and Problematic Internet Use [1,2,6,26,27]. Though less frequently diagnosed with Gaming Disorder than adolescent boys, girls who meet the diagnostic requirements may be at greater risk of developing emotional or behavioral problems. Therefore, besides gender differences in Internet Gaming Disorder prevalence, females require particular attention. With regard to age, no studies have investigated the potential role of stages of adolescence on Compulsive Internet Use. Although adolescents and young adults suffer from Internet Addiction/Compulsive Internet Use more than adults, no studies have yet investigated differences across different stages of adolescence in depth.

With regard to gender, more specifically, Morahan-Martin and Schumacher [28] found in a sample of college students that males were more likely than females to be pathological users, with a ratio of 4:1. Pathological use was determined by responses to 13 questions which assessed evidence that internet use was causing academic, work, or interpersonal problems, personal distress, withdrawal symptoms, or mood-altering use. Scherer [29] tested gender differences among college students and reported that dependent internet users included a significantly larger proportion of men to women than the non-dependent users. Chou and Hsiao [30], among a sample of more than 900 Taiwan college students, found that only three respondents were female students out of a total of 54 internet addiction cases. With regard to adolescence, Di Nicola et al. [31] found no gender differences in the Internet Addiction Test among Italian adolescents and young adults. Ko et al. [32] found gender differences in the Chinese Internet Addiction Scale among Taiwanese adolescents, with males reporting higher levels than females.

Therefore, it seems important to investigate gender differences in more depth, as well as age group differences, among adolescents, with regard to problematic internet use (and not only internet gaming), and take into account that females and males can use internet in different ways (different activities such as gaming, chat, posting and viewing photos, videos, etc.).

1.2. Internet Use, Alexithymia, and Dissociation

In the previous sections it was highlighted that people can use the internet to avoid or alleviate negative affects, and they can use it in a compulsive way, showing preoccupation, loss of control, withdrawal, and tolerance related to the internet use [1–7,15]. In other words, addiction behaviors like Compulsive Internet Use may be considered reactions to dysregulated emotions, or rather a coping strategy to compensate for emotional regulation deficits, namely, to regulate emotions. Recent reviews [12,33] found strong associations between problematic internet use and emotion dysregulation, considered and measured above all by the Difficulties in Emotion Regulation Scale [34] and the Emotion Regulation

Questionnaire [35]. The literature suggests that high levels of alexithymia impair the appropriate selection of emotion regulation strategies [36]. In this context, Yang et al. [33] mentioned that the construct of emotional dysregulation has many facets and dimensions, such as alexithymia, that should be better investigated in relation to addiction behaviors.

The concept of alexithymia has received increasing levels of attention. This concept was formulated by Sifneos in 1973 [37]. It describes people with emotions (biological components of affects) but with a deficit in ability to represent emotions, namely through psychological components of affects, such as images, thoughts, fantasies, dreams. In other words, a difficulty in experiencing feelings. Alexithymia is considered a difficulty in elaborating visceral information, sensations, and perceptions; processing and regulating emotions; representing, symbolizing, and thinking (consciously and unconsciously); and naming emotions. In other words, alexithymia can be considered a difficulty in integrating emotions and cognition, and experiencing feelings without denying/avoiding/discharging/acting out emotions. More specifically, alexithymia is defined as an incapacity to discriminate between physical sensations and feelings, to distinguish different affective states, and to verbalize them. Alexithymia is described as being composed by the following dimensions: difficulty in identifying feelings; difficulty in communicating feelings to others; and externally oriented thinking (operational thinking) [38]. Alexithymia is not a diagnostic category, it is not a disorder, and it is not only related to psychosomatic conditions, but it can be viewed as an aspect of personal functioning that has a role in many clinical conditions, such as medical and psychological disorders [39,40]. Studies have found that alexithymia has a role in Internet Addiction/Problematic Internet Use [15,41].

Besides alexithymia, dissociation has a role in internet addiction as a way to escape from negative emotional states [13,14,16,26,27,31]. Dissociation is considered to be a lack of integration or disaggregation due to extreme emotional arousal, as well as a defense mechanism, namely, a mental process which can vary along a continuum from a normal to pathological level, from adjustment to maladjustment [42]. Putnam [42] identified the defense role of dissociation in four main aspects: automation; alteration and alienation of Self; compartmentalization; and protection from suffering that cannot be processed. From a phenomenological point of view, dissociation refers to three different meanings [3]: dissociation of some mental functions (a disconnection between a person's thoughts, memories, feelings, actions or sense of who he or she is); dissociation as depersonalization/derealization (experiences of unreality or detachment from one's mind, self or body/one's surroundings); dissociation as multiplicity (e.g., plurality of consciousness, dissociative identity disorder). Referring to the nosology, the ICD-11 [6] distinguishes between Dissociative Neurological Symptom Disorder, Dissociative Amnesia, Trance Disorder, Possession Trance Disorder, Dissociative Identity Disorder, Partial Dissociative Identity Disorder, and Depersonalization–Derealization Disorder. The DSM-5 [1,2] instead classifies Dissociative Identity Disorder, Dissociative Amnesia, and Depersonalization/Derealization Disorder. The PDM-2 [3], considering the specificity of dissociation during adolescence, reports that adolescents can have a variety of dissociative symptoms as a lack of continuity in mental functioning, which can be associated with many different evolutive or clinical conditions. Research has found a positive association between dissociation and Internet Addiction [13,14,16,31].

Dissociative reactions are manifestations of defense mechanisms used to alleviate painful emotions, while alexithymia is an emotional dysregulation. Dissociation and alexithymia can be considered distinctive but overlapping phenomena. Research has identified it both in adulthood and in adolescence. The strongest association is between the difficulty of identifying feelings (one dimension of alexithymia) and dissociation. Scholars have argued that alexithymic characteristics may contribute to dissociation [43–47].

The literature [15] suggests that alexithymia may play a role in pathogenesis and maintenance of Internet Addiction, with a facilitating role for dissociation. Craparo [13] found significant correlations between Internet Addiction and both alexithymia and dissociation among Italian students aged between 18 and 21 years. A recent study [16] found that

dissociation partially explained the relationships between alexithymia and problematic online gambling, among a sample of emerging adults, adults, and the elderly.

No studies have tested the role of dissociation in the relationships between alexithymia and problematic internet use among adolescents.

Referring to gender and age differences in levels of alexithymia and dissociation, some studies [17,18] have suggested that alexithymia decreases during adolescence, and other studies have suggested that normative dissociation reaches its peak during latency years, declining during adolescence [19,20]. Referring to gender, research has suggested that adolescent females report a higher difficulty in identifying and expressing feelings than males, while there were no significant differences in the levels of dissociation [46]. Despite everything that has been said, so far as is known, no studies have investigated if alexithymia and dissociation have the same role in problematic internet use among male and female adolescents.

1.3. The Present Study

This study aimed to evaluate among adolescents, distinguished by gender and age, (a) problematic internet use, alexithymia, and dissociation levels; (b) the correlations between internet use, alexithymia, and dissociation; and (c) the role of dissociation in the relationship between alexithymia and problematic internet use.

Based on the literature [1,2,6,26,27,46], it was hypothesized that males would report more problematic internet use than females, while females would report more alexithymia than males. No gender differences were expected in dissociation levels. Moreover, it was expected that both alexithymia and dissociation would decrease with age.

Regarding the relationships between the main variables, it was hypothesized that alexithymia and dissociation were positively associated with problematic internet use, with dissociation playing a mediation role in the relationship between alexithymia and problematic internet use [13–16,31,43–47]. No hypothesis was advanced for gender as a moderator.

2. Materials and Methods

2.1. Participants and Procedures

The research was implemented in a medium-sized town in southern Italy during the month of May 2022. Participants were recruited from high schools. Parental signed consent was required and collected for students under 18, while students aged 18 and over signed the consent by themselves. The study was conducted in accordance with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards, the ethical code of the Italian Psychology Association (AIP) (<http://www.aipass.org/node/26>, accessed on 10 January 2021), and the Italian Code concerning the protection of personal data (Legislative decree No. 196/2003). Participants signed informed consent. No incentive was given. The research project was previously submitted and then approved by the Research Committee of Giustino Fortunato University (Benevento, Italy) through the protocol of the Academic Senate on 2 February 2021.

Data were collected through convenience sampling, adopting the following inclusion criteria: (a) signed the informed consent, (b) completed the entire survey form, (c) aged between 12 and 19 (adolescents). Data were collected through the use of an online survey (Google Forms) that the participants filled in during school time.

A total of 624 Italian high school students participated in the study. Participants who did not meet one or more inclusion criteria were removed. The final sample comprised 594 adolescents aged between 13 and 19 (Mean age = 16.04; Sd = 1.45). Participants were 47.6% female and 52.4% male, of whom 20.4% were early, 40.0% were middle, and 39.6% were late adolescents.

2.2. Measures

2.2.1. Internet Use. A Set of Items That Assess

Time spent on the Internet: Participants were required to indicate on a 4-point scale (from 0 = “up to half an hour” to 3 = “more than two hours”) the average amount of time spent on the internet every day.

Activities on the Internet: Participants were asked to indicate on a 4-point scale (from 1 = “not at all” to 4 = “extremely”) how connected they are to the internet when doing the following activities: Listening to music; watching videos/series; looking at images, photos, stories; gaming; searching for information; studying; chatting with friends/acquaintances; sending/receiving email; navigating without a destination; shopping; making new friends or dating.

2.2.2. Symptoms/Difficulties

A set of 22 items (“Have you noted recently the following manifestations, behaviors or feelings?”) were graded on a 4-point Likert scale from 1 (“never”) to 4 (“always”) to assess a series of symptoms/difficulties (e.g., sleeping, eating, physical, anxiety, attention, depressive, addiction). The total score was the mean of all items and ranges between 1 and 4. Higher scores indicate greater difficulty. Cronbach’s alpha was 0.94.

2.2.3. Satisfaction with Life

A set of 8 items (“How much are you satisfy in each of the following aspects of your life?”) were ranked on a 4-point Likert scale from 1 (“not at all”) to 4 (“extremely”) to assess satisfaction with some aspects of life (general, affects, society, friendships, family, school, leisure, future). The total score was the mean of all items and ranges between 1 and 4. Higher scores indicate a greater satisfaction with life. Cronbach’s alpha was 0.85.

2.2.4. Compulsive Internet Use

Compulsive Internet Use Scale (CIUS-14) [4,48,49]. CIUS-14 is a self-reported measure with items rated on a 5-point Likert scale (from 0 = “never” to 4 = “very often”). The 14 items represent the core elements of compulsive or addictive internet use, and they comprise one factor. The total score ranges between 0 and 56. The higher the score is, the higher the Compulsive Internet Use will be. The cut-off is >21. Cronbach’s alpha was 0.94.

2.2.5. Alexithymia

Toronto Alexithymia Scale (TAS-20) [38,50]. TAS-20 is a self-reported measure with items rated on a 5-point Likert scale (from 1 = “strongly disagree” to 5 = “strongly agree”). The 20 items comprise 3 dimensions: difficulty identifying feelings; difficulty describing feelings to others; and externally oriented style of thinking. The total score ranges between 20 and 100. The higher the score is, the higher the alexithymia will be. The TAS-20 cut-off points are: ≤ 51 for non-alexithymia; 52–60 for possible alexithymia; ≥ 61 for alexithymia. Cronbach’s alphas were 0.80 for total score, 0.90 for difficulty identifying feelings, 0.74 for difficulty describing feelings to others, and 0.32 for externally oriented style of thinking.

2.2.6. Dissociation

Adolescence-Dissociative Experience Scale (A-DES) [51–53]. A-DES is a self-reported measure in a version for adolescents, with items rated on a 11-point Likert scale (from 0 = “never” to 10 = “always”). The 30 items comprise 4 dimensions: dissociative amnesia; absorption and imaginative involvement; depersonalization and derealization; and passive influence. The total score is equal to the mean of all the items and ranges between 0 and 10. The higher the score is, the higher the dissociation will be. The A-DES cut-off is <4. Cronbach’s alpha was 0.95 for total score, 0.84 for dissociative amnesia, 0.77 for absorption and imaginative involvement, 0.90 for depersonalization and derealization, and 0.79 for passive influence.

2.3. Data Analysis

Normality for all the measures was tested, including skewness and kurtosis, with values between -2.0 and 2.0 [54].

In order to describe the sample, preliminary analyses were carried out. Descriptive statistics were carried out for gender and age group. A Chi-square test was run to verify the distribution of gender and age group. Then, the effects of gender, age group, and their interaction were tested on Internet Use, Symptoms/Difficulties, and Satisfaction with Life. All the scores related to the items of Internet Use were compared using Multivariate Analysis of Variance (MANOVA) with gender and age groups as between-subject variables, testing their interaction. Finally, two separate ANOVAs were run to compare Symptoms/Difficulties scores and Satisfaction with Life scores, with gender and age groups as between-subject variables, testing their interaction. Effect size was measured using partial eta-squared, with 0.0099 , 0.0588 , and 0.1379 being small, medium, and large effects, respectively [55]. Therefore, only significant differences with at least small effect sizes ($\eta p^2 > 0.0099$) were taken into account, because differences showing effect sizes lower than 0.0099 could be trivial.

Then, gender and age group differences were tested on Problematic Internet Use, alexithymia, and dissociation. All the scores were compared using MANOVA with gender and age group as between-subject variables, testing their interaction. A series of chi-square tests was run to verify the distribution of the categories of alexithymia, dissociation, and Compulsive Internet Use between gender.

Correlations between Problematic Internet Use, alexithymia, and dissociation were carried out separately for females and males. Effect size was interpreted according to Cohen [56], with correlation coefficients of 0.10 , 0.30 , and 0.50 representing small, medium, and large effect size, respectively. Thus, significant correlations with Pearson's r lower than $|0.10|$ were not interpreted because they are considered negligible.

Two separate simple linear regressions were run to calculate the total effect of TAS-20 on CIUS-14, separately in females and males. To examine the moderated mediational model, according to Germani and colleagues [57], SPSS macro was used (Process, Model 59) [58]. Please, see the conceptual diagram in Figure 1. A variable has a moderation effect when the indirect effect (mediation) of an independent variable on a dependent variable changes at different levels of the moderator [56]. The mediation of A-DES in the relation between TAS-20 and CIUS-14, and the moderation of gender (i.e., Females and Males), were tested by using a 5000 bootstrap sample and 95% confidence intervals (CI). If the confidence interval excluded 0, the effect was significant [58,59]. Gender was inserted in the model as a moderator, testing all possible interactions (TAS-20 $\times$ Gender on A-DES, A-DES $\times$ Gender on CIUS-14, TAS-20 $\times$ Gender on CIUS-14). The proportion mediated (PM = indirect effect/total effect) was calculated.

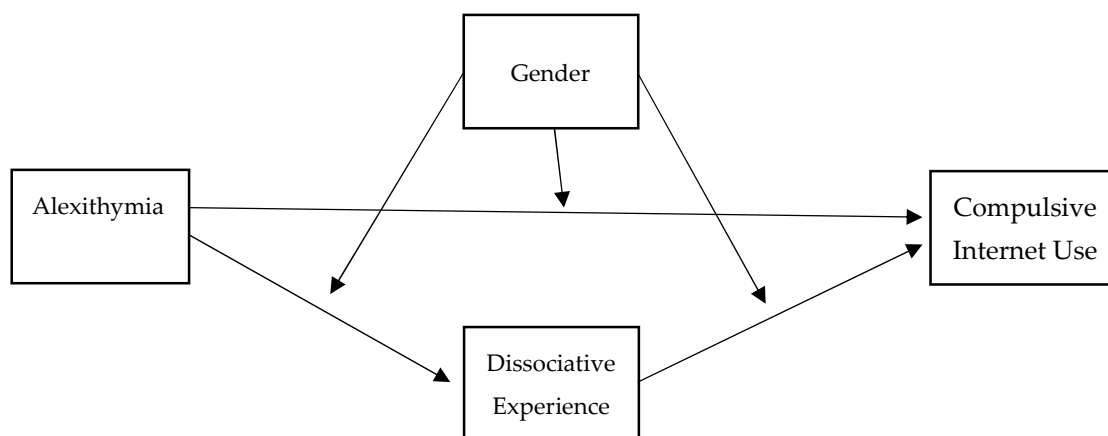


Figure 1. Conceptual diagram of the moderated mediational model.

3. Results

3.1. Preliminary Results

In Table 1 are reported demographic variables, Internet Use variables, Symptoms/Difficulties, and Satisfaction with Life of the sample, by gender and age group.

Table 1. Descriptive statistics of demographic variables, Internet Use, Symptoms/Difficulties, and Satisfaction with Life.

	Early (<i>n</i> = 121)		Middle (<i>n</i> = 238)		Late (<i>n</i> = 235)		Test		
	Female (<i>n</i> = 54)	Male (<i>n</i> = 67)	Female (<i>n</i> = 106)	Male (<i>n</i> = 132)	Female (<i>n</i> = 123)	Male (<i>n</i> = 112)			
<i>N</i>	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>	<i>G</i>	<i>G. A.</i>	<i>Int.</i>
Listening to music	3.31 ± 0.82 3.05 ± 0.88	2.84 ± 0.88	3.29 ± 0.75 3.14 ± 0.82	3.01 ± 0.85	3.17 ± 0.82 3.26 ± 0.75	3.37 ± 0.67	*	<i>n.s.</i>	*
Watching videos/series	3.02 ± 0.81 3.01 ± 0.82	3.00 ± 0.83	2.92 ± 0.81 2.93 ± 0.85	2.94 ± 0.89	3.00 ± 0.85 3.12 ± 0.84	3.25 ± 0.81	<i>n.s.</i>	<i>n.s.</i>	<i>n.s.</i>
Viewing images, photos, stories	2.96 ± 0.84 2.71 ± 0.95	2.51 ± 0.99	3.12 ± 0.72 2.89 ± 0.82	2.65 ± 0.83	3.16 ± 0.74 3.01 ± 0.75	3.01 ± 0.75	*	*	*
Gaming	1.89 ± 0.88 2.38 ± 1.03	2.78 ± 0.98	1.91 ± 0.76 2.22 ± 0.87	2.48 ± 0.88	1.80 ± 0.89 2.12 ± 1.00	2.47 ± 1.00	**	<i>n.s.</i>	<i>n.s.</i>
Searching for information	2.91 ± 0.68 2.76 ± 0.81	2.64 ± 0.88	2.94 ± 0.55 2.96 ± 0.67	2.97 ± 0.75	3.19 ± 0.70 3.10 ± 0.67	3.00 ± 0.63	*	*	<i>n.s.</i>
Studying	2.81 ± 0.73 2.74 ± 0.80	2.67 ± 0.86	2.98 ± 0.70 2.84 ± 0.74	2.73 ± 0.76	3.17 ± 0.74 2.96 ± 0.77	2.72 ± 0.74	*	<i>n.s.</i>	<i>n.s.</i>
Chatting with friends/acquaintances	3.43 ± 0.74 3.21 ± 0.83	3.03 ± 0.87	3.57 ± 0.55 3.42 ± 0.70	3.29 ± 0.78	3.58 ± 0.56 3.54 ± 0.56	3.48 ± 0.57	*	*	<i>n.s.</i>
Sending/receiving email	1.81 ± 0.80 1.67 ± 0.72	1.55 ± 0.63	1.74 ± 0.65 1.71 ± 0.66	1.69 ± 0.68	2.24 ± 0.76 2.07 ± 0.76	1.89 ± 0.71	*	**	<i>n.s.</i>
Navigating without a destination	2.06 ± 1.02 1.93 ± 0.95	1.81 ± 0.89	2.37 ± 0.97 2.11 ± 0.98	1.91 ± 0.95	2.41 ± 0.95 2.18 ± 0.94	1.94 ± 0.88	*	<i>n.s.</i>	<i>n.s.</i>
Shopping	1.91 ± 0.73 1.90 ± 0.76	1.90 ± 0.78	2.24 ± 0.83 2.03 ± 0.85	1.87 ± 0.82	2.41 ± 0.87 2.23 ± 0.85	2.04 ± 0.78	*	*	<i>n.s.</i>
Making new friends or dating	1.78 ± 0.86 1.74 ± 0.82	1.70 ± 0.80	1.62 ± 0.83 1.61 ± 0.85	1.60 ± 0.86	1.64 ± 0.83 1.69 ± 0.82	1.75 ± 0.81	<i>n.s.</i>	<i>n.s.</i>	<i>n.s.</i>
Time spent on the internet	2.78 ± 0.46 2.64 ± 0.67	2.54 ± 0.78	2.80 ± 0.56 2.74 ± 0.54	2.70 ± 0.52	2.75 ± 0.57 2.78 ± 0.50	2.82 ± 0.41	<i>n.s.</i>	<i>n.s.</i>	*
Symptoms/Difficulties	2.25 ± 0.69 1.85 ± 0.66	1.53 ± 0.43	2.32 ± 0.68 2.01 ± 0.69	1.75 ± 0.59	2.35 ± 0.61 2.14 ± 0.64	1.91 ± 0.59	***	*	<i>n.s.</i>
Satisfaction with Life	2.91 ± 0.63 2.95 ± 0.60	2.98 ± 0.57	2.78 ± 0.57 2.84 ± 0.59	2.89 ± 0.61	2.73 ± 0.52 2.76 ± 0.55	2.79 ± 0.58	<i>n.s.</i>	*	<i>n.s.</i>

Notes: *G* = Gender; *G.A.* = Group Age; *Int.* = Interaction between *G* and *G.A.* *n.s.* = Not significant; * significant at $p < 0.05$ with small effect size; ** significant at $p < 0.05$ with medium effect size; *** significant at $p < 0.05$ with large effect size.

The Chi-square test highlighted that the distribution of gender across age groups was equal.

There were no gender and age group differences in the amount of time spent on the internet. With regard to the activities on the internet, the main results of interest for problematic internet use indicated that females spent more time than males viewing images, videos or stories, chatting with friends, and navigating without a destination; while males reported a higher amount of time spent gaming online than females. Moreover, the time spent viewing images, photos or stories, searching for information, sending/receiving emails, shopping, and chatting with friends/acquaintances increased across age groups.

In order to analyze the role of Internet Use on Compulsive Internet Use, two multiple regression analyses for female and male participants were conducted using CIUS-14 score as a dependent variable and Activities on Internet scores as independent variables. Results indicated that viewing images, photos, stories ($b = 0.145$, $t = 2.12$, $p = 0.035$) for females, and watching videos/series ($b = 0.132$, $t = 2.12$, $p = 0.035$), gaming ($b = 0.122$, $t = 2.06$, $p = 0.040$), and navigating without a destination ($b = 0.148$, $t = 2.52$, $p = 0.012$) predicted CIUS-14 score.

Referring to psychological adjustment/maladjustment, Satisfaction with Life decreased and Symptoms/Difficulties increased significantly across the stages of adolescence. Females reported more Symptoms/Difficulties than males.

3.2. Gender and Group Age Differences on TAS-20, A-DES, and CIUS-14 Total Scores

The results of the MANOVA revealed a significant multivariate main effect for gender ($Wilks' \lambda = 0.908$, $F(3, 586) = 19.71$, $p < 0.001$, $\eta^2 = 0.092$), but not for age group ($Wilks' \lambda = 0.981$, $F(6, 1172) = 1.90$, $p = 0.076$, $\eta^2 = 0.010$) or their interaction ($Wilks' \lambda = 0.991$, $F(6, 1172) = 0.87$, $p = 0.513$, $\eta^2 = 0.004$). Mean, standard deviation, and the univariate main effects for gender and age groups are shown in Tables 2 and 3. There were significant and meaningful differences in TAS-20 total score with a medium effect size, and CIUS-14 score with a small effect size, with females reporting higher levels than males. No differences were found for A-DES TS. In line with this, the following percentages were recorded according to the cut-offs of the three measures: Referring to TAS-20, among females: non-alexithymia—28.3%; possible alexithymia—28.6%; alexithymia—43.1%; among males: non-alexithymia—49.8%; possible alexithymia—29.6%; alexithymia—20.6%; ($\chi^2(2) = 41.49$, $p < 0.001$). Referring to A-DES, among females: normal dissociation—72.8%; pathological dissociation—27.2%; among males: normal dissociation—74.3%; pathological dissociation—25.7%; ($\chi^2(1) = 0.17$, $p = 0.682$). Referring to CIUS-14, among females: non-compulsive internet use—47.3%; Compulsive Internet Use—52.7%; among males: non-compulsive internet—68.5%; Compulsive Internet Use—31.5% ($\chi^2(1) = 27.26$, $p < 0.001$).

Table 2. Gender differences in the mean scores of the TAS-20, A-DES, and CIUS-14 total scores.

	Females (<i>n</i> = 283)		Males (<i>n</i> = 311)		<i>F</i>	<i>p</i>	η_p^2
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
TAS-20 TS	58.26	0.72	51.54	0.67	46.91	0.000	0.074
A-DES TS	2.90	0.12	2.66	0.11	2.17	0.141	0.004
CIUS-14	22.58	0.69	17.51	0.64	28.93	0.000	0.047

Table 3. Age group differences in the mean scores of the TAS-20, A-DES, and CIUS-14 total scores.

	Early (<i>n</i> = 121)		Middle (<i>n</i> = 238)		Late (<i>n</i> = 235)		<i>F</i>	<i>p</i>	η_p^2
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
TAS-20 TS	55.56	1.04	54.87	0.74	54.26	0.74	0.54	0.584	0.002
A-DES TS	2.97	0.17	2.69	0.13	2.69	0.13	0.97	0.381	0.003
CIUS-14	20.42	0.99	18.58	0.71	21.12	0.71	3.31	0.037	0.011

Since there was not a significant multivariate main effect of age group, or a significant interaction between age group and gender, the age group variable was not considered in the following analyses.

3.3. Gender Differences on TAS-20 and A-DES Subscales

The results of the MANOVA revealed a significant multivariate main effect for gender ($Wilks' \lambda = 0.869$, $F(7, 586) = 12.66$, $p < 0.001$, $\eta^2 = 0.131$). The mean, standard deviation, and univariate main effects for gender are shown in Table 4. There were significant and meaningful difference in all the TAS-20 subscales, with females reporting higher scores in DIF and DDF than males, who in turn reported higher EOT levels. No differences were present in the A-DES subscales.

Table 4. Gender differences in the mean scores of the TAS-20 and A-DES subscales.

	Females (<i>n</i> = 283)		Males (<i>n</i> = 311)		<i>F</i>	<i>p</i>	η_p^2
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
DIF	19.89	0.42	15.82	0.40	48.10	0.000	0.075
DDF	17.28	0.26	13.95	0.25	81.63	0.000	0.121
EOT	20.73	0.25	21.69	0.24	7.21	0.007	0.012
DA	2.73	0.12	2.55	0.12	1.01	0.317	0.002
AbII	2.86	0.12	2.82	0.12	0.07	0.797	0.001
DD	2.84	0.12	2.48	0.12	4.66	0.031	0.008
PI	3.12	0.13	2.86	0.13	2.03	0.155	0.003

Note: DIF = difficulty identifying feelings; DDF = difficulty describing feelings to others; EOT = externally oriented style of thinking; TAS-20 TS = TAS-20 total score; DA = dissociative amnesia; AbII = absorption and imaginative involvement; DD = depersonalization and derealization; PI = passive influence; A-DES TS = A-DES total score.

3.4. Correlations between TAS-20, A-DES, and CIUS-14 Dimensions

As shown in Table 5, the TAS-20 TS was positively and significantly associated with the CIUS-14 score with medium effect size, in both groups. Referring to TAS subscales, among females: DIF had a medium effect size; DDF and EOT had a small effect size; among males: DIF and DDF had a medium effect size; EOT was not significantly associated.

Table 5. Bivariate correlations of TAS-20, A-DES, and CIUS-14 as a function of gender.

	1	2	3	4	5	6	7	8	9	10
1. DIF	-	0.67 *	−0.01	0.87 *	0.34 *	0.34 *	0.48 *	0.40 *	0.45 *	0.38 *
2. DDF	0.70 *	-	0.02	0.81 *	0.16 *	0.08	0.23 *	0.15 *	0.19 *	0.24 *
3. EOT	−0.10	−0.13 *	-	0.39 *	0.19 *	0.21 *	0.11	0.13 *	0.16 *	0.13 *
4. TAS TS	0.90 *	0.80 *	0.25 *	-	0.34 *	0.32 *	0.43 *	0.35 *	0.41 *	0.38 *
5. DA	0.38 *	0.22 *	0.23 *	0.42 *	-	0.78 *	0.78 *	0.77 *	0.91 *	0.30 *
6. AbII	0.35 *	0.20 *	0.19 *	0.38 *	0.86 *	-	0.76 *	0.74 *	0.88 *	0.32 *
7. DD	0.44 *	0.26 *	0.16 *	0.45 *	0.88 *	0.83 *	-	0.82 *	0.95 *	0.33 *
8. PI	0.44 *	0.25 *	0.12 *	0.43 *	0.83 *	0.78 *	0.84 *	-	0.90 *	0.33 *
9. A-DES TS	0.43 *	0.25 *	0.19 *	0.45 *	0.95 *	0.92 *	0.97 *	0.91 *	-	0.35 *
10. CIUS-14	0.44 *	0.35 *	0.02	0.44 *	0.23 *	0.26 *	0.26 *	0.22 *	0.26 *	-

Note: Correlations for female participants (*n* = 283) are presented above the diagonal, and correlations for male participants (*n* = 311) are presented below the diagonal. DIF = difficulty identifying feelings; DDF = difficulty describing feelings to others; EOT = externally oriented style of thinking; TAS-20 TS = TAS-20 total score; DA = dissociative amnesia; AbII = absorption and imaginative involvement; DD = depersonalization and derealization; PI = passive influence; A-DES TS = A-DES total score. * *p* < 0.05.

TAS-20 TS and A-DES TS were positively and significantly correlated, with a medium effect size, both in females and males. More specifically, DIF was correlated to all the A-DES subscales with a medium effect size in both groups, while DDF and EOT had a small effect size in both groups.

The A-DES TS and subscales were positively and significantly associated with CIUS-14 score, with a medium effect size among females and a small effect size among males.

3.5. Moderated Mediation Model with TAS-20, A-DES, and CIUS-14

Before testing the moderated mediational model, the total effect of TAS-20 on CIUS-14 was tested separately in females and males. With regard to females, the model was significant ($F_{(1281)} = 44.95, p < 0.001$) and explained about 14% of the variance in CIUS-14 ($R^2 = 0.138$). TAS-20 had a significant total effect on CIUS-14 ($b = 0.371, t = 6.70, p < 0.001$).

With regard to males, the model was significant ($F_{(1309)} = 74.08, p < 0.001$) and explained about 19% of the variance in CIUS-14 ($R^2 = 0.191$). TAS-20 had a significant total effect on CIUS-14 ($b = 0.440, t = 8.60, p < 0.001$).

The model with TAS-20, gender, and their interaction as predictors and CIUS-14 as the outcome variable was significant ($F_{(3590)} = 52.19, p < 0.001$) and explained about 21% of the variance in CIUS-14 ($R^2 = 0.209$). Overall, TAS-20 had a significant total effect on CIUS-14 ($b = 0.393, t = 10.76, p < 0.001$) and was not moderated by gender, because the interaction between TAS-20 and gender was not significant ($b = 0.072, t = 0.99, p = 0.321$).

Next, the effect of TAS-20 on mediator was calculated (see Table 6). The model with TAS-20, gender, and their interaction as predictors and A-DES (mediator) as an outcome variable was significant ($F_{(3590)} = 46.49, p < 0.001$) and explained about 19% of the variance in A-DES ($R^2 = 0.191$). TAS-20 significantly predicted A-DES ($b = 2.232, t = 11.69, p < 0.001$), but its interaction with gender was not significant ($b = 0.597, t = 1.57, p = 0.117$).

Table 6. Standardized coefficients of the moderated mediational model.

Paths	Direct Effects				Indirect Effects	
	<i>b</i>	<i>se</i>	<i>t</i>	<i>p</i>	<i>b</i>	<i>CI (95%)</i>
Total sample (<i>N</i> = 594)						
TAS-20 TS → A-DES TS	2.232	0.190	11.69	<0.001		
Gender → A-DES TS	7.099	4.472	1.59	0.112		
TAS-20 TS × Gender → A-DES TS	0.597	0.380	1.57	0.117		
A-DES TS → CIUS-14	0.029	0.007	3.83	<0.001		
Gender → CIUS-14	−2.921	0.845	−3.46	<0.001		
A-DES TS × Gender → CIUS-14	−0.035	0.015	−2.28	0.023		
TAS-20 TS → CIUS-14	0.332	0.040	8.30	<0.001		
TAS-20 TS × Gender → CIUS-14	0.132	0.079	1.66	0.096		
Females (<i>n</i> = 283)						
A-DES TS → CIUS-14	0.048	0.011	4.23	<0.001	0.093	0.093, 0.158
TAS-20 TS → CIUS-14	0.262	0.053	4.89	<0.001		
Males (<i>n</i> = 311)						
A-DES TS → CIUS-14	0.012	0.010	1.21	0.224	0.032	−0.024, 0.090
TAS-20 TS → CIUS-14	0.395	0.058	6.72	<0.001		

Note: → = effect on; × = interaction with.

Finally, the full moderated mediational model was tested (see Figure 1 and Table 6). It accounted for about 23% of the explained variability in CIUS-14 score ($R^2 = 0.235$) and was significant ($F_{(5588)} = 36.12, p < 0.001$). A-DES significantly predicted CIUS-14 scores ($b = 0.029, t = 3.83, p < 0.001$). TAS-20 showed a direct effect on CIUS-14 ($b = 0.332, t = 8.30, p < 0.001$). The interaction between TAS-20 and gender was not significant ($b = 0.132, t = 1.66, p = 0.096$), while the interaction between A-DES and gender was significant ($b = −0.035, t = −2.28, p = 0.023$). More specifically, TAS-20 had a direct effect on CIUS-14, both in females ($b = 0.262, t = 4.89, p < 0.001$) and males ($b = 0.395, t = 6.72, p < 0.001$). Furthermore, TAS-20 had an indirect effect on CIUS-14 as mediated through A-DES in females ($b = 0.093, CI = 0.039, 0.158, PM = 25.07\%$), but not in males ($b = 0.032, CI = −0.024, 0.090, PM = 7.27\%$).

4. Discussion

This study was aimed to evaluate differences between gender (females vs. males) and age group (early, middle, and late adolescents) in adolescents with regard to problematic internet use (Compulsive Internet Use), alexithymia, and dissociation levels, as well as the relations between these variables, with particular attention to dissociation as a potential mediator in the effect of alexithymia on problematic internet use. Overall, results indicated that there were important gender differences, while age group was not so important in explaining Compulsive Internet Use, alexithymia, and dissociation levels, as well as the relations between these variables.

The main results were that females reported higher Compulsive Internet Use and alexithymia levels than males. The average dissociation level was similar in these two groups. The results related to Compulsive Internet Use did not confirm the hypothesis based on the literature [1,2,6,26,27], according to which males were supposed to show higher problematic internet use than females. Referring to age group, no significant differences were found. The association between alexithymia and Compulsive Internet Use, as well as the correlation between alexithymia and dissociation, were similar for males and females, showing a positive and significant association with medium effect size. Specifically, the difficulty to identify feelings was the dimension of alexithymia strongly associated with dissociation and Compulsive Internet Use. Besides these similarities, the relation between dissociation and Compulsive Internet Use was stronger among females than males. In fact, dissociation partially explained the effect of alexithymia on Compulsive Internet Use only in the female group. In other words, gender moderated the relation between alexithymia and problematic internet use via dissociation, which was a mediator of this relationship only for females. That is to say, alexithymia played a main role in problematic internet use among adolescents irrespective of gender. Although dissociation levels were similar in females and males, it played a key role in Compulsive Internet Use among females.

4.1. Problematic Internet Use, Alexithymia, and Dissociation Levels

In order to analyze the main results more deeply, it is important to note that there were gender differences in the use of the internet. Although there were no gender or age differences in the average amount of time spent every day on the internet, females reported that they used the internet to view images, photos, and stories, chat with friends/acquaintances, and shop online much more frequently than males. The same difference was present across the three stages of adolescence, with increasing age. Moreover, females reported that they navigated the internet without a destination more than males, who in turn played games online much more than females. These results are in line with research that indicated different use of the internet in males and females, as well as with recent studies that indicated a changing trend towards female predominance in excessive internet use [60,61], and are essential to explaining gender differences on Compulsive Internet Use. As said, females reported higher Compulsive Internet Use than males, which was opposite most results present in the literature [28–30,32,60]. By using the CIUS-14 cut-off, about a half of female participants can be considered addicted to the internet, compared to one-third of males. Taking into account the activities that participants engaged in on the internet, watching videos/series, viewing images, photos, and stories, gaming online, navigating on the internet without a destination, and making new friends were associated with Compulsive Internet Use. Multiple regression analyses indicated that, for males, navigating on the internet without a destination, watching video/series, and gaming online; and for females, viewing images, photos, and stories, were the activities particularly related to internet addiction. Furthermore, additional evidence has come to our attention regarding the female group: the higher presence of difficulties/symptoms compared to males. Finally, across stages of adolescence, symptoms increased, and Satisfaction with Life decreased.

Regarding the gender and age group differences referring to alexithymia and dissociation, in line with the literature [46], females reported higher alexithymia than males. By looking at the TAS-20 cut-off, over 40% of females exceeded the cut-off for alexithymia, compared to about 20% of males. More specifically, females reported higher difficulty in identifying and describing feelings and lower externally oriented thinking compared to males. Considering the low Cronbach's alpha of the EOT subscale, this result should be not considered reliable. Nonetheless, it is possible to affirm that females reported higher difficulty in identifying and describing than males, while dissociation levels were similar in females and males, in line with the majority of studies conducted among adolescents [53]. Accordingly, about 27% of females and 26% of males crossed the cut-off point of the A-DES. Regarding age group differences, although some studies suggested that

alexithymia [17,18] and dissociation levels [19,20] decreased during adolescence, we did not find any significant difference.

4.2. *The Correlations between Internet Use, Alexithymia, and Dissociation*

Now, moving on to discuss the role of alexithymia and dissociation on problematic internet use, and looking at the correlations, the results confirm that the higher the alexithymia and dissociation, the higher the Compulsive Internet Use will be. However, the strength of these associations is quite different between females and males. Among females, difficulty to identify feelings is the aspect of alexithymia most related to Compulsive Internet Use, while among males even the difficulty to describe and communicate one's own feelings to others was important. These results confirmed that adolescents who have difficulties with identifying, expressing, and communicating emotions may overuse the internet to regulate their emotions better and to fulfill their unmet social needs. Another difference deserves our attention. All the aspects of dissociation, namely dissociative amnesia, absorption, and imaginative involvement, depersonalization and derealization, and passive influence were associated with Compulsive Internet Use, mostly among females. This relation in the whole sample can be explained in two ways. On the one hand, the tendency to use dissociative mechanisms (from normal to pathological levels) may find expression in the various activities on the internet, which can offer to users an experience of dissociative process. Therefore, internet use lends itself to use dissociative processes for manage emotions. On the other hand, internet usage can elicit dissociative experiences, such as absorption, immersion, and imaginative involvement, with experiences of unreality or detachment from one's mind, self or body/one's surroundings [62]. The stronger associations between dissociative aspects and Compulsive Internet Use among females compared to males, might be explained by the marked alexithymia present in this group. With regard to the association between alexithymia and dissociation, difficulty identifying feelings was the dimension mostly connected to dissociation, in both groups. Scholars argue that alexithymia (as a personality trait) fosters dissociation (as a defense mechanism/coping strategy/symptoms) [47]. However, conversely, because in dissociation one's feelings are divided off from awareness, adolescents could have no words to describe what they are unaware of, or are too ashamed to talk about [46].

4.3. *The Role of Dissociation on the Relation between Alexithymia and Problematic Internet Use*

Given all of the above, the mediation moderated model with alexithymia as a predictor, dissociation as a mediator, Compulsive Internet Use as an outcome variable, and gender as a moderator, indicated that the effect of alexithymia on Compulsive Internet Use mediated by dissociation was moderated by gender, with dissociation mediating the effect only among females. Alexithymia predicted Compulsive Internet Use and dissociation both in females and males. Therefore, this confirms that difficulty in emotional regulation may induce dissociative mechanisms and problematic internet use. However, the effect of dissociation on Compulsive Internet Use, including alexithymia, was moderated by gender. The mediation effect of dissociation was significant only for females. Therefore, although dissociation levels were similar among males and females, only in the latter group did dissociation partially explain the effect of alexithymia on Compulsive Internet Use. This result might be explained by the differences between the two groups regarding alexithymia, Symptoms/Difficulties, and the use of internet.

4.4. *Limitations*

Before concluding, limitations must be highlighted. First, the present study considers a convenience sample of Italian adolescents. Therefore, this undermines the generalizability of the results. Second, all the measures were self-reported. Therefore, it is not possible to exclude the potential effects of social desirability, over/under reporting, etc., as well as common method variance. Third, although theoretically, clinically, and empirically it is well accepted that alexithymia has a role in both dissociation and Compulsive Internet Use,

and dissociation has a role in Compulsive Internet Use, this study was cross-sectional, thus it was not possible to exclude possible bidirectional relations.

5. Conclusions

In conclusion, this study suggests that problematic internet use of females is increasing, or at least it is not less worrying compared to that of males. Adolescent females showed higher problematic internet use than males. They also reported higher alexithymia levels than males. Difficulty identifying and describing feelings and dissociation are risk factors for Compulsive Internet Use in adolescence, irrespective of gender. However, among females, dissociation played a key role in explaining Compulsive Internet Use levels. In fact, among females, the link between alexithymia and Compulsive Internet Use can be explained in part by the role that dissociation plays.

Future research should monitor and compare problematic internet use, alexithymia, and dissociation levels in male and female adolescents. The role of dissociation in the relationships between alexithymia and Compulsive Internet Use, taken separately for females and males, should be further investigated. The findings of this study should be replicated in other samples of adolescents, clinical and non-clinical, both in cross-sectional and longitudinal studies, as well as through cross-cultural studies.

This study suggests the need to carry out a prevention program on the risks related to Compulsive Internet Use. Moreover, prevention and treatment programs focusing on and aiming at reducing alexithymia (in particular the difficulty to identify feelings) and dissociation, and the promotion of emotion regulation strategies, should be developed to verify their efficacy in reducing the problematic internet use. On the basis of results coming from future research, policy and practice could be implemented to face the topical and relevant issue of problematic internet use in adolescents.

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Article

A Multi-Mediation Analysis on the Impact of Social Media and Internet Addiction on University and High School Students' Mental Health Through Social Capital and Mindfulness

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Abstract: Introduction: Social media addiction (SMA) and internet addiction (IA) are increasingly prevalent, impacting mental health (MH) globally. This study investigates the mediating roles of mindfulness and social capital (SC) in the relationship between SMA, IA, and MH among Ethiopian high school and university students, contributing to the Sustainable Development Goal (SDG) 3 of good health and well-being. Methods: A cross-sectional study was conducted with 1160 university and 1473 high school students in Dessie, Ethiopia. Participants completed validated questionnaires assessing SMA, IA, mindfulness, SC, and MH. Structural Equation Modeling (SEM) with a multi-mediation Model (SMM) was used to examine the hypothesized relationships. Results: SEM revealed that both SMA and IA had a direct negative effect on mindfulness, SC, and MH in both high school and university students. Notably, mindfulness and SC significantly and positively predicted MH, indicating their protective role against the negative effects of SMA and IA. Furthermore, both mindfulness or SC fully or partially mediated the relationship between SMA, IA, and MH, highlighting their crucial role in explaining the association. Conclusions: This study provides evidence for the crucial roles of mindfulness and SC in buffering the negative effects of SMA and IA on MH among Ethiopian students. The findings highlight the need for educational and health interventions that foster mindfulness and SC to enhance student mental health and promote a healthy digital environment. These results offer valuable insights for educators, health professionals, and policymakers in Ethiopia and other developing countries facing similar challenges.

Keywords: social media addiction; internet addiction; mindfulness; social capital; mental health; multi-mediation analysis

1. Introduction

Globalization, driven by the widespread use of social media and internet access, has brought the world closer together, transforming it into a global village [1–3]. This digital system has made high school and university students' learning and life easier, but the excessive use of the internet and social media may also cause mental, academic, and other health-related problems [4–6]. Globally, the number of Internet users climbed from 414 million in 2000 to 665 million in 2002, and by 31 December 2019, it had surpassed 4.574 billion [7]. Internet addiction is now becoming a major mental health issue among university and college students. For instance, in American 25.1% [8], in China it ranges

from 10.6% to 13.6% [9], in Taiwan 15.3% [10], in Malaysian 36.9% [11], in Iranian 40.7% [12], in Japanese 38.2 [13], in Lebanon 16.8% [14], in Nepal 35.4% [15], in Jordan 40% [16], and in Turkey 1.6% [17], in Ethiopia it ranges from 35.2% to 85% [18]. Social media addiction is another possible worldwide problem that can have an impact on the mental wellbeing of the younger generation. This is because the majority of today's youth squander precious time on social media due to their rising usage frequency. People become hooked on social media due to their constant need to use or log on to it, as well as the excessive time and energy they expend on it [19–21]. According to long-term cohort research conducted in the US, adolescents who spent time on social media for more than three hours a day had a twofold increased chance of suffering negative mental health outcomes, such as anxiety and depressive symptoms [22]. Young adults and their mental health have improved as a result of social media usage restrictions [23]. Another study has demonstrated that a four-week social media platform deactivation improves subjective well-being such as self-reported happiness, depression, and anxiety by approximately 25–40% compared to the effects of psychological interventions such as individual therapy, group training, and self-help therapy [24]. Based on research published [20], 12% of users of social networking sites suffer from social media addiction. Social media such as Telegram, Facebook, TikTok, Whats App, Instagram, Twitter, LinkedIn, and YouTube are the most popular media that have attractive and diverse spaces for online communication among students and the young generation [25,26]. Even if the use of the internet and social media is valuable for students, when they use them unhealthy or extensively, it becomes problematic to use the internet through these social media. Due to their working nature, university and high school students, who are the most productive parts of societies and represent future builders in any country, fall victim to social media and internet addiction, which affects their mental health. Mental health, which is our best resource and pillar for our thinking, feelings, and functioning in dealing with various life situations [27], plays a vital role in ensuring the dynamism and efficiency of any society. The mental health of the students is essential for raising their learning and scientific awareness [28]. Health promotion experts have become interested in the growing incidence of mental dysfunction and the associated costs to communities as a result of the shift in illness patterns in the modern world toward non-communicable diseases [27]. Addressing mental health issues in relation to internet addiction is therefore crucial, since addictive behavior on the internet has adverse effects such as depression and anxiety and puts people's mental health at greater risk [29]. Most university students had addictive behavior toward the internet [30], and those who were addicted to the internet developed a higher risk of mental health than ordinary users of the internet [30], and excessive use led to psychological injury, mental health damage, and other health problems. This is because when they are used frequently, they can seriously harm a person's lifestyle while neglecting their vital social interactions and general health.

Internet addiction (IA) and social media addiction (SMA) are two related but distinct issues that can have significant impacts on the mental health and well-being of young people [31]. While social media platforms and internet access offer opportunities for access to information, social connection, learning, and self-expression [31,32], they can also contribute to problems such as cyberbullying, social comparison, excessive screen time, declining academic performance, and deteriorating mental health [19,33]. Internet addiction (IA) refers to excessive and compulsive/problematic internet use as an addictive disorder that affects an individual's overall health status and interferes with daily activities [34–36], whereas social media addiction (SMA) focuses on problematic social media use or social networking addiction, involves an excessive and compulsive use of social networking platforms such as Facebook, Instagram, Twitter, and Snapchat [37]. Research conducted in Saudi Arabia, China, South Korea, and Ethiopia has revealed high rates of internet

addiction among high school and university students [38–40]. For example, studies in China and South Korea conducted on internet addiction found that adolescents reported a 13% and 22% rate of internet addiction [39,40], respectively. Research by [41] reported that university students reported higher mean scores in internet addiction than high school students. A study also conducted in Ethiopia found that internet addiction negatively and significantly predicted mental health and positive psychological capital [6]. These studies have shown that SMA and IA have negative impacts on mental health, positive psychological variables, academic performance, mindfulness, moral potency, sleep patterns, and overall well-being [19,42–45]. The detrimental effects of IA include depression, mental health disorders, a decreased sense of control, and a hindrance to sleep patterns [46,47]. Similarly, SMA has been associated with social anxiety, decline of academic performance, social capital and mental well-being, low self-esteem, mood and anxiety disorders, and cyberbullying [48–51]. Social media addiction affects student academic performance in the following ways: spending more time online and less time on study, interrupting students' time management, and interfering with students' work by distracting them and making them unable to stay focused, which may make it difficult for them to encode and remember what they are learning [52,53]. Prolonged usage of social media causes psychological and medical issues, including obesity [54] and mental comorbidities, disrupted sleep patterns and result in poor sleep quality, social isolation, loneliness, depression, sadness, suicidal thoughts, cyberbullying, online harassment, sedentary behaviors, and disorders related to alcohol and tobacco use, which further exacerbate mental health issues [55,56]. Excessive use of the IA and SMA affects their brain by triggering dopamine release, which can lead to dependency and withdrawal symptoms. Besides, SMA is positively associated with social anxiety [48], burnout and depersonalization [57], academic performance, and mental well-being [51]. Due to the nature of constant connectivity and real-time updates, social media creates a fear of missing out on experiences and compulsive checking behaviors. Mindfulness enhances self-regulation by increasing awareness of one's thoughts, emotions, and behaviors, helping students recognize signs of addiction and manage their impulses to engage excessively with social media or the internet. This can reduce stress, anxiety, depression, and other psychological hazards. Social capital provides enhanced social support through networks of relationships and norms of reciprocity and trustworthiness that buffer against stress, loneliness, and other negative emotions linked to SMA and IA. These constructs are vital for developing interventions and preventive strategies aimed at mitigating IA and SMA and enhancing an individual's overall well-being and performance [58,59]. These findings highlight the need to understand the complex relationships between SMA, IA, and social capital, mindfulness, and their impact on mental health and academic performance. To address the research gap, this study aimed to examine the connections between IA, SMA, social capital, mindfulness, and mental health. This study adopts a multi-mediation analysis.

2. Literature Findings of Social Media Addiction, Internet Addiction and Its Several Associations

2.1. The Relation Between Social Media Addiction and Mental Health

Social media has emerged as the leading online service, drawing the attention of millions of users worldwide. Due to the possibility of fast communication and access to a large amount of information disseminated swiftly [60,61]. However, scientific evidence shows that SMA affects people's mental health [52]. For example, addicted social media users were associated with greater levels of depression and suicidal thoughts [62]. SMA is a psychological state of maladaptive dependence and compulsive use [63] and is overly concerned and strongly motivated to devote vast amounts of time and energy to

using social media. The implications of SMA are significant [63] and overly concerned and strongly motivated to devote vast amounts of time and energy to using social media. The implications of social media addiction are significant. Research suggests low work performance [64], low life satisfaction [65], and high stress [66] to be some of the adverse outcomes. The majority of young people in today's generation waste their valuable time on this platform due to increased usage frequency. The insatiable need to use or log on to social media, as well as spending so much time and energy on it, cause people to become addicted to social media [20]. According to long-term cohort research conducted in the US, adolescents who spent time on social media had an increased chance of suffering negative mental health outcomes [22] and social media usage restrictions have improved mental their health [23]. Another study has demonstrated that a social media platform deactivation improves subjective well-being such as self-reported happiness, depression, and anxiety [24]. Mental illness is a growing public health issue, has a greater impact on people's health globally, and negatively impacts individuals' quality of life at home, work, school, and in social settings [67]. Knowing the precise elements that enhance or deteriorate mental health is helpful for enhancing the efficiency of health promotion programs, predicting mental health declines, and comprehending the beginning and progression of illness and its symptoms, which can manifest as mood, cognitive decline, physical and emotional reactions, and interpersonal and psychological issues. Another study reported that users of social networking sites suffer from social media addiction [20].

Social media addiction is a current public mental health concern that involves uncontrollable use of the Internet for a prolonged period per day. It is also called pathological internet use, leading to psychosocial distress and significant impairment in health or interpersonal relationships [68].

In today's world, college and university students highly use internet access for social media due to the better accessibility of smart phones and the internet, which helps the learning and teaching process. This internet use through social media helps students overcome their needs for exit exams, graduate admission tests, e-learning, research and project work, and their day-to-day education. Moreover, students use their internet for the purposes of social networks, entertainment, watching movies and news, checking email, using internet games, online shopping, maintaining relationships, and making new friends [69]. However, the use of social media and the internet excessively becomes problematic since it consumes their time and academic thought, resulting in academic failure, poor direct social interaction, decreased concentration ability, a negative affective state, and poor engagement in physical activity [70]. The extensive use of social media results in physical and social psychological problems such as psychiatric comorbidities, insomnia, depression, suicide ideation, anxiety, tobacco use disorders, alcohol use disorders, sleep disorders, and obesity [71–73]. Overuse of social media also fosters a climate that is advantageous for students, emphasizing inappropriate sexual exposure online, victimization from cyberbullying, excessive use of computers for academic purposes, and excessive use of computers for gaming purposes [74]. Social media addiction was related to sociodemographic factors like gender, smartphone use, and living area [13,75]. Men use Facebook and Twitter at rates of 16.4% and 26%, respectively, while women use them at rates of 8.3% and 13%, respectively [53]. Another study reported that girls are more likely than boys to visit Facebook and Instagram frequently [55]. Moreover, some common characteristics of university students, such as being unmarried, younger, having access to a smartphone, and being unemployed, make them problematic users of the internet on social media [7,31]. It is significantly increased with grade [76,77]. Male and senior students experience more problematic internet use than females and juniors [77]. In contrast, a study in Italy reported that adolescent females were more problematic internet users than their male

counterparts [78]. The study also shows a negative association between parental norms about internet use, parent-adolescent contact, and teenage problematic internet use, while parental internet use was positively connected with teenage problematic internet use [79]. In sum, social media addiction is a valid predictor of mental health among both university and high school students. Thus, we proposed the following research hypothesis (RH):

RH1. *social media addiction negatively affects mental health among both university and high school students.*

2.2. The Relation Between Social Media Addiction, Mindfulness, and Social Capital

Students use their smart phones for social media and internet purposes due to their portability, speed, convenience, personalization, and aggregate use. Researchers [79,80] found that mindfulness and social capital are the most potential psychological resources that may safeguard mental health, reduce loss of relationships and loss of control, and have a protective role in social media addiction and internet addiction in adolescents [81,82]. These psychological resources are also the most important positive psychological resources that substantially support an individual's healthy digital system and functioning while using both social media and internet access [83]. Mindfulness can be described as an intentional, present-focused awareness without judgement, and it involves directing one's attention to the current experience in a receptive and open manner rather than dwelling on the past or worrying about the future [84–87], which helps to overcome social media addiction and safeguard the mental health of adolescents [86,87]. Unlike constructs like positive psychological capital, emotional intelligence, or even social cognitive theory, mindfulness does not rely primarily on cognitive processing or intellectual engagement; rather, it is characterized by a receptive, non-judgmental awareness and acceptance of the current experience as it unfolds [85]. Mindfulness is a self-regulation technique that places a strong emphasis on being aware of and paying attention to the present moment in order to improve emotional control and produce positive emotional outcomes [85,88–91]. This practice has been negatively related to social media addiction, stress, depression, and mental health [91–93], whereas it has been positively related to mental health, social capital, and positive outcomes on hedonic and eudaimonic well-being constructs [94].

Specifically, a study by Rostila et al. [83] found that smartphone addiction, such as cognitive preoccupation with one's smartphone and compulsive patterns of use, was significantly associated with lower-level mindfulness. Similarly, ref. [92] revealed that more problematic social media use is associated with a lower level of mindfulness. A study by [95] found that social media addiction reduces mindfulness. In addition, various studies have reported the crucial role of mindfulness, such as promoting intercultural, interreligious, and inter-contemplative competencies, helping to address swiftly pathogenic factors, reducing social media addiction or problematic social media use [92,96,97], increasing positive emotions, reducing stress, and improving quality of life [98–100]. Remarkably, mindfulness has a protective role in the correlation between mental health and SMA in adolescents [82].

Social capital is another substantial positive social resource for high school and university students to overcome SMA and help foster a healthy digital system. A study by [101] found that social capital is defined as a personal relationship and the benefits that come with it, with some individuals interacting, forming bonds, and bridging. A study show that social media addiction is negatively associated with social capital bridging [79]. However, other studies confirmed that social capital played a key role in enhancing the COVID-19 response or adverse effects, including addiction [100]. Similarly, social capital and mindfulness have been shown to positively correlate, whereas perceived stress and social capital have been found to negatively correlate [101]. Such inconclusive arguments need further

research in different cultural settings using advanced methods and a diverse population. The above scientific evidence leads us to consider that social capital and mindfulness as positive psychological and social resources play an important protective role in enhancing social media addiction and boosting mental health through a healthy digital system for high school and university students. Therefore, the substantial relationship between social media addiction social capital, mindfulness, and mental health needs more empirical investigation in comprehensive. Thus, we proposed the following testable research hypothesis:

RH2. *Social media addiction negatively affects social capital, mindfulness, and mental health among both university and high school students.*

2.3. Internet Addiction and Mental Health

Adolescents' health and well-being are negatively impacted by excessive internet use [81], which has been linked to stress, sleep issues, and personality disorders [102]. According to a study conducted on Iranian students, social media use is linked to mental health problems like anxiety and depression [103]. A previous study also reported that increased internet use among college students is directly tied to a decline in the level of mental wellbeing and adjustment [104]. Internet addiction may lead to low psychological well-being due to the limited dimension of friendship [105]; isolation, stress, and loneliness are more common among students who are addicted [106]. Moreover, internet addiction is negatively and significantly related to general positive affect, emotional ties, and life satisfaction among adolescents [105]. It may cause students to spend less time talking with their families, experience more daily stress, feel lonelier and depressed [105], and experience social impairment that affects general well-being [107]. Additionally, internet addiction has been linked to psychological and behavioral health issues like poor physical health like sleep deprivation, exhaustion, unhealthy eating habits, and a lack of physical activity [108], anxiety and depression [109], and attention deficit hyperactivity disorder [110].

Studies have also demonstrated a correlation between internet addiction and social issues, including inadequate communication [111], heightened parental conflict [112], and addictions to online gaming, gambling, and pornography [113]. To enhance individuals' well-being, mindfulness would be helpful to individuals' conducive coping mechanisms while suppressing maladaptive coping strategies [114]. This is because internet addiction is mediated by mindfulness, and high mindfulness can alleviate the negative effects of internet addiction or a low level of psychological resources [115,116]. This means individuals with low mindfulness exhibit addictive smart phone use, and as the level of their mindfulness increases, their problematic phone use decreases [117,118].

Conversely, people who practice high mindfulness tend to use the internet less than people who practice low mindfulness [119]. This is because people who have high mindfulness levels frequently have optimistic and upbeat outlooks on life and the future, and they are better able to handle issues like problematic social media and internet use [119]. Therefore, we proposed the following testable research hypothesis:

RH3. *Internet addiction negatively affects mental health of the student population.*

2.4. Internet Addiction, Social Capital, and Mindfulness

A study found that extensive internet use among participants was associated with a decline in social life, an increase in feelings of hopelessness and loneliness, and reduced communication with family members at home. Specifically, as individuals spent more time

online and accumulated less social capital, they had less time for direct interactions with friends, family, and colleagues [120].

For instance, internet use at work was strongly linked to decreased time spent with coworkers, while excessive internet use at home significantly detracted from the quality of time shared with family and friends. These findings suggest that greater engagement in online activities may lead to diminished opportunities for meaningful face-to-face connections, ultimately impacting individuals' overall well-being.

Previous studies have demonstrated that an increase in internet addiction is associated with greater social distancing. Specifically, there is a negative correlation between social capital and internet addiction, indicating that higher levels of social capital can help prevent the development of online addiction [92,121]. This suggests that fostering strong social connections may mitigate the risk of internet addiction and its associated impacts on individuals' lives. University students who are addicted to smartphones experience greater negative impacts on their social relationships, leading to weakened attachments to their family, close friends, and relatives [122]. Due in large part to their demanding academic programs and maladaptive health habits, university students are widely recognized as a vulnerable population susceptible to psychological health difficulties [123]. Nevertheless, Internet addiction (IA) remains an area of research that has received comparatively less attention. In today's society, adolescents are particularly vulnerable to the negative effects of IA, which can adversely impact their moral character and psychological well-being [124].

Research has identified mindfulness and psychological capital as the most effective positive psychological tools for preserving ego strength and reducing levels of internet addiction [125–128]. These constructs are vital for developing interventions and preventive strategies aimed at mitigating internet addiction. Additionally, they play a crucial role in enhancing an individual's overall well-being and performance, especially in cases of severe internet addiction [126,128].

Mindfulness is the discipline of being completely present and engaged in the present moment without passing judgment [127], which has been widely researched for its several benefits. These include buffering against internet addiction [128], improving mental health [6], reducing depression [123], and safeguarding ego strength [19]. A study found that mindfulness interventions have potential benefits in reducing internet addiction [19,128]. A comprehensive study by [126,128–130] found that internet addiction negatively and mindfulness positively predicted students' mental health, and a negative association was found between mindfulness and internet addiction. Thus, both university and high school students who develop internet addiction may be less likely to have social resources and mindfulness skills. This led to the following testable research hypothesis:

RH4. *Internet addiction negatively affects social capital, mindfulness, and mental health among both university and high school students.*

2.5. Social Capital, Mindfulness, and Mental Health

Social capital is one of the main potential safeguards against internet and social media addiction. People's mental health significantly improved when they had more social capital, such as cognitive social capital [130,131]. Social capital may have an impact on health outcomes by eliminating possibilities for unhealthy behavior and quickly promoting and disseminating health information [131].

Increased financial, medical, and transportation resources are made available to people with high social capital, which has been shown to improve general health [132]. Larger social networks may make it easier for a person to get social assistance, which improves health [118]. Furthermore, individuals with access to network members who engage in

healthy lifestyles may seek information from these connections, which can reinforce and promote positive health behaviors [133]. Social capital, such as a strong social network and higher trust in neighbors, has a protective factor against depression [133].

People who report feeling socially isolated within their networks are more likely to experience depression than those who maintain a greater number of connections [119,120]. Social capital is positively correlated with psychological well-being, suggesting that a robust network of social relationships plays a crucial role in enhancing mental health outcomes. The second influential positive psychological resource is mindfulness, which promotes mental health and acts as a moderator between internet and SMA and mental health. The literature that is now available illustrates the connection between mindfulness and internet addiction, which has a significant impact on people's social lives. The detrimental impacts of social media can be successfully mitigated by mindfulness [134]. It provides benefits to individuals by maintaining mental health [135]. According to studies by [134,135], it helps people by preserving mental health, raising subjective well-being, improving mental clarity and intensity of attention, boosting productivity, lowering stress and depression. Certain research has linked people's mental health and mindfulness. For instance, studies show that high levels of self-esteem and low levels of social anxiety are significantly predicted by mindfulness [133–136]. Social capital also reduces anxiety and improves overall mental well-being [137,138]. Thus, we hypothesized that:

RH5. *Social capital and mindfulness positively affect mental health among both university and high school students.*

2.6. Theoretical Foundations and Research Hypothesis

The positive psychology theory proposed by Seligman [139], the social cognitive theory developed by [140], transactional model of stress and coping (TMSC) by [141]; and the cognitive-behavioral model of pathological internet use [142,143] serve as the theoretical foundations for this novel study. The theory of positive psychology, as developed by [139], has been associated with various phenomena such as internet addiction, social media addiction, mindfulness, social capital, and mental health. Consequently, positive psychology theory offers a practical framework for examining the role of mindfulness as mediator in the relationship among IA, SMA, and the mental health of students. Nowadays, due to its highly beneficial qualities, mindfulness construct had integrated with the positive psychology model [144], and mindfulness based programs and practices have been highly associated with many positive mental health and psychological outcomes [145].

Additionally, Albert Bandura's Social Cognitive Theory [140] explains that regulating social activities, including healthy social media use and internet access, plays a crucial role in regulating social and moral behavior as well as essential resources for social functioning, fostering the development of social competencies and internal standards. In addition, the transactional model of stress and coping (TMSC) by Davis [141] posits that individuals' response to stress involves transactions between the person and their environment and it could be relevant for understanding how mindfulness and social capital act as coping mechanisms in dealing with stressors related to IA and SMA [141]. To strengthen these ideas, a study by Rizzo and Alparone [36] found that adolescents experiencing greater feelings of loneliness during isolation had poorer mental health and a lower quality of life. This underscores the importance of social capital. The theory also provides the best framework for investigating how individuals' coping strategies, including mindfulness practices and social capital (social support networks), influence their experiences with addictive behaviors [141].

Finally, a cognitive-behavioral model of pathological internet use (PIU) by [142] theorizes that internet addiction links cognitive symptoms such as ruminative cognitive styles, low self-worth, and social anxiety to the development of internet addiction, particularly in the context of social media use [142]. This model suggests that these cognitive factors can contribute to excessive and problematic online behaviors, affecting social capital by potentially reducing face-to-face interactions and impacting mental health through heightened feelings of loneliness, isolation, and diminished self-esteem, emphasizing the need for interventions that address these cognitive patterns to promote healthier internet use and improve overall well-being [6,142,143]. The theoretical models used in this study such as the Seligman's positive psychology theory [139], Bandura's social cognitive theory [140], the transactional model of stress and coping (TMS) [141], and a cognitive-behavioral model of Pathological Internet Use (PIU) [142] emphasizes that social networking, social capital and mindfulness are crucial components for enhancing mental health and reducing internet and social media addiction among university and high school students) [140–143]. These theories emphasize the importance of person-environment interaction, social networking, being aware of the environment, social capital and mindfulness as positive psychological and social resources for reducing internet and social media addiction and promoting mental health.

By conducting an in-depth study into the mediating effects of social capital and mindfulness, this innovative study aims to offer valuable insights into the complex relationships among social media addiction (SMA), internet addiction (IA), mindfulness, social capital, and mental health amongst both university and high school students. The findings of this research will not only contribute to the existing literature but also have significant implications for policymakers, educators, and mental health professionals, shedding light on the potential positive impact of social capital and mindfulness in nurturing students' digital mental well-being. Through its innovative approach, this study seeks to make a significant contribution to the field by addressing the gap (methodological, conceptual, and contextual) in knowledge surrounding the influence of social capital and mindfulness on students' digital mental health. By uncovering the underlying mechanisms and pathways through which these factors operate, this research has the potential to shape effective interventions and strategies aimed at promoting healthy digital habits and overall mental well-being among students. By emphasizing the significance of mindfulness and social capital in the 21st century as important psychological skills within the context of digital environments, this study stands out as a novel and original endeavor. It recognizes the changing landscape of students' lives, highly influenced by the digital realm, and seeks to empower individuals and institutions with evidence-based insights to navigate these complex associations. As a result, this study not only has academic relevance but also carries practical implications that can inform the development of policies and educational initiatives tailored to support students' mental health in the digital era.

Limited research has been conducted in Ethiopia to investigate the relationship between internet addiction and mental health [6,143]. This study is novel in that, to the best of our knowledge, no previous studies have explored the role of multi-mediation analysis of social capital and mindfulness in the association among social media addiction, internet addiction, and mental health from a developing country perspective or cultural setting. Based on the theoretical frameworks outlined above, it is essential to investigate the potential impact of social media and internet addiction on high school and university students' mental health, considering social capital and mindfulness as potential positive resources that may be depleted. To enhance the robustness of the study, it is recommended to utilize larger and more diverse samples. Therefore, we propose the following research hypothesis:

Hypothesis 6a. *social capital and mindfulness partially mediate the relationship between social media addiction and mental health, and internet addiction and mental health constructs.*

Hypothesis 6b. *social capital and mindfulness fully mediate the relationship between social media addiction, internet addiction, and mental health.*

In summary, based on the positive psychology theory [139], the social cognitive theory [140], the transactional model of stress and coping [141] and the cognitive-behavioral model of pathological internet use [142,143], the purpose of the present study was to test the mediation effects of social capital and mindfulness on the relationship between social media addiction, internet addiction and mental health of university and high school students. The proposed interrelationships are visually represented in the hypothesis model depicted in Figure 1:

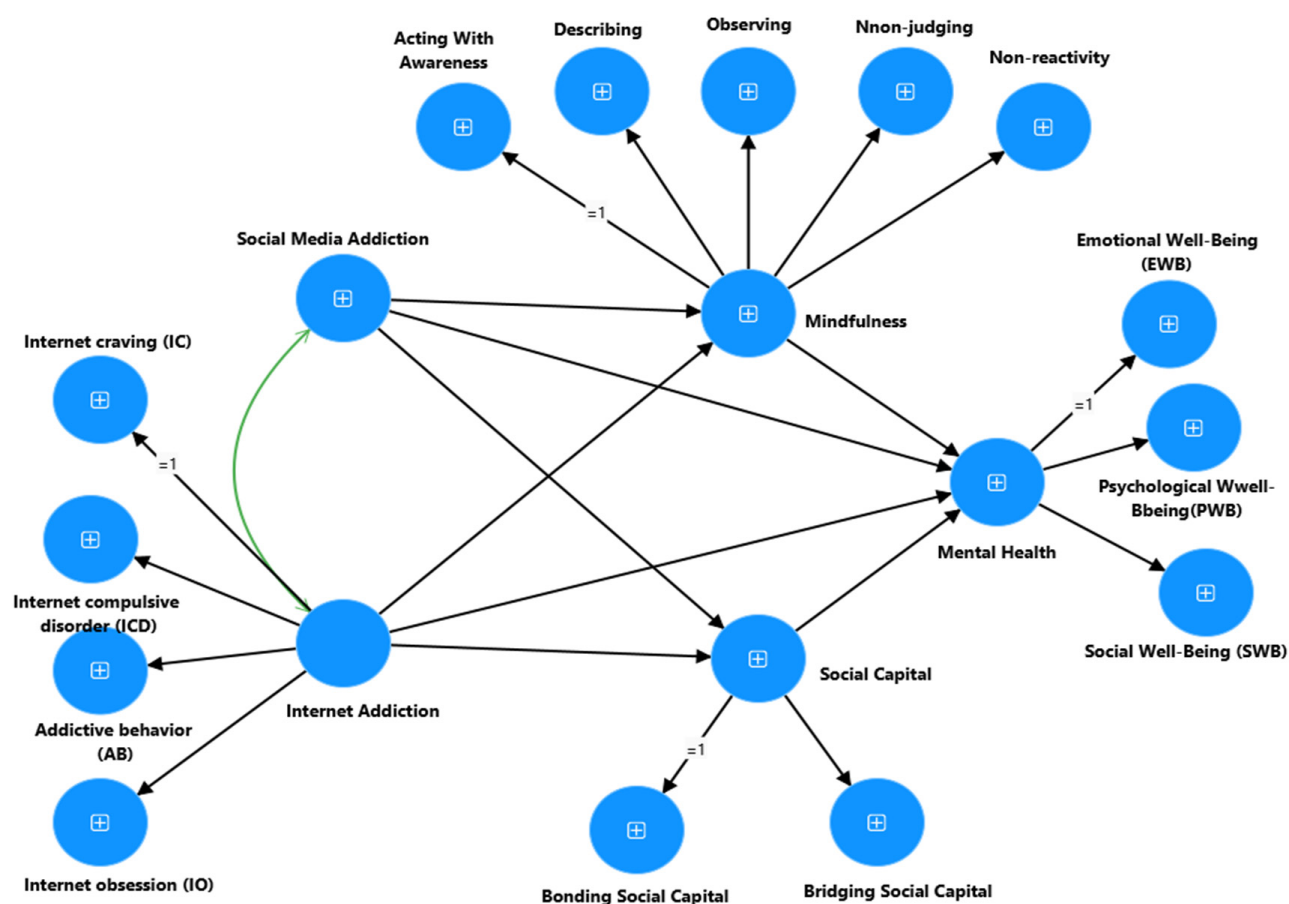


Figure 1. Proposed Full multi-mediation model to explain the association between social media addiction, internet addiction, social capital, mindfulness, and mental health. Note. The figure illustrates the proposed associations among the constructs in the theoretical model.

3. Materials and Methods

3.1. Research Design

A large cross-sectional design with an associational approach is well suited to the current study to achieve the stated objectives. To achieve the stated objectives, we targeted both high school students and college students belong to age groups, with levels of maturity and responsibilities. High school students are usually younger. May be in a phase of exploration and social growth were social media's crucial for building and sustaining peer connections. On the contrary college students are generally more concentrated on

achievements. Preparing for their careers which could affect why they use social media and internet. The Ministry of Education's move towards platforms and digital resources has had an impact on both high school and university students alike due to the shift in educational methods [6,19,144]. Understanding how students interact with the internet and social media has become essential for educators and policymakers as reliance on tools for learning continues to grow. Studying the variations in media and internet usage patterns and susceptibility to addiction among school and college students offers valuable insights into how these platforms impact students at diverse academic stages. The knowledge of these distinctions can aid in creating tailored interventions and support mechanisms to encourage habits among students.

3.2. Study Setting

The study's target populations are Amhara Regional State public university undergraduate and five selected high school students in Ethiopia.

3.3. Sample and Sampling

The samples were selected from one public university and five selected high schools in the Amhara Regional State of Ethiopia. The university and high schools were purposefully selected due to their convenience for data collection and their large populations. The samples were then chosen using proportionate stratified random sampling. For instance, the high school student samples were selected across grades and genders (refer to Table 1) based on the population numbers. After clearly defining the strata, we utilized simple random sampling to select the samples. The sample comprised 2633 respondents, with a mean age of 19.3 years ($SD = 2.03$), ranging from 16 to 29 years of age. The sample encompassed 1160: 689 (59.4%) male and 474 (40.9%) female undergraduate graduate students at Wollo University in Dessie, Ethiopia and 873 (59.3) males and 600 (40.7%) females with a total of 1473 high school students from Dessie Town, Ethiopia (See details in Table 1). In this study, the researcher intends to use advanced structural equation modelling and psychometric measures (confirmatory factorial analysis, discriminant, and convergent validity) based on proposed general guidelines for absolute sample size: (1) small ($n = 100$); (2) medium, $n =$ approximately 150; and (3) large ($n > 200$) [146]. Thus, it is often recommended that researchers have 200 cases or more for their study sample to achieve statistically stable estimates and fewer sampling errors [146]. As a result, in both planned studies, we adhere to this guideline.

Table 1. Descriptive statistics, kurtosis, and skewness of high school and university students, respectively.

Variables	Min		Max		Mean		Std. Dev		Skewness		Kurtosis	
	Univ.	High sc.	Univ.	High sc.	Univ.	High sc.	Univ.	High sc.	Univ.	High sc.	Univ.	High sc.
Interent caraving	5.00	5.00	28.00	28.00	20.00	20.01	5.06	4.98	−1.09	−1.07	0.60	0.58
Internet compulsive disorder	4.00	4.00	22.00	22.00	14.75	14.81	4.27	4.20	−0.76	−0.78	−0.18	−0.11
Addictive behaviour	4.00	4.00	20.00	20.00	15.29	15.07	4.07	4.04	−0.88	−0.82	0.07	0.02
Internet obsession	4.00	4.00	20.00	20.00	14.85	15.03	4.65	4.42	−0.77	−0.88	−0.47	−0.14
Acting with awareness	4.00	4.00	24.00	24.00	15.88	16.07	5.47	5.32	−0.79	−0.84	−0.13	0.04
Describing	4.00	4.00	24.00	24.00	15.91	16.05	5.54	5.33	−0.80	−0.83	−0.18	−0.01
Observing	4.00	4.00	24.00	24.00	13.89	14.13	5.41	5.33	−0.26	−0.29	−0.79	−0.73
Non-judging	4.00	4.00	24.00	24.00	12.68	12.77	4.99	4.81	−0.16	−0.22	−0.75	−0.67
Non-reactivity	4.00	4.00	25.00	25.00	15.37	15.18	5.37	5.18	−0.61	−0.59	−0.26	−0.17
Emotional well-being	3.00	3.00	21.00	21.00	11.04	11.00	4.57	4.38	−0.23	−0.25	−0.71	−0.62
Psychological well-being	6.00	6.00	42.00	42.00	23.41	23.43	8.96	8.54	−0.49	−0.53	−0.43	−0.26
Social well-being	5.00	5.00	35.00	35.00	19.96	20.02	7.62	7.27	−0.60	−0.66	−0.44	−0.27
Bonding	4.00	4.00	24.00	24.00	15.88	15.66	5.08	5.37	−0.83	−0.77	−0.03	−0.30
Brdging	4.00	4.00	24.00	24.00	14.81	14.69	5.42	5.37	−0.41	−0.35	−0.65	−0.68
Social media addiction	3.00	6.00	36.00	36.00	16.35	16.62	8.020	7.87	0.19	0.09	−1.19	−1.22
SocialCapital	8.00	8.00	48.00	48.00	30.70	30.36	9.63	9.95	−0.65	−0.60	−0.02	−0.25
Mindfulness	20.00	20.00	120.00	120.00	73.75	74.20	21.41	20.37	−0.98	−1.08	0.81	1.15
Mental health	14.00	14.00	98.00	98.00	54.42	54.46	19.85	18.76	−0.60	−0.67	−0.053	0.23

Table 1. Cont.

Variables	Min		Max		Mean		Std. Dev		Skewness		Kurtosis	
	Univ.	High sc.	Univ.	High sc.	Univ.	High sc.	Univ.	High sc.	Univ.	High sc.	Univ.	High sc.
Intrerent Addiction	17.00	17.00	90.00	90.00	64.90	64.91	14.23	13.87	−1.06	−1.12	1.41	1.68
Demographic Data of the participants												
High School						University						
Sex	Male	873	59.3%	Sex	Male	689					59.4% 40.6%	
	Female	600	40.7%		Female	471						
Name of high schools	Hotie	471	32%	Batch	Freshman	635					54.7	
	Memihir	375	25.5%		Sophomre	403						
	Akalewold											
	Kidame	275	18.7%		Senior	122						
	Gebeya											
Grade Level	Nigus M.	199	13.5%									
	Tita	153	10.4%									
	9	507	34.4%									
	10	502	4.1%									
	11	464	31.4									

Notes: High Sc. = High School students; Max = maximum; Min = minimum; Std. Dev = standard deviation; Univ = University Students.

3.4. Instruments

The reliabilities (Cronbach's alpha, composite reliability) and validities (convergent, discriminant validity, construct validity using confirmatory Factor Analysis-CFA) of the scales were calculated and reported in this study.

3.4.1. Demographics Questionnaire and Data Quality Controlling

The demographic questionnaire obtained information regarding sex, age, grade level, and batch (year) of the students. Additionally, to increase the accuracy of the data, there were four attention and honesty check items included based on scientific recommendations [147,148]. The first item, "Please choose 'agree' for this question", was used to test whether the subject was careless or inattentive. If the subject did not choose the fixed response of "agree", their data was excluded [147–149]. The next three items which were rated on a 4-point Likert scale from 1 (strongly disagree) to 4 (strongly agree)—"I answered all the questions truthfully", "I never lied", and "I never hid myself"—were intended to assess the honesty and truthfulness of the subject's responses. If a person scored low (≤ 2 on the 4-point Likert scale) on any of these three items, their data was also excluded, as this would suggest a tendency toward self-reported deception [147–149]. By including these validity checks, the researchers aimed to ensure the truthfulness and reliability of the self-reported data collected through the demographic questionnaire.

3.4.2. Bergen Social Media Addiction Scale (BSMAS)

The BSMAS used in this study (see supplementary S1A and S2A for both university and high school students) was a six-item developed by [150] based on Bergen Facebook Addiction Scale which includes six main elements (mood, salience, tolerance, modification, conflict, relapse, and withdrawal) of addiction proposed by [151]. The BSMAS is a single factor scored between very rarely (1) and very often (5) points. The scale was adapted to the Turkish culture by [152] and had a strong reliability and construct validity. The Cronbach's α value of the scale was found to be 0.88. In the present study, the scale in both university and high school students demonstrated ($\alpha = 0.963, 0.962$; CR = 0.963, 0.963; AVE = 0.810, 0.807), high internal consistency, construct reliability and discriminant validity respectively. The confirmatory factor analysis (CFA) fit values showed an acceptable fit in the current study for both university and high school students ($\chi^2/\text{df} = 6.70, 6.71$ TLI = 0.911, 0.904,

CFI = 0.912, 0.920, RMSEA = 0.085, 0.88 (95% CI = 0.076, 0.043 to 0.098, 0.072), SRMR = 0.029, 0.33), respectively.

3.4.3. Internet Addiction Scale (IAS)

An original instrument of the IAS developed by [153] later adapted by [6,143] to assess an individual's excessive and compulsive internet use that interferes with daily functioning using a 17-item scale used in this study (see supplementary S1B and S2B for both university and high school students). The IAS was a seven-item response option ranging from Very Strongly disagree (1) to Very Strongly agree (7). The IAS is a total of 17 items measured with four dimensions and in the present study the internal consistency, construct reliability, convergent and discriminant validity respectively were: (a) Internet craving ($\alpha = 0.936, 0.934$; CR = 0.936, 0.934; AVE = 0.746, 0.739), (b) Internet compulsive disorder ($\alpha = 0.913, 0.910$; CR = 0.914, 0.911; AVE = 0.726, 0.717), Addictive behavior ($\alpha = 0.903, 0.900$; CR = 0.905, 0.904; AVE = 0.704, 0.696), and Internet obsession ($\alpha = 0.931, 0.924$; CR = 0.932, 0.926; AVE = 0.772, 0.756) and the total scale was $\alpha = 0.94$. A construct validity of the measure using CFA found that the four-factor model looked to provide an excellent fit to the data ($\chi^2/df = 4.27, 4.53$, TLI = 0.973, 0.968, CFI = 0.978, 0.973, RMSEA = 0.053, 0.061 (95% CI = 0.048, 0.051 to 0.058, 0.078), SRMR = 0.029, 0.030), respectively. In the previous study, the construct validity (acceptable) and reliability both Cronbach alpha and CR (ranged from 0.883, 0.883 to 0.927, 0.927) of the scale was also confirmed, respectively [6]. The Internet Addiction Scale negatively correlated with mental health [6] and mindfulness [19,154].

3.4.4. Personal Social Capital Scale-8 (PSCS-8)

The PSCS-8 consists of 8 items (see supplementary S1C and S2C for both university and high school students) and each item is scored on a 5-point Likert ranging from 1 (a few) to 5 (a lot) originally developed by [155], the short form revised by Wang et al. [101] was used in this study. PSCS-8 is grouped into two dimensions: bonding and bridging. The reliability coefficients for the PSCS-8 scale in the previous study for two factors were: bonding (0.70), and bridging (0.73) and total (0.78) [101]. A sample item is "There is a special person who is around when I am in need". The two factor PSCS-8 scale in the present study for both university and high school students demonstrated: bonding ($\alpha = 0.936, 0.942$; CR = 0.936, 0.943; AVE = 0.786, 0.804), and bridging ($\alpha = 0.930, 0.906$; CR = 0.930, 0.908; AVE = 0.768, 0.711), high internal consistency, construct reliability and discriminant validity respectively. Moreover, a confirmatory factor analysis (CFA) for both university and high school students ($\chi^2/df = 4.78, 4.43$, TLI = 0.949, 0.946, CFI = 0.965, 0.963, RMSEA = 0.067, (95% CI = 0.061, 0.051 to 0.098, 0.091), SRMR = 0.026, 0.032) was also conducted on the scale to check the construct validity and confirmed an acceptable range based on the conventional criteria's of [156].

3.4.5. The Five Facet Mindfulness Questionnaire Short Form (FFMQ-SF)

The FFMQ-SF developed by [126] and later modified by [127] was used in this study (see supplementary S1D and S2D for both university and high school students) aimed to assess mindfulness levels. The FFMQ-SF has five sub-scales and respondents' responses are given on a 5-point Likert scale ranging from 1 (very rarely true) to 5 (almost always true). The original version of each sub-scales with four items: acting with awareness, describing, observing, non-judging, and non-reactivity internal consistency ranged from $\alpha = 0.69$ to 0.85, which demonstrated acceptable reliability. In the present study, the five sub scales for both university and high school students: (a) acting with awareness ($\alpha = 0.952, 0.946$; CR = 0.952, 947; AVE = 0.833, 0.816), describing ($\alpha = 0.946, 0.938$; CR = 0.947, 0.940; AVE = 0.818, 0.797), observing ($\alpha = 0.947, 0.945$; CR = 0.948, 0.945; AVE = 0.819, 0.812), non-judging ($\alpha = 0.908$,

0.894; CR = 0.910, 0.896; AVE = 0.717, 0.685) and non-reactivity (α = 0.922, 0.905; CR = 0.927, 0.911; AVE = 0.761, 0.728) demonstrating high internal consistency, construct reliability and discriminant validity respectively. The construct validity of the FFMQ-SF using CFA demonstrated that the five-factor model for both university and high school students looked to provide an excellent fit to the current data (χ^2/df = 4.38, 4.47 TLI = 0.973, 0.965, CFI = 0.977, 0.971, RMSEA = 0.054, 0.059 (95% CI = 0.050, 0.056, 0.058, 0.063), SRMR = 0.04, 0.035), respectively.

3.4.6. Mental Health Continuum-Short Form [MHC-SF]

Mental Health Continuum-Short Form [MHC-SF] is the most widely used tool designed to evaluate the mental health status of an adolescent and youth used in our study (see supplementary S1E and S2E for both university and high school students). The main MHC-SF was used to evaluate the mental health of the participants [152]. The frequency of enjoyment, social belongingness to a community, and regulating the psychological functioning of daily life were assessed using the MHC-SF test [157]. The three main categories of social, emotional, and psychological well-being were employed to gauge how well teenagers' mental health was functioning.

The scale developed by [157] covered three dimensions: social well-being (5 items; α = 0.74), emotional well-being (3 items; α = 0.85), and psychological well-being (6 items; α = 0.84) and comprised 14 items [158]. The overall scale of MHC-SF reliability was α = 0.91. Respondents rate each item on a 7-point Likert scale, ranging from 1 (Very strongly disagree) to 7 (Very strongly agree). This scale possessed excellent construct validity [157]. In the present study, the three factor MHC-SF sub scales for both university and high school students: Emotional Well-Being (α = 0.951, 0.946; CR = 0.950, 0.945; AVE = 0.863, 0.852), Psychological Well-Being (α = 0.974, 0.969; CR = 0.973, 0.969; AVE = 0.858, 0.837), and Social Well-Being (α = 0.974, 0.971; CR = 0.974, 0.971; AVE = 0.882, 0.868), which showed high internal consistency, construct reliability, and discriminant validity respectively. The construct validity of the MHC-SF using CFA demonstrated an excellent fit to the current data for both university and high school students (χ^2/df = 3.61, 3.70, TLI = 0.987, 0.985, CFI = 0.989, 0.988, RMSEA = 0.041, 0.043 (95% CI = 0.040, 0.041 to 0.062, 0.061), SRMR = 0.011, 0.013). Besides, the dependability and validity of the Amharic version have been proven in the Ethiopian context [6,143].

3.4.7. The Scales over All Evaluation

The author(s) of the study conducted several analyses to evaluate the quality of the scales used in this research. The results showed that all estimated parameters for the scales were statistically significant, indicating that the scales effectively measured the intended constructs. Additionally, the composite reliability of the scales, which assesses the internal consistency or reliability of the items within each scale, ranged from 0.896 to 0.971. These values were higher than the recommended threshold of 0.60 proposed by [159]. This suggests that the scales demonstrated excellent internal consistency, implying that the items within each scale were highly reliable measures of the constructs.

Furthermore, the average variance extracted (AVE) for each scale, which measures the amount of variance captured by the scale's items relative to measurement error, ranged from 0.685 to 0.868. These values exceeded the suggested threshold of 0.50 by [159]. This indicates that the scales exhibited good convergent validity and discriminant validity, effectively measuring the intended constructs and sharing a substantial amount of variance. Therefore, based on the analysis results, it can be concluded that the five scales used in the study demonstrated convergent validity, good discriminant validity, and satisfactory internal quality.

3.5. Data Analysis

To analyze the data, the study utilized two main statistical software packages, including SPSS version 29 and Smart PLS 4.0.1.3. Before commencing the analysis phase, several assumptions were carefully examined, including outliers, normality, linearity, multicollinearity, and singularity [156,160,161]. Once the necessary criteria were met, the data underwent analysis. It is worth noting that to avoid multicollinearity issues between main variables, it is recommended to maintain a correlation value below 0.90 [161]. In addition, to identify any potential issues with multi-collinearity in the data, the researchers used VIF (Variance Inflation Factor) and tolerance measures, as suggested by [6,19,156]. Additionally, the Harman single-factor test was used to assess the bias caused by common method variance based on the recommendation of [162]. Consequently, it was determined that the correlation value between binary variables in this study remained below this threshold. Furthermore, to confirm the normal distribution of the collected data should fall within the range of skewness (≤ 2) and kurtosis (≤ 4) values. Fortunately, the skewness and kurtosis values recorded in this study adhered to this criterion, thus satisfying the assumption of normality based on the assumption of [163]. In this study, the sample size is 300 or more, which supports the assumption of normality. The absolute values of skewness and kurtosis for the variables (Internet Addiction, Social Media Addiction, mindfulness, Social Capital, and Mental Health) are within the acceptable range for normal distribution (skewness ≤ 2 , kurtosis ≤ 4) recommended by [163]. For the structural equation modelling analysis, various fit values deemed acceptable in the literature were adopted as the criteria for evaluation [161,164–166]. These criteria include a chi-square to degrees of freedom ratio (χ^2/df) of less than 5, Tucker-Lewis index (TLI), comparative fit index (CFI), and incremental fit index (IFI) all above 0.90, root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) below or equal to 0.08 [156]. Adhering to these criteria, the structural equation modelling analysis in this study was deemed appropriate for further interpretation.

In line with the recommended practices, confirmatory factor analysis (CFA) was conducted on the scales before testing the model [166]. Consequently, the measurement model was thoroughly tested, and subsequently, the formulated mediation model was examined. Consequently, CFA was conducted on the scales and the measurement and structural model were tested, then the formulated multi-mediation model was tested. Finally, to examine indirect effects, the researchers calculated 95% bias-corrected and accelerated confidence intervals using the bootstrap method with 5000 resamples.

3.6. Procedures of the Studies

3.6.1. Data Collection System

The study involved participants from one large public university and five high schools which are found in the Amhara regional State of Ethiopia. University and high school students were chosen because they commonly use smartphones and actively engage with social networking sites for their learning. Due to students' limited awareness of research importance and potential carelessness, an offline survey is the most suitable data collection system, which was conducted in our study to ensure reliable data. Participants were informed about the study's objectives, and their participation was completely voluntary. Data collection took place over a three-month period from December to February during the 2023/2024 academic year.

3.6.2. Adaptation, Translation, and Validation of the Measures

Cross-cultural validation was employed to adapt and validate instruments originally developed for other cultures [167]. This process ensures the suitability of the measures

in a culturally diverse context like Ethiopia [167]. Various scales, such as the Internet Addiction Scale (IAS) [153], the Five Facet Mindfulness Questionnaire Short Form (FFMQ-SF) [126,127], the Personal Social Capital Scale (PSCS-8) [101]; the Bergen Social Media Addiction Scale (BSMAS) [150], and Keyes' Mental Health Continuum-Short Form (MHC-SF) [152] were adapted and translated for use in the Ethiopian context. The recommended guidelines for cross-cultural validation were followed, including forward and back translation, synthesis, expert review, and testing validation [168]. The adapted instruments were then pretested and validated.

After validating the measures, the study aimed to conduct a multi-mediation analysis to explore the indirect effects of independent variables on a dependent variable through a series of mediators [169–174]. SMA is particularly useful when there is a sequential chain of mediators, where each mediator influences the next until the final mediator affects the dependent variable [149,169]. This analysis helps uncover the complex relationships and underlying mechanisms between variables. Confirmatory Factor Analysis (CFA) and structural equation modelling (SEM) was used to assess the measurement (factorial) validity and structural validity of the proposed models. Goodness-of-fit indices, such as normed chi-square, Tucker Lewis Index, Comparative Fit Index, Standardized Root Mean Residual, and Root Mean Squared Error of Approximation, were considered to evaluate the model fit [156]. CFA and SEM enhance the rigour and robustness of the analysis. The study identified mindfulness and social capital as influential factors mediating the relationship between internet addiction, social media addiction, and students' mental health.

3.6.3. Ethics of the Research

The data collection process for this research was conducted following the guidelines established by the American Psychological Association (APA). The study received approval ethical letter from the ethics committee at the first author's university, Institute IRB, with the reference number 302/2023. All participants were adequately informed about the study, and the procedures were carried out in compliance with the Helsinki Declaration, including adherence to regulations such as 21 CFR 50 (Protection of Human Subjects) and 21 CFR 56 (Institutional Review Boards).

In this study, the students participating in the study neither received financial inducements nor any academic inducements such as academic credits. Participants were fully informed about the study's purpose, procedures, and voluntary nature. They were assured of anonymity, and no identifying information or medical treatment was involved. Participants were aware of their right to withdraw from the study at any time. By initiating the survey, participants were considered to have read and accepted the informed consent. Throughout the research process, the researchers strictly adhered to the protocols, guidelines, and regulations outlined by the international research code of ethics. This approach ensured that students could engage in the research freely, fostering an environment of trust and integrity. By prioritizing voluntary participation, the study aimed to gather genuine insights while respecting the autonomy and well-being of the students involved.

4. Results

4.1. Demographic Data, Descriptive Statistics, Kurtosis, and Skewness

Table 1 provides the descriptive statistics, including the demographic detail data, mean, and standard deviation, for the different variables in the study.

The absolute values of kurtosis and skewness for the variables (social media addiction, internet addiction, social capital, mindfulness, and mental health) are within the acceptable range for normal distribution (kurtosis ≤ 4 , skewness ≤ 2) recommended by [163,171]. In this study, the skewness values for social media addiction, internet addiction, social capital,

mindfulness, and mental health for university and high school students were found to be (0.19, 0.09), (−1.06, −1.12), (−0.65, −0.60), (−0.98, −1.08), and (−0.60, −0.67), respectively. The kurtosis values for these constructs for university and high school students were found to be (−1.19, −1.22), (1.41, 1.68), (−0.02, −0.25), (0.81, 1.15), and (−0.053, 0.23), respectively.

4.1.1. Multi-Collinearity Diagnostics

There are no issues with multicollinearity in our present study (see Table 2), as indicated by the Tolerance values of each predictor variables on criterion variable (mental health) being close to those in the model. Conversely, if the tolerance values are close to zero, it suggests a higher risk of multicollinearity [161]. To assess multicollinearity, the VIF statistic should ideally fall between 0 and 5, with lower numbers being more desirable, even approaching [161]. In our study, the VIF was below 5, indicating the absence of multicollinearity. Additionally, the tolerance limits for each independent variable were all greater than or equal to 0.01, further supporting the conclusion that our independent variables were free from multicollinearity issues, as measured by VIF and Tolerance.

Table 2. VIF and Tolerance of multi-collinearity statistics on students' mental health.

Model		Standardized Coefficients		t	Sig.	Collinearity Statistics	
		Beta				VIF	Tolerance
University students	Internet Addiction	−0.30		−12.29	0.000	1.08	0.92
	Social Meda Addiction	−0.15		−5.93	0.000	1.15	0.87
	Social Capital	0.10		3.86	0.000	1.23	0.81
	Mindfulness	0.31		11.53	0.000	1.35	0.74
High school students	Internet Addiction	−0.28		−12.79	0.000	1.08	0.92
	Social Media Addiction	−0.14		−6.47	0.000	1.15	0.87
	Social Capital	0.12		5.10	0.000	1.24	0.81
	Mindfulness	0.33		13.71	0.000	1.34	0.74

Furthermore, we conducted the Harman single-factor test to investigate the presence of common method bias in our study for both university and high school students. The results revealed that all constructs exhibited a common method bias rate of only 31.58% and 30.50% for both university and high school students, which falls below (50%) the recommended fit requirements. Therefore, we concluded that, our study demonstrated the absence of multicollinearity issues through the favorable tolerance values and VIF scores. The low rate of common method bias further validated the reliability of our findings.

4.1.2. Pearson Correlation Among the Study Constructs

For further analysis and steps establishing correlation among the constructs is the most important and preliminary. As a result, following the guidelines of [143,164,173], a correlation analysis was conducted to test the first hypothesis and determine the relationships between the independent factors (Social media addiction, internet addiction, social capital, mindfulness) and the criterion variable (mental health).

The results revealed a negative correlation between social media addiction (SMA) with the social capital ($r = -0.20, p < 0.01$; $-0.18, p < 0.01$), mindfulness ($r = -0.33, p < 0.01$; $-0.22, p < 0.01$), and mental health ($-0.33, p < 0.01$; $-0.40, p < 0.01$) on university and high school students, respectively. Besides, on both university and high school students, we found a negative correlation between internet addiction (IA) and social capital ($r = -0.17, p < 0.01$; $-0.20, p < 0.01$), mindfulness ($r = -0.23, p < 0.01$; $-0.33, p < 0.01$), and mental health ($-0.42, p < 0.01$; $-0.34, p < 0.01$), respectively. However, a positive significant correlation was found between mindfulness and social capital with mental health and among themselves (see Table 3).

Table 3. Pearson correlations (r) among the socio-demographic factors and the study variables.

Variables	University Students (<i>n</i> = 1160)						
	1	2	3	4	5	6	7
1. Gender	1						
2. Batch	0.04	1					
3. Internet Addiction	−0.04	−0.01	1				
4. Social Meda Addiction	−0.02	−0.06	0.20 **	1			
5. Social Capital	−0.03	0.01	−0.17 **	−0.20 **	1		
6. Mindfulness	−0.01	0.02	−0.23 **	−0.33 **	0.43 **	1	
7. Mental health	0.06	0.05	−0.42 **	−0.33 **	0.32 **	0.48 **	1

Variables	High school students (<i>n</i> = 1473)						
	1	2	3	4	5	6	7
1. Gender	1						
2. Grade level	0.04	1					
3. Internet Addiction	−0.03	−0.05	1				
4. Social Meda Addiction	−0.02	−0.04	0.22 **	1			
5. Social Capital	−0.04	−0.03	−0.20 **	−0.18 **	1		
6. Mindfulness	−0.03	0.06	−0.33 **	−0.22 **	0.43 **	1	
7. Mental health	0.06	0.05	−0.34 **	−0.40 **	0.34 **	0.49 **	1

Note: **. Correlation is significant at the 0.01 level (2-tailed).

Additionally, the gender ($r = 0.08$, $p < 0.01$) and batch ($r = 0.11$, $p < 0.01$) showed a significant positive correlation with mental health of university students. However, gender had a negative correlation with social capital ($r = -0.07$, $p < 0.01$), and positively correlated with mental health ($r = 0.071$, $p < 0.01$) of high school students. Besides, high school students in terms of grade level had a positive correlation with mindfulness ($r = 0.06$, $p < 0.05$) and mental health ($r = 0.11$, $p < 0.01$) (see Table 3).

Furthermore, the absence of noteworthy correlations with socio-demographic factors suggests that these factors did not influence the relationship between the main constructs. Our analysis of Pearson correlation coefficients revealed no significant associations between the main constructs and variables such as gender, batch, and grade level (refer Table 3). As a result, we did not deem it necessary to further investigate the impact of socio-demographic factors on the main constructs.

4.2. Group Differences

To further analyze the differences between school types (university vs. high school), we conducted independent sample *t*-test (see Table 4), provides the actual results from the independent-samples *t*-test. In addition to this, Levine's Test for Equality of Variances was computed. The significance (*p*-value) of Levene's test is greater than 0.05 (the alpha level selected for the test) for all variables except mental health "Equal variance assumed" test was taken. For mental health, Equal variance not assumed test was taken. The results indicated that there were no statistically significant differences observed between school types: university and high school as demonstrated by Independent sample *t*-test for social media addiction, internet addiction, social capital, mindfulness, and mental health ($t = 0.872$, $df = 263$, $p = 0.383$; $t = 0.886$, $df = 2631$, $p = 0.375$; $t = -0.554$, $df = 2631$, $p = 0.580$; ($t = -0.058$, $df = 2631$, $p = 0.954$) and ($t = -0.028$, $df = 2631$, $p = 0.977$) respectively.

Table 4. T-test results for equality of mean scores (Levene’s Test for Equality of Variances) by school type on main variables (N = 2633, df = 2631).

Variables	Levene’s Test for Equality of Variances	F	Sig.	t	Sig. (2-Tailed)	University (N = 1160)		High School (N = 1473)	
						Mean	Std.	Mean	Std.
SMA	Equal variances assumed	0.565	0.452	−0.872	0.383	16.35	8.02	16.63	7.88
	Equal variances not assumed			−0.871	0.384				
SC	Equal variances assumed	2.439	0.118	0.886	0.375	30.70	9.64	30.35	9.95
	Equal variances not assumed			0.890	0.374				
Mind.	Equal variances assumed	2.776	0.096	−0.554	0.580	73.7517	21.41	20.37	20.37
	Equal variances not assumed			−0.551	0.582				
MH	Equal variances assumed	5.059	0.025	−0.059	0.953	54.42	19.85	54.46	18.76
	Equal variances not assumed			−0.058	0.954				
IA	Equal variances assumed	0.792	0.374	−0.028	0.977	64.90	14.23	64.91	13.87
	Equal variances not assumed			−0.028	0.977				

Note: IA = Internet Addiction, Mind = Mindfulness, MH = Mental Health, SC = Social Capital, SMA = Social Media Addiction. Interpretation of the independent-samples *t*-test in this study: If the Sig. value is larger than 0.05 (e.g., 0.07, 0.10) and if the significance level of Levene’s test is $p = 0.05$ or less (e.g., 0.01, 0.001), you should use the first line in the table, which refers to equal variances assumed and equal variances not assumed, respectively. Also, if the value in the Sig. (2-tailed) column is equal or less than 0.05 (e.g., 0.03, 0.01, 0.001), then there is a significant difference in the mean scores on the study variable for each of the two groups and if the p value (Sig. 2-tailed) is above 0.05 (e.g., 0.06, 0.10), there is no significant difference between the two groups.

4.2.1. Measurement and Structural Model

Measurement and structural models were then assessed. The measurement model consisted of five latent constructs and 15 indicators. The Personal Social Capital Scale (PSCS-8) had two indicators, the Five Facet Mindfulness Questionnaire Short Form (FFMQ-SF) was measured by five indicators, the Internet Addiction Scale (IAS) was measured by four indicators, the Bergen Social Media Addiction Scale (BSMAS) had one indicator, and Keyes’ Mental Health Continuum-Short Form (MHC-SF) had three indicators. The measurement model demonstrated a good fit based on the confirmatory factor analysis (CFA) results (see Supplementary Files from S1A to S1E for university students and from S2A to S2E for high school students).

After conducting an examination of the measurement model for the PSCS-8, FFMQ-SF, IAS, BSMAS, and MHC-SF, our next step involved assessing the overall constructs of the measurement model across various scales. This analysis encompassed model one (1) to model seven (7) for both university and high school students. The result demonstrated a good fit to the data for all models (model 1 to model 7) (see Table 5). These results indicate that the latent variables are accurately represented by their corresponding indicators. The structural model was then evaluated after confirmed measurement model. To test the structural model, we examined the fitness of indices of the latent constructs, and fitted to the data, yielding the acceptable fitness of indices. Finally, the full and the partial mediation model of structural models, namely Social Media Addiction → Social Capital and mindfulness → Mental health (Model 1-SMA); Social media addiction → Social Capital → Mental health (Model 2-SMA); Social media addiction → mindfulness → Mental health (Model 3-SMA); Internet addiction → Social Capital and mindfulness → Mental health (Model 4-IA); Internet addiction → Social Capital → Mental health (Model 5-IA); Internet addiction → mindfulness → Mental health (Model 6-IA) and Social media addiction and Internet addiction → Social Capital and mindfulness → Mental health (Model 7-SMA and IA) (see the details in Table 5). The findings revealed that, the measurement models and structural models (Model 1 to 7) demonstrated an acceptable fit to the data (see Table 5). All factor loadings were significant and ranged between 0.71 to 0.95, ($p = 0.001$), indicating that the

indicators effectively captured the underlying latent variables. In summary, the measurement model and structural model for both university and high school students exhibited an acceptable fit to the data, indicating that the indicators accurately represented the latent constructs and the relationships between the constructs were well-supported by the data. The results of the study provide evidence for the reliability, convergent validity, discriminant validity, and construct validity of the social media addiction, internet addiction, social capital, mindfulness, and mental health constructs among undergraduate university and high school students. The structural model supports the proposed relationships between these constructs, confirming and proving the proposed hypotheses (see Table 5).

Table 5. Confirmatory Factor Analysis of the Constructs Using the Measurement Model and the Structural Model.

Confirmatory Factorial Analysis of the Variables											
Fitness of Indices		University Students					High School Students				
		$\chi^2(df)$	χ^2/df	TLI	CFI	RMSEA	$\chi^2(df)$	χ^2/df	TLI	CFI	RMSEA
Models	Social media addiction	780 (9) *	6.70	0.911	0.912	0.085	888 (19) *	4.7	0.904	0.920	0.088
	Internet addiction	482 (113) *	4.27	0.973	0.978	0.053	658 (113) *	4.53	0.968	0.973	0.061
	Social Capital	318 (19) *	4.78	0.949	0.965	0.067	426 (20) *	4.43	0.946	0.963	0.061
	Mindfulness	701 (160) *	4.38	0.973	0.977	0.054	988(160) *	4.47	0.965	0.971	0.059
	Mental health	341 (74) *	4.61	0.987	0.989	0.041	422 (74) *	3.70	0.985	0.988	0.043
Model 1-SMA	Measurement Model	6686 (1025) *	5.01	0.912	0.920	0.069	10,836 (1065) *	5.17	0.901	0.908	0.079
	Structural model	7679 (111) *	5.21	0.901	0.907	0.073	10,836 (1065) *	5.17	0.901	0.908	0.079
Model 2-SMA	Measurement Model	1798 (342) *	5.30	0.963	0.968	0.060	2252 (342) *	4.58	0.959	0.963	0.062
	Structural model	1798 (342) *	5.30	0.962	0.968	0.061	2252 (342) *	4.58	0.959	0.963	0.062
Model 3-SMA	Measurement Model	5970 (729) *	4.94	0.927	0.931	0.058	7382 (729) *	4.83	0.903	0.909	0.079
	Structural model	5970 (729) *	4.94	0.927	0.931	0.058	7382 (729) *	4.83	0.903	0.909	0.079
Model 4-SMA	Measurement Model	7315 (1561) *	4.08	0.920	0.927	0.056	10,423 (1561) *	5.67	0.900	0.909	0.062
	Structural model	8408 (1633) *	5.15	0.911	0.915	0.059	11,910 (690) *	5.29	0.901	0.908	0.065
Model 5-IA	Measurement Model	2200 (1160) *	3.19	0.968	0.970	0.043	2749 (656) *	4.13	0.962	0.966	0.046
	Structural model	2200 (1160) *	3.19	0.968	0.970	0.043	2877 (690) *	3.17	0.962	0.964	0.046
Model 6-IA	Measurement Model	5970 (1209) *	4.94	0.925	0.929	0.061	7143 (1158) *	4.16	0.921	0.928	0.059
	Structural model	5970 (1209) *	4.94	0.927	0.931	0.058	8058 (1209) *	4.64	0.913	0.918	0.063
Model 7-MA and IA	Measurement Model	8708 (1910) *	4.56	0.916	0.923	0.055	12,211 (1910) *	5.39	0.901	0.906	0.061
	Structural model	9885 (1992) *	4.96	0.907	0.911	0.058	13,840 (1992) *	5.94	0.903	0.908	0.064
Rule of Thumb			≤5	≥0.90	≥0.08		≤5		≥0.90	≥0.08	

Note: * $p < 0.001$, χ^2 = chi-squared, df = degrees of freedom, TLI = Tucker Lewis index, CFI = comparative fit index, RMSEA = root mean error square of approximation. Model 1-SMA: Social media addiction → Social Capital and mindfulness → Mental health (see Figures 2 and 3). Model 2-SMA: Social media addiction → Social Capital → Mental health (see Appendices A.1 and B.1). Model 3-SMA: Social media addiction → mindfulness → Mental health (see Appendices A.2 and B.2). Model 4-IA: Internet addiction → Social Capital and mindfulness → Mental health (see Figures 4 and 5). Model 5-IA: Internet addiction → Social Capital → Mental health (see Appendices A.3 and B.3). Model 6-IA: Internet addiction → mindfulness → Mental health (see Appendices A.4 and B.4). Model 7-SMA and IA: Social media addiction and Internet addiction → Social Capital and mindfulness → Mental health (see Figures 6 and 7).

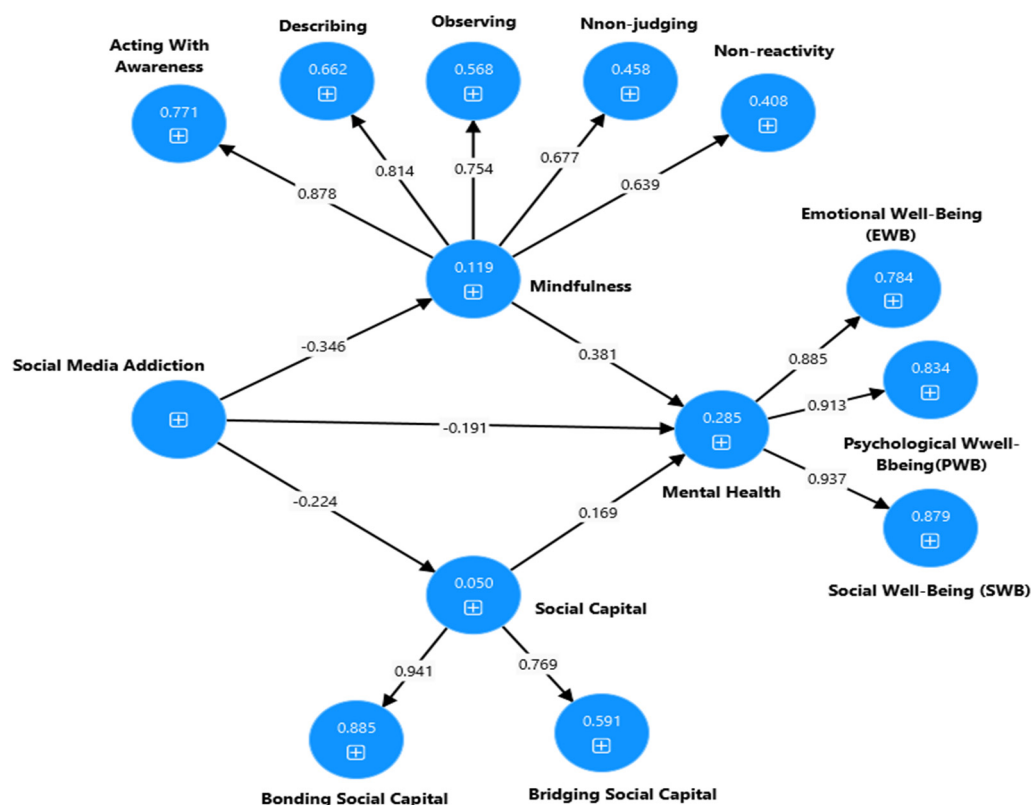


Figure 2. Output of the partial mediation model to explain the association between the social media addiction, social capital, mindfulness, and mental health of university students.

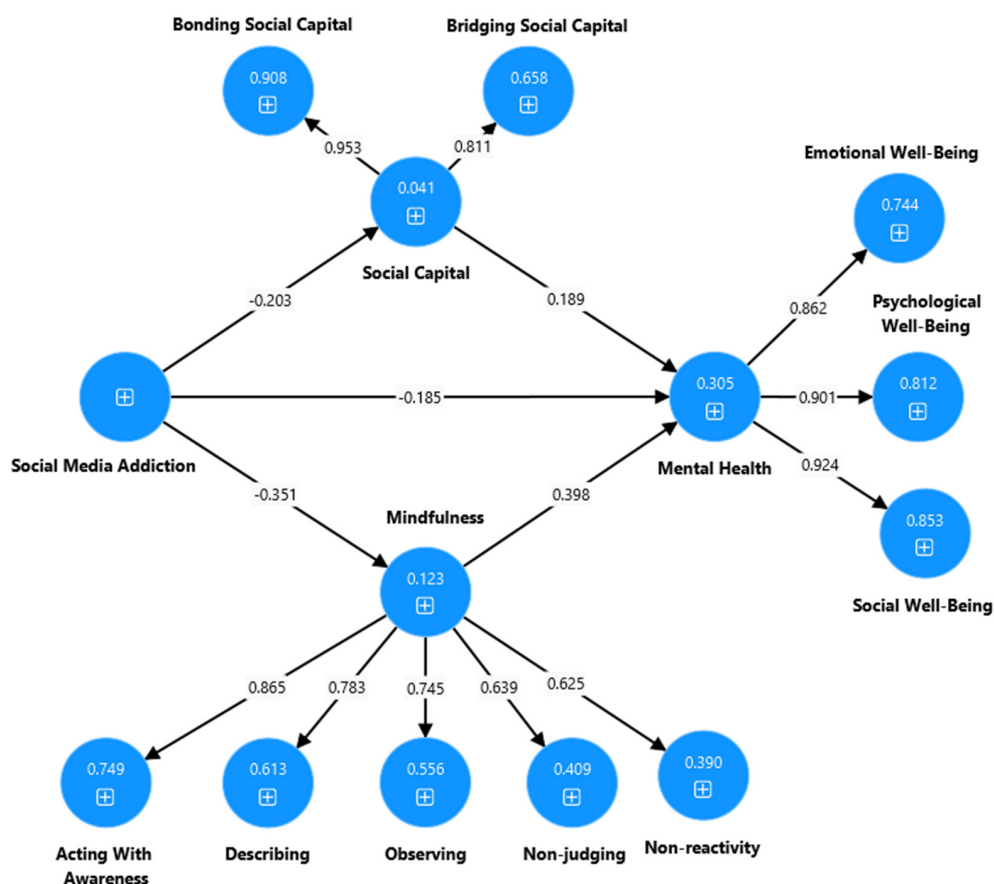


Figure 3. Output of the partial mediation model to explain the association between the social media addiction, social capital, mindfulness, and mental health of high school students.



Figure 4. Output of the partial mediation model to explain the association between the Internet Addiction, social capital, mindfulness, and mental health of university students.

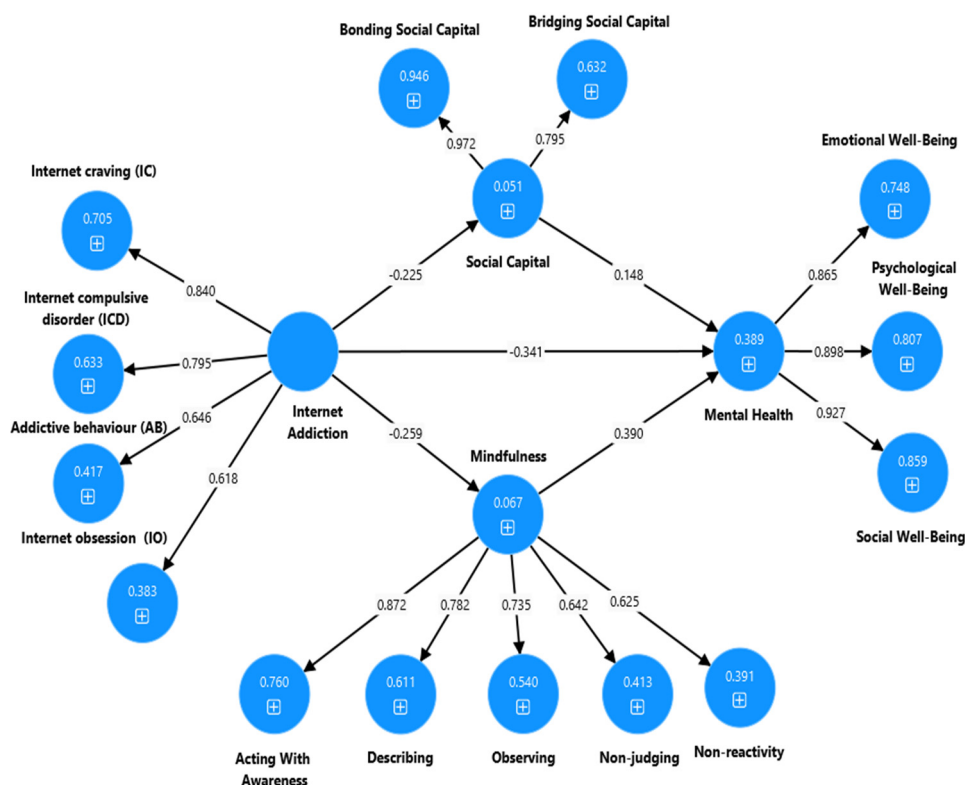


Figure 5. Output of the partial mediation model to explain the association between the internet addiction, social capital, mindfulness, and mental health of high school students.

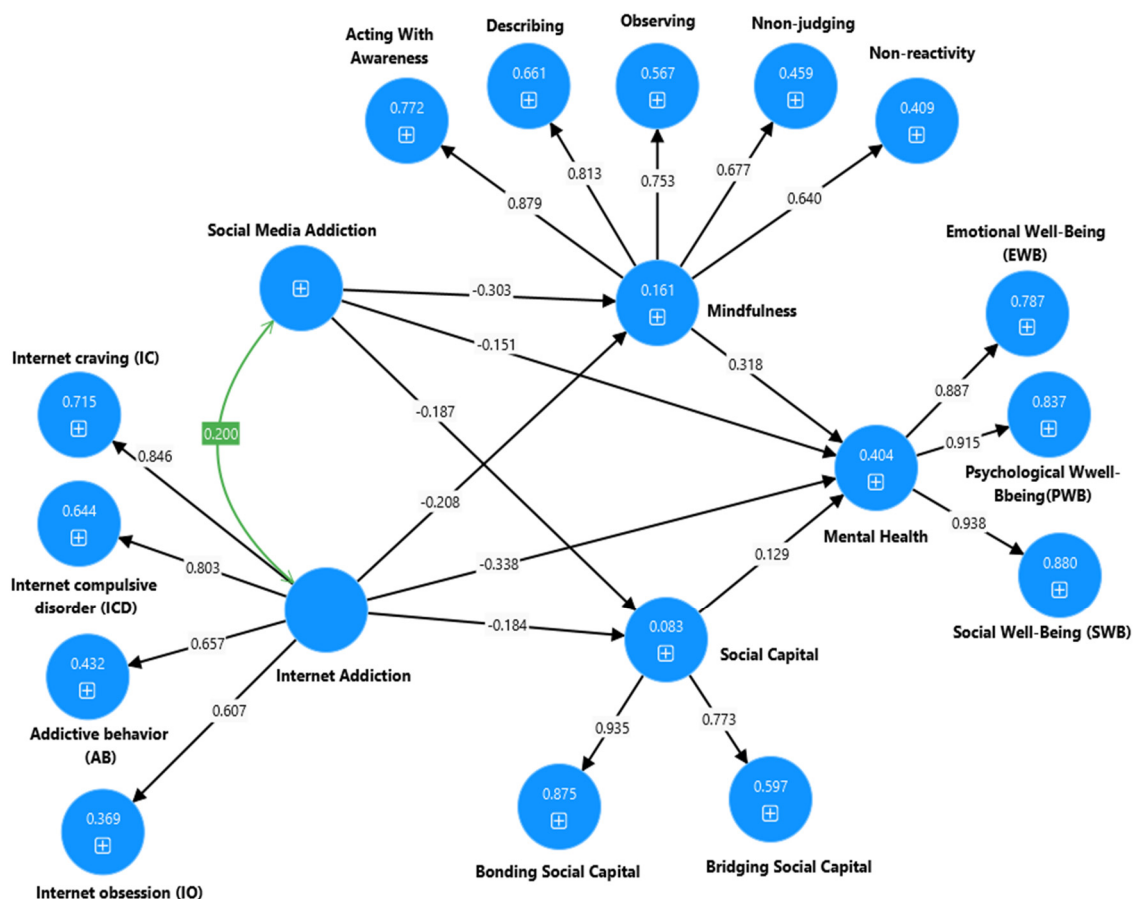


Figure 6. Output of complete multi-mediation model to explain the association between SMA, IA, social capital, mindfulness, and mental health of university students.

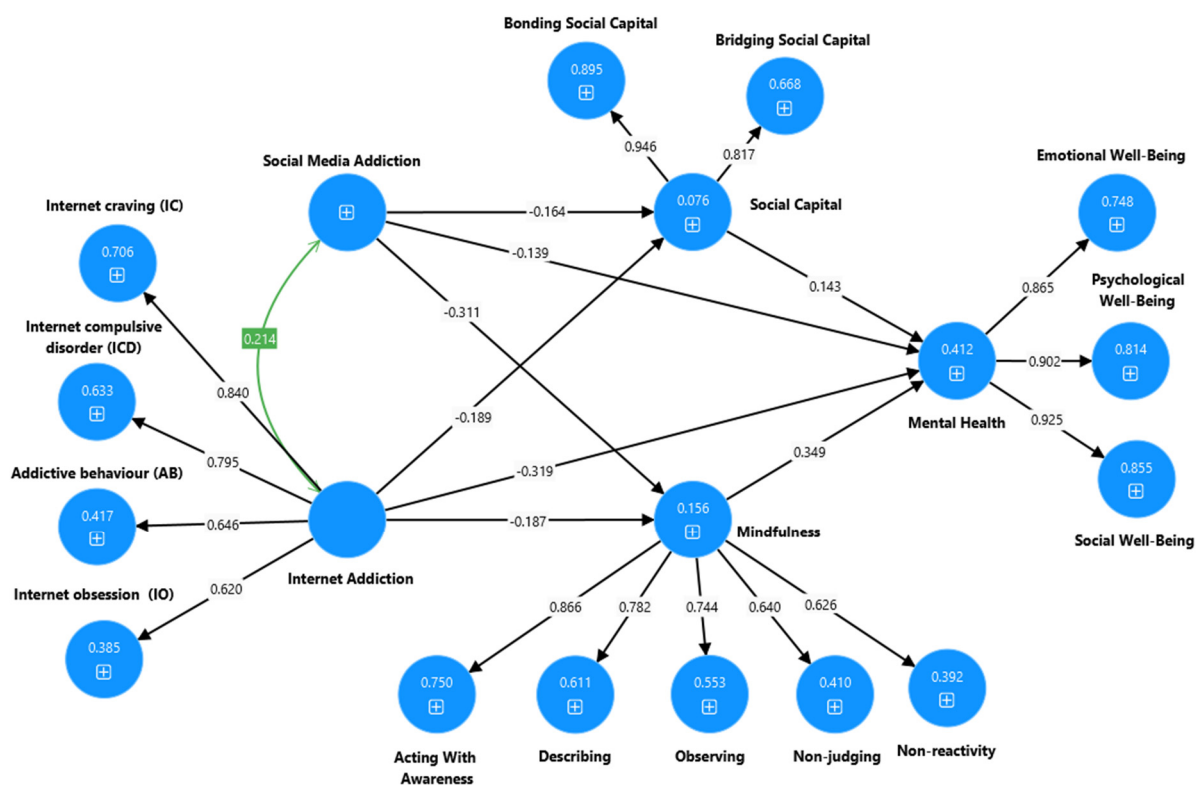


Figure 7. Output of Full multi-mediation model to explain the association between SMA, IA, social capital, mindfulness, and mental health of high school students.

4.2.2. Partial (Single) Mediation Analysis

To further observe the mediating role of both social capital and mindfulness in the relationship between social media addiction (SMA) and mental health (MH) and internet addiction (IA) and mental health (MH), a partial (single) mediation analysis was first performed in Smart PLS software version 4.1.0.3 [172].

As we hypothesized (RH6a), the mediating effect of social capital between SMA and MH was significant ($\beta = -0.065$, [bootstrapped 95% CI: $-0.095, -0.044$], $p = 0.001$; $\beta = -0.062$, [bootstrapped 95% CI: $-0.085, -0.041$], $p = 0.002$) for both university and high school students, respectively. Besides, mindfulness was played a significant mediating effect on the relationship between SMA and MH for both university and high school students ($\beta = -0.153$, [bootstrapped 95% CI: $-0.187, -0.117$], $p = 0.002$; $\beta = -0.163$, [bootstrapped 95% CI: $-0.1951, -0.130$], $p = 0.002$), respectively.

In addition, social capital and mindfulness played a significant mediating role between SMA and MH for both university and high school students ($\beta = -0.170$, [bootstrapped 95% CI: $-0.206, -0.133$], $p = 0.002$; $\beta = -0.178$, [bootstrapped 95% CI: $-0.213, -0.143$], $p = 0.002$), respectively.

Furthermore, both social capital and mindfulness together partially mediated the relationship between IA and MH for both university and high school students ($\beta = -0.134$, [bootstrapped 95% CI: $-0.173, -0.105$], $p = 0.001$; $\beta = -0.130$, [bootstrapped 95% CI: $-0.166, -0.096$], $p = 0.002$), respectively. Besides, social capital played a significant mediating role between IA and MH ($\beta = -0.055$, [bootstrapped 95% CI: $-0.082, -0.033$], $p = 0.001$; $\beta = -0.059$, [bootstrapped 95% CI: $-0.084, -0.039$], $p = 0.001$) for both university and high school students, respectively. Mindfulness also played a significant mediating effect on the relationship between IA and MH for both university and high school students ($\beta = -0.107$, [bootstrapped 95% CI: $-0.140, -0.077$], $p = 0.002$; $\beta = -0.108$, [bootstrapped 95% CI: $-0.1401, -0.080$], $p = 0.001$), respectively.

Our research hypothesis (RH6a) fully confirmed and after checking the single mediation analysis, we performed the full mediation or multi-mediation analysis for both university and high school students.

4.2.3. Multi-Mediation Models

After conducting a thorough evaluation of construct reliability, measurement model (construct validity), and structural model tests using advanced methods, we proceeded to examine a multi-mediation models (MMM) using structural equation modeling (SEM) using PLS-SEM. This model serves as the analytical framework for systematically examining the relationships between independent and dependent variables and conducting hypothesis testing [173]. To test a multiple mediation model following the recommendation of the authors [173], we followed the steps of first running a set of separate single mediation analyses, one for each proposed single mediator separately, followed by testing the indirect effects (i.e., each specific and total indirect effect) and the direct effect between the independent variables and the dependent variable computed.

The structural model provides several statistical metrics, including coefficient of determination (R^2), predictive relevance, and direct and indirect path coefficients, which are important for our analysis [174].

Our research objectives state that students believe social media and internet addiction have a negative influence on their mental health, with mindfulness and social capital as played a mediating role. To assess the significance of the predictive relationships, we employed corrected bias bootstrapping in the Smart PLS software [172]. This method helps determine the directionality (positive or negative), magnitude, and significance of

the independent variables' (social media addiction, internet addiction, social capital and mindfulness) influence on the dependent variables (mental health) [172–174].

Table 6 showed the direct effect analysis for each path. The proposed research hypotheses (RH1 to RH4) focused on “Do Internet Addiction (IA) and Social Media Addiction (SMA), have a direct negative effect on social capital, mindfulness, and mental health (MH) among both university and high school students? Results indicated that SMA and IA had a negative significant indirect effect on university students MH through social capital and mindfulness, supporting our research hypothesis (RH6a) ($\beta = -0.121$ [bootstrapped 95% CI: -0.154 to -0.096], $p = 0.001$) and $\beta = -0.090$ [bootstrapped 95% CI: -0.119 to -0.066], $p = 0.001$), respectively (See Figure 2). University students also perceived both SMA and IA to exert a negative direct effect on mindfulness ($\beta = -0.303$, [bootstrapped 95% CI: -0.354 , -0.251], $p = 0.002$; $\beta = -0.208$, [bootstrapped 95% CI: -0.261 , -0.146], $p = 0.002$), social capital ($\beta = -0.188$, [bootstrapped 95% CI: -0.244 , -0.129], $p = 0.002$; $\beta = -0.184$, [bootstrapped 95% CI: -0.254 , -0.111], $p = 0.002$) and MH ($\beta = -0.151$, [bootstrapped 95% CI: -0.204 , -0.102], $p = 0.002$; $\beta = -0.338$, [bootstrapped 95% CI: -0.390 , -0.283], $p = 0.003$), respectively. Furthermore, university students believe that social capital ($\beta = 0.129$, [bootstrapped 95% CI: 0.067 to 0.194], $p = 0.001$) and mindfulness ($\beta = 0.318$, [bootstrapped 95% CI: 0.250 to 0.385], $p = 0.002$) positively affects both their MH. Therefore, RH1 to RH4 are fully supported, as displayed in Table 6. Besides, in Figure 3, we observed a tested model aimed at investigating whether social media addiction (SMA) use independently or partially influences university students' mental health. This investigation considered the mediating factors of mindfulness and social capital, both individually and in combination. The results revealed several significant relationships. Firstly, we found that SMA had a direct negative effect on social capital, mindfulness, and mental health in the partial model with the mediating factors of social capital, and mindfulness as indicated in Tables 6 and 7. SMA indirectly affects university students' mental health separately through social capital and mindfulness. This suggests that SMA without internet addiction (IA) in a separate model predicts that students with low SMA engagement tend to exhibit greater social capital, mindfulness, and mental health. This suggests that SMA without IA in separate model predicted students who possess a low engagement of SMA tend to exhibit greater social capital, mindfulness, and mental health. Secondly, IA was found to have a negative direct effect on university students' mental health through social capital and mindfulness. This implies that students with high internet addiction are more likely to demonstrate lower social capital, mindfulness, and mental health, and vice versa (see Table 6). Thirdly, IA showed a negative direct effect on social capital and MH through social capital as well as through mindfulness, suggesting that students who have better social capital resources and mindfulness skills tend to reduce IA and boost students' mental health. Our data thus answered RH3 and RH4.

Regarding high school students, our findings found that SMA and IA had a negative significant indirect effect on students MH through social capital and mindfulness, $\beta = -0.132$, [bootstrapped 95% CI: -0.162 , -0.104], $p = 0.002$; $\beta = -0.092$, [bootstrapped 95% CI: -0.121 , -0.068], $p = 0.001$, respectively, supporting our research question (RH6a) (see Table 6). We also found that SMA and IA had a direct significant effect on the three constructs namely; mindfulness ($\beta = -0.310$, [bootstrapped 95% CI: -0.358 , -0.261], $p = 0.003$; $\beta = -0.187$, [bootstrapped 95% CI: -0.245 , -0.1344], $p = 0.001$); social capital ($\beta = -0.164$, [bootstrapped 95% CI: -0.211 , -0.109], $p = 0.003$; $\beta = -0.189$, [bootstrapped 95% CI: -0.254 , -0.132], $p = 0.001$); and Mental Health ($\beta = -0.139$, [bootstrapped 95% CI: -0.186 , -0.090], $p = 0.002$; $\beta = -0.319$, [bootstrapped 95% CI: -0.375 , -0.266], $p = 0.002$), respectively. Furthermore, university students believe that social capital ($\beta = 0.143$, [bootstrapped 95% CI: 0.086 to 0.195], $p = 0.002$) and mindfulness ($\beta = 0.349$, [bootstrapped 95% CI: 0.289

to 0.419], $p = 0.001$) positively predicts both their MH. Therefore, RH1 to RH4 are fully supported, as displayed in Table 6. In our multi-mediation model, the potential predictive power of social media addiction and internet addiction using R^2 values for social capital (0.083 (8.3%), 0.076 (7.6%)), for mindfulness (0.161 (16.1%), 0.156 (15.6%)) and for mental health (0.404 (40.4%), 0.412 (41.2%)) for both university and high school students, respectively. The comprehensive set of statistical techniques of all measurement and structural model outcomes can be found in Table 5, and the structural model is visually represented in Figures 2–7, Appendices A.1–A.4 and B.1–B.4.

Table 6. The direct and indirect effects of independent variables on students' mental health using a 95% biased corrected confidence interval.

Predictors	Outcome Variables	Standardized Direct Effect							
		Bootstrap 95% CI for University Students (N = 1160)				Bootstrap 95% CI for High School Students (N = 1473)			
		Beta	LBC	UBC	p-Value	Beta	LBC	UBC	p-Value
Social media addiction	Mindfulness	−0.303	−0.354	−0.247	0.002	−0.310	−0.358	−0.261	0.003
Social media addiction	Social Capital	−0.188	−0.244	−0.128	0.002	−0.164	−0.211	−0.109	0.003
Social media addiction	Mental health	−0.151	−0.197	−0.096	0.003	−0.139	−0.186	−0.090	0.002
Internet addiction	Mindfulness	−0.208	−0.267	−0.146	0.002	−0.187	−0.245	−0.134	0.001
Internet addiction	Social Capital	−0.184	−0.258	−0.108	0.002	−0.189	−0.254	−0.132	0.001
Internet addiction	Mental health	−0.318	−0.253	−0.394	0.001	−0.319	−0.375	−0.266	0.002
Mindfulness	Mental health	0.318	0.253	0.394	0.001	0.349	0.289	0.419	0.001
Social Capital	Mental health	0.129	0.059	0.193	0.004	0.143	0.086	0.195	0.002
Partial Mediation: Direct Effect of SMA on MH through Mindfulness and Social Capital									
Social media addiction	Mindfulness	−0.346	−0.396	−0.290	0.002	−0.351	−0.391	−0.301	0.004
Social media addiction	Social Capital	−0.224	−0.283	−0.162	0.002	−0.203	−0.253	−0.143	0.003
Social media addiction	Mental health	−0.191	−0.243	−0.136	0.003	−0.185	−0.232	−0.137	0.001
Mindfulness	Mental health	0.381	0.310	0.455	0.002	0.398	0.335	0.469	0.001
Social Capital	Mental health	0.169	0.101	0.232	0.002	0.189	0.136	0.251	0.002
Partial Mediation: Direct Effect of SMA on MH through Mindfulness									
Social media addiction	Mindfulness	−0.342	−0.392	−0.286	0.002	−0.348	−0.388	−0.298	0.004
Social media addiction	Mental health	−0.199	−0.249	−0.143	0.002	−0.190	−0.236	−0.140	0.002
Mindfulness	Mental health	0.447	0.387	0.505	0.002	0.469	0.418	0.529	0.001
Partial Mediation: Direct Effect of SMA on MH through Social Capital									
Social media addiction	Social Capital	−0.208	−0.268	−0.148	0.002	−0.190	−0.241	−0.131	0.003
Social media addiction	Mental health	−0.287	−0.342	−0.233	0.002	−0.292	−0.340	−0.245	0.001
Social Capital	Mental health	−0.312	−0.259	−0.371	0.001	0.325	0.274	0.377	0.002
Partial Mediation: Direct Effect of IA on MH through Mindfulness and Social Capital									
Internet addiction	Mindfulness	−0.275	−0.338	−0.209	0.002	−0.259	−0.320	−0.203	0.001
Internet addiction	Social Capital	−0.224	−0.310	−0.144	0.001	−0.225	−0.292	−0.160	0.001
Internet addiction	Mental health	−0.358	−0.411	−0.304	0.002	−0.341	−0.395	−0.3292	0.002
Mindfulness	Mental health	0.361	0.287	0.429	0.002	0.390	0.332	0.460	0.001
Social Capital	Mental health	0.138	0.073	0.204	0.002	0.148	0.092	0.204	0.002
Partial Mediation: Direct Effect of IA on MH through Mindfulness									
Internet addiction	Mindfulness	−0.254	−0.311	−0.190	0.002	−0.238	−0.296	−0.183	0.001
Internet addiction	Mental health	−0.362	−0.412	−0.307	0.002	−0.348	−0.401	−0.300	0.002
Mindfulness	Mental health	0.423	0.362	0.478	0.002	0.452	0.405	0.515	0.001
Partial Mediation: Direct Effect of IA on MH through Social Capital									
Internet addiction	Social Capital	−0.188	−0.265	−0.116	0.002	−0.197	−0.259	−0.141	0.001
Internet addiction	Mental health	−0.415	−0.465	−0.362	0.002	−0.397	−0.445	−0.351	0.001
Social Capital	Mental health	0.290	0.233	0.350	0.002	0.300	0.247	0.350	0.002

Note: The model description of predictors, mediators, and outcome variables. CI = Confidence interval; LBC = Lower bound, UBC = Upper bound.

Table 7. Bootstrapping standardized indirect effect using 95% biased corrected confidence interval predicting Students both university and high school students.

Standardized Indirect Effect									
Models		Bootstrap 95% CI for University Students (N = 1160)				Bootstrap 95% CI for High School Students (N = 1473)			
		Beta	LBC	UBC	p-Value	Beta	LBC	UBC	p-Value
	Model 1-SMA	−0.170	−0.206	−0.133	0.002	−0.178	−0.213	−0.143	0.002
	Model 2-SMA	−0.065	−0.095	−0.044	0.001	−0.062	−0.085	−0.041	0.002
	Model 3-SMA	−0.153	−0.187	−0.117	0.002	−0.163	−0.195	−0.130	0.002
	Model 4-IA	−0.0130	−0.166	−0.096	0.002	−0.134	−0.173	−0.105	0.001
	Model 5-IA	−0.055	−0.082	−0.033	0.001	−0.059	−0.084	−0.039	0.001
	Model 6-IA	−0.107	−0.140	−0.077	0.002	−0.108	−0.140	−0.080	0.001
Model 7-SMA and IA	SMA	−0.121	−0.149	−0.091	0.002	−0.132	−0.162	−0.104	0.002
	IA	−0.090	−0.119	−0.063	0.002	−0.092	−0.121	−0.068	0.001

Note: CI = confidence interval, LBC = lower bound, UBC = upper bound; Model 1-SMA: Social media addiction → Social Capital and mindfulness → Mental health (see Figures 2 and 3). Model 2-SMA: Social media addiction → Social Capital → Mental health (see Appendices A.1 and B.1). Model 3-SMA: Social media addiction → mindfulness → Mental health (see Appendices A.2 and B.2). Model 4-IA: Internet addiction → Social Capital and mindfulness → Mental health (see Figures 4 and 5); Model 5-IA: Internet addiction → Social Capital → Mental health (see Appendices A.3 and B.3); Model 6-IA: Internet addiction → mindfulness → Mental health (see Appendices A.4 and B.4); Model 7-SMA and IA: Social media addiction and Internet addiction → Social Capital and mindfulness → Mental health (see Figures 6 and 7).

5. Discussion

Consistent with the results of various previous studies, this research confirmed the negative relationships between social media addiction (SMA) and internet addiction (IA) with mindfulness, social capital, and mental health (MH) for both university and high school students [11,12,50,83,90,94,99,100,111–116,136,137]. Additionally, this study built a serial mediation or multi-mediation effect model. It revealed that when taking mindfulness and social capital as mediating variables, both play multiple roles in the relationship with SMA, IA, and MH: First, SMA has a direct negative effect on mindfulness, social capital, and mental health for both university and high school students, Second, IA has a direct negative effect on mindfulness, social capital, and mental health for both university and high school students, Third, mindfulness and social capital also had a positive direct effect on both university and high school students mental health. Fourth, through mindfulness and social capital, SMA and IA also indirectly influence the mental health of university and high school students. A high level of mindfulness and social capital resources helps reduce the risk of SMA and IA for both university and high school students. Fifth, mindfulness partially mediates the relationships between SMA and mental health as well as IA and mental health for both university and high school students. Sixth, social capital also partially plays a mediating role in SMA and mental health, as well as IA and mental health for both university and high school students. The measurement and structural model (models 1 to 7) confirmed the model fitness and applicability of the proposed multi-mediation models. Overall, the positive psychology constructs and social cognitive constructs namely mindfulness and social capital imposes a multiple direct and mediating effect on mental health. In other words, even not considering the direct effects, mindfulness and social capital not only influences directly but also play a mediating role among SMA, IA, and mental health for both university and high school students. The findings suggest that mindfulness and social capital play an important role in buffering and mediating the impacts of SMA and IA on the students MH. From a positive psychology lens, these results offer valuable insights for designing SMA and IA interventions targeting university and high school students.

Specifically, consistent with several previous studies regarding the relationship among the constructs [50,81], the results revealed a significant negative correlation between SMA with mindfulness [135], social capital [137], and mental health [66–68,78,105]. Similarly, IA and mindfulness [19,123,126,128], social capital [121], and mental health [6]. This

highlights the detrimental impact of SMA and IA on these important psychological factors [19,42–44]. However, it is worth noting that when used appropriately, SMA and IA can have positive impacts, such as facilitating virtual interactions and supporting academic achievement [6,125,143].

The study's key contribution is the examination of the mediating roles of mindfulness and social capital in the relationship between SMA and MH, IA and MH separately and together. The results revealed that both mindfulness and social capital partly (see Figures 1–4, Appendices A.1–A.4 and B.1–B.4) and fully mediated (see Figures 5 and 6) the negative relationship between SMA and MH, and IA and MH. Our findings align with research on the detrimental effects of SMA and IA on mental health [6,42–44,143], and the protective role of mindfulness and social capital [6,143] and social capital [84,86]. Specifically, the study confirmed that higher social capital and mindfulness lead to lower SMA and IA, and better mental health among both university and high school students, consistent with the protective role of mindfulness and social capital in mediating adverse experiences and boosting adolescents' mental health [81–86]. Additionally, mindfulness and social capital was found to partially mediate the relationship between SMA and MH, as well as IA and MH, highlighting the importance of fostering social capital resources and mindfulness intervention to mitigate the negative impacts of SMA, IA, to foster mental health of young adolescents and to keep healthy digital system.

This study also investigated the direct effects of SMA, IA, mindfulness, and social capital on mental health. Several studies consistently with our study found that SMA and IA have negative impacts on mental health, positive psychological variables, academic performance, mindfulness, moral potency, sleep patterns, and overall well-being [19,42–44]. Interestingly in this study, SMA and IA was found to be a negative predictor of social capital, mindfulness, and MH. The results confirmed that social capital and mindfulness are a significant positive predictor of MH, supporting the idea that social capital and mindfulness are positively related to MH [18,47–51,92,129]. However, the complex relationships and influence of each predictor on mental health of high school and university students require further investigation [114]. For university and high school students, mindfulness [6] and social capital [36,65,84,86] are critical important positive factors that reduce SMA and IA. The relationship between mindfulness, IA, and SMA has been identified, and mindfulness and social capital can be helpful to decreasing SMA and IA [9]. Taking into consideration university and high school students, this study found that reducing Social Media Addiction (SMA) and internet addiction (IA) through high levels of social capital and mindfulness boosts their mental health status. These findings emphasize the need for interventions that address both SMA and IA as potential protecting factors both mindfulness and social capital played a mediating role in enhancing MH among university and high school students. The study's contributions include addressing conceptual, methodological, and contextual gaps by testing a multi-mediation analysis using Structural Equation Modeling (SEM) related to the scarcity of this associational research in Ethiopian and global contexts, as well as providing new insights into the underlying mechanisms and mediators of the relationships between SMA, IA, social capital, mindfulness, and MH. The cultural and institutional context of Ethiopia adds unique perspectives to the existing literature from developing country perspectives.

Overall, the research on the connections among internet addiction (IA), social media addiction (SMA), social capital, mindfulness, and mental health addresses a pressing issue in today's digital landscape. Based on the major findings, we suggest the following recommendations for educators, researchers, and policymakers.

General recommendation: Preventive Strategies for Internet and Social Media Addiction

Several studies have found that the best preventive strategies for internet and social media addiction, based on empirical research findings, are the following. These strategies will help reduce internet and social media addiction and improve the mental health status of adolescents.

Schools as Prevention Hubs: Schools should act as information and prevention hubs, aiding in early identification of problematic internet use and collaborating with mental health services to support students [175].

Mental Health Literacy: Enhance mental health literacy through systemic changes in education systems and evidence-based parental education to raise awareness of the positive and negative impacts of technology [175].

Psychoeducation and Upskilling: Address psychosocial and communication issues, focusing on self-regulation, content-related concerns like sexting, and context-related issues such as cyberbullying and body image problems [175].

Emotion Regulation Strategies: Utilize sensory methods, imaginative techniques, and mindfulness-based methods to improve psychophysiological emotion regulation [176].

Behavioral Psychology and Neurobiological Etiology Models: Integrate neurobiological insights with behavioral understanding to address Internet Use Disorders effectively, drawing parallels with substance-related addictions [176].

The PROTECT Etiology Model: Strengthen targeted behavioral, cognitive, and emotional therapies to combat Internet Use Disorders driven by gratification and compensation mechanisms [176].

Health Policy Strategy: Develop robust health policy strategy prioritizing research on specific forms of problematic internet use within addiction studies to establish evidence-based harm-reduction policies [177].

Cognitive Behavioral Model (CBM): Implementing CBM to target and modify maladaptive cognitions associated with internet addiction (IA) is an effective strategy for addressing cognitive distortions linked to IA [178].

Recommendations for Researchers

- Conduct longitudinal studies to evaluate the long-term efficacy of mindfulness and social capital interventions in reducing social media and internet addiction.
- Investigate how cultural variations influence the associations between social media addiction, internet addiction, mindfulness, social capital, and mental health [92,127,130,131,143].

Recommendations for Educators

- Incorporate mindfulness practices into the curriculum to enhance attention control, emotional regulation, and stress management skills [19].

Recommendations for Policy Makers

- Develop digital wellness policies promoting guidelines for addressing social media and internet addiction among students [175–179].
- Design training programs for educators to address digital addiction and mental health issues in educational settings [177].
- Enhance digital literacy through programs encouraging appropriate internet and social media usage.
- Introduce school-based interventions focusing on resilience, coping strategies, and social skills to counteract negative effects of social media and internet addiction.

6. Conclusions

The findings of this study revealed that SMA and IA among university and high school students exhibited widespread complex relationships with social capital, mindfulness, and intellectual health (MH). This study confirms the negative effects of SMA and IA on

students' mental health and highlights the intricate dynamics through which mindfulness and social capital mitigate these adverse effects. The study demonstrates that both SMA and IA exert direct negative influences on mindfulness, social capital, and mental health among students. This direct effect underscores the pervasive detrimental impact of excessive social media and internet use. Moreover, the positive direct effects of mindfulness and social capital on mental health indicate that these constructs serve as critical buffers against the negative impacts of SMA and IA. Furthermore, the research delineates the indirect pathways through which SMA and IA affect mental health via mindfulness and social capital. By partially mediating these relationships, mindfulness and social capital not only buffer the direct negative effects but also facilitate a healthier mental state among students. This dual role of direct influence and mediation underscores the importance of fostering both mindfulness and social capital as protective factors in interventions targeting SMA and IA. The finding of this compressive study recommends the need for multifaceted interventions that address not only IA and SMA but also encouraging mindfulness and social capital development, such as promoting digital literacy, fostering mindfulness practices, and enhancing social support networks to manage their social media and internet usage and improve their mental health.

7. Limitation and Future Research Direction

In recent years, researchers in the fields of education, psychology, and health sciences have studied the crucial links between social media addiction (SMA), internet addiction (IA), social capital, mindfulness, and mental health in young populations. These studies have highlighted the potential mediating roles of mindfulness and social capital in this relationship and underscored their practical relevance for both general education (secondary schools) and higher education (universities and colleges). First, key findings from this body of research suggest that SMA and IA negatively predict social capital, mindfulness, and mental health among both university and high school students. That is, as students' levels of mindfulness and social capital improve, their SMA and IA decrease and their mental state increases. These two positive psychological resources—mindfulness and social capital—show promise as interventions to improve student mental health in both academic settings. Second, understanding the factors that influence mental health is a critical global agenda because organizational success, productivity, and the overall quality of life of individuals are linked to the mental health status of the productive population. As a long-term goal, practitioners and researchers are encouraged to broadly focus on positive psychology theories (mindfulness, positive psychological capital, emotional intelligence) and Albert Bandura's social cognitive theory (social capital) to improve students' mental health using the latest scientific findings and sophisticated research methods. Third, an important limitation of this study is its dependence on variables assessed through scale scores, which may not directly align with the clinical diagnosis of social media addiction or internet addiction, commonly approached syndromally. Future studies should address this limitation by incorporating diagnostic criteria to enhance the clinical relevance and applicability of findings in real-world settings.

Fourth, while this research examined mental health in an educational context, the models developed and tested can be used in a variety of other settings, such as clinical, marketing, and other organizations, to address issues associated with SMA and IA across diverse populations.

Fifth, to further strengthen the evidence, future research should consider engaging not only students but also teachers and other health professionals to gain diverse perspectives on the links between SMA, IA, social capital, mindfulness, and mental health. Additionally, intervention studies that provide university and high school students with

training in mindfulness strategies and sources of social capital could offer valuable insights into improving their mental health, using social media and the internet in healthy ways, and improving mindfulness intervention skills. Six, while this study used the common method Bises (CMB) using the Herman single-factor solution, VIF/Tolerance and reported reliable findings, the use of a self-report measure and a single data source increases the potential for single method bias. Finally, while this study utilizes mediation analysis to explore potential indirect relationships among variables, it is important to acknowledge a significant limitation due to the inability to infer causality. Mediation analysis can indicate associations and suggest pathways, but it does not establish definitive cause-and-effect relationships. Therefore, we recommend that future studies conduct experimental and quasi-experimental designs.

Moreover, this study is limited due to cross-sectional design, it could not show a temporal relationship and the scope of addiction measures. While the study focuses on general internet and social media addiction, it does not extend to clinical diagnoses of social media addiction disorder or internet addiction disorder. This may limit the generalizability of the findings to more severe cases and the broader spectrum of addiction behaviors. Future research could benefit from including these clinically defined disorders to better understand their impact on students' mental health. Future research should explore meta-analytic, longitudinal, and experimental approaches to address these methodological limitations and further validate the relationships explored in this important area of inquiry.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/ijerph22010057/s1>, Supplementary File: the raw data of the whole study models including confirmatory factor analysis and structural models used for this study.

Author Contributions: Conceptualization, G.T.Z., A.E.B. and T.N.; methodology, G.T.Z. and A.E.B.; validation, G.T.Z. and A.E.B.; formal analysis, G.T.Z.; investigation, T.N., A.E.B. and G.T.W.; Visualization, G.T.Z. and A.E.B.; resources, G.T.Z., G.T.W., A.E.B. and T.N.; Data curation, G.T.Z., A.E.B., and T.N.; Writing—original draft, G.T.Z., A.E.B. and T.N.; Writing—review & editing G.T.Z., G.T.W., A.E.B. and T.N.; supervision, G.T.Z. and A.E.B.; project administration, G.T.Z. and G.T.W.; funding acquisition, G.T.Z. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement: The studies involving human participants were reviewed and approved by the IRB committee of Wollo University, Ethiopia with a protocol code (Ref. No. 302/2023). Written consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

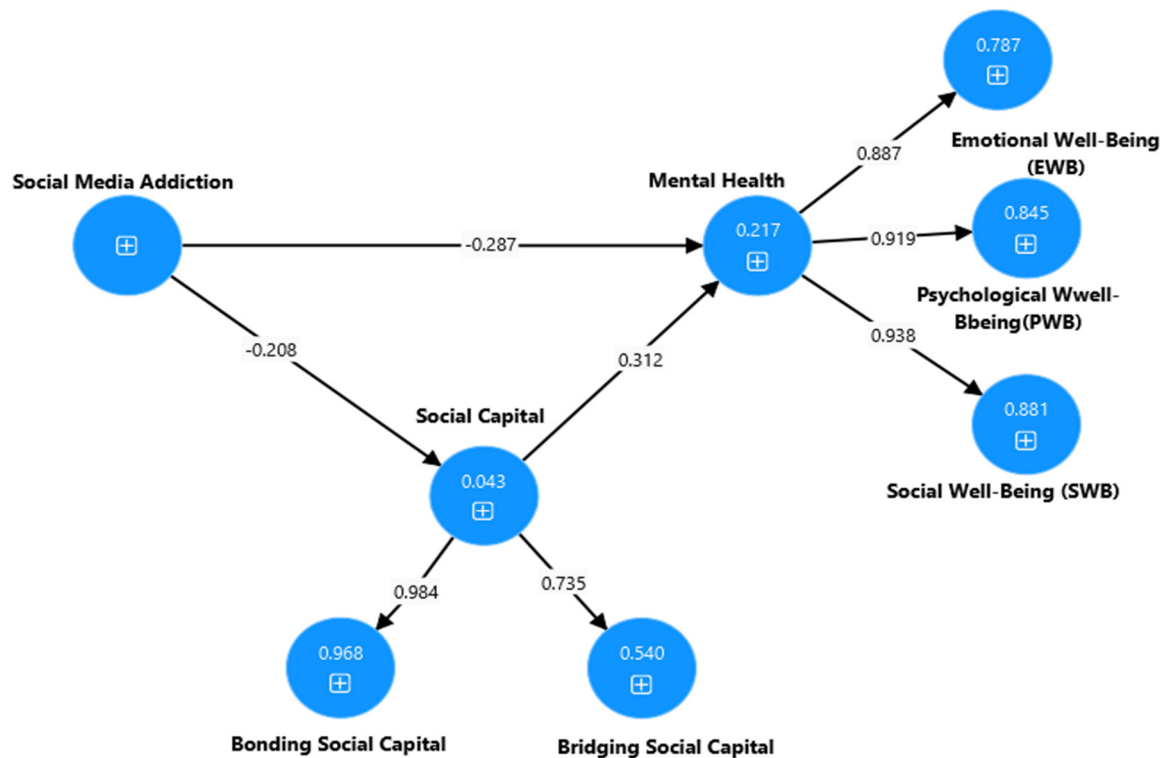
Informed Consent Statement: This study adhered to the ethical standards outlined by the American Psychological Association (APA) and the National Association of Psychology regarding human subjects. Participants were fully informed about the study's purpose, procedures, and voluntary nature. The participants from the university and high school did not receive any financial compensation; their involvement was based entirely on voluntary participation as stipulated by the laws of the nation. They were assured of anonymity, and no identifying information or medical treatment was involved. Participants were made aware of their right to withdraw from the study at any time. By initiating the survey, participants were considered to have read and accepted the informed consent.

Data Availability Statement: The raw data supporting the study of this article is publicly attached with this article.

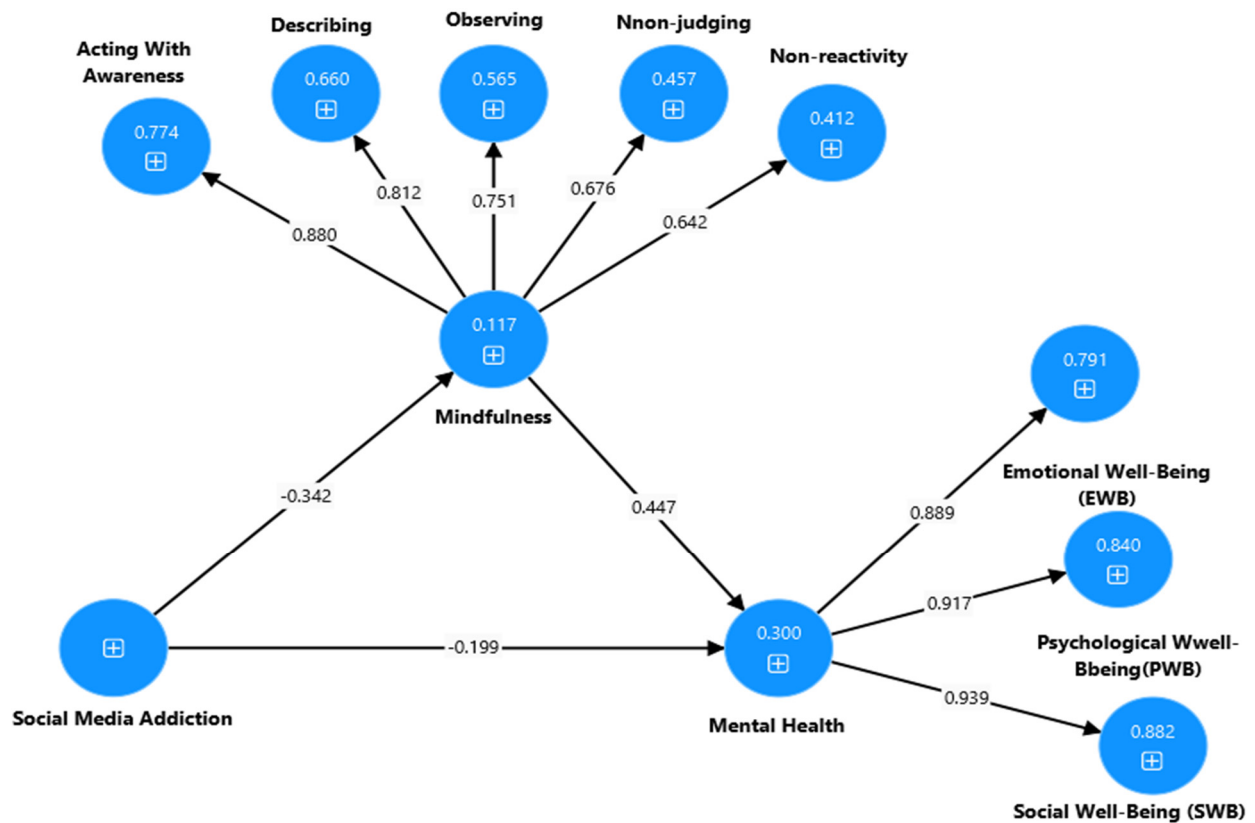
Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A. Structural Models for University Students

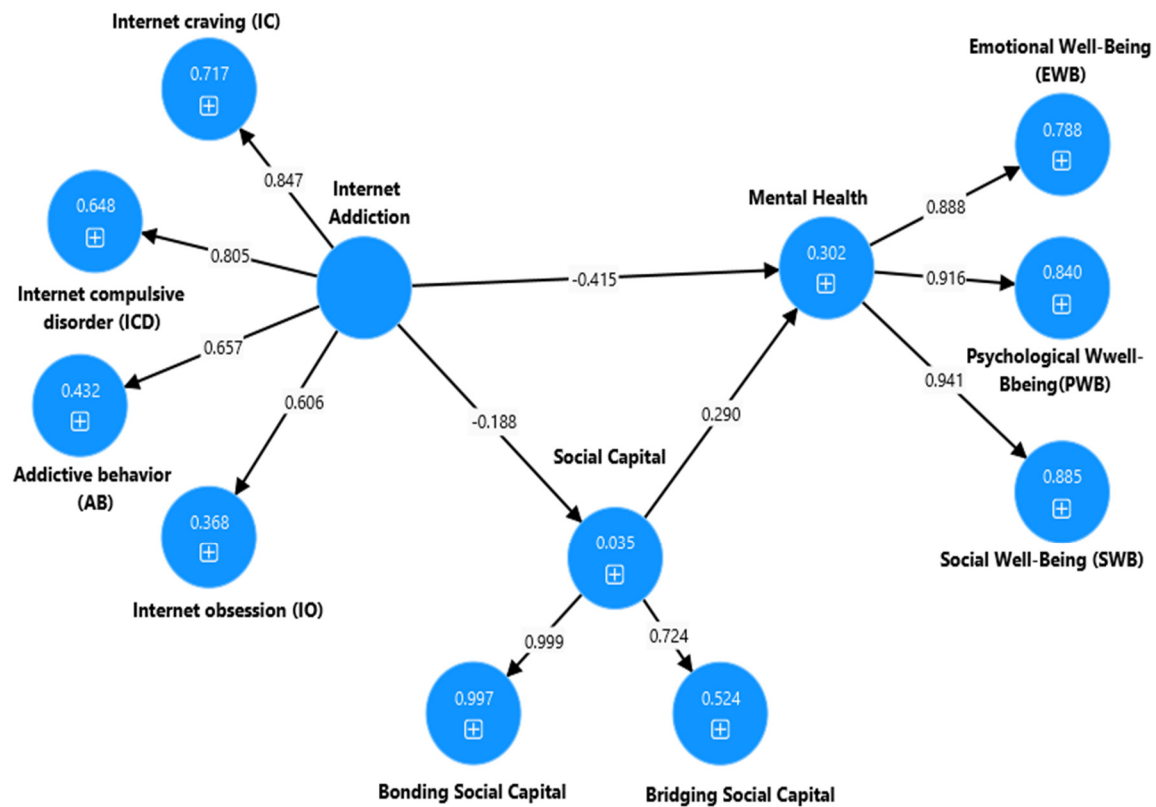
Appendix A.1. Partial Mediation of SMA on MH Through Social Capital of University Students



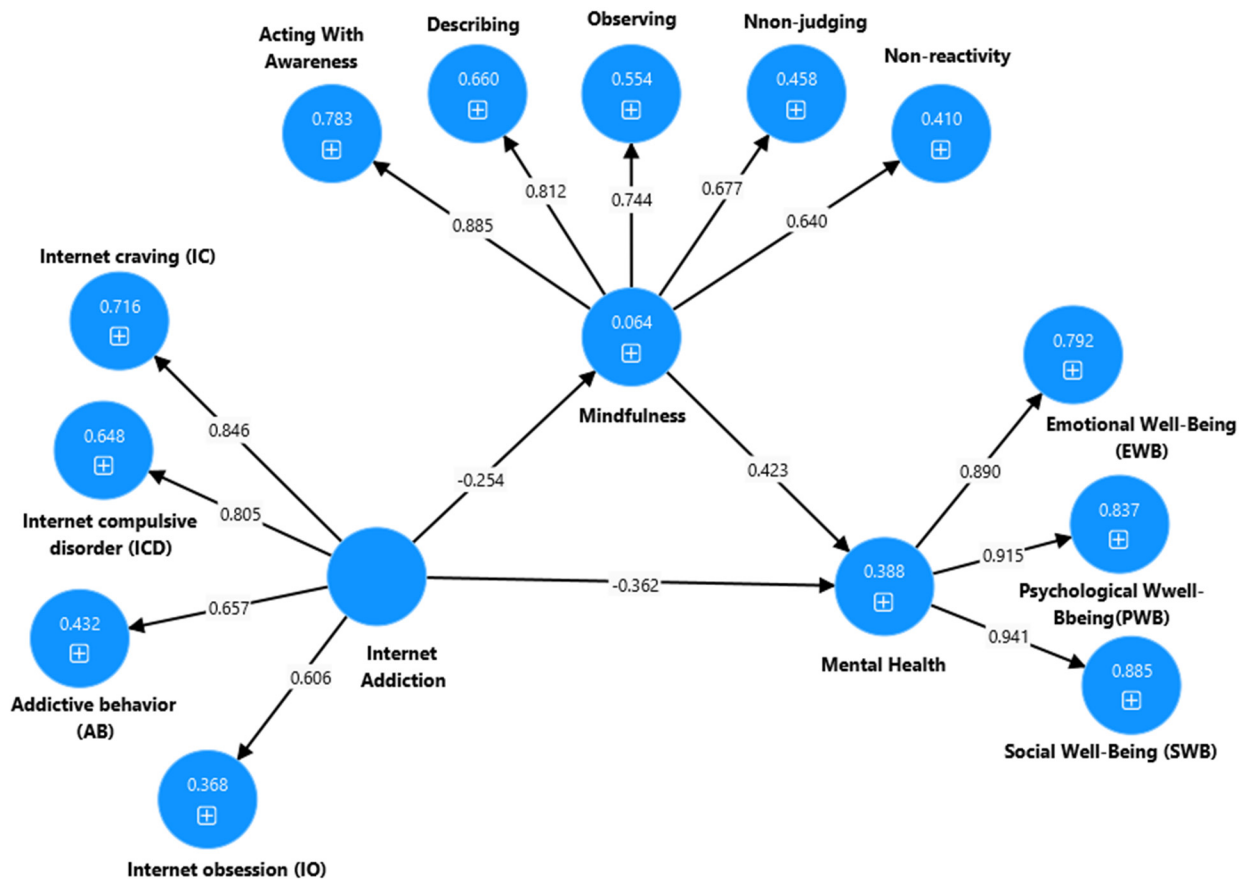
Appendix A.2. Partial Mediation of SMA on MH Through Mindfulness of University Students



Appendix A.3. Partial Mediation of IA on MH Through Social Capital of University Students

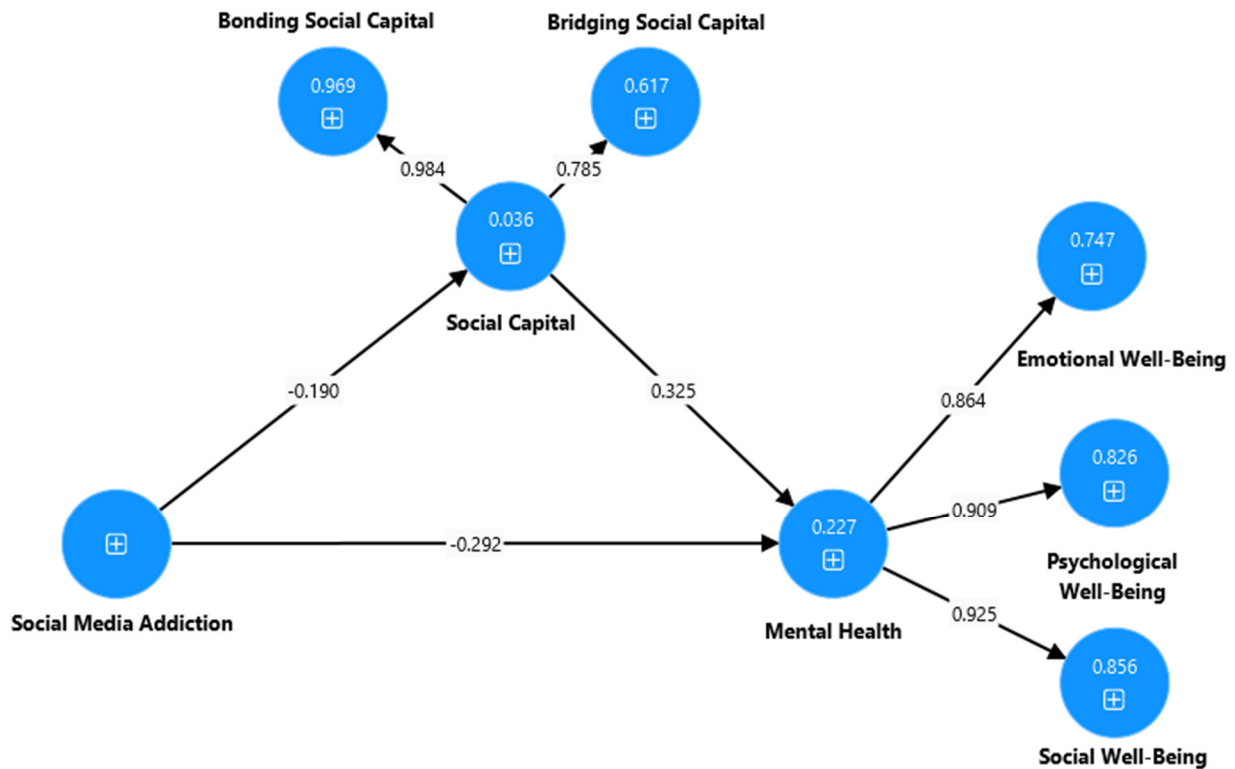


Appendix A.4. Partial Mediation of IA on MH Through Mindfulness of University Students

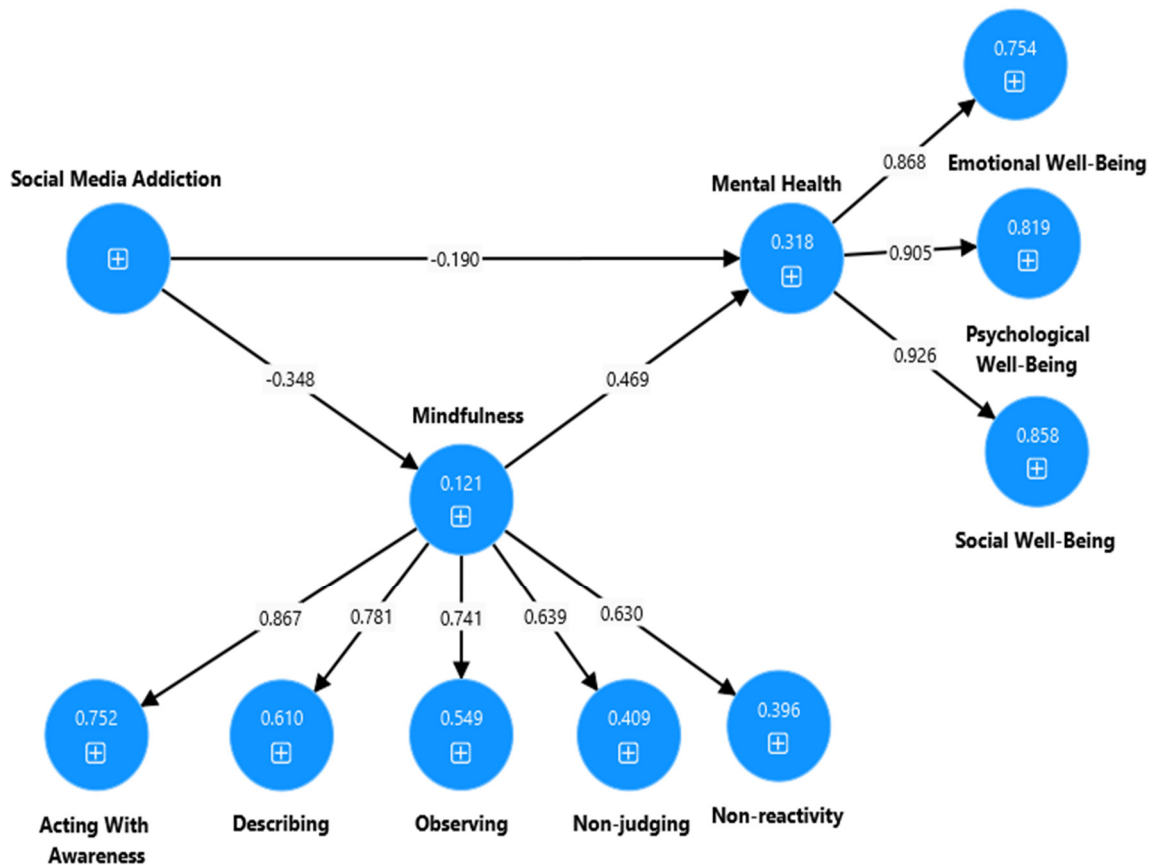


Appendix B. Structural Models for High School Students

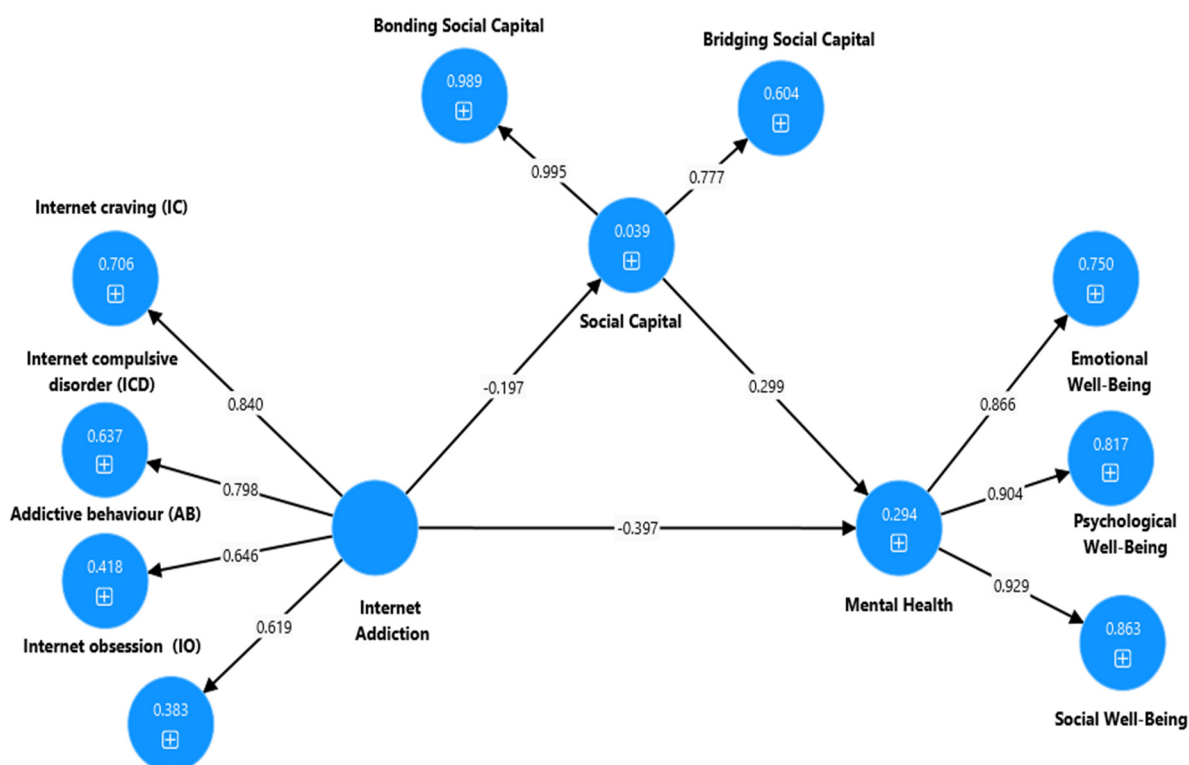
Appendix B.1. Partial Mediation of SMA on MH Through Social Capital of High School Students



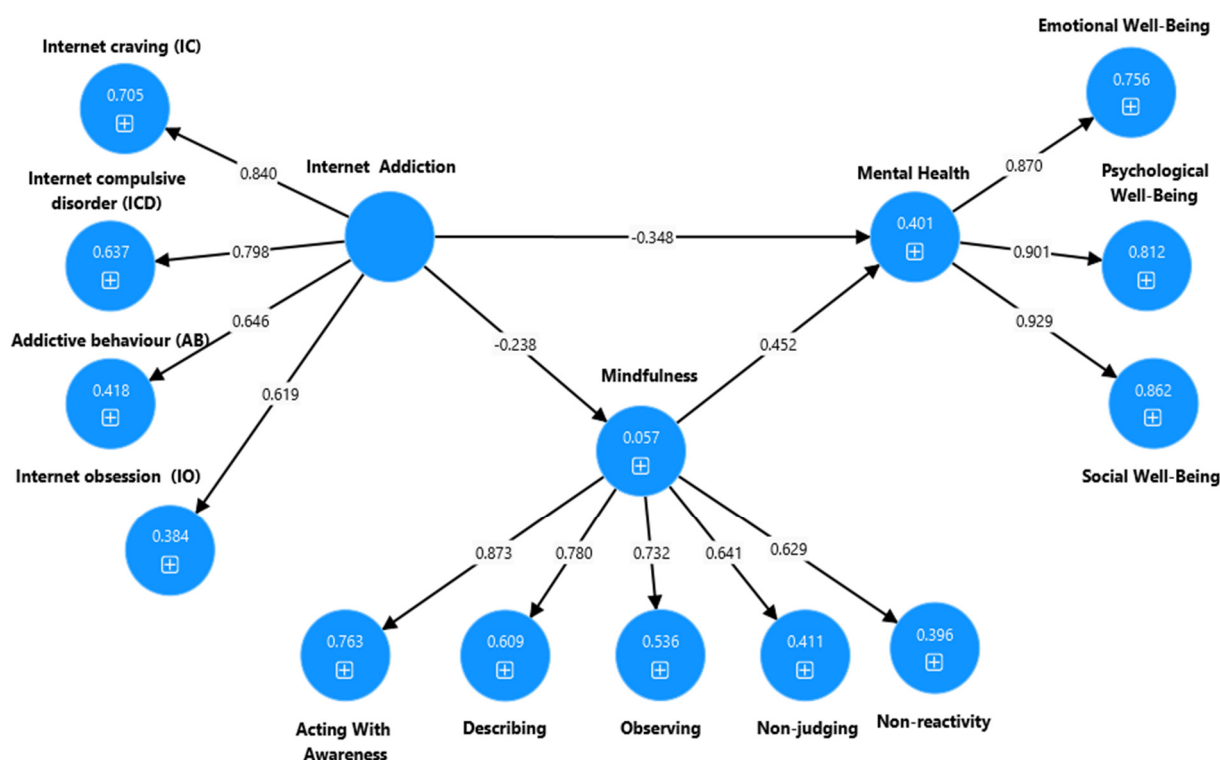
Appendix B.2. Partial Mediation of SMA on MH Through Mindfulness of High School Students



Appendix B.3. Partial Mediation of IA on MH Through Social Capital of High School Students



Appendix B.4. Partial Mediation of IA on MH Through Mindfulness of High School Students



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Article

Insecure Minds through the Looking Glass: The Mediating Role of Mentalization in the Relationships between Adult Attachment Styles and Problematic Social Media Use

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Abstract: Research shows that insecure attachment styles and failures in mentalizing are associated with increased problematic social media use (PSMU). This study aimed to investigate the mediating role of failures in mentalizing in the relationships between attachment styles and PSMU within a large sample of individuals from the community. The study involved the participation of 3600 adult volunteers (2312 females, 64.2%) aged between 18 and 60 years old ($M = 29.92$; $SD = 10.68$). Participants completed measures to assess socio-demographics, adult attachment styles, mentalization, and PSMU. Findings showed that secure and dismissing attachment styles predicted reduced levels of PSMU, and that preoccupied and fearful attachment styles predicted increased levels of PSMU. The relationships between adult attachment styles and PSMU were mediated by failures in mentalizing. Thus, individuals with preoccupied and fearful attachment styles may excessively resort to social media as a means of coping with unprocessed mental states. Clinical interventions that focus on improving mentalizing abilities and promoting the adoption of appropriate self-regulation strategies might reduce maladaptive engagement in social media.

Keywords: problematic social media use; attachment; mentalization; mediation model

1. Introduction

Social media encompasses a variety of digital platforms that enable individuals to share information, interact with others, and participate in communities. As of 2022, there were over 4.59 billion social media users worldwide, and this number is expected to rise to nearly six billion by 2027 [1]. Research shows that the use of social media may have both favorable and unfavorable consequences on individuals' well-being, depending on their psychological differences [2–4].

In recent decades, there were suggestions that an excessive involvement with Internet platforms, such as social media, could be conceptualized as a behavioral addiction that shares similar characteristics with substance or gambling addictions [5–7]. For example, the components model of addiction posits that all forms of addiction are characterized by six core symptoms, which are salience, tolerance, mood modification, relapse, withdrawal, and conflict [6]. Although there is agreement about the potential for addictive behaviors related to online activities, some scholars proposed that the problematic use of Internet platforms can be understood as a compensatory strategy aimed at coping with personal

and interpersonal vulnerabilities [8–10]. This approach focuses on the psychological processes underlying the problematic use of Internet platforms and may play a significant role in reducing the risk of overpathologizing temporary dysfunctional patterns of online activities [11]. In this study, we will use the term “problematic social media use” (PSMU) to broadly refer to excessive or otherwise dysregulated use of social media, such that it leads to addictive-like symptoms (e.g., mood modification and relapse) and impairments in various areas of individual functioning, including health, work, intimate relationships, and so forth [12,13]. Notably, previous research shows that the problematic use of Internet platforms might reflect a spectrum that encompasses different problematic online behaviors, including excessive gaming, cyberchondria, problematic cybersex, dysregulated online shopping, problematic online gambling, and PSMU [14]. Accordingly, each type of problematic online behavior may exhibit distinct characteristics and be linked to specific risk factors [15]. Hence, it is imperative to account for individual motivations and pertinent psychological mechanisms that may underpin the misuse of specific Internet platforms, along with the persistence over time and clinical relevance of the maladaptive behaviors on the Internet [16].

In this respect, research supports the role of PSMU in coping with psychological and interpersonal difficulties, also showing that PSMU is associated with several psychological vulnerabilities, such as emotion dysregulation [17–19], alexithymia [20,21], fear of missing out [22–24], low self-esteem [25–27], and loneliness [28,29].

1.1. Adult Attachment Styles and PSMU

Adult attachment styles may play a relevant role in PSMU [30,31]. Attachment is an innate motivational system that prompts individuals to form intimate relationships with others throughout their lifespan, aiming to attain a sense of safety and comfort [32,33]. Experiences in early attachment relationships shape the representations of the self, others, and the relationship between the self and others—also known as internal working models—which in turn have a profound impact on the individual’s cognitive, affective, and social development [34]. It is noteworthy that individuals might display secure, anxious, or avoidant attachment attitudes in close relationships during adulthood. Individuals with secure attachment attitudes are prone to perceiving others as available and being self-confident in close relationships. Individuals with anxious attachment attitudes tend to perceive themselves as unworthy, experience a fear of rejection, and depend on others. Individuals with avoidant attachment attitudes are prone to self-reliance and tend to devalue intimacy in close relationships [35]. Bartholomew and Horowitz [36] divided adult attachment into four categories, namely secure, dismissing, preoccupied, and fearful attachment styles, by referring to positive and/or negative representations of the self and others: secure attachment style is characterized by a positive representation of both self and others; dismissing attachment style is characterized by a positive representation of self and a negative representation of others; preoccupied attachment style is characterized by a negative representation of self and a positive representation of others; and fearful attachment style is characterized by a negative representation of both self and others. Additionally, adult attachment styles can be differentiated based on the levels of attachment anxiety and avoidance in close relationships. High levels of attachment anxiety are underpinned by a negative representation of the self, while elevated attachment avoidance is associated with a negative representation of others.

A recent systematic review showed different patterns of association between attachment and PSMU depending on the users’ developmental stage and their interpersonal context [31]. For example, secure attachment to the mother, rather than the father, was found to be negatively associated with PSMU among adolescents [37,38], and insecure attachment to peers was found to be associated with heightened levels of PSMU among older but not younger adolescents [39]. Additionally, existing literature supports the relevant role of attachment across various relational contexts in PSMU, suggesting that secure attachment might prevent the onset of PSMU, and that anxious attachment attitudes might

foster PSMU [31]. Individuals with secure attachment attitudes may employ social media to strengthen the bonds within close relationships [40,41], whereas individuals with anxious attachment attitudes might engage in PSMU to satisfy their needs for relatedness and self-presentation, concurrently alleviating their fear of rejection [42,43]. However, there are inconsistent findings concerning the relationship between avoidant attachment attitudes and PSMU [31]. For example, Worsley and colleagues [44] investigated the mediating effects of attachment attitudes and depressive symptoms on the relationship between childhood maltreatment and PSMU among young adults. Their findings show that anxious attachment attitudes were associated with increased levels of PSMU, whereas avoidant attachment attitudes were associated with decreased levels of PSMU. Similarly, Liu and Ma [45] examined the potential role of emotion regulation as a mediating variable in the association between insecure attachment attitudes and PSMU within a sample of college students. They found that anxious attachment attitudes were associated with increased levels of PSMU, and that emotion dysregulation has indirect effects on this relationship. However, avoidant attachment attitudes were not significantly associated with PSMU. In contrast, Monacis and colleagues [46] investigated the associations between attachment attitudes and PSMU among adolescents and young adults. They found that PSMU was predicted negatively by confidence and discomfort with closeness—which are core characteristics of secure and avoidant attachment attitudes, respectively—and positively by the need for approval and relationship as secondary—which are core characteristics of anxious and avoidant attachment attitudes, respectively.

Additionally, research shows that preoccupied and fearful attachment styles—characterized by high levels of anxiety embedded in a negative view of the self—are associated with increased levels of PSMU, and that other psychological factors might contribute to explain these relationships. Accordingly, Costanzo and colleagues [47] found that the tendency to excessively resort on fantasy (i.e., maladaptive daydreaming [48]) partially mediated the relationship between preoccupied attachment style and PSMU, and fully mediated the relationship between fearful attachment style and PSMU. Gori and colleagues [49] showed that preoccupied and fearful attachment styles were associated with increased levels of PSMU, and that these relationships were fully mediated by low self-esteem, fear of missing out, and a larger amount of time spent on social media. It is advisable that further research identifies additional psychological factors involved in the relationship between attachment styles and PSMU to enhance understanding of the processes that might foster PSMU in individuals with an insecure attachment style, and to assist clinicians in planning tailored interventions.

1.2. Adult Attachment Styles, Failures in Mentalizing and PSMU

Mentalizing activities might hold a relevant influence on PSMU. Mentalization (or “reflective functioning”) is the ability to represent one’s own and other’s behaviors in terms of mental states, and is highly involved in emotion regulation [50,51]. The development of mentalization is embedded in early attachment relationships. In fact, parental reflective functioning—that is, the caregivers’ capacity to represent both their own and their offspring’s mental states [52–54]—plays a critical role in understanding and satisfying child’s needs, enhancing emotion regulation abilities and attachment security [55–57]. Conversely, child abuse and neglect are associated with insecurity in close relationships and impairments in mentalizing abilities [58–60].

Adult attachment styles are associated with different emotion regulation strategies in response to distressing events, potentially influencing mentalizing abilities. Individuals with a secure attachment style perceive others as available and, thus, are prone to seek comfort and assistance within close relationships. Individuals with anxious attachment attitudes, who have a negative view of themselves, tend to resort on the hyperactivation of the attachment system, exhibiting intense attempts to attain the proximity of others. Finally, individuals with avoidant attachment attitudes, thus displaying a negative view of others, are prone to resort to the deactivation of the attachment system, implying avoidance of

intimacy and self-reliance [35]. Secure attachment strategies are associated with adequate mentalizing abilities during distressing events, whereas hyperactivating and deactivating strategies might increase the risk of failures in mentalizing [61]. However, the employment of deactivating strategies may enable individuals to exclude distressing feelings associated with negative attachment experiences from awareness while still retaining the capacity to cognitively process their own and others' mental states, given that distress levels are not excessively elevated [33]. There is consistent evidence showing that insecure attachment, specifically preoccupied and fearful attachment styles, are associated with increased failures in mentalizing [62–66].

Research suggests that failures in mentalizing are involved in addictive behaviors [67–70], including problematic online behaviors such as PSMU [71–73]. In fact, difficulties in identifying and regulating distressing feelings may increase the risk of resorting to substance use or engaging in dysfunctional behaviors as a means of seeking relief [74–76]. Accordingly, failures in mentalizing one's own and others' mental states might lead to the development and maintenance of PSMU as a coping strategy to deal with unprocessed feelings and to avoid the perceived unpredictability of face-to-face interactions [72,73]. Bassi and colleagues [77] examined the relationships between childhood maltreatment, anxious and avoidance attachment attitudes, failures in mentalizing, and PSMU symptoms in a sample of emerging adults. Results show that failures in mentalizing were directly associated with increased levels of childhood maltreatment, anxious attachment attitudes, and PSMU symptoms. Thus, individuals who were exposed to child maltreatment and display anxious attachment attitudes are prone to experiencing failures in mentalizing, which in turn fosters PSMU. However, no studies were conducted to investigate the potential mediating effects of failures in mentalizing on the associations between adult attachment styles (i.e., secure, dismissing, preoccupied, and fearful) and PSMU.

1.3. Aims of the Study

In light of current literature, this study aimed to test the mediating role of failures in mentalizing in the relationships between adult attachment styles and PSMU. In fact, individuals with a secure attachment style might maintain adequate mentalizing abilities in response to distressing events, displaying a lower risk of engaging in PSMU. Accordingly, secure attachment styles could be negatively associated with levels of PSMU, and reduced failures in mentalizing could mediate this relationship. In contrast, individuals with preoccupied or fearful attachment styles might excessively resort on social media in order to cope with unprocessed feelings by seeking emotional support from others. Thus, failures in mentalizing could mediate the positive association between preoccupied and PSMU, and between fearful attachment and PSMU. Finally, individuals with a dismissing attachment style might display a lower risk for impairments in cognitively representing one's own and others' inner experiences, and avoid to engaging in interactions through social media use. Therefore, it is expected that decreased levels of failures in mentalizing mediate the negative association between dismissing attachment style and PSMU.

Additionally, there is some evidence that being female, a younger age, having lower levels of education, and a greater amount of time spent on social media are associated with increased levels of PSMU [78–83]. Accordingly, we investigated the effects of sociodemographic variables and self-reported time spent on social media in the relationships between adult attachment styles, failures in mentalizing, and PSMU.

2. Materials and Methods

2.1. Participants and Procedures

The sample of the study consisted of 3600 adult individuals (2312 females, 64.2%). The age range of the participants was between 18 and 60 years ($M = 29.92$; $SD = 10.68$). On average, participants completed 14.75 years of education ($SD = 2.70$). Participants were recruited by means of advertisements that were posted on social media platforms, such as Facebook and WhatsApp. Each advertisement included a link to an online survey, which

comprised an informed consent schedule, a sociodemographic schedule, and different self-report measures. Those individuals who electronically signed the informed consent were automatically directed to complete the sociodemographic schedule and self-report measures. All the participants entered the study willingly and no compensation was provided to them. The current study was carried out as a component of a broader research project, which obtained approval from the Ethics Committee of the Center for Research and Psychological Intervention (CERIP) of the University of Messina (protocol code: 119094). A previous, reduced version of the dataset was employed to perform a study on the relationship between child maltreatment, adult attachment, failures in mentalizing, and PSMU in $N = 1614$ emerging adults (807 females, 50%) aged between 18 and 30 years old ($M = 23.84$; $SD = 3.21$) [77]. The study was conducted in adherence to the Helsinki Declaration.

2.2. Measures

The Bergen Social Media Addiction Scale (BSMAS; [84–86]) is a self-report measure that assesses social media addiction in accordance with the component model [6]. The BSMAS includes six items rated on a 5-point Likert scale (1 = “very rarely”; 5 = “very often”). The following question is an example of an item: “How often during the last year have you used social media so much that it has had a negative impact on your job/studies?”. Research supported the validity and reliability of the BSMAS [87–89]. However, recent evidence suggests that some items of the BSMAS might fail to assess social media addiction as a unitary construct, and thus, to differentiate excessive engagement in social media from social media addiction [12]. Accordingly, in the current study, we used the BSMAS total score to evaluate PSMU. Cronbach’s alpha was 0.83 for the full scale.

The Relationship Questionnaire (RQ; [36,90]) is a self-report measure that assesses adult attachment styles, including secure, dismissing, preoccupied, and fearful, through four first-person statements. Participants were asked to indicate how each statement represented them on a 7-point Likert scale (1 = “strongly disagree”; 7 = “strongly agree”). The following statement is an example of an item: “I want to be completely emotionally intimate with others, but I often find that others are reluctant to get as close as I would like. I am uncomfortable being without close relationships, but I sometimes worry that others don’t value me as much as I value them” (referred to the preoccupied attachment style). The RQ showed discriminant validity [91] and test-retest reliability [92].

The Reflective Functioning Questionnaire (RFQ; [93,94]) is a self-report instrument that assesses mentalizing capacities. It consists of eight items rated on a 7-point Likert scale (1 = “strongly disagree”; 7 = “strongly agree”). The following first-person statement is an example of an item: “If I feel insecure I can behave in ways that put others’ backs up”. The RFQ includes two six-item subscales, namely certainty and uncertainty about mental states. The Italian version of the RFQ subscales demonstrated satisfactory psychometric properties, which include adequate factor structure, construct validity, and reliability [94]. In the current study, we used the uncertainty about mental states subscale to evaluate failures in mentalizing. The Cronbach’s alpha of this subscale was 0.63.

A sociodemographic schedule was administered to collect information on sex, age, years of education, and the daily average amount of hours spent on social media.

2.3. Statistical Analyses

Descriptive statistics were computed for all variables. Sex differences for age, years of education, self-reported time spent on social media, adult attachment styles, failures in mentalizing, and PSMU were examined through *t*-test. Pearson’s *r* correlation coefficients were computed to investigate the associations between age, years of education, self-reported time spent on social media, adult attachment styles, failures in mentalizing, and PSMU. A multiple linear regression analysis was performed to test whether adult attachment styles and failures in mentalizing predicted PSMU, taking into account the effects of sociodemographic characteristics (i.e., sex, age, and years of education) and self-reported time spent on social media. Finally, four mediation analyses were computed

to investigate the mediating effects of failures in mentalizing in the relationships between adult attachment styles and PSMU. Thus, each model included one of the adult attachment styles (i.e., secure, dismissing, preoccupied, and fearful) as an independent variable, failures in mentalizing as a mediator variable, and PSMU as the dependent variable. The other adult attachment styles, sociodemographic characteristics, and self-reported time spent on social media were inserted as covariates in the models. Scores on independent and mediator variables were mean-centered in order to reduce collinearity. The significance of indirect effects was tested by performing 5000 percentile bootstrap samples. The critical level for determining statistical significance was established by setting a p -value of 0.05: the indirect effect of the mediation model can be considered significant if the value of 0 is not encompassed within the 95% confidence interval. Mediation analyses were computed using Process Macro version 4.1 for SPSS [95].

3. Results

3.1. Descriptive Statistics and Sex Differences

Descriptive statistics and sex differences are reported in Table 1. The mean scores on the scales evaluating secure, dismissing, preoccupied, and fearful attachment styles (ranging from 2.52 to 3.31) suggest a heterogeneous distribution of adult attachment styles among participants. Additionally, the mean scores on the scales evaluating failures in mentalizing and PSMU fell within the expected range for individuals from the community, suggesting that the severity of failures in mentalizing and PSMU symptoms was not clinically significant for the majority of participants. Females reported a larger amount of time spent on social media and higher levels of preoccupied and fearful attachment styles, failures in mentalizing, and PSMU, whereas males reported higher levels of secure attachment style.

Table 1. Descriptive statistics and sex differences ¹.

Variable	Full Sample (N = 3600)			Females (N = 2312)		Males (N = 1288)		$t_{(3598)}$	p
	M	(SD)	Range	M	(SD)	M	(SD)		
Age	29.92	(10.68)	18–60	29.19	(10.34)	31.25	(11.15)	−5.56	<0.01
Years of education	14.75	(2.70)	5–21	14.97	(2.57)	14.37	(2.87)	6.40	<0.01
Time spent on social media (hours)	2.66	(1.99)	0–20	2.80	(2.03)	2.41	(1.88)	5.73	<0.01
RQ—Secure attachment style	3.31	(1.89)	1–7	3.23	(1.89)	3.46	(1.88)	−3.53	<0.01
RQ—Dismissing attachment style	3.13	(1.84)	1–7	3.11	(1.83)	3.16	(1.85)	−0.76	0.45
RQ—Preoccupied attachment style	2.52	(1.69)	1–7	2.56	(1.69)	2.44	(1.68)	2.10	0.04
RQ—Fearful attachment style	3.04	(1.86)	1–7	3.18	(1.89)	2.79	(1.79)	6.15	<0.01
RFQ—Uncertainty about mental states	0.67	(0.57)	0–3	0.69	(0.58)	0.62	(0.55)	3.62	<0.01
BSMAS—Problematic social media use	13.08	(5.07)	6–30	13.50	(5.03)	12.33	(5.04)	6.64	<0.01

¹ Sex: “Female” was coded as 0, and “Male” was coded as 1; RQ = Relationship Questionnaire, RFQ = Reflective Functioning Questionnaire, and BSMAS = Bergen Social Media Addiction Scale.

3.2. Associations among Variables

Pearson’s r correlation coefficients among the study variables are shown in Table 2. Secure attachment style was negatively associated with failures in mentalizing and PSMU, dismissing attachment style was negatively associated with failures in mentalizing, and both preoccupied and fearful attachment styles were positively associated with failures in mentalizing and PSMU. Additionally, sociodemographic characteristics and time spent on social media were significantly correlated with the variables of interest: age was negatively associated with insecure attachment styles (i.e., dismissing, preoccupied, and fearful), failures in mentalizing, and PSMU; years of education were positively associated with a secure attachment style, and negatively associated with preoccupied attachment style, failures in mentalizing, and PSMU; time spent on social media was positively associated with secure

attachment style, and negatively associated with both attachment styles characterized by a negative view of the self (i.e., preoccupied and fearful), failures in mentalizing, and PSMU.

Table 2. Pearson's r correlations among the investigated variables ².

Variable	2.	3.	4.	5.	6.	7.	8.	9.
1. Age	0.12 **	−0.24 **	0.02	−0.09 **	−0.19 **	−0.25 **	−0.04 *	−0.26 **
2. Years of education	-	−0.09 **	0.09 **	0.02	−0.06 **	−0.03	−0.11 **	−0.06 **
3. Time spent on social media (hours)		-	−0.04 *	−0.01	0.11 **	0.08 **	0.14 **	0.41 **
4. RQ—Secure attachment style			-	−0.14 **	−0.15 **	−0.25 **	−0.14 **	−0.10 **
5. RQ—Dismissing attachment style				-	0.00	0.13 **	−0.06 **	−0.02
6. RQ—Preoccupied attachment style					-	0.29 **	0.18 **	0.21 **
7. RQ—Fearful attachment style						-	0.14 **	0.20 **
8. RFQ—Uncertainty about mental states							-	0.25 **
9. BSMAS—Problematic social media use								-

² RQ = Relationship Questionnaire, RFQ = Reflective Functioning Questionnaire, BSMAS = Bergen Social Media Addiction Scale, * $p < 0.05$, and ** $p < 0.01$.

The results of multiple linear regression analysis are presented in Table 3. A dismissing attachment style predicted decreased levels of PSMU, whereas adult attachment styles characterized by a negative view of the self (i.e., preoccupied and fearful) and failures in mentalizing predicted increased levels of PSMU. Furthermore, being female, a younger age, and a larger amount of time spent on social media were positive predictors in the model.

Table 3. Regression model predicting the severity of problematic social media use ³.

Variable	β	SE	Partial r	t	p
Sex	−0.04	0.16	−0.05	−2.87	<0.01
Age	−0.14	0.01	−0.15	−8.90	<0.01
Years of education	0.01	0.03	0.01	0.57	0.57
Time spent on social media (hours)	0.33	0.04	0.34	21.78	<0.01
RQ—Secure attachment style	−0.02	0.04	−0.03	−1.59	0.11
RQ—Dismissing attachment style	−0.03	0.04	−0.04	−2.29	0.02
RQ—Preoccupied attachment style	0.10	0.05	0.10	6.28	<0.01
RQ—Fearful attachment style	0.08	0.04	0.08	4.84	<0.01
RFQ—Uncertainty about mental states	0.16	0.13	0.18	10.70	<0.01

³ Sex: “Female” was coded as 0, and “Male” was coded as 1; RQ = Relationship Questionnaire, RFQ = Reflective Functioning Questionnaire, and BSMAS = Bergen Social Media Addiction Scale; Model: $F(9,3590) = 135.05$, $p < 0.001$, and $R^2 = 0.25$.

The results of mediation analyses are displayed in Figure 1a–d. We found that failures in mentalizing mediated the relationships between attachment styles and PSMU. In the first model (Figure 1a), the negative association between secure attachment style and PSMU was fully mediated by failures in mentalizing. In the second model (Figure 1b), dismissing attachment style had a negative effect on PSMU through the partial mediating effect of failures in mentalizing. In the third and fourth models, failures in mentalizing partially mediated the positive association between preoccupied attachment style and PSMU (Figure 1c), and between fearful attachment style and PSMU (Figure 1d). Significant associations were found between PSMU and covariates in all models. The sociodemographic characteristics predicting increased levels of PSMU were being female ($\beta = -0.049$; 95% CI $[-0.829, -0.210]$; $se = 0.158$; $p = 0.001$) and a younger age ($\beta = -0.132$; 95% CI $[-0.078, -0.048]$; $se = 0.008$; $p < 0.001$). Additionally, a larger amount of time spent on social media was associated with increased PSMU ($\beta = 0.347$; 95% CI $[0.808, 0.960]$; $se = 0.039$; $p < 0.001$). Finally, secure and insecure attachment styles (i.e., dismissing, preoccupied, and fearful) were significant covariates in all mediation models.

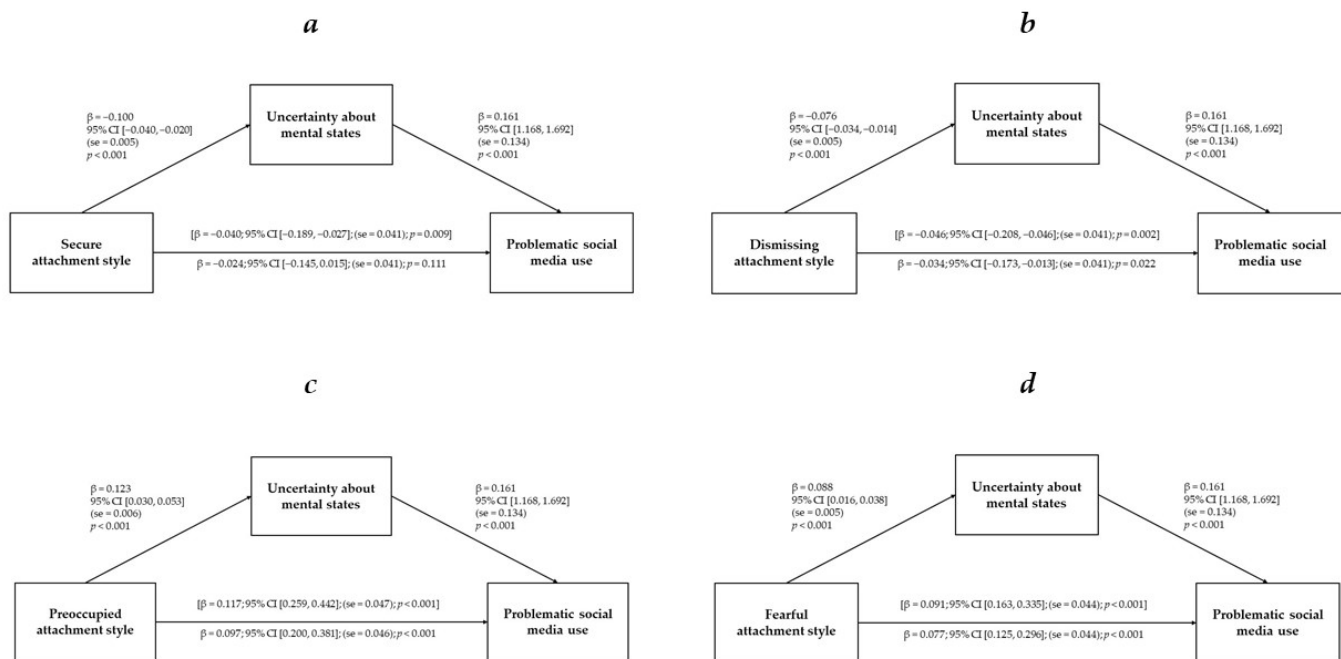


Figure 1. (a–d). Mediating effects of uncertainty about mental states on the relationships between attachment styles and problematic social media use.

4. Discussion

The current study examined the mediating role of failures in mentalizing in the relationship between adult attachment styles and PSMU. Significant sex differences were observed among participants. Females reported higher levels of preoccupied and fearful attachment styles compared to males, who reported higher levels of secure attachment. This finding is consistent with research suggesting that females are more prone to exhibiting anxious attachment attitudes than males [96]. In contrast, higher mentalizing abilities were observed among males. This finding might seem surprising, considering that the relevant literature does not suggest sex differences in mentalization [94,97]; however, it might represent a byproduct of a younger age observed among females in the sample, since a younger age is associated with decreased levels of mentalizing abilities [93]. Additionally, females reported greater levels of PSMU, which aligns with meta-analytic research [83]. According to the literature, a larger amount of time spent on social media, a younger age, and lower education were associated with increased PSMU [78,98–100].

Correlation analyses revealed that secure and dismissing attachment styles were negatively associated with failures in mentalizing. This finding suggests that secure and dismissing attachment styles may promote reflective functioning during distressing experiences. In fact, the activation of the attachment system in secure individuals who perceive their efforts to seek proximity and emotional support as effective may sustain reflective functioning [61]; in contrast, the deactivation of the attachment system in individuals with a dismissing attachment style implies the exclusion of disturbing feelings from awareness, preventing failures in cognitive mentalizing [33]. Preoccupied and fearful attachment styles were positively associated with failures in mentalizing. Thus, the hyperactivation of the attachment system in individuals who perceive themselves negatively and experience high levels of anxiety in close relationships may impair mentalizing abilities [61,65].

Secure attachment style was negatively associated with PSMU, whereas preoccupied and fearful attachment styles were positively associated with PSMU. This finding supports previous literature suggesting that secure attachment may reduce the risk of a maladaptive involvement in social media, and that anxious attachment attitudes, which are rooted in a negative view of the self, may foster PSMU [31,47,49,101]. In fact, individuals with preoccupied or fearful attachment styles may excessively resort to social media platforms

in order to alleviate anxiety in social interactions and fulfill their needs of relatedness and self-presentation [42,102,103]. In accordance with previous research [71,72], we also found a positive association between failures in mentalizing and PSMU. Accordingly, PSMU may represent an attempt to cope with unprocessed feelings by seeking refuge in an online environment perceived as more predictable and stable than offline interpersonal contexts [73].

Regression analysis showed that attachment styles characterized by a negative view of the self—i.e., preoccupied and fearful attachment styles—predicted increased levels of PSMU. Despite correlation analyses not showing a significant association between dismissing attachment and PSMU, regression analysis displayed that dismissing attachment style had a negative effect on PSMU when this association was controlled for sociodemographic characteristics, time spent on social media, and failures in mentalizing. Accordingly, some individuals with a dismissing attachment style might have a lower risk of engaging in PSMU. Finally, PSMU was predicted by being female, a younger age, and a larger amount of time spent on social media.

Mediation analyses provided further elucidation on the effects of adult attachment styles and failures in mentalizing on PSMU, showing that failures in mentalizing mediated the relationships between adult attachment styles and PSMU. Secure attachment style predicted reduced levels of PSMU, and this relationship was fully mediated by failures in mentalizing. Thus, a secure attachment style may sustain the ability to reflect on one's own and others' mental states, promoting adaptive emotion regulation strategies within close relationships [50,51]. As a result, individuals with a secure attachment style might have a lower likelihood of resorting to PSMU [46,86] as a coping strategy for dealing with personal and psychosocial difficulties [8]. Failures in mentalizing partially mediated the negative association between dismissing attachment style and PSMU. Despite previous research showing inconsistent findings on the role of avoidant attachment attitudes in PSMU [31], our findings suggest that individuals who exhibit a dismissing attachment style—characterized by a positive view of the self and the tendency to be self-reliant [36]—and possess proper mentalizing abilities have a low risk of engaging in PSMU. On the one hand, the deactivation of the attachment system, when the levels of distress are not excessively high, may support cognitive mentalizing abilities, preventing the use of social media as an emotion regulation strategy; on the other hand, the tendency to self-reliance may reduce the likelihood of participating in interactions with others through social media. Finally, preoccupied and fearful attachment styles were predictively associated with increased PSMU through the indirect partial effect of failures in mentalizing. These findings extend to previous research showing that the positive relationships between preoccupied attachment style and PSMU, and between fearful attachment style and PSMU, might be explained by different factors, such as the tendency to excessively resort to fantasy [47], low self-esteem [101], the fear of missing out [49], and so on. In fact, anxious attachment attitudes, stemming from a negative view of the self, may foster failures in mentalizing, which in turn may increase the dysfunctional use of social media platforms in order to meet one's own relational needs and to alleviate negative feelings [16,77].

In line with other literature findings, being female, a younger age, and a larger amount of time spent on social media were significant covariates in all mediation models [78,83,98–100]. From a compensatory perspective, the duration of social media usage could be closely associated with the level of psychological vulnerabilities that prompt individuals to engage in such Internet platforms [8].

The current study is not devoid of certain limitations. The sample of the study included individuals from the community, limiting the generalizability of results to individuals who exhibit impairments in their personal and interpersonal functioning due to a maladaptive involvement in social media. Thus, future studies should investigate the role of adult attachment styles and failures in mentalizing in individuals who suffer from high levels of PSMU. Despite the variables of the study being evaluated through well-validated measures, the use of self-report instruments may increase the risk of bias. Accordingly,

it is advisable that further research employs structured or semi-structured interviews to assess the variables of interest. Additionally, the cross-sectional design of the study did not allow detection of causal relationships between adult attachment styles, failures in mentalizing, and PSMU. Longitudinal studies are therefore recommended to ascertain the effects of adult attachment styles and failures in mentalizing on PSMU. Additionally, future studies should investigate the role of attachment patterns in various interpersonal contexts, such as relationships with parents, peers, or partners, in preventing or fostering failures in mentalizing and PSMU. Finally, further research is needed to examine the potential moderating or mediating effects of other variables, such as mind-wandering, maladaptive daydreaming, and emotion dysregulation, on the relationships between adult attachment styles and PSMU.

5. Conclusions

Its limitations notwithstanding, this study provides evidence for the role of failures in mentalizing in the relationships between adult attachment styles and PSMU. Our findings suggest that secure and dismissing attachment styles may reduce the risk of using social media as a maladaptive coping strategy aimed at dealing with unprocessed feelings; in contrast, anxious attachment attitudes, stemming from a negative view of the self, may increase the likelihood to experience failures in mentalizing abilities, which in turn, increases the vulnerability to PSMU.

Furthermore, the current study can have relevant implications for the assessment and treatment of PSMU. It is advisable that clinicians carefully evaluate the attachment styles and mentalizing abilities of patients who are excessively involved in social media in order to plan tailored interventions. In fact, it is fundamental that clinicians adopt a non-judgmental approach when treating patients with preoccupied or fearful attachment styles, being cautious not to contribute to their feelings of inadequacy in close relationships. Consequently, clinicians should assist patients in establishing a sense of security in therapeutic relationships [33], helping them to reflect on their and others' mental states and adopt adaptive strategies aimed at managing their negative feelings [104]. Consequently, it might be essential to assist patients in recognizing the role played by their negative representation of the self and high anxiety levels in the adoption of maladaptive self-regulation strategies, such as PSMU. Pursuing these objectives might be essential for mitigating the inclination towards maladaptive utilization of social media and enhancing the individual and interpersonal functioning of people suffering from PSMU.

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Article

The Role of Prosocial Behavior, Aggression, and Assertiveness in Explaining Cyberbullying Victimization Among Youth

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Abstract: This study aimed to examine cyberbullying among youth regarding prosocial behavior, aggression, passive aggression, assertiveness, and passive assertiveness. The study included 183 adolescents (51.4% girls, 39.9% boys, and 8.7% defined as another gender) aged 15 to 18. Aggressive, passive-aggressive, assertive, passive-assertive, prosocial, and cyberbullying behaviors were assessed using self-report questionnaires. The results revealed significant differences in how various responses to conflictual social situations relate to experiences of cyberbullying. Aggressive and passive-assertive behaviors were the strongest predictors of cyberbullying victimization. Furthermore, both behaviors significantly mediated the relationship between prosocial behavior and experiences of cyberbullying. These findings provide insight into practical strategies for dealing with cyberbullying and contribute to our existing understanding of the role of aggression and assertiveness in online harassment.

Keywords: cyberbullying victimization; aggression; assertive behavior; prosocial behavior; adolescence

1. Introduction

Nowadays, young people have constant access to mobile devices (e.g., mobile phones, computers, and tablets), providing them with nearly unlimited opportunities to connect with peers and access information [1]. While this accessibility fosters self-development—such as acquiring new knowledge, developing skills, and establishing new connections—it also presents various risks, including cyberbullying [2,3]. Cyberbullying is influenced by multiple psychosocial factors, with one of the most significant being aggression [2,4]. Previous studies on aggression in the context of cyberbullying have primarily focused on the general levels of aggression among perpetrators or victims, e.g., [2,4,5]. A review of recent literature indicates that researchers are increasingly examining specific aspects of aggression, such as reactive and proactive aggression [6–8], verbal and physical aggression [2], or instrumental and impulsive aggression [9]. However, most studies in the context of cyberbullying tend to focus on single dimensions of aggression without considering their broader or combined impact on cyberbullying experiences [2,4,5]. Moreover, recent studies suggest that responses to social conflict can be viewed on a continuum [10–12], ranging from aggressive to assertive, with intermediate passive behaviors (passive-aggressive vs. passive-assertive behaviors).

Given that few studies have examined different types of aggression in the context of cyberbullying victimization—and none have explored the continuum of behaviors from aggression to assertiveness—this study aimed to investigate the experience of cyberbullying as an example of a social conflict situation through the lens of four distinct types of reactions to conflictual social scenarios rather than relying on the traditional, singular

conceptualization of aggression or assertiveness. This approach provides a deeper understanding of which behaviors are most relevant in the context of cyberbullying victimization. Additionally, the study controlled prosocial behavior, as it plays a crucial role in influencing both aggressive and assertive responses.

1.1. Cyberbullying

Cyberbullying is a form of bullying that occurs through electronic media [2,13]. It involves repeated acts of aggression intended to cause harm or distress to another person [1,2,13,14]. The prevalence of cyberbullying among young people ranges from 10% to 53%, depending on the population studied and the methods used to measure and define cyberbullying [2,15]. Cyberbullying encompasses various behaviors carried out through digital platforms, including exclusion from online groups, spreading rumors and false information, and making threats, insults, and intrusive messaging [1,15]. While traditional bullying is significantly related to cyberbullying, there are key differences between the two. Compared to traditional bullying, cyberbullying has a broader audience, offers greater anonymity, persists over time, and is more difficult to control [1,13]. Cyberbullying negatively impacts an individual's psychosocial functioning, regardless of whether they are the perpetrator or the victim [1,15].

1.1.1. Cyberbullying and the Behavioral Continuum: From Aggression to Assertiveness

Aggressive, passive-aggressive, assertive, and passive-assertive behaviors represent four distinct responses to the same social conflict situation. Aggressiveness is characterized by defending one's rights and needs while violating the rights of others. Assertiveness, on the other hand, involves respecting one's rights and needs while also respecting those of others [10,16]. Passive aggressiveness and passive assertiveness both involve subordinating one's own needs and rights; however, the former simultaneously infringes upon the rights of others, whereas the latter does not [10]. These four types of responses can be viewed as forming a continuum. Aggressiveness and assertiveness can be seen as opposing reactions, with their passive forms serving as intermediates. For instance, assertiveness provides a socially acceptable way of managing hostility or anger, whereas aggressiveness does not [10]. Additionally, while aggressiveness and assertiveness are direct responses to social conflict, their passive counterparts represent postponed, indirect ways of reacting to such situations [10,16–18].

Research findings indicate significant relationships between aggression, assertiveness, and cyberbullying [2,4,5]. Most studies suggest that aggression increases the risk of involvement in cyberbullying, both as a perpetrator and as a victim [2,4]. However, some studies do not confirm this relationship [19]. In contrast, research on the link between assertiveness and cyberbullying has yielded inconsistent results [5,20]. One study found that assertiveness predicts lower involvement in cyberbullying [20], while another reported the opposite effect [5]. Additionally, some studies found no significant relationship between assertiveness and experiencing cyberbullying [2,5,20], while others identified opposing patterns depending on the population studied—showing a significant positive correlation among Spaniards and a significant negative correlation among Ecuadorians [14].

Some inconsistencies in research findings may be explained by different subtypes of aggression and assertiveness [19]. For example, aggression can be categorized as either reactive or proactive. Reactive aggression, often called “impulsive” aggression, is an immediate response to a perceived or actual threat, such as retaliating against someone. In contrast, proactive aggression, also known as “instrumental” aggression, is goal-directed and not driven by the current situation but instead by an anticipated reward—for instance, discrediting someone for professional gain or social recognition [8,21]. Both perpetrators

and victims of cyberbullying report higher levels of both reactive and proactive aggression compared to individuals not involved in cyberbullying [6,22]. Moreover, reactive aggression may be more strongly associated with cyberbullying victimization than proactive aggression, possibly due to impulsive, defensive reactions to frustration [6,7]. On the other hand, among cyberbullying perpetrators, proactive aggression is more strongly linked to cyberbullying than reactive aggression, as it is often used in a more calculated and strategic manner [21].

1.1.2. Cyberbullying and Prosocial Behavior

Prosocial behaviors are actions intended to help another person or a group of people. The key factors motivating prosocial behavior include empathy, altruism, and the principle of reciprocity [23]. These behaviors are associated with skills such as cooperation, helping others, and sharing [5,13]. Additionally, prosocial behaviors serve as a crucial protective factor for children and adolescents, helping to mitigate various challenges, such as externalizing and internalizing disorders [13,24].

The tendency toward prosocial behavior is significantly associated with both aggressive and assertive behaviors, as well as with cyberbullying in both victims and perpetrators [4,5,7,10]. For example, a longitudinal study by Fu et al. (2023) demonstrated the protective role of prosocial behavior in reducing the risk of experiencing cyberbullying [13]. Youth who engage in prosocial behaviors are more liked by their peers and are considered more socially attractive, which decreases their likelihood of being targeted for violence [24–26]. Moreover, in environments where antisocial behaviors such as rivalry and competition are prevalent, cyberbullying tends to be more common [5,14]. A study by Zhan et al. (2022) found that social responsibility effectively reduces both perpetration and victimization in cases of violence [27]. However, while prosocial behavior generally protects against cyberbullying, its role in lowering victimization is not always significant [5]. Similar findings have been observed in studies examining the relationship between traditional bullying and empathy [23].

1.2. The Present Study

This study aimed to examine the experience of cyberbullying among youth in terms of aggressiveness, assertiveness, passive aggressiveness, and passive assertiveness. Additionally, prosocial behaviors were controlled as they are important determinants of both cyberbullying and aggressive or assertive behaviors. Compared to previous studies that have focused on the reactive/proactive distinction of aggression or examined aggressive and assertive behaviors separately, this study adopted a more detailed conceptualization of aggression while also considering prosocial behaviors—the key factors influencing aggression and assertiveness. This approach provides valuable insights into the causes and conditions underlying behaviors related to the experience of cyberbullying among youth. By framing aggression and assertiveness as a continuum, this study offers a more precise mapping of behaviors associated with cyberbullying. To our knowledge, this is the first study to explore aggressive behaviors along a continuum while also controlling for the variable of prosocial behaviors in the context of cyberbullying. Based on the theoretical framework presented, two hypotheses were proposed.

Since prosocial behavior is a key factor in effectively managing social relationships, we hypothesized that it would be negatively related to aggression and the experience of cyberbullying and positively associated with assertive behavior (Hypothesis 1). Furthermore, given that assertive and aggressive behaviors are significantly linked to cyberbullying, we hypothesized that these behaviors would serve as significant mediators in the relationship

between prosocial behavior and cyberbullying (Hypothesis 2). The conceptual model is presented in Figure 1.

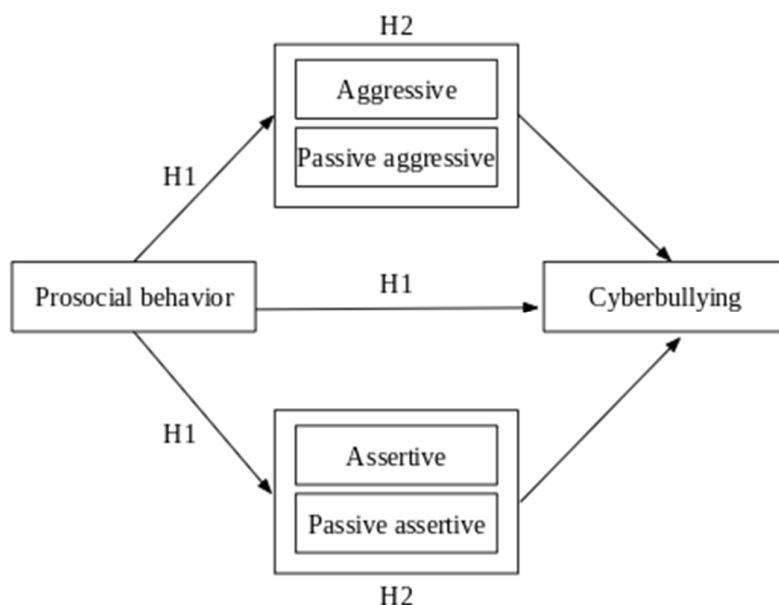


Figure 1. Mediation model of the relationship between prosocial behavior and cyberbullying.

2. Materials and Methods

2.1. Participants and Procedure

The study recruited 183 secondary school students from Wrocław, Poland. The eligibility criterion for the purposive sample was the participants' age. The participants' ages ranged from 15 to 18 years, with a mean age of 16 ($SD = 0.76$). The gender distribution included 94 girls (51.4%), 73 boys (39.9%), and 16 participants (8.7%) who selected a different gender option. To perform correlation analysis, a sample size of at least 176 participants is required to detect a medium effect size ($r = 0.21$, $\alpha = 0.05$, $1 - \beta = 0.80$), indicating that our sample size was sufficient.

The study was conducted using Google Forms, and participants were not compensated for their participation. School principals, teachers, and parents provided consent for the study to be conducted. Before the study, the participants gave their consent and were informed about the purpose of the research and its confidentiality. The study was registered on the ASPREDICTED website (<https://aspredicted.org/ym7uw.pdf>) (accessed on 20 February 2025).

2.2. Measures

2.2.1. Measurement of Prosocial Behavior

Students completed the prosocial behavior scale from the Big Five Personality Inventory for Children [28] in its Polish adaptation [29]. This scale was chosen because it enabled the study of prosocial behaviors among children and adolescents, which is important given the aims of the current study. A similarly simple format was used in previous related studies, e.g., [10,29,30]. This scale consisted of three items that measure different prosocial behaviors in students. Participants responded using a 4-point scale (definitely not true, not true, accurate, and definitely true) to indicate how much each statement applied to them. An example item is as follows: I try to help others. The estimated internal consistency was $\alpha = 0.73$ and $\omega = 0.75$, suggesting that the reliability and internal consistency of the scale were good.

2.2.2. Measuring the Continuum from Aggression to Assertiveness

The youth completed the Aggressive-Assertive Behavior Questionnaire, which assesses four types of reactions (aggressiveness, assertiveness, passive aggressiveness, and passive assertiveness) to a conflictual social situation [31]. This questionnaire allows for the examination of differences between aggression and assertiveness, which is important in relation to the study's objectives. Instruments of this type demonstrate high construct validity and internal reliability and are widely used in research on aggression and assertiveness among young people, e.g., [10,29]. The questionnaire measures the intensity of the participants' four reactions. It is based on earlier methods used to examine the continuum of behaviors from aggression to assertiveness, e.g., [17,18] but extends this continuum by including both passive-aggressive and passive-assertive behaviors. The questionnaire consists of four statements depicting a conflictual social situation and serves as a screening tool due to its concise format. Each statement corresponds to one of four possible reactions: aggressive, assertive, passive aggressive, and passive assertive. Participants rate each reaction on a 5-point scale, ranging from 1 (Never) to 5 (Always). This format allows for the calculation of scores for each of the four reaction types (ranging from 4 to 20 points), as well as separate scores for aggression and assertiveness (ranging from 8 to 40 points), and an overall score (ranging from 16 to 80 points), which can indicate social competence. An example statement and possible responses are the following: When someone teases you, I: (a) immediately start teasing them too, (b) leave them alone, I prefer to be friends with someone else, (c) distance myself from the person thinking that I will pay them back anyway, and (d) point out to the person that I do not like what they are doing and ask them to stop. Confirmatory factor analysis confirmed the scale's structure with four reaction types (aggression, assertiveness, passive aggressiveness, and passive assertiveness): chi-square = 198, $df = 98$, RMSEA = 0.075, CFI = 0.894, and TLI = 0.870. The model fit values were acceptable [32]. The reliability for the individual scale factors was as follows: aggression $\alpha = 0.78$ and $\omega = 0.78$; assertiveness $\alpha = 0.80$ and $\omega = 0.80$; passive aggression $\alpha = 0.64$ and $\omega = 0.65$; and passive assertiveness $\alpha = 0.67$ and $\omega = 0.68$. Given that the scale is designed as a screening tool, the reliability for passive assertiveness and passive aggressiveness is at an acceptable level, while the reliability for aggression and assertiveness is satisfactory [33].

2.2.3. Cyberbullying Victimization

The experience of cyberbullying was assessed using a procedure like those used in the studies by Fu et al. (2023) and Przewłocka (2015) [13,34]. Participants were asked whether they had experienced cyberbullying in the past month. They responded to a single question: How often in the past month did a student or students from your school behave in the following ways towards you: insulted you online or via text message, called you names, expressed hatred towards you, commented on your posts in an offensive manner, or threatened you online? The responses ranged from 1 to 5, with 1 indicating never, 2 indicating at least once a month, 3 indicating several times a month, 4 indicating several times a week, and 5 indicating every day. Higher scores indicated a higher level of cyberbullying.

2.2.4. Plan of Analysis

Analyses were conducted using the Jamovi software (Version 2.6, jamovi, Sydney, Australia) [35–37]. In the first step, a simple correlation analysis was performed between the variables assessed in the self-report study to confirm their suitability for the mediation model. Next, a multiple linear regression analysis was conducted to identify the most potent predictors among the four types of behaviors (aggression, assertiveness, passive

aggression, passive assertiveness) about the experience of cyberbullying and to confirm the nonlinearity of the variables. A mediation analysis was then performed using the Advanced Mediation Models package [36–38] in Jamovi software [35–37]. The independent variable was prosocial behavior; the mediators were the types of behaviors that significantly predicted the experience of cyberbullying in the regression model; and the dependent variable was the experience of cyberbullying. Because the skewness and kurtosis indicated a non-normal distribution of the cyberbullying variable, correlations involving this variable were conducted using Spearman's *rho* coefficient. The mediation analyses were performed using the bootstrapping method (1000 bootstrap samples to estimate the 95% confidence intervals).

3. Results

3.1. Preliminary Analyses

When analyzing the frequency of adolescents' responses to the question about their experience of cyberbullying in the past month, the most frequently selected answer was *never* (77.9%, $n = 141$). The analysis of responses also revealed that 8.3% ($n = 15$) experienced cyberbullying once a month, 4.4% ($n = 8$) experienced it several times a month, 3.3% ($n = 6$) experienced it several times a week, and 6.1% ($n = 11$) experienced it daily. Two students did not respond to the question about their experience of cyberbullying.

Analyzing the results presented in Table 1, it was found that prosocial behaviors were negatively related to aggression and passive aggression and positively related to assertiveness and passive assertiveness. Moreover, prosocial behaviors were negatively associated with cyberbullying. These results confirm that prosocial behaviors help individuals cope with social situations, including determining how adolescents handle social conflict situations and may serve as a protective factor against cyberbullying. The correlations obtained were consistent with the assumptions of Hypothesis 1. Therefore, regression analysis was conducted in the next step to identify the best predictor of cyberbullying.

Table 1. Descriptive statistics and correlations for study variables.

Variables	1	2	3	4	5	6
1. Cyberbullying	1	−0.16 *	0.24 **	0.23 **	−0.08	−0.27 ***
2. Prosocial behavior		1	−0.41 ***	−0.25 ***	0.34 ***	0.39 ***
3. Aggressive			1	0.73 ***	−0.13	−0.45 ***
4. Passive aggressive				1	−0.04	−0.28 ***
5. Assertive					1	0.28 ***
6. Passive assertive						1
7. M	1.51	9.20	8.07	7.80	11.7	12.8
8. SD	1.13	2.03	3.88	3.42	4.44	3.87

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

3.2. Regression Analysis

The tolerance values ($1 - R^2$) and variance inflation factor (VIF) were calculated for the independent variables to check for multicollinearity. It was found that there were no issues with multicollinearity, as the tolerance values were more significant than 0.20 and the VIF was less than 10 [39,40]. Additionally, the Durbin–Watson value was 1.82, indicating no autocorrelation. After confirming that all assumptions were met, regression analysis was conducted with cyberbullying as the dependent variable and the four types of reactions to a conflictual situation as the independent variables (Table 2).

Table 2. Regression analysis predicting cyberbullying on aggressive-assertive continuum.

Model Predictors	Cyberbullying		
	b	SE	β
1. Aggressive	0.07	0.03	0.24 *
2. Passive aggressive	−0.004	0.03	−0.01
3. Assertive	−0.02	0.02	−0.08
4. Passive assertive	−0.05	0.02	−0.17 *

* $p < 0.05$.

The regression analysis results showed that different types of behaviors in social conflict situations accounted for approximately 14% of the variance in cyberbullying ($F = 6.94$, $p < 0.001$). Analyzing the individual predictors, it was found that aggression was the strongest predictor. The second significant predictor was passive assertiveness, while passive aggression and assertiveness were insignificant. The regression model (Table 2) confirmed that aggression and passive assertiveness explained most of the individual variance in cyberbullying.

3.3. Mediation Analyses

Mediation analyses conducted to explain the overall level of cyberbullying (Figure 2) confirmed the good fit of the model to the data, $F = 9.09$, $p < 0.001$, $R^2 = 0.13$. The results confirmed a significant indirect effect of prosocial behavior through aggression [$b = -0.05$, boot 95% CI $[-0.110, -0.006]$] and passive assertiveness [$b = -0.04$, boot 95% CI $[-0.085, -0.001]$] on cyberbullying. These findings support Hypothesis 2. Furthermore, the direct effect of prosocial behavior on cyberbullying was not significant, indicating that prosocial behavior affects cyberbullying indirectly [$b = -0.03$, boot 95% CI $[-0.136, 0.069]$]. The total indirect effect of aggression and passive assertiveness as simultaneous mediators was significant, with a value of [$b = -0.12$, boot 95% CI $[-0.228, -0.019]$], suggesting that these two variables jointly link prosocial behavior and the experience of cyberbullying. The final mediation model is shown in Figure 2, and a summary of the mediation results is presented in Table 3.

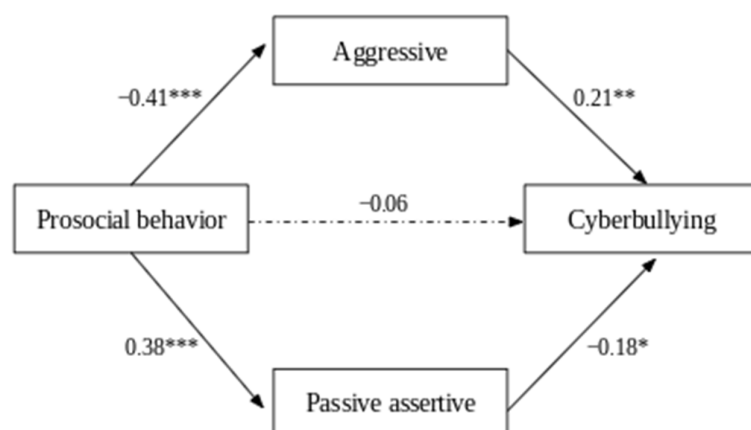


Figure 2. The mediation model with standardized effects of the relationship between prosocial behavior and cyberbullying. The dotted lines indicate nonsignificant relations and the dash line significant relations. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 3. Summary of serial mediation results for cyberbullying symptoms analysis.

Outcome Variables	Predictors	b	SE	β
Aggressive	Prosocial behavior	−0.78	0.13	−0.41 ***
	Passive assertive	0.74	0.13	0.38 ***
Cyberbullying	Prosocial behavior	−0.03	0.04	−0.06
	Aggressive	0.06	0.02	0.21 **
	Passive assertive	−0.05	0.02	−0.18 *

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

4. Discussion

Although the relationship between aggression and cyberbullying has been well documented [4], the relationship between different types of behaviors in social conflict along the continuum from aggression to assertiveness is less clear. To address this gap in research, the present study focused on the effect of aggressive, assertive, passive-aggressive, and passive-assertive behaviors on the experience of cyberbullying. At the same time, prosocial behavior, which is a significant predisposing factor for both aggressive behavior and cyberbullying, was controlled for. Several valuable findings emerged. First, prosocial behavior was significantly associated with all types of reactions to conflictual social situations (positively with assertiveness and passive assertiveness, and negatively with aggression and passive aggression) and negatively with the experience of cyberbullying. Second, the analysis of variables in one model showed that passive assertiveness and aggression are significant mediators of the relationship between prosocial behavior and cyberbullying victimization. These results may serve as valuable references for understanding the ways of coping with cyberbullying experiences and may help explain some inconsistencies found in previous studies.

According to Hypothesis 1, it was expected that prosocial behavior would be negatively associated with aggression and the experience of cyberbullying and positively related to assertive behavior. Our findings confirm this hypothesis: as prosocial behavior decreases, assertive behavior also decreases, while aggressive behavior and the experience of cyberbullying increase. Previous research supports these findings, suggesting that prosocial behavior, which aims to help others, is an important protective factor against various problems in children [24–26,41–43]. Such behaviors foster a positive socialization cycle [13], which enhances their ability to cope in social situations, shapes positive character traits like self-control, and promotes positive emotions [4,7,10,42,43]. Prosociality encourages the development of strategies based on empathy and cooperation, which is associated with higher assertiveness and lower aggression [4,5,10]. Furthermore, students who engage in prosocial behavior are more liked and attractive to their peers [25,26], and in environments where social responsibility and cooperation dominate, the experience of violence, including cyberbullying, is lower [5,24,27,41].

The current data confirmed Hypothesis 2. More frequent prosocial behaviors in students lead to a greater amount of passive assertiveness and less frequent use of aggression in social conflict situations, which, in turn, contributes to a reduction in the experience of cyberbullying. These results are consistent with previous studies, which have shown that prosocial behaviors are associated with both aggressive and assertive behaviors [4,5,10] and that aggressive and assertive behaviors are linked to the experience of cyberbullying [4,14]. Prosocial attitudes may be a significant motivational factor for behaviors from aggression to assertiveness [10]. This is partly supported by the correlation results in the current study, which show that as behavior progresses along this continuum (aggressive, passive aggressive, passive assertive, assertive), the strength of the relationship decreases and

shifts from negative to positive. This suggests that prosocial behaviors play a significant role in predicting behaviors along the aggression-assertiveness spectrum [10]. Moreover, as confirmed by the results of the mediation analysis in this study, students with lower aggression and higher passive assertiveness experience less cyberbullying. These two types of behaviors emerged as the most significant when considering the variance across all four types (aggression, passive aggression, passive assertiveness, and assertiveness). The study's results indicate that students less prone to aggression and avoiding confrontation are less likely to engage in conflicts and have more excellent peer support, reducing the likelihood of experiencing harassment through mobile devices. These findings align with previous research highlighting the role of emotional and behavioral factors, including prosocial behaviors, in moderating the impact of problematic smartphone use and online engagement in adolescents' mental health and risk behaviors, such as Internet addiction and peer-related difficulties [42,44]. They are also consistent with evidence showing that deficits in emotional intelligence and empathy among young adults contribute to problematic social media use and its associated negative outcomes [43].

The results obtained in the current study may also help explain some inconsistencies in previous research [5,20]. For example, some studies report a significant negative relationship between assertiveness and the experience of cyberbullying [14], while others found no relationship [2,5]. These inconsistencies may be attributed to subtypes of assertiveness. As shown in the present study, passive assertiveness significantly predicted the experience of cyberbullying, while assertiveness did not when different types of behaviors were controlled in a single model. This suggests that only passive assertiveness may counteract cyberbullying, and assertiveness or confrontation with the perpetrator could, in some cases, even increase the likelihood of experiencing cyberbullying. This is consistent with findings emphasizing that strategies involving confrontation with the perpetrator of violence may exacerbate the experience of cyberbullying [43,45,46]. Moreover, the results may also support a stronger relationship between reactive aggression, rather than proactive aggression, and the experience of cyberbullying [7]. In the analyzed model, as per the definition, passive aggression is postponed and, therefore, more like proactive aggression, whereas aggression is defined as an immediate reaction and, thus, more identical to reactive aggression. The findings from this study indicate the more significant role of aggression than passive aggression in explaining the experience of cyberbullying. This suggests that impulsive, aggressive reactions may escalate retaliation in the form of cyberbullying.

4.1. Limitations

This study has several limitations. First, it focused on a sample of Polish adolescents, so the results may be culturally specific and not apply to other cultures. Therefore, it is essential to examine the generalizability of our findings across different cultural contexts. Second, the sample was purposeful, and although it allowed for detecting relationships between the variables studied, it was not representative. Consequently, future studies should aim to replicate the findings with a more representative sample. Third, this was a cross-sectional study, which limits the ability to establish causal relationships. Therefore, longitudinal and experimental studies should be conducted as the next step to determine how prosocial behavior and different types of reactions to conflictual social situations may influence cyberbullying. Fourth, the study variables were measured using questionnaires with data from a single source (i.e., student self-reports). These self-report measures are susceptible to response biases (e.g., recall errors and socially desirable responses), and as a result, the effects may be overestimated due to standard method variance. Future studies should consider combining self-report measures with other data collection methods. Fifth, while prosocial behaviors were examined in this study, other factors may also

significantly predict the experience of cyberbullying. Therefore, future research should explore the potential mediating role of various types of reactions to conflictual social situations and additional factors, such as peer relationships. Positive peer relationships may protect against cyberbullying [5,13,44] and promote less aggression and greater assertiveness [10,24,25,41,43,47].

4.2. Implications

The study makes several significant contributions to the literature. First, it enhances the existing understanding of the role of aggression and assertiveness by explaining the experience of cyberbullying. It was found that aggressive and passive-assertive reactions are the most significant predictors of cyberbullying experiences. Furthermore, an aggressive reaction to a cyberbullying situation may exacerbate the situation, while responding in a passive-aggressive manner may serve as a protective strategy. The results of this study suggest that effective strategies for coping with cyberbullying are those that involve indirect methods, which are passive-assertive actions. These include seeking social support from sources such as parents, helplines, and school professionals, blocking the bully's account, reporting the incident to administrators, or changing one's profile on the platform.

In contrast, direct actions such as confrontation or retaliation against the perpetrator are the least effective method [45]. Second, while prosocial behaviors are associated with the experience of cyberbullying, their role is more indirect than direct, primarily influencing behaviors ranging from aggressive to assertive. These findings help explain how developing positive social relationships and improving social competencies can aid in preventing the experience of cyberbullying. This highlights potential intervention goals aimed at reducing the phenomenon of cyberbullying.

5. Conclusions

This study tested two hypotheses regarding the relationship between prosocial behavior, aggression, assertiveness, and the experience of cyberbullying. In accordance with Hypothesis 1, it was assumed that prosocial behavior would be significantly negatively related to aggression and the experience of cyberbullying and positively related to assertive behavior. The results obtained confirmed this hypothesis. Students who more frequently engage in prosocial behavior showed less aggression and experienced cyberbullying less frequently while also demonstrating assertive behavior more frequently. Additionally, the mediation analysis confirmed Hypothesis 2, which proposed that assertive and aggressive behaviors could serve as significant mediators in the relationship between prosocial behavior and cyberbullying. Aggressive behaviors and passive assertiveness were found to be significant mediators in this relationship. The findings indicate that aggression positively predisposes students to experiences of cyberbullying, while passive assertiveness negatively predisposes them. Additionally, prosocial behaviors indirectly predict cyberbullying through these two types of behaviors. The results highlight that the relationship between aggression, assertiveness, and the experience of cyberbullying is more complex than previously suggested and points to potential strategies for addressing cyberbullying.

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Article

Cyberbullying Perpetration and Socio-Behavioral Correlates in Italian and Spanish Preadolescents: A Cross-National Study and Serial Mediation Analysis

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Abstract: The spread of information and communication technologies (ICTs) has brought advantages and disadvantages, particularly impacting youth, who use the Internet and social media applications daily. In preadolescents' social development, problematic social media use (PSMU) and cyberbullying (CB) are potential risk factors across several countries. PSMU is defined as the lack of regulation of social media platforms that is associated with negative outcomes in everyday life, while CB refers to using digital technology to harass, threaten, or embarrass another person. Among preadolescents, CB perpetration is frequently associated with cybervictimization (CV) experiences. The underlying mechanisms that drive this relationship have received limited attention. The aim of the cross-national comparative study, rooted in the general aggression model, is to investigate the direct and indirect effects between cyberbullying perpetration and cybervictimization, testing a model involving PSMU and moral disengagement (MD) as serial mediators in this association. A total of 895 Italian and Spanish preadolescents ($M_{age} = 11.23$, $SD_{age} = 1.064$) completed a self-report survey during school hours. Descriptive statistics were computed, and a serial mediation model was run. The results show that CV is positively associated with CB, and that PSMU and MD positively serially mediate the CV–CB link. This study's insights suggest the need for tailored educational interventions targeting European youth, to promote more positive online social interactions and a safer digital environment.

Keywords: cybervictimization; cyberbullying perpetration; general aggression model; moral disengagement; preadolescence; problematic social media use

1. Introduction

1.1. Cybervictimization as a Predictor of Cyberbullying Perpetration

In recent decades, Western countries have faced the spread of information and communication technologies (ICTs) and social media applications [1], which has increased the number of individuals connected daily to the Internet for several activities [2]. Through digital devices, preadolescents engage in positive and negative behaviors and habits, encountering opportunities and risks previously beyond reach [3].

Among the risks associated with problematic Internet use and problematic social media use (PSMU) in preadolescence is cyberbullying, a social problem progressively

studied as a digital evolution of traditional bullying [4]. Cyberbullying perpetration is defined «as the use of digital technologies to harass, intimidate, or embarrass others» [5,6]. The authors reviewed multiple studies and determined that, on a global scale, the average annual rate of cybervictimization ranges from 14% to 21% [7]. Between 10% and 72% of youths have reported experiencing cyberbullying [8]. These alarming rates are associated with severe consequences for victims, including mental health issues, social development difficulties, and diminished self-esteem [9,10]. Additionally, cybervictimization refers to being harmed or mistreated via electronic communication technologies such as the Internet and social media platforms, encompassing aggression, harassment, or intimidation perpetrated online [11], and is expressed in multiple forms, including harassment, impersonation, stalking, or spreading malicious rumors or images [12]. It may cause emotional distress, psychological harm, and general long-term negative consequences for victims' personality development [13].

In the European context, the prevalence of cyberbullying perpetration and cybervictimization among young individuals has garnered increasing attention, shedding light on the scope of this issue within this diverse setting in which multiple cultures participate. Italy and Spain, as evidenced by the proliferation of studies on the topic [14], are among the European countries most affected by these social mechanisms. In the 2022 Italian Health Behavior in School-aged Children (HBSC) survey, 94,178 children aged 11, 13, 15, and 17 completed the questionnaire, which was distributed throughout all regions; 6388 classes were sampled. In the 11-year-old age group, 17.2% of males and 21.1% of females have been identified as victims of cyberbullying; 12.9% of boys and 18.4% of girls were victims of cyberbullying perpetration; 9.2% of boys and 11.4% of girls were reported to be victims in the 15-year-old age group. The survey reports that in families, as age increases, the ease with which boys open up to their parents decreases; 13- and 15-year-old girls, compared to boys of the same age, find it more difficult to talk to their father figure. In 2022, 31% of minors were cybervictims at least once, compared to 23% in 2020. In Spain, a systematic review of the literature, including 21 studies, revealed that, since 2010, the median perpetration of cyberbullying in Spain was 24.64%, with a median cybervictimization prevalence of 26.65% [15,16].

Developmental research dealt with the link between cyberbullying perpetration and cybervictimization, revealing their bidirectional association [17]. Globally, most cybervictimized preadolescents subsequently suffer from mental health issues, including increased stress and the adoption of maladaptive coping strategies [18]. Further research indicates that individuals who experience cybervictimization are more likely to engage in cyberbullying perpetration themselves [19]. This phenomenon can be understood through the lens of the “cycle of violence” theory, which suggests that victims of aggression may resort to aggressive behaviors as a coping mechanism or to regain a sense of control and power [20], suggesting that cybervictimization experiences can be viewed as situational factors triggering negative emotional responses, such as anger or distress [21]. Relatively few studies have examined those who are both victims of cyberbullying and perpetrators (i.e., cyberbully-victims) [22]. In the digital context, the anonymity and perceived detachment provided by online interactions can exacerbate this cycle, making it easier for victims to become perpetrators without social repercussions, in association with emotional distress, social isolation, and the desire for revenge [23,24]. Understanding this link is crucial for developing effective prevention and intervention strategies targeting both the victims' needs and the motivations behind perpetration, aiming to break this detrimental cycle and promote healthier online interactions among preadolescents [25].

Among the possible risks faced by some preadolescents, PSMU, video games, and Internet use have progressively emerged as potentially pressing public health concerns

across numerous Western countries due to their impact on preadolescents' social development processes [26–31]. In particular, in association with parental monitoring attitudes, recent studies have illustrated the interplay between escapism as an attempt to reduce negative emotions, parental mediation styles, and interpersonal skills [32–34]. Building upon prior research [35], the current study posits that cybervictimization in preadolescence might serve as a precursor to cyberbullying perpetration, reflecting the cyclical nature of online aggression [36]. In the context of cyberbullying experiences, victims are often driven by a personal need to regain control or seek revenge on the bully and retaliate by becoming perpetrators themselves [37]. Therefore, cybervictimization experiences might significantly increase the likelihood of individuals engaging in subsequent cyberbullying perpetration, perpetuating a vicious cycle of online aggression and intensifying the psychological distress experienced by both victims and perpetrators [38]. This study aims at uncovering the underlying processes involved in the cybervictimization–cyberbullying perpetration link in preadolescence, introducing the serial mediating action played by PSMU and moral disengagement.

1.2. Theoretical Framework

The general aggression model (GAM) describes how personal and situational factors could interact to affect an individual's thoughts, feelings, and behaviors, leading to aggressive conduct [39]. According to the model, aggressive behaviors are the result of complex interactions between situational variables (e.g., provocation and exposure to violent media) and individual differences (e.g., personality traits and past experiences), which influence cognitive (e.g., aggressive thoughts), affective (e.g., anger), and arousal states. These internal states, in turn, might affect decision-making processes, which can result in aggressive or non-aggressive behaviors depending on the context and the individual's control over their responses [40].

The GAM offers a comprehensive framework for understanding cyberbullying among preadolescents, integrating individual-specific and situational factors [41]. Specifically, the model suggests that experiences of cyberbullying alter an individual's state, prompting aggressive behaviors. Cybervictimization could serve as a situational trigger, catalyzing cyberbullying, and aversive events could activate hostile attitudes, leading to aggressive impulses as situational triggers [42].

While previous studies have examined the relationship between traditional bullying and cyberbullying and the influence of factors such as gender, emotional problems, depression, and anxiety [43], the underlying mediating mechanisms between cybervictimization and cyberbullying perpetration still remain unclear. The GAM, addressing both person-specific and situation-specific factors, provides valuable lens through which to explore these mediating mechanisms. Within the GAM, PSMU and MD might be interpreted as serial mediating factors in the cyberbullying perpetration–cybervictimization link, providing a deeper understanding of the mechanisms through which cybervictimization leads to the perpetration of cyberbullying in preadolescence. The proposed pathway suggests that experiencing cybervictimization may elevate PSMU, leading to maladaptive user interactions with social media platforms. This study introduces PSMU as a mediator between CV and CB, a behavioral pattern that typically develops over a longer period. This, in turn, can encourage MD processes, by which people distance themselves from feelings of guilt or moral responsibility. These cognitive self-regulatory strategies eventually pave the way for engaging in cyberbullying behaviors, reinforcing the cycle of online aggression [44].

1.3. The Mediating Role of Problematic Social Media Use

Preadolescents are a vulnerable age group aged between 9 and 14 [45], in which the brain is still developing, and social relationships are essential for positive development [46]. As contemporary preadolescents grow up using digital tools and social media platforms from an early age, most of them today face both opportunities, such as for socialization, learning, and entertainment [47], and risks, such as PSMU, exposure to inappropriate content, and problematic online gaming, among others [48,49]. PSMU refers to the excessive or maladaptive individual patterns of engagement with social media platforms, characterized by withdrawal symptoms, mood modification, and conflict [50]. Thus, technological environments and social media platforms can foster social connections and provide platforms for self-expression and creativity [51]. They enable young people to access vast amounts of information, collaborate on educational projects, and build supportive online communities [52].

In this study, we adopted the term PSMU over “social media addiction” to avoid controversies, since the latter is not officially recognized as a disorder in the DSM-5 [53]. This decision aligns with the current literature, which distinguishes between problematic usage patterns and clinically diagnosable addiction [54]. For some individuals, this problematic habit can become a dominant activity in their lives, causing preoccupation (salience) and the usage of social media to alter moods or induce pleasurable feelings (mood modification). Over time, more engagement is needed to achieve the same effects (tolerance), and discontinuing use can result in negative psychological and sometimes physiological symptoms (withdrawal), often leading to relapse. This problematic use can cause internal conflicts, such as the loss of control, and external conflicts, including relationship and academic or work problems [55]. In the context of cyberbullying research, PSMU might play a mediating role in the cybervictimization–cyberbullying perpetration link for several reasons. Preadolescents who are frequently online may be more likely to encounter aggressive behaviors or become targets of harassment [56]. Moreover, PSMU can impair emotional regulation and coping mechanisms, making it more difficult for victims to manage the distress caused by cybervictimization experiences [57]. This emotional turmoil can lead some victims to engage in retaliatory aggression as a maladaptive coping strategy, thereby perpetuating the cycle of cyberbullying [58]. Additionally, PSMU involves seeking validation and social approval, which can exacerbate feelings of rejection and isolation when victimized, leading to aggressive behaviors to regain control and social standing [59]. Thus, the nature of PSMU can both increase the likelihood of experiencing cybervictimization and heighten the propensity to respond with cyberbullying behaviors [60]. In the context of the GAM, PSMU might be viewed as a personal maladaptive situational experience triggered by both environmental and individual variables, further leading to negative online social behaviors, such as cyberbullying perpetration. Thus, the role of PSMU in the CV–MD–CB link reflects its capacity to drive the progression of harmful online behaviors and amplify the impact of underlying moral attitudes.

1.4. The Mediating Role of Moral Disengagement

Moral disengagement (MD) entails cognitive self-regulatory mechanisms allowing individuals to rationalize or justify harmful behaviors, thereby alleviating feelings of guilt or moral responsibility, through cognitive restructuring, diffusion of responsibility, or euphemistic labeling [61]. These strategies can occur in multiple contexts, including cyberbullying episodes among preadolescents, where perpetrators may practice rationalizations, such as advantageous comparison, minimizing the harm caused, or using social comparison to justify their behaviors [62]. In the context of cyberbullying perpetration, moral disengagement is defined as “an influence on traditional bullying and cyberbullying

cognitive process, by which a person justifies his/her harmful or aggressive behavior, by loosening his/her inner self-regulatory mechanisms [...] which usually keeps behavior, in line with personal standards” [63] (p. 81). Regarding online social behaviors in preadolescence, MD mechanisms can contribute to the perpetration of a wide range of antisocial actions [64]. Cyberspace grants anonymity and reduced accountability, making it easier for individuals to engage in cyberbullying and aggressive online actions without facing any consequences [65], or to retaliate against perpetrators of online aggression. MD enables individuals to justify their actions and disregard the ethical implications of behaviors: “the advent of the Internet ushered in a ubiquitous vehicle for disengaging moral self-sanctions from transgressive conduct. The Internet was designed as a highly decentralized system that defies regulation. Anybody can get into the act, and nobody is in charge” [66] (p. 68).

Building on previous research, in the current study, MD is proposed as a mediating factor between cybervictimization, PSMU, and cyberbullying perpetration [67]. It may act as a link between PSMU and cyberbullying perpetration, suggesting that heightened PSMU might lead to the adoption of MD mechanisms, which in turn might more likely be associated with cyberbullying perpetration. MD involves cognitive restructuring and justifications to disengage from moral standards, allowing individuals to rationalize their harmful actions. These strategies might lead to perpetuating negative behaviors toward others in cyberspace [68]. Preadolescents might experience reduced self-awareness and restraints, fueling MD and subsequently influencing cyberbullying and cybervictimization dynamics. Within the GAM, MD processes might play a role in the individual desensitization that facilitates the perpetration of harmful online actions in cybervictims and problematic young social media users.

1.5. The Current Study

The current study investigates online social behaviors and psychological characteristics in Italian and Spanish preadolescents, linking cybervictimization, PSMU, MD, and cyberbullying perpetration. Moreover, the serial mediating model aimed at testing the effects of PSMU and MD on the association between cybervictimization and cyberbullying perpetration has been examined. The relationship between PSMU and MD is based on the premise that a generalized problematic engagement with social media might precede and facilitate disengaged moral reasoning, rather than the other way around. Specifically, PSMU may act as a precursor to MD, as unregulated social media use can foster a detachment from consequences, the normalization of harmful behaviors, and reduced self-regulation in online social interactions. In addition, the MD–PSMU causal relationship has been less explored in psychological research and was not an aim of the current study. We were interested in exploring the following research questions:

Research Question 1: Is cybervictimization directly and positively associated with cyberbullying perpetration among Italian and Spanish preadolescents?

Research Question 2: Is this relationship mediated by the serial indirect and positive effect of PSMU and MD in both samples?

As serial positive mediating effects, PSMU and MD may contribute to cyberbullying perpetration by facilitating negative and aggressive online interactions among peers, providing a platform for anonymity and disinhibition, and amplifying peer influence dynamics (see Figure 1). Thus, understanding the serial mediating roles of PSMU and MD is crucial for designing effective preventive interventions aimed at mitigating the negative impact of cyberbullying and cybervictimization among preadolescents.

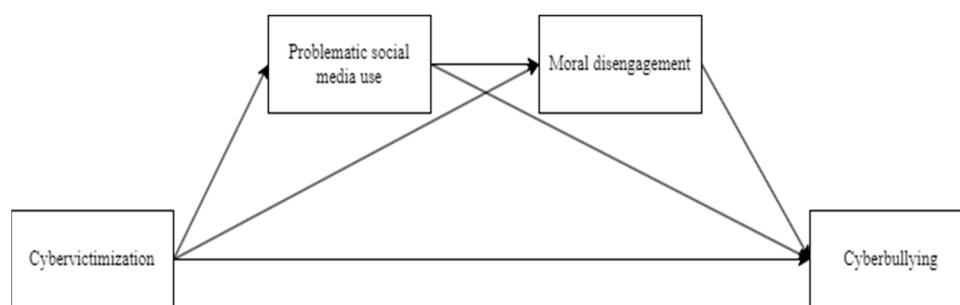


Figure 1. Theoretical model of serial mediation effects, linking cybervictimization and cyberbullying through the serial mediating actions of PSMU and MD.

Among the risk factors associated with cybervictimization and cyberbullying perpetration in preadolescence, it is worth investigating the interplay of PSMU and MD within the context of negative social online interactions among peers due to their pervasive influence in preadolescents' social behaviors [69,70]. Understanding the dynamics between these variables in the link between cybervictimization and cyberbullying perpetration is essential for unraveling the processes that might enhance the cycle of negative online interactions among preadolescents [71]. Previous research conducted in Italy and Spain [72,73] highlights both sociocultural similarities and differences between the two countries regarding cyberbullying and cybervictimization. Given these parallels and distinctions, as well as comparable educational contexts [74], further investigation into the perpetuation of online aggression is crucial.

The hypotheses under investigation in this cross-national study are the following: (i) cybervictimization and cyberbullying perpetration present a positive direct association in a cross-national sample of Italian and Spanish preadolescents; and (ii) PSMU and MD positively and serially mediate the relationship between cybervictimization and cyberbullying perpetration in Italian and Spanish preadolescents.

These hypotheses are grounded in several factors. Firstly, the literature shows that PSMU has been linked to negative online behaviors among preadolescents, including cyberbullying, suggesting that individuals who engage in PSMU patterns may be more prone to experiencing cybervictimization or perpetrating cyberbullying [75,76]. Moreover, MD mechanisms, enabling individuals to justify or excuse antisocial actions, may play a crucial role in facilitating the transition from cybervictimization to cyberbullying perpetration by attenuating online moral inhibitions and increasing the likelihood of engaging in aggressive behaviors against peers [77,78]. The decision to employ a serial mediation model, wherein PSMU precedes MD in the direct relationship between cybervictimization and cyberbullying perpetration, stems from theoretical considerations and is supported by the existing literature [79]. PSMU might lead to negative engagement with social media platforms, potentially leading to the frequent adoption of dysfunctional social and cognitive attitudes and behaviors in daily life [80]. Previous research suggests that prolonged and passive use of social media applications may contribute to the development of negative attitudes and behaviors, including MD mechanisms [81], exacerbating the scope and negative consequences of the relationship between cybervictimization and cyberbullying. This approach tentatively addresses a gap in the literature concerning the interplay of PSMU and MD within the social dynamics of experiencing and perpetrating cyberbullying during preadolescence.

Lastly, the cross-national analysis involving Italy and Spain is motivated by the scientific urge to comprehend the psychosocial characteristics of online social behaviors among Italian and Spanish preadolescents [82], given that past studies highlighted similar trends regarding cyberbullying, as well as related factor levels in these two countries [83,84]. By

delineating these relationships in the current cross-national study involving Italian and Spanish preadolescents, tailored interventions to target specific risk factors and promote healthier online behaviors within a European policy framework, fostering a safer and more positive digital environment for young individuals, can be proposed [85].

2. Materials and Methods

2.1. Participants and Procedures

Through a self-report survey, levels of cybervictimization, PSMU, MD, and cyberbullying perpetration were assessed in a convenience sample of Italian and Spanish preadolescents ($N = 895$, 54.6% Italian participants, 45.4% Spanish participants) aged 9–14 ($M = 11.23$, $SD = 1.064$) (see Table 1). All approached students participated in the survey in both countries since the excluded individuals did not receive consent from their parents.

Table 1. Descriptive statistics in the Italian ($n = 489$) and Spanish ($n = 406$) samples.

	Italy		Spain	
	<i>N</i>	%	<i>N</i>	%
Gender				
Males	236	48.3	197	48.5
Females	246	50.3	209	51.5
Prefer not to respond	6	1.2		
Non-binary	1	0.2		
Age				
9	-	-	44	10.8
10	14	2.9	165	40.6
11	131	26.8	182	44.8
12	236	48.3	13	3.2
13	105	21.5	2	0.5
14	3	0.6		
		<i>M (SD)</i>	<i>M (SD)</i>	
Problematic social media use	13.64 (4.84)		11.56 (4.77)	
Moral disengagement	53.3 (13.29)		44.40 (11.84)	
Cybervictimization	14.42 (4.97)		12.38 (3.37)	
Cyberbullying	13.21 (4.29)		11.53 (1.62)	
Age	11.90 (0.783)		10.42 (0.745)	

This study and its procedures were conducted according to the criteria of the Ethics Committee of the University of Calabria (Prot. no. 0010986 of 13 February 2023). In Spain, this study and its procedures were preliminarily approved by the local research team and by the doctoral committee of the University of Cordoba. The procedures used in this study adhere to the tenets of the Declaration of Helsinki. In Italy, the participants were contacted after selecting thirty-one classes in schools in the region of Calabria (southern Italy) who were willing to participate. In both Italy and Spain, the schools were selected by using a search database in which a list of local school institutions was stored and persuaded to join the investigation through a motivation letter to the school principals introducing the purposes of this study. After obtaining permission from the corresponding school principals, the participants' parents were informed by letter about the purpose of the research, the voluntary nature of participation, and the anonymity of responses. Parents provided informed consent for their son or daughter's participation. In addition, participants provided signed assent agreeing to take part in this study. Italian and Spanish

research assistants collected the data after providing a general description of the research aims and measures (defining social media and cyberbullying in terms of aggression and victimization). Participants had about 30 min to complete a self-report survey during class time and could withdraw at any moment.

2.2. Measures

The participants completed a self-report questionnaire containing a set of different measures. For the purposes of this study, only some of these measures were considered.

Sociodemographic information was collected, such as gender, age, and frequency of use and habits related to the Internet and social media platforms.

Problematic social media use was assessed using the Italian [86] and Spanish versions [87] of the Bergen Social Media Addiction Scale (BSMAS). The BSMAS is a 6-item self-report measure that assesses addictive behaviors related to social media use, such as withdrawal symptoms, mood modification, and conflict (e.g., “You spend a lot of time thinking about social media or planning how to use it”). Participants rated each item on a Likert scale from 1 (*very rarely*) to 5 (*very often*), with higher scores indicating higher levels of PSMU (Italian sample: Cronbach’s $\alpha = 0.719$; Spanish sample: Cronbach’s $\alpha = 0.760$). The English version of the scale is provided in Table S1 [88].

Moral disengagement was measured using the Italian [89] and Spanish adolescent versions [90] of the *Moral Disengagement Scale* (MDS). The scale is a 24-item self-report measure that assesses cognitive mechanisms that allow individuals to justify or excuse their harmful behaviors (e.g., “It is alright to fight to protect your friends”). Participants rated each item on a Likert scale from 1 (not at all) to 5 (very much), with higher scores indicating higher levels of moral disengagement (Italian sample: Cronbach’s $\alpha = 0.839$; Spanish sample: Cronbach’s $\alpha = 0.806$). Given confirmation from prior studies of the internal consistency of the single-factor structure of the scale [91], a total mean score was calculated for moral disengagement. The English version of the scale is provided in Table S2 [92].

Cyberbullying perpetration and cybervictimization were measured through the European Cyberbullying Intervention Project Questionnaire (ECIP-Q) in its Italian [93] and Spanish versions [94]. The ECIP-Q is a 22-item self-report measure, with the former 11 items measuring victimization and the latter 11 measuring aggressions, that assesses the frequency and severity of cybervictimization and cyberbullying behaviors in the past two or three months, such as spreading rumors, posting mean comments (e.g., “I altered pictures or videos of another person that had been posted online”), or excluding others from online groups or stealing someone’s identity and personal information (e.g., “Someone created a fake account, pretending to be me”). Participants rated each item on a Likert scale from 1 (never) to 5 (several times a week), with higher scores indicating higher levels of cybervictimization (Italian sample: Cronbach’s $\alpha = 0.846$; Spanish sample: Cronbach’s $\alpha = 0.830$) and cyberbullying (Italian sample: Cronbach’s $\alpha = 0.853$; Spanish sample: Cronbach’s $\alpha = 0.616$). The English version of the scale is provided in Table S3 [94].

2.3. Analysis Procedure

The statistical analyses were conducted in four steps using IBM SPSS 27.0. First, descriptive analyses (means and standard deviations) were computed alongside *t*-tests for independent samples to examine gender differences. A van der Waerden’s data ranking transformation on the kurtosis and skewness values of cybervictimization and cyberbullying perpetration was applied due to their excessively high magnitudes. This transformation aimed to normalize the distribution and mitigate the extreme values observed in these variables. Effect sizes were measured adopting Cohen’s *d*, providing a clearer understanding of gender influences on the variables. Second, Pearson bivariate correlations were analyzed to

explore potential relationships between the key variables. Third, a serial mediation analysis (using SPSS Process macro v.27.0, Model 6) [95] examined whether PSMU and MD serially mediated the association between CV and CB. This approach utilized bootstrapping with 5000 resamples, allowing for more accurate confidence intervals and reducing the risk of type I errors. The mediation analysis also assessed the total effect and proportion mediated (PM) to gauge the indirect effect's contribution.

A significant effect is indicated when the confidence intervals do not encompass zero. Previous studies found that gender was associated with cyberbullying perpetration and cybervictimization [96–98]. Thus, this variable was included as a covariate in all analyses. Gender was dichotomous (0 = female, 1 = male, 2 = I prefer not to answer, 3 = other). Cases where participants selected 2 or 3 were excluded from the analysis due to their very low numbers, which did not impact the overall results. Additionally, age and nationality were also included as covariates to account for their potential influence on the variables' outcomes.

3. Results

3.1. Descriptive Statistics

In Table 1, descriptive statistics of the variables are reported for both Italian and Spanish participants, showing overall low levels of cybervictimization and cyberbullying perpetration.

Table 2 summarizes the results of the independent samples *t*-test conducted on the investigated variables, categorized by gender.

Table 2. T-test results for independent samples and mean differences controlled for gender.

Variables	Females (M ± SD)	Males (M ± SD)	<i>t</i> -Value	df	<i>p</i> -Value	Mean Difference	Cohen's <i>d</i>	Effect Size Interpretation
Problematic social media use	12.74 ± 5.21	12.66 ± 4.62	0.253	886	0.8	0.08	0.01	Small
Moral disengagement	46.97 ± 12.9	51.51 ± 13.4	−5.15	886	0.000	−4.54	−0.34	Medium
Cybervictimization	0.02 ± 0.82	0.09 ± 0.86	−1.28	886	0.2	−0.07	−0.08	Small
Cyberbullying	0.005 ± 0.7	0.13 ± 0.82	−2.47	848.27	0.014	−0.127	−0.16	Small

The results indicate no statistically significant mean differences across the primary variables when comparing gender groups, with most effect sizes reflected by small to medium Cohen's *d* values. This suggests that, in general, gender did not play a significant role in differentiating levels of PSMU, cybervictimization, or cyberbullying. However, the analysis revealed that MD was the only variable to show a medium effect size, hinting at some degree of gender-related variance. Specifically, males showed higher mean scores in both MD and cyberbullying ($p < 0.05$), suggesting that they may be more involved in aggressive online interactions than females. This finding may imply that males and females differ slightly in how they rationalize or justify aggressive behaviors online, warranting further investigation.

Table 3 summarizes the results from the bivariate correlations among the variables, indicating strong positive correlations between all investigated variables. Notably, PSMU presented strong correlations with MD, CV, and CB, and CV presented a strong positive correlation with CB. We included age in the correlation analysis because we were interested in exploring whether problematic social media use increases with age.

Table 3. Bivariate correlations among the primary variables in the whole sample.

Variables	1	2	3	4	5
1. Problematic social media use	1				
2. Moral disengagement	0.373 ***	1			
3. Cybervictimization	0.344 ***	0.215 ***	1		
4. Cyberbullying	0.327 ***	0.274 ***	0.573 ***	1	
5. Age	0.175 **	0.373 ***	0.344 ***	0.327 ***	1

*** $p < 0.001$. ** $p < 0.05$.

3.2. Mediation Model

Mediation analysis was performed to explore the serial mediating role of PSMU and MD in the association between cybervictimization and cyberbullying perpetration. The results (Table 4) reveal a significant total effect of CV on CB perpetration ($\beta = 0.071$, $SE = 0.013$, 95% CI [0.045; 0.098]), indicating that higher levels of CV are associated with increased CB perpetration.

Table 4. Direct and indirect effects of standardized estimates of cybervictimization (CV, Independent variable), Problematic Social Media Use (PSMU), and Moral Disengagement (MD) as serial mediators of cyberbullying (CB; outcome).

Pathway	B	SE	t	95% [CI]		P	F
				LL	UL		
CV -> CB							
Total effect	0.071	0.013		0.045	0.098	<0.001	
Direct effect	0.499	0.026	17.28	0.401	0.503	<0.001	85.47
Specific indirect effects							
CV-PSMU-MD-CB	0.013	0.003		0.006	0.021	<0.001	
CV-PSMU-CB	0.041	0.012		0.016	0.067	<0.001	44.58
CV-MD-CB	0.016	0.006		0.006	0.029	<0.001	59.36

Note: CI = Confidence Interval; LL = lower limit; UL = upper limit.

Furthermore, PSMU and MD serially mediate this relationship, showing strong positive associations. Specifically, CV predicts PSMU ($\beta = 0.35$, 95% CI [1.68; 2.38]), which in turn predicts MD ($\beta = 0.28$, 95% CI [0.59; 0.93]). MD subsequently predicts CB perpetration ($\beta = 0.14$, 95% CI [0.004; 0.011]), suggesting that PSMU and MD play crucial roles in the pathway from CV to CB. The results highlight a significant indirect effect of PSMU and MD on the cybervictimization–cyberbullying perpetration link (H2: PSMU and MD positively and serially mediate the relationship between cybervictimization and cyberbullying perpetration in Italian and Spanish preadolescents).

In the mediation model, cybervictimization positively predicted PSMU, MD, and cyberbullying. Further, both PSMU and MD presented statistically significant indirect serial effects in the cybervictimization–cyberbullying association. The results show that PSMU and MD positively and partially mediated the relationship between cybervictimization and cyberbullying perpetration (see Figure 2).

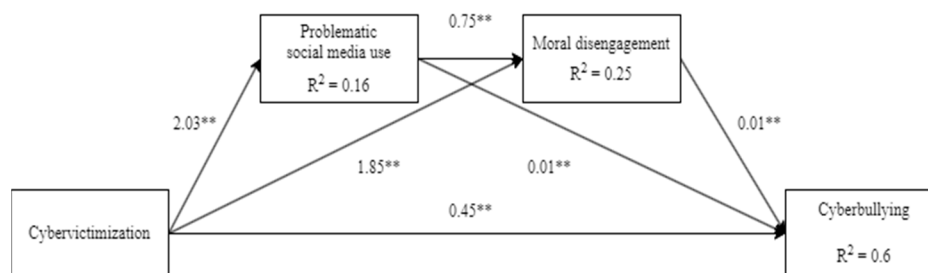


Figure 2. Non-standardized estimate results from the serial mediating research model. ** $p > 0.001$.

4. Discussion

This study aimed (1) to examine the positive associations between CV, PSMU, MD, and CB perpetration in a sample of Italian and Spanish preadolescents and (2) to examine the positive serial mediating action of PSMU and MD on the CV–CB link.

In line with H1 (cybervictimization and cyberbullying perpetration present a positive direct association in a cross-national sample of Italian and Spanish preadolescents), the results confirm our hypothesis and reveal that the scores for the primary variables mirror findings from previous studies [73]. These findings reinforce the understanding of cyberbullying as a potential global concern for preadolescents, emphasizing the significant roles of cybervictimization and PSMU in both Italian and Spanish participants. From the perspective of the GAM, various situational and individual factors, such as PSMU and MD, intensify negative online behaviors among preadolescents [99]. These variables might exacerbate aggressive tendencies, making them central to understanding the complex interplay between victimization and perpetration in online social peer interactions [100]. By capturing these dynamics in both Italian and Spanish contexts, the current findings offer an interesting cross-national perspective on the cyclical nature of online aggression, highlighting how these factors shape harmful social media interactions among preadolescents. The increasing integration of social media applications' use in preadolescents' daily life worldwide through smartphone devices amplifies the likelihood of cybervictimization, especially among those heavily engaged with these platforms [101]. These findings highlight the need for targeted prevention and intervention strategies to mitigate these risks. Addressing such issues requires early identification and tailored support, particularly in regions with heightened exposure to digital media.

Cultural, educational, and policy-driven factors may influence the differences between Italian and Spanish participants in cyberbullying-related variables. One key difference lies in educational policies regarding technology use. Such policy variations between Italian and Spanish schools may contribute to differences in PSMU and online aggression patterns [102]. Beyond policy, cultural attitudes toward digital supervision and parenting styles may also play a role. Research suggests that Mediterranean parenting styles, while traditionally protective, vary across countries in terms of digital monitoring. Spanish parents tend to emphasize structured family routines and digital literacy, whereas Italian parents may lean toward greater autonomy in online interactions [103]. Future research should further explore these cultural moderators, considering how national policies, educational strategies, and familial norms interact to influence cyberbullying dynamics in different contexts, as well as motivations driving online behaviors [32–34].

The results from the mediation analysis provide empirical evidence supporting the serial mediation model, confirming H2 (PSMU and MD positively and serially mediate the relationship between cybervictimization and cyberbullying perpetration, such that higher levels of cybervictimization lead to higher levels of PSMU and MD, which in turn lead to higher levels of cyberbullying, both in Italy and Spain). PSMU and MD serially mediate the relationship between CV and CB in both Italy and Spain. The findings reveal

that experiencing cybervictimization might promote problematic engagement with social media applications in Italian and Spanish participants, which in turn could increase MD tendencies, ultimately leading to higher levels of cyberbullying perpetration. This cyclical pathway underscores the role of PSMU in amplifying MD, illustrating that a broader negative engagement with social media platforms strengthens the risk of adopting morally disengaged behaviors that justify harmful online actions [104]. The model fitting within the GAM framework demonstrates that cybervictimization might act as a situational factor that might trigger self-regulatory cognitive and emotional changes in participants, making them more likely to engage in maladaptive social media use [105]. This increased use of social media platforms might provide fertile ground for developing MD mechanisms, where participants may justify or excuse their own aggressive actions. This, in turn, perpetuates the cycle of cyberbullying, especially for those already victimized online [106]. The stronger indirect effects through PSMU further confirm that frequent and problematic use of social media strengthens aggressive scripts and attitudes, leading to a higher likelihood of cyberbullying [107]. The cross-national aspect of this study, involving Italian and Spanish participants, highlights the importance of these findings across different contexts. Despite similarities between these countries, such as language and cultural values, differences in smartphone use policies at schools can affect the intensity and frequency of social media platform engagement and thus online behaviors. The serial mediation link identified in both contexts reinforces that national variations do not diminish the robust effect of PSMU and MD on cyberbullying perpetration.

According to the GAM, aggression is the result of a complex interaction between individual and situational variables [108]. In this study, PSMU and MD might represent situational inputs and person-specific factors that influence the internal state of Italian and Spanish preadolescents, triggering aggressive responses such as cyberbullying. The results from this study reinforce the GAM's premise that while situational factors (e.g., cybervictimization) are critical in initiating aggression, the long-term perpetuation of these behaviors is deeply rooted in personal and cognitive factors (e.g., moral disengagement) amplified by external stimuli (such as problematic engagement with social media) [109]. These results point to the importance of addressing both environmental (e.g., regulation of social media use) and cognitive (e.g., moral reasoning) factors in intervention strategies, supporting the GAM's multifaceted approach to understanding aggression.

5. Conclusions

The findings of this study contribute to the literature on cyberpsychology, extending knowledge of the risk factors connected to cyberbullying and its perpetration in European preadolescents. In addition, the results underscore the need for a common European policy framework promoting guidance on responsible and pro-social digital literacy citizenship to prevent cyberbullying and negative online social experiences in preadolescence. By providing research insights to inform tailored interventions, this study aims to promote a safer online environment and enhance the well-being of Italian and Spanish preadolescents.

Based on our findings and the previous literature, educators and policymakers might consider adopting evidence-based research interventions to practically address cyberbullying and its perpetration, as well as negative online habits in preadolescents and adolescents, through socio-emotional and moral learning, peer culture education, or digital literacy [106–108].

This research is cross-nationally significant, contributing to the understanding of cyberbullying within the Italian and Spanish contexts and guiding evidence-based strategies to address its impacts. The serial mediation model illuminates how PSMU and MD serially and partially mediate the pathway from cybervictimization to cyberbullying, offering a nuanced understanding of these dynamics. The cross-national nature of the sample

strengthens this study's relevance, indicating that despite slight cultural variations, such as smartphone policies in schools, the core relationships between these variables persist across contexts. This research underscores the importance of culturally tailored intervention strategies targeting online behaviors and cognitive distortions early in preadolescence. Its findings can inform the development of preventive measures and policies in schools, both within Europe and internationally, thereby expanding the scope of cross-cultural cyberbullying research.

In sum, this research emphasizes the critical role of PSMU and MD in the cycle of cyberbullying, particularly for those who have experienced cybervictimization, and highlights how interventions targeting social media application use and cognitive self-regulation could break the escalation of online aggression across different European contexts. This work moves the field of cyberpsychology forward by highlighting the need for comprehensive interventions that address behavioral and cognitive factors contributing to cyberaggression, stressing the critical period of preadolescence for prevention efforts. It also emphasizes the importance of cross-national research, showcasing how country-specific factors, such as school policies, shape online behaviors in distinct yet comparable ways. Through this, this study advocates for European policies to effectively address cyberbullying.

6. Limitations and Further Research

This study's reliance on self-report data introduces possible biases such as social desirability and recall bias, which could affect the accuracy of participants' responses. One significant limitation of the present study lies in its reliance on cross-sectional data to test a serial mediation model, which inherently assumes causal relationships between variables. While mediation analysis is a useful statistical technique, it does not allow robust testing of causality when bidirectional and simultaneous influences likely exist among the variables. Specifically, in the relationship between CV and CB, there is strong theoretical justification for conceptualizing cybervictimization as a situational trigger that elicits impulsive aggressive behaviors, a mechanism often observed in aversive situations where hostile attitudes are activated. This view suggests a more immediate, reactive link between CV and CB. The role of PSMU may create tension within the hypothesized temporal sequence, as impulsive aggressive behaviors theoretically contradict the sustained behavioral engagement associated with PSMU. However, the model and relationships tested, and the results obtained, confirm similar results obtained from longitudinal studies on these variables [35]. Despite these challenges, the present study sought to address this complex relationship in a novel way by exploring PSMU as a mediating mechanism in a cross-national sample of Italian and Spanish preadolescents. While causal claims cannot be made, this approach sheds light on potential underlying processes that link victimization and perpetration, emphasizing PSMU's pervasive role in shaping digital interactions. However, future research should employ longitudinal data to better assess the directionality of these relationships. By comparing two European cultural contexts, this study offers insights into shared and unique dynamics among preadolescents in both countries, providing a foundation for future longitudinal research to better disentangle the temporal and bidirectional relationships between CV, PSMU, and CB [110–112].

Another significant limitation is the cross-national nature of the sample drawn from Italy and Spain. Despite their geographic proximity, these countries exhibit differences in school policies, notably the use of smartphones. In Spanish schools, smartphones were rarely used, which may influence the frequency and context of problematic social media use, compared to Italy, where more permissive policies exist. These differences could affect how students interact with social media, potentially shaping their experiences of cybervictimization, moral disengagement, and cyberbullying differently. Cultural factors such as norms

around technology use and educational practices were not directly measured, limiting the understanding of how contextual factors influence the findings. Moreover, the lower reliability of the ECIP-Q among Spanish preadolescents on the cyberbullying perpetration items may be influenced by these cultural tendencies, affecting online aggressive behavior and general normative habits regarding smartphone and Internet use. Furthermore, the use of Likert scales to measure complex constructs such as moral disengagement might not fully capture the depth and variability of this phenomenon, raising concerns about the precision of measurements. Future research should explore longitudinal designs to understand the evolving nature of these relationships over time and include a broader cultural range to enhance the generalizability of the findings. The role of external factors such as family dynamics, peer interactions, and specific national policies surrounding technology use should be further investigated as potential moderators in understanding cyberbullying behavior. Future studies should consider incorporating more situational variables within the GAM framework to better capture the nuances of online aggression and its prevention in various cultural contexts.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/ijerph22030389/s1>, Table S1: The English version of the BSMAS. Here are six statements to consider. For each, answer: (1) very rarely, (2) rarely, (3) sometimes, (4) often, or (5) very often; Table S2: The English version of the MDS. The following items correspond to the various mechanisms of moral disengagement. Moral justification: 1, 9, 17, 25. Euphemistic language: 2, 10, 18, 26. Advantageous comparison: 3, 11, 19, 27. Displacement of responsibility: 5, 13, 21, 29. Diffusion of responsibility: 4, 12, 20, 28. Distorting consequences: 6, 14, 22, 30. Attribution of blame: 8, 16, 24, 32. Dehumanization: 7, 15, 23, 31. Respondents indicate their agreement with each statement using a 5-point Likert scale, where: 1 = Strongly Disagree; 2 = Disagree; 3 = Undecided; 4 = Agree; 5 = Strongly Agree; Table S3: The English version of the ECIP-Q, a 22-item self-report instrument designed to assess cyberbullying behaviors among adolescents. It evaluates two dimensions: cyber-victimization and cyber-aggression, each comprising 11 items. Respondents indicate the frequency of specific behaviors over the past two months using a 5-point Likert scale: 0 = Never; 1 = Once or twice; 2 = Once a month; 3 = Once a week; 4 = More than once a week.

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Institutional Review Board Statement: This study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of University of Calabria (protocol code Prot. no. 0010986 of 13 February 2023).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study, their parents, and school principals.

Data Availability Statement: The datasets presented in this article are not readily available because the data are part of an ongoing study. Requests to access the datasets should be directed to corresponding author.

Conflicts of Interest: The authors declare no conflicts of interest.

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