Abstract

Problematic Internet Use (PIU), with its adverse health outcomes, is a clinically established phenomenon that is not formally diagnosable yet. The latest PIU research reveals differential psychological mechanisms underlying two types of Internet usage: social use (like using social media, chatrooms, and others) and non-social use (like live streaming, short-form video viewing, and others). Social forms of PIU often signal underlying interpersonal issues, including loneliness, attachment problems, and social skill deficits. In comparison, non-social usage might indicate emotion regulation problems, including emotion recognition deficits, poor cognitive empathy, and emotion suppression. A common developmental concomitant of these functions is the ability to mentalize, operationalized as Reflective Functioning (RF). While studies supporting the role of impaired RF in problematic social uses of the Internet abound, only a few studies relating RF deficits to non-social PIU are identifiable. Also, mentalizing is multidimensional, with cognitive and affective poles influencing emotion regulation and interpersonal functioning. Deficits in both poles of mentalizing have been differentially implicated in non-social and social PIU. Based on the latest empirical evidence in Internet-use problems, the multifaceted role of mentalizing could be meaningfully assimilated into a novel social-cognitive model of PIU. To that end, the current paper attempts to theoretically integrate affective and cognitive mentalizing, with its roles in emotion regulation and interpersonal functioning, into Bandura's Social-Cognitive Theory of PIU. The theoretical model might have implications in developing a mentalization-based treatment modality for PIU that could train individuals in efficiently regulating emotions and navigating real-life social situations without resorting to an over-involvement with the virtual world.

Keywords: Problematic Internet Use; mentalizing; emotion regulation; interpersonal functioning; Social-Cognitive Theory; reflective functioning; affective mentalizing
“read” or imagine these mental states in ourselves and in others is called “mentalizing” (Fonagy & Allison, 2012). While ToM is “cold” knowledge about the possession of a mind with predictable thoughts and behaviors, mentalizing is a reflective understanding of self and others in socio-emotional contexts (Górska & Marszał, 2014).

ToM deficits show in autism spectrum disorders (ASD; O’Nions et al., 2014), attention deficit hyperactivity disorder (ADHD; Ilzarbe et al., 2020), and Schizophrenia (Pickup & Frith, 2001). These conditions entail neurodevelopmental pathologies with cognitive and social impairments at the ability level (Rees et al., 2021; Scandurra et al., 2019). Mentalizing deficits, on the other hand, exist in disorders with emotion regulation (Górska & Marszał, 2014) and impulse control problems at its core, such as borderline personality disorder (BPD; Rifkin-Zybutz et al., 2021), substance-use disorders (SUDs; Quednow, 2020; Savov & Atanassov, 2013), behavioral addictions to food (Innamorati, 2017) and gambling (Ciccarelli et al., 2021), and eating disorders (Gagliardini et al., 2020).

Studying social-cognitive correlates would be particularly important in behavioral addictions as they present more prominent emotional and social symptoms, while drug addictions show more physical signs and symptoms (Alavi et al., 2012). The relationship between social-cognitive functions and behavioral pathologies is bidirectional, with impaired social cognition presenting both as a cause and an outcome of drug or behavioral addictions (Brand et al., 2019; Quednow, 2020).

Over the past decade, unhealthy Internet use has gained attention as a possible behavioral addiction (Alavi et al., 2012; Jorgenson et al., 2016; Ryding & Kaye et al., 2018). Along with accessibility, ease, and other advantages, the Internet has unlocked unlimited media content and perpetual connectedness, which can adversely affect users’ offline lives. The socio-emotional implications of Problematic Internet Use (PIU) are of particular interest to multidisciplinary researchers (e.g., Chao et al., 2020; Gioia et al., 2021). Internet use calls for a controlled expenditure of time, attention, and involvement, for which self-reflective and regulative mechanisms are important. A loss of ability to engage in adaptive and non-harmful Internet usage can lead to adverse functional outcomes such as reduced job or academic productivity, increased loneliness, and impaired physical well-being (e.g., body pain and sleep disturbances; Cai et al., 2023; Kelley & Gruber, 2013) among others. Mentalization ability guides a complex network of cognitive and affective functions that underlie emotion regulation (Bersani et al., 2022), self-control and monitoring (Fonagy, 2018), and overall self-regulatory behaviors (Savov & Atanassov, 2013). Difficulties in reflecting on internal mental processes, including thoughts, feelings, and needs, could lead to behavioral problems like PIU. The current paper aims to assimilate recent work on mentalizing deficits in PIU into an integrated social-cognitive conceptualization explaining the development of social and non-social PIU.

**Methods**

The authors report recent studies relating three manifestations of mentalizing: Reflective Functioning (RF; Fonagy et al., 1998), affect mentalizing or cognitive empathy (Baron-Cohen & Wheelwright, 2004), and cognitive mentalizing or perspective-taking (PT; Luyten et al., 2020) to PIU. The paper discusses the connection between mentalizing and PIU through problems in emotion regulation and interpersonal functioning. Mentalization-related variables are then integrated into the existing uses and gratification-based social cognitive theory (SCT) of addictive Internet use to explain how deficits in mentalization ability might underlie PIU and its adverse health outcomes.

The article search was not an exhaustive one. A streamlined search for studies over the past ten years was conducted across two databases: PUBMED and APA PsycNet. The authors searched for: (1) current understandings of PIU using terms “Internet addiction,” “Compulsive Internet use,” “Problematic Internet Use,” “Internet use disorder,” “Problematic Use of Internet,” “Pathological Internet Use,” “Internet Gaming Disorder,” “Gambling Disorder,” “SNS addiction,” “Problematic Mobile Phone Use,” “Problematic SNS Use,” “Social Media Addiction,” “Binge-watching” (2) studies relating RF, cognitive empathy, perspective-taking (PT), and PIU using a combination of terms “Reflective Functioning,” “Cognitive Empathy,” “Cognitive Mentalizing,” “Affective Empathy,” “Affect Mentalizing” with “Substance Abuse,” “Substance Use Disorders,” “Behavioral Addictions,” and PIU related terms, and (3) social cognitive theory of PIU and PIU related terms.

The upcoming sections define PIU and discuss its types, ongoing debates around the concept, and its current clinical status. The authors discuss models of PIU that are relevant to the conceptualization proposed in the present article. Studies reporting mentalizing deficits in PIU and its various forms are reported in Tables 1 and 2. The article then attempts to explain how distal developmental factors, linked to proximal psychosocial factors, result in specific Internet use and misuse patterns.
Current Understanding of Problematic Internet Use (PIU)

PIU is being viewed from myriad research lenses ranging from communication to clinical psychology to neuroscience. The deleterious impacts of Internet overuse were first documented by Kimberly Young (1996), followed by further exploration of over 600 cases of heavy Internet users exhibiting clinical signs of addiction. The term “Internet Addiction Disorder” was fictitiously coined by Ivan Goldberg, who later renamed it “Pathological Internet-use Disorder” (Wallis, 1997). PIU is associated with adverse psychosocial outcomes such as poor sleep quality (Shadzi et al., 2020), anxiety (Kaess et al., 2014), depression (Lam & Peng, 2010), and social isolation (Caplan, 2002).

There are diverse concepts related to PIU that have often been used interchangeably or measured as a single phenomenon at the cost of overlooking conceptual nuances. The upcoming section sheds light on conceptual distinctions leading to a clearer understanding of PIU and its forms. The awareness of distinct phenomenology and processes underlying the broader rubric of PIU would ensure research reliability and yield results that can be translated into effective policies and preventive measures.

Specific and Generalized PIU

At least two patterns of PIU can be distinguished, namely, specific and generalized. This differentiation was introduced by R. A. Davis (2001) in his cognitive-behavioral model of PIU. While a specific form of PIU (SPIU) involves the use of particular Internet functions like online shopping or pornography sites, a generalized form (GPIU) involves spending excessive amounts of time in a variety of online activities with no particular purpose (Brand et al., 2016; Widyanto & Griffiths, 2006). SPIU signals pre-existing psychopathology that would manifest itself in channels other than the Internet. For instance, a pathological shopper would engage in problematic shopping behavior offline, i.e., even without available online opportunities. GPIU, however, exists because of the Internet itself and would have no existence outside of it. Social problems like poor perceived social support or social isolation often trigger GPIU (Widyanto & Griffiths, 2006).

As seen further in the text, psychosocial correlates and causative factors differ between SPIU and GPIU. Theoretical distinctions between the two have also been made by specific authors in their work (e.g., Brand, Laier, et al., 2014; Brand, Young, et al., 2014; Brand et al., 2016, 2019; Caplan, 2002, 2005; R. A. Davis, 2001; Widyanto & Griffiths, 2006). PIU studies must begin with this differentiation to identify the true nature of the problem and the psychosocial mechanisms associated with it. It would entail using proper tools based on the type of PIU being studied and a clearer understanding of whether users are overly dependent on specific activities readily available on the Internet (SPIU) or the Internet itself (GPIU).

Content and Process PIU

Another differentiation that could affect research outcome is content vs. process motivations underlying PIU. The classification proposed by Song et al. (2004) is recently being explored in the context of problematic Internet and smartphone use (e.g., Dai et al., 2021; Elhai, Hall, et al., 2017; Hao et al., 2022; Rozgonjuk & Elhai, 2021; Serra et al., 2021; van Deursen et al., 2015; Wickord & Quaiser-Pohl, 2022). Initially, Song et al. (2004) explained: (a) content use of Internet as fulfilling a user's purpose in connection to the outside world, e.g., someone looking-up job opportunities online in order to secure an interview in the real world, while (b) process use as involving the consumption of the Internet itself that distances the user from the outside world, e.g., a student spending time “doom-scrolling”, (i.e., scrolling through social media and news for long hours seeking primarily negative information; Satici et al., 2022) to avoid studying for exams. Doomsrolling has been related to heightened states of anxiety, and people engaging in it can experience a loss of control over media consumption leading to compromised physical and mental well-being (Sharma et al., 2022). Thus, process use of the Internet has a greater likelihood of turning into PIU, given its potential to create a dependence on the Internet itself at the cost of offline activities and relationships (LaRose et al., 2001; Rozgonjuk & Elhai, 2021; Song et al., 2004). Subtypes of process Internet use, such as “binge-watching” (Raza et al., 2021; Starosta et al., 2021) and short-form video applications (SVA) viewing (J. Yang et al., 2022; X. Zhang et al., 2019), have significant addictive potential. Studies exploring the
relative strength of social and non-social Internet use in predicting PIU have reported that both can lead to addictive technology usage patterns (van Deursen et al., 2015; Wickord & Quaiser-Pohl, 2022).

Further, there are two broad classes of Internet applications: social and non-social. While social use (usually done through smartphones) comprises rewarding experiences obtained through online social interactions (van Deursen et al., 2015), non-social use comprises gratification from the mere consumption of online media (Song et al., 2004). Both process and content uses can be further typified as social or non-social. For instance, one may use a social feature of the Internet for both content and process gratifications, e.g., chatting on a social networking site (SNS) to connect with a possible suitor offline (content use) vs. spending time on SNS to escape real-life interpersonal deficits (process use). Studies exploring Problematic SNS Use (PSNSU; Hussain & Griffiths, 2018; Hussain & Wegmann, 2021) and Problematic Social Media Use (PSMU; Bányai et al., 2017; Shannon et al., 2022) can be said to have studied process type of social Internet use. Researchers need to collect information regarding how the Internet is being used (predominantly social or non-social) and for what purposes they are being used (predominantly content or process). Distinctive functional outcomes and underlying psychological mechanisms might characterize different Internet usage patterns.

“Internet Addiction” vs. “Problematic Internet Use”: A Conceptual Debate

The addictive potential of the Internet has been argued upon since its first formal identification by Young (1996). There exists much disagreement over an appropriate diagnostic label for the phenomena. A variety of terminologies like “Problematic Internet Use,” “Excessive Internet Use,” “Compulsive Internet Use,” “Internet Use Disorder,” “Internet Addiction,” “Pathological Internet Use,” and “Cyber Dependence” (Laconi et al., 2014; Widyanto & Griffiths, 2006), and so on, exists in the literature. Experts in the field have long been discussing the need to assign a diagnostic label to the condition to aid universality in understanding (Shapira, 2003). Idiosyncratic features of the virtual world allow for disinhibition and enhanced risk-taking (Suler, 2004), less threatening interpersonal communications (Caplan, 2002), and avenues for overcoming offline social deficits (R. A. Davis, 2001) that could determine problematic usage patterns. Although certain SPIUs, like excessive online gaming or shopping, have addiction-like patterns characterized by salience, mood modification, tolerance, withdrawal, conflict, and relapse (Kuss & Griffiths, 2015; Kuss & Lopez-Fernandez, 2016; Zhao et al., 2017), GPIU patterns can hardly be explained using the addiction criterion alone.

Further complications arise from ambiguities in measuring the PIU construct. At least forty-five different measurement scales guided by varying PIU conceptualizations exist (Laconi et al., 2014). There are three main traditions in PIU assessment: (a) tools following the DSM-IV criteria for substance dependence, (b) tools guided by the cognitive-behavioral model of GPIU, and (c) tools following the behavioral addiction paradigm modelled after the DSM-IV criteria for pathological gambling (see Laconi et al., 2014 for a review). A few commonly used scales, such as Young's Internet addiction test (IAT; Young, 1998b), Chen's Internet addiction scale (CIAS; S.-H. Chen et al., 2003), and the Internet addiction scale (IAS; Nichols & Nicki, 2004) view Internet use problems as an addictive condition. They measure psychological dependence, withdrawal, tolerance, and significant costs to overall functioning through their items. Another class of tools uses impulse control conceptualizations, such as Young's Internet Addiction Diagnostic Questionnaire (IDAD; Young, 1996) and the updated version of Young's IAT (Aboujaoude, 2010). A few scales measuring PIU from a cognitive-behavioral framework (R. A. Davis, 2001) are the Generalized Problematic Internet Use Scale (GPIUS; Caplan, 2002) and the Online Cognition Scale (OCS; R. A. Davis et al., 2002).

Along similar lines, Tokunaga and Rains, (2016) have described three classes of PIU conceptualization: (a) substance dependence, (b) impulse control, and (c) relationship-building resource deficit. All three approaches measure a loss of control over Internet use as a core feature of PIU. In contrast, tolerance and withdrawal are measured under the substance use and impulse control perspectives alone. Finally, greater interpersonal efficacy online, as compared to offline, is uniquely measured under the relational deficit perspective. Many existing studies have failed to match PIU conceptualization to PIU measurement tool in research (Dahl & Bergmark, 2020).

Further, PIU measures based on the substance dependence framework usually assess mood-modifying effects of Internet use which is inconsistent with substance dependence definitions. On the other hand, PIU measures based on the impulse control and relational-deficit frameworks are better aligned with their respective conceptualizations. Overall, PIU shows greater construct validity when conceptualized as an impulse control problem or a relational-deficit problem than as a substance use disorder (Tokunaga & Rains, 2016). SPIUs, such as
PSNSU, have also been studied as an addiction or a cognitive-behavioral problem, with multiple assessment tools having variable cut-off points (Varona et al., 2022).

To sum up, there continues to be a mismatch between conceptualization and measurement in PIU research, a lack of consensus on the addictive nature of Internet-use problems, an underrepresentation of other existing models, such as the Interaction of Person-Affect-Cognition-Execution (I-PACE; to be discussed later in the current article; Brand et al., 2019) or the dual-system theory (DST; Turel & Qahri-Saremi, 2016), and the existence of a variety of different terms to address it by.

In the current paper, the term Problematic Internet Use (PIU) is used as it is inherently non-pathologizing, allowing space for further exploration until the exact nature of the problem is known. While reporting other researchers' works, the term originally used in their articles is used. Across most paradigms, maladaptive cognitions, affect, and behaviors related to self and others in inter and intrapersonal contexts have been associated with PIU (Brand et al., 2016; R. A. Davis, 2001; Tokunaga & Rains, 2016), further strengthening the need to view the condition through a social cognitive lens. Although the addiction paradigm was the first to emerge, empirical evidence supporting it is far from conclusive. For furthering the understanding of PIU, more psychosocial perspectives need to be explored. The current article attempts to propose one testable conceptualization that could fill existing gaps in the PIU literature.

Clinical Status of PIU

Neuroadaptation in the reward pathways of the brain, the crux of drug-related addictions, has also been noted in certain behaviors (e.g., gambling, buying, or eating) that produce short-term stimulation of the reward systems leading to the experience of addictive states (Grant et al., 2010; Karim & Chaudhri, 2012). The fifth revision of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013) shifted Gambling Disorder from an Impulse Control Disorder classification to the Substance Related and Addictive Disorders section. Internet Gaming Disorder (IGD) got included in Section III of the manual, as a condition requiring further study. The International Statistical Classification of Diseases and Related Health Problems−11 (ICD-11; World Health Organization, 2019) includes IGD and Gambling Disorders alongside SUDs. Other SPIUs, such as excessive online shopping, PSNSU, PSMU, or GPIU, have not yet received formal diagnostic statuses. The clinical understanding of these conditions is continually evolving, and support for PIUs beyond gaming and gambling is not that straightforward.

Coming to clinical presentation, PIU shows some overlap with symptoms of substance and behavioral addictions. Repeated unsuccessful attempts at cutting down, preoccupation, and using the behavior when emotionally distressed have been reported in behavioral addictions to food and gaming (Meule & Gearhardt, 2014), and in PIU (Kuss & Lopez-Fernandez, 2016; Li et al., 2015). Particularly clinical signs seen in certain forms of SPIU, such as irritability, restlessness, and urge following cessation of gaming in IGD (Kaptsis et al., 2016; Yen et al., 2022), craving in SNS addiction (Leng et al., 2019), and altered attention to incentive stimuli in Internet gaming and gambling disorders (Werle et al., 2021) mimic symptoms of addiction to substances. Further, impulsivity has been consistently linked to certain forms of SPIU, such as IGD (Ryu et al., 2018; Şalvarlı & Griffiths, 2022), binge-watching (Starosta et al., 2021; Steins-Loeber et al., 2020), and Internet addiction (Lee et al., 2012; Y. Zhang et al., 2021). Impulsivity, in turn, is linked to higher levels of approach behaviors, as seen in behavioral addictions of compulsive buying and sexual addiction (Granero et al., 2016) and Internet addiction (Diotaiuti et al., 2022). Impulsivity and a biased preference for perceiving consequences of drug-taking as rewarding are noted in drug-related addictions consistently (Kozak et al., 2019; Poulton & Hester, 2020). Experts in the field have identified two types of PIU behaviors, namely, an impulsive type (including gaming, gambling, online buying/shopping, cybersex/pornography viewing, and social media use) and a compulsive type (including behaviors such as excessive health-related information searching, stalking people online, and digital hoarding), with significant overlap between the subtypes (Fineberg et al., 2022).

Early age of initiation is a risk factor for SUDs (e.g., tobacco, alcohol, cannabis; Bracken et al., 2013; Moss et al., 2014), certain SPIUs (e.g., IGD; Beard et al., 2017; Nakayama, Matsuzaki, et al., 2020) and for GPIU (Chang et al., 2014; Nakayama, Ueno, et al., 2020; Tsitsika et al., 2014).

However, researchers have deemed the confirmatory approach, i.e., utilizing substance addiction criteria for PIU, as undue confirmation of a medical model without adequate qualitative exploration of psychosocial factors in its phenomenology (Flayelle, Maurage, Vögele, et al., 2019; Kardefelt-Winther et al., 2017). Instead of viewing PIU as
a compulsion, more studies need to view it as a faulty coping mechanism stemming from maladaptive motivations underlying its use (Kardefelt-Winther, 2014a).

One of the reasons for the confirmatory approach might be the frequent failure of Internet addiction research in considering the nature of online activities one is involved in and associated functional outcomes in varied profiles of Internet users. Studies on Internet addiction have mainly covered some specific form (e.g., gaming, or online sex addiction). This gap in research questions the confirmation and indiscriminate application of addictive conceptualizations to all kinds of Internet use problems as pre-emptive.

Neurobiologically, similarities between PIU and other addiction disorders show mixed findings. For instance, substance and behavioral addictions, such as binge eating and pathological gambling, activate the brain's reward pathways and directly affect the dopaminergic system (H. S. Kim & Hodgins, 2018; Werle et al., 2021). Similar activation in the mesocorticolicmbic reward system with reduced resting-state glucose metabolism in dopaminergic projection areas in the striatum and cortical regions have been reported in problematic online gaming (Kuss & Griffiths, 2012; Park et al., 2010; Weinstein & Lejoeux, 2022). Morphological changes in the fronto-striatal reward circuitries have been reported in habitual and addicted Internet users (Altbäcker et al., 2016; Kühn & Gallinat, 2015). A study exposing subjects with Instagram addiction to Instagram-themed cues reported activation of the dopaminergic reward system and deactivation of the executive control network, also seen in persons with various drug addictions (Nasser et al., 2020). Borrowing from theories of substance use, Brand (2022) identified two driving neural pathways to "online addictive behaviors": (a) a "feels better" path entailing positive (i.e., delivering pleasure) and negative (i.e., avoiding negative mood states) reinforcements involving the ventral striatum (nucleus accumbens), and the dorsal striatum, and (b) a "must do" path characterized by compulsive behaviors, involving the dorsal striatum (putamen and caudate nucleus). A third path regulating the two driving paths constitutes a "stop now" or self-control process maintained by the dorsolateral prefrontal cortex.

However, few other researchers have reported the absence of dopaminergic system alterations in gambling and binge-eating disorders as opposed to drug addictions (Majuri et al., 2017). Further, a recent study reported variabilities in resting state electroencephalography (EEG) readings between IGD (raised delta and theta activity and reduced beta activity) and Internet Addiction (raised gamma activity and reduced beta and delta activity; Burleigh et al., 2020). A study analyzing Magnetic Resonance Imaging (MRI) scans of SNS users reported: (a) bilateral reduction in grey matter volumes in the amygdala (like substance and gambling addictions) and (b) healthy anterior-/mid-cingulate cortical volumes (dissimilar to other addictions; He et al., 2017). Similarities and differences in brain morphology for PIUs and SUDs (Park et al., 2010) strengthen the call for distinct conceptualizations and treatment modalities. Also, future researchers need to study SPIUs and GPIU separately and extensively to reach conclusive findings. The nuanced role of application-specific features must be studied in greater detail to understand the roots of problematic Internet usage (Brand, 2022).

**Overview of PIU Models**

The existence of multiple classifications and terminologies for PIU is accompanied by diversity in theoretical models explaining the phenomena. Many of these theories need empirical testing. This section summarizes PIU models that helped identify the factors of the social cognitive model proposed in the current article.

Young (1998a) primarily suggested the role of catastrophic thinking and escape motivations in the compulsive use of the Internet. R. A. Davis's (2001) cognitive-behavioral conceptualization views PIU as a distinct pattern of Internet-related cognitions, such as ruminating about Internet use, poor self-efficacy, self-doubt, and behaviors that lead to adverse life outcomes. The theory explains pre-existing psychopathology, like depression, social anxiety, and substance dependence, as necessary distal causal factors coupled with proximal distortions in thinking leading to PIU. Caplan's (2002) model introduces a unique cognitive-behavioral variable called 'preference for online social interaction' (POSI) in the aetiology of PIU. POSI is seen in individuals with social skill deficits who experience screen-mediated social interactions as less distressing than face-to-face ones. Thus, cognitive-behavioral models associate defective self-regulation with underlying cognitive distortions related to self, others, and Internet use, resulting in PIU and its adverse health outcomes (Caplan, 2010).

Influenced by the cognitive-behavioral school of thought, Brand et al. (2014) used neuropsychological and neuroimaging evidence to formulate a model of SPIU under the addiction framework. They explained how reduced prefrontal control is associated with poor self-regulation and dysfunctional Internet usage to cope with negative affect, which reinforces Internet use as a rewarding experience. Subsequently, Brand et al. (2016) proposed a
revised moderated-mediation model of PIU where predispositions such as psychopathology (e.g., depression and anxiety) and personality traits (e.g., impulsivity and low self-esteem) interact with maladaptive coping styles and outcome expectancies in one’s choice of Internet use. Internet use then leads to an experience of gratification, reinforcing the initial stream of cognitions and behaviors. This comprehensive model of SPIU, called the I-PACE model, also adapted to other addictive behaviors (Brand et al., 2019), explains how a complex interplay of personological and biological predispositions, affective and cognitive responses, and higher-level executive mechanisms result in problem behaviors.

Flayelle et al. (2023) recently proposed a need-based psychological conceptualization of PIU where design features of online applications influence Internet users’ self-control abilities concerning PIU. In their theoretical model, the authors discuss two processes underlying PIU: (a) model-based processes and (b) model-free processes. Model-based processes involve subjective cost-benefit analyses leading to the choice of problematic online behaviors over alternatives guided by online design features catering to specific psychological needs. For example, immersive graphics in gaming or engaging narratives in TV series can help distract one from negative emotional states, or getting “likes” on social media can temporarily alleviate a sense of low self-worth. Model-free processes involve online behaviors triggered by cues. Such as personalized advertisements or push notifications on gaming apps and unpredictable online reinforcements like retweets or notifications on social media encourage compulsive online behaviors through learning processes such as habit formation and incentive sensitization.

Other models have proposed that SPIU using mobile phones can be driven by excessive reassurance-seeking, impulsivity, or extraversion, eventually leading to addictive, dangerous, or antisocial forms of problematic mobile phone use (PMPU; Billieux, 2012; Billieux et al., 2015; Canale et al., 2021). Models explaining PSNSU have implicated the role of ‘Fear of Missing Out’ (FoMO; a constant fear that one is absent from rewarding experiences that others might be having) as pivotal in the development of the problem (Fioravanti et al., 2021; Pontes et al., 2018; Yin et al., 2021). Recently, Dailey et al. (2020) proposed a biopsychosocial model for Problematic Social Media Use with biological (i.e., age), social (i.e., gender, the intensity of use, need for social media, and social comparison), and psychological (i.e., stress, empathic concern, conscientiousness, and depression) variables accounting for observed variance in the sample. For typically non-social online engagements, such as single-player gaming, binge-watching, and pornography watching, there exists a variety of models but little consensus among them. As discussed in previous sections, gaming and gambling have mainly been explained under addiction, impulse-control, and behavioral addiction frameworks. The recently proliferated online activity of binge-watching, viewed from a non-pathologizing lens, has been reported to involve multiple psychological processes in its aetiology, such as motivation to watch (e.g., relaxation, social interaction), impulsivity traits of the watchers and individual differences in emotional reactivity (Flayelle, Maurage, Karila, et al., 2019). Akin to the compensatory model, problematic binge-watching has been conceptualized as a maladaptive coping or emotion regulation strategy to deal with negative affective experiences (Flayelle, 2020).

Although parts of the I-PACE model have been tested, a proposed link between social cognitions (loneliness, perceived social support, and social distrust) and excessive use of communication applications remain sparingly addressed (Brand et al., 2016). While elaborate theoretical models supply essential information to clinicians, testing specific models that translate into targeted clinical interventions is equally important. Social cognitive factors also influence the preference for Internet applications (LaRose & Eastin, 2004). According to Kardefelt-Winther’s (2014a) compensatory Internet use model, the motivation to use certain online applications over others is due to their compensatory potential. The deleterious effects of Internet use arise when it is used to gratify offline unmet psychosocial needs. Thus, merely studying psychological predictors of compulsive use patterns is not enough. For instance, in another study by Kardefelt-Winther (2014b), a widely cited association between social anxiety and excessive online gaming became insignificant when stress was statistically controlled. The findings highlighted that it is crucial to consider the function the Internet plays (e.g., reducing stress) in the context of psychosocial vulnerabilities (e.g., social anxiety), eventually resulting in PIU. To that end, the model proposed in the current article combines the psychological vulnerabilities approach with the motivations for use approach to explain the relationship between Internet use and PIU. The authors explain the relationship between social cognitive vulnerabilities and PIU through unfulfilled psychosocial needs that motivate specific patterns of Internet use and overuse.
Mentalizing, first described in the context of self-related pathology observed in borderline personality disorder (Fonagy & Bateman, 2007), develops in the backdrop of the first attachment relationship to one's mother or primary care-giver (Fonagy & Bateman, 2016) which influences the developing sense of self and its regulatory functions (Fonagy & Target, 2003; Fonagy et al., 2018, Schwarzer et al., 2021). Acquisitions in mentalizing continues over the course of development which peaks during adolescence owing to the expanding biological and socio-cultural demands of that age (Luyten et al., 2021). Poor mentalizing causes difficulty in grasping social cues and responding appropriately in complex social environments as is seen in individuals with Autism (Isaksson et al., 2019). Mentalization ability influences regulation of behaviour through self-monitoring, affect regulation and self-control (Fonagy, 2018).

Reflective Functioning

Mentalization is operationalized as Reflective Functioning (RF; Fonagy et al., 1998). RF is an unconscious, automatic process of self-reflection that influences one's self-regulatory behaviors that can sustain or inhibit impulsive behaviors in emotionally laden contexts (Debbané et al., 2016; Fonagy & Luyten, 2018). RF is implicated in forming a stable sense of self and self-regulatory behaviors, particularly in adolescence (Chevalier et al., 2021; Fonagy & Target, 1997).

Deficits in self-reflective and regulatory functions of mentalizing have been routinely implicated in SUDs (Håkansson et al., 2018). There is a dearth of studies exploring RF in the context of adolescent SUDs. A study exploring social cognitive determinants of SUDs in adolescents reported that multi-substance users held “unhealthy” positions on measures of attitude, intentions, prescriptive norms, and self-efficacy compared to those non-users (Victoir et al., 2007). Research with adults has focused primarily on parental RF (PRF), i.e., a parent's ability to reflect on their own and the offspring's mental states in the context of the parent-child relationship (Slade, 2005), in SUDs. Impaired RF in a parent with drug dependence can lead to difficulties in PRF, adversely influencing parent-child relations and the child's attachment patterns (Håkansson et al., 2018; Suchman et al., 2010). Persons with SUD show higher levels of uncertain RF (concrete, inflexible way of mentalizing of own or someone else's mind; Fonagy & Target, 2006) and impaired PRF (Handeland et al., 2019). Resting-state frontal electroencephalography (EEG) reports show: (a) enhanced beta and gamma spectral power reflecting higher arousal states and (b) positive correlation between delta spectral power and pre-mentalizing (a form of non-mentalizing/pretend mode where reality and perception do not match) in mothers with SUD (Ngoh et al., 2022). Maternal SUD is related to altered neural activity and adverse parent-child outcomes due to impaired PRF.

PRF also influences parental emotional availability, thereby affecting offspring's emotional states and forming the basis for adult attachments and emotion regulation, both of which show impairments in persons with SUDs (Luyten et al., 2017; Suchman et al., 2010).

Mentalizing difficulties can play a role in addictive food consumption, particularly in the presence of strong emotions (Innamorati et al., 2017). Women with binge-eating disorder (BED) and clinically overweight women reportedly exhibit lower RF, significantly contributing to BED over depression and interpersonal problems (Maxwell et al., 2017). Ciccarelli et al. (2021) showed that ‘uncertainty about mental states’ (Reflective Functioning Questionnaire-8 (RFQ-8) subscale) and emotion regulation problems, along with distorted patterns of thinking, were associated with adolescent gambling. RF deficits can cause rapid and inaccurate information processing and impair one's ability to form long-term goals leading to engagement in impulsive behaviors, such as gambling, to relieve negative emotional states in the short term (Cosenza et al., 2019). Hyper-mentalizing, or holding complex and rigid models of mind without adequate empirical evidence, has also been associated with gambling problems (Nigro et al., 2019).

Thus, accurate mental-state inference of self and others is vital for forming healthy attachments, emotional stability, and adequate self-regulation. RF deficits have been reported in the initiation and maintenance of problematic technology use (Musetti, Brazzi, et al., 2020). Although the addictive nature of PIU is still debatable, similarities with addictive disorders, when viewed through a developmental lens, deserve attention. Table 1 summarizes a handful of studies that have explored the role of RF in PIU and its various forms.
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<th>Author(s)</th>
<th>Aim</th>
<th>Mentalization-based variable</th>
<th>PIU-based variable</th>
<th>Theoretical model</th>
<th>Summary of findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Musetti, Brazzi, et al. (2020)</td>
<td>Examine the role of childhood traumatic experiences, and RF in PMPU</td>
<td>RF (predictor)</td>
<td>RFQ-8</td>
<td>PMPU (outcome)</td>
<td>PMPU-SV</td>
</tr>
<tr>
<td>Musetti et al. (2021)</td>
<td>Examine the association between CEA and PSNSU</td>
<td>RF and self-other differentiation (mediator)</td>
<td>RFQ-u</td>
<td>PSNSU (outcome)</td>
<td>IAT-SNS</td>
</tr>
<tr>
<td>Borghesi et al. (2022)</td>
<td>Investigate the association between traumatic experiences, CIU, and RF</td>
<td>RF (mediator)</td>
<td>RFQ-8</td>
<td>CIU (outcome)</td>
<td>CIUS</td>
</tr>
<tr>
<td>Imperato et al. (2022)</td>
<td>Examine the relationship between RF and adolescents’ identity development, mediated by PSNSU</td>
<td>RF (independent)</td>
<td>RFQ-8</td>
<td>PSNSU (mediator)</td>
<td>IAT-SNS</td>
</tr>
<tr>
<td>Ciccarelli et al. (2022a)</td>
<td>Investigate common predictors of adolescent gambling and IGD</td>
<td>RF (predictor)</td>
<td>RFQ-8</td>
<td>IGD (outcome)</td>
<td>IGDS9-SF</td>
</tr>
<tr>
<td>Ciccarelli et al. (2022b)</td>
<td>Examine the role of mentalization, loneliness, psychological distress in problematic gaming behaviour</td>
<td>RF (predictor and mediator)</td>
<td>RFQ-8</td>
<td>IGD (outcome)</td>
<td>IGDS9-SF</td>
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</tbody>
</table>

Note. RFQ-8 = Reflective Functioning Questionnaire-8 items scale; PMPU-SV = Problematic Mobile Phone Use Questionnaire-Short Version; RFQ-u = Reflective Functioning Questionnaire-uncertain subscale; CEA = Childhood emotional abuse; IAT-SNS = Internet Addiction Test-Social Networking Site; CIU = Compulsive Internet Use; CIUS = Compulsive Internet Use Scale; IGDS9-SF = Internet Gaming Disorder Scale-Short Form.

Specific psychological factors are construed to underlie the reported relationships. Studies suggest that social features of the Internet might be overused as a maladaptive coping strategy by individuals with childhood adversities (Musetti, Brazzi, et al., 2020; Worsley et al., 2018). It might indicate an increased need to form virtual identities and connect to people online to deal with unpleasant emotional states and a perceived lack of social
Empathy is a multidimensional concept with both cognitive and affective elements. Perspective-Taking (PT), i.e., the tendency to spontaneously adopt the psychological point of view of others, is the cognitive aspect of empathy (M. H. Davis, 1983). PT and recognition of emotions are crucial to affective mentalizing (Baron-Cohen & Wheelright, 2004; Perry & Shamay-Tsoory, 2013).

Multiple studies have reported deficits in facial emotion recognition in persons with alcohol use disorder (PwAUD; Attwood & Munafò, 2014; Castellano et al., 2015; Eastwood et al., 2020), with patients often showing recovery of deficits post abstinence (Erol et al., 2017). PwAUD are more likely to misidentify emotions as anger or disgust (Bora & Zorlu, 2016), and this negativity bias correlates with AUD severity (Freeman et al., 2018). Emotion recognition deficits are acquired from prolonged alcohol abuse and have adverse interpersonal implications that increase the risk of relapse (Kornreich et al., 2002; Quednow, 2020). PwAUD and non-dependant high-risk individuals with a family history of alcohol dependence have shown impaired emotion recognition on the Reading the Mind in the Eyes Task (RMET; Hill et al., 2007; Maurage et al., 2016). RMET, an experimental task consistently used for assessing affective ToM, cognitive empathy, and perspective-taking, involves choosing between four basic emotional states by looking at standardized pictures of the eye region (Baron-Cohen et al., 1997, 2001). However, other studies have reported intact cognitive but impaired affective subcomponent of empathy, indicating an emotional-affective pathology in PwAUD (Maurage et al., 2016; Nandrino et al., 2014). Some other studies report a contradictory effect of acute alcohol consumption in enhancing happy emotion decoding and fostering sociability (Dolder et al., 2017; Kano et al., 2003). Emotion recognition deficits have also been reported in abstinent cannabis (Bayrakçı et al., 2015), active methamphetamine (Y. T. Kim et al., 2011), opioid (Garland et al., 2017; Macfie et al., 2020), and cocaine (Decker et al., 2016) users.

Studies exploring affective mentalizing deficits in behavioral addictions also exist. There is evidence of impaired cognitive empathy and emotion recognition problems in persons with eating disorders, such as Anorexia Nervosa and BED (Kerr-Gaffney et al., 2019; Saure et al., 2022), and emotion dysregulation can trigger food addiction symptoms (Pivarunas & Conner, 2015). Multiple studies have reported significant deficits in affective and cognitive empathy in gambling behaviors (Hurel et al., 2019; Wu et al., 2022). A cross-generational study of video gamers revealed a negative association between the amount of time spent on games and cognitive empathy, as game playing reduces the need to infer mental states, thereby lessening the need to activate one’s social brain (Shin & Ahn, 2013).Alexithymia (difficulty in identifying, verbalizing, and analyzing one’s emotions) is conceptually related to cognitive empathy. It has been implicated in gambling disorders (Marchetti et al., 2019) with deficits in emotion identification in the form of over-identification of negative emotions leading to efforts at emotional suppression and experiential avoidance through excessive Internet gambling (Rogier & Velotti, 2018).
Summarized in Table 2 are a few PIU studies that used the RMET, the standard measuring tool for affective mentalizing. A handful of other PIU studies have used the perspective-taking (PT) subscale of the Interpersonal Reactivity Index (IRI), a direct measure of cognitive empathy or affective mentalizing. A few other studies have used alternative behavioral measures of emotion recognition, which reflects affective mentalizing.

Table 2. Summary of Studies Relating Cognitive Empathy and Perspective-Taking (PT) to Various Forms of Problematic Internet Use (PIU).

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Main aim(s)</th>
<th>Mentalization-based variable</th>
<th>PIU-based variable</th>
<th>Theoretical model</th>
<th>Summary of findings</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Variable type</td>
<td>Tool</td>
<td>Variable type</td>
<td>Tool</td>
</tr>
<tr>
<td>Melchers et al. (2015)</td>
<td>Examine the association between empathy and PIU</td>
<td>PT, as part of detailed empathy assessment (correlational)</td>
<td>IRI, EQ</td>
<td>PIU (correlational)</td>
<td>IAT</td>
</tr>
<tr>
<td>Hui et al. (2019)</td>
<td>Examining effect of cognitive vs. affective empathy on IGD symptoms</td>
<td>PT, as part of detailed empathy assessment (predictor)</td>
<td>Empathy component from PBT</td>
<td>IGD (outcome)</td>
<td>IGD criteria of DSM-5</td>
</tr>
<tr>
<td>Chun et al. (2017)</td>
<td>Assessing the association between excessive smartphone use and facial emotional processing and behavioral activation/inhibition systems</td>
<td>Facial emotion processing (correlational)</td>
<td>Facial emotion discrimination task</td>
<td>Excessive smartphone use</td>
<td>SAPS</td>
</tr>
<tr>
<td>Ge et al. (2017)</td>
<td>Exploring how Internet Addiction affects facial expression recognition</td>
<td>Facial expression recognition (correlational)</td>
<td>Chinese FAPS, Eye-tracking system</td>
<td>Internet Addiction (correlational)</td>
<td>Adolescent PIUS</td>
</tr>
</tbody>
</table>

Variability in information processing in Internet Addiction vs. healthy controls with more complex negative emotion processing in former.
<table>
<thead>
<tr>
<th>Study</th>
<th>Goal</th>
<th>Measures</th>
<th>Outcomes</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lachmann et al. (2018)</td>
<td>Explore the relationship between IAD, SUD, empathy, and life satisfaction</td>
<td>PT, as part of detailed empathy assessment (correlational)</td>
<td>IUD, SUD (correlational)</td>
<td>IUD, lower empathy, and lower life satisfaction are correlated; higher PT and lower SUD reported in Chinese males</td>
</tr>
<tr>
<td>Únal-Aydın et al. (2020)</td>
<td>Examine the role of emotion recognition in SNS addiction</td>
<td>Emotion Recognition (independent)</td>
<td>SNS addiction (dependent)</td>
<td>No specific model discussed</td>
</tr>
<tr>
<td>Aydin et al. (2020)</td>
<td>Examine the role of metacognitions and emotion recognition as predictors of IGD</td>
<td>Emotion Recognition (predictor)</td>
<td>IGD (outcome)</td>
<td>Meta-worry and poor recognition of negative emotions predict IGD</td>
</tr>
<tr>
<td>Únal-Aydın et al. (2021)</td>
<td>Investigate metacognitions and emotion recognition as predictors of PSNSU</td>
<td>Emotion Recognition and metacognitions (predictor)</td>
<td>Children's versions of RMET, MCQ</td>
<td>Developmental pathology</td>
</tr>
<tr>
<td>Dalvi-Esfahani et al. (2021)</td>
<td>Study the effect of EC empathic concern and PT on SMA, moderated by personality</td>
<td>PT (predictor)</td>
<td>SMA (outcome)</td>
<td>Both EC and PT predict SMA with a moderating role played by extraversion</td>
</tr>
<tr>
<td>Arató et al. (2023)</td>
<td>Examine EFE-related functional brain changes in PIU and ESU</td>
<td>EFE Recognition (correlational)</td>
<td>PIU and ESU (correlational)</td>
<td>PIU and ESU associated with amygdala's functional connections for cognitive control functions and social cognition</td>
</tr>
</tbody>
</table>

Note. EQ = Empathy Quotient; FERT/P = Facial Expression Recognition Task/Paradigm; PBT = Prosocial Personality Battery; SAPS = Smartphone Addiction Proneness Scale; DLPCF = Dorsolateral Prefrontal Cortex; dACC = Dorsal Anterior Cingulate Cortex; FAPS = Facial Affective Picture System; IUD = Internet Use Disorder; SUD = Smartphone Use Disorder; s-IAT = short-Internet Addiction Test; SAS = Smartphone Addiction Scale; SMAS = Social Media Addiction Scale; IGDT = Internet Gaming Disorder Test; MCQ = Metacognitions Questionnaire; SMA = Social Media Addiction; BSMAS = Bergen Social Media Addiction Scale; SMDAS = Social Media Disorder Scale; EFE = Emotional Face Expression; FERP = Facial Emotion Recognition Paradigm; ESU = Excessive Smartphone Use; PIUQ = Problematic Internet Use Questionnaire; SABAS = Smartphone Application-Based Addiction Scale.

One of the earliest studies relating empathy and Internet use problems reported positive associations between emotional quotient (EQ) and PIU but none with any of the IRI subscales, particularly PT (Melchers et al., 2015). A study on IGD showed deficits in personal distress but not in empathic concern or PT (Hui et al., 2019). Studies have reported associations between IAD and difficulty identifying negative facial expressions (Z. Chen et al., 2017; Ge et al., 2017). A study on PIU using smartphones reported lower cognitive empathy reflected in poor PT skills (Lachmann et al., 2018). Studies exploring PSNSU have mixed observations, including both presence (Únal-Aydın et al., 2020) and absence of emotion recognition deficits on the RMET (Únal-Aydín et al., 2021). Another study reported empathic concern, and PT negatively predicted social media addiction (SMA), with the personality trait of extraversion negatively mediating this relationship (Dalvi-Esfahani et al., 2021). The only study, in the authors'
knowledge, assessing affective mentalizing in IGD, utilizing the RMET, reported insufficient ability of negative emotion recognition along with negative meta-worry (i.e., psychological distress and worry arising from a perceived loss of control over internal states; Aydin et al., 2020) in persons with IGD. Functional MRI of excessive smartphone users, when exposed to facial expression images, have reported functional alterations: (a) in connections between the amygdala and frontal cortex, and various cortical gyri (such as temporal, supramarginal, and cingulate; Arató et al., 2023), and (b) in the dorsolateral prefrontal and dorsal anterior cingulate cortices (Chun et al., 2017). These brain areas deal with emotion regulation, cognitive control of emotions, and social-cognitive functions (such as emotion recognition in social contexts). Studies using event-related potentials for exploring overall empathy have reported lowered discrimination of painful images at both early automatic (N200 amplitude; Wang et al., 2014) and later cognitive processing (P300 amplitude) levels (Jiao et al., 2017).

However, findings related to affective mentalizing and PIU are not free from inconsistencies. A study on cognitive and affective components of empathy in SMA found no significant relationship between the variables under study (Bhojak & Bapu, 2021). Turel et al. (2018) reported that MRI scans of excessive Facebook users show greater GMV in posterior regions of the left and right superior temporal gyri, which is associated with facial emotion perception, and in left and middle temporal gyri and left fusiform gyri, which deals with face recognition.

Although contradictions exist, studies have primarily indicated a deficit in mentalizing of affect in self and others, as reflected in poor cognitive empathy and emotion recognition, in persons with PIU. Individuals exhibiting PIU might be turning to negative Internet use patterns to maladaptively cope with negative emotional states (Aydin et al., 2020). The ability to infer emotional states and the re-appraisal of cognitions underlying emotions in self and others is a prerequisite to healthy emotion regulation (Tully et al., 2016). Emotion dysregulation has been associated with generalized PIU, specifically with PSNSU (Gioia et al., 2021; Quaglieri et al., 2021). Poor affective mentalizing would affect interpersonal functioning as accurate judgments about internal emotional states of self and others are central to social functioning (van Kleef et al., 2016).

The latest support for affective pathologies in PIU arrives with research in short-form video application (SVA) viewing (e.g., YouTube shorts and Instagram reels) and binge-watching (e.g., video streaming on Netflix and Voot) on mobile phones (Elhai, Levine, et al., 2017). There has been a proliferation in SVA-watching, which usually runs for 15 to 30 seconds and poses great addictive potential (Lu et al., 2022; X. Zhang et al., 2019), leading to constant scrolling behaviors seen in mobile phone users. Problematic series watching can lead to loss of control, poor sleep, and neglected overall health (Orosz et al., 2016). While reports claim that such non-social uses of the Internet are related to emotional suppression (Rozgonjuk & Elhai, 2021; J. Yang et al., 2022), boredom (Lu et al., 2022), and escape motivations (Starosta et al., 2021), other studies have identified positive binge motivations involving relaxation and experience of reward (Boca, 2017). Studies on binge-watching must surpass the disorder framework and identify specific watcher profiles showing irregular over-involvement and non-addictive patterns (Flayelle et al., 2017). Researchers need to consider the underlying motivations for binge or SVA watching. Reasons might range from enjoyable to problematic aspects, such as dealing with loneliness or as a maladaptive emotion regulation strategy (Flayelle et al., 2020; Rubenking & Bracken, 2018; Starosta et al., 2019).

There is a growing understanding of the roles of emotional and interpersonal problems in PIU. However, studies are yet to adopt a developmental conceptualization in explaining the differential role of cognitive and affective functions of mentalizing on emotion regulation and interpersonal functioning in the context of PIU. The authors thread the ongoing discussion in the upcoming sections by proposing a social-cognitive conceptualization of PIU.

A Social-Cognitive Conceptualization of PIU

Summarying Extant Knowledge: From Bandura to the Present

Bandura (1989) first proposed a Social-Cognitive Theory (SCT) explaining human behavior in the context of social learning. According to his initial conceptualization, an interaction between cognitive expectations of positive and gratifying outcomes and beliefs about self-efficacy in certain behaviors influences a person's behavioral choices (Bandura, 1986, 1989). SCT has been applied to various human phenomena, like the choice of health-promoting vs. damaging behaviors (Bandura, 1998; Van Zundert et al., 2009), media consumption (Katz et al., 1974), and Internet usage (LaRose, 2001; LaRose et al., 2001). Researchers applying SCT to substance use explain how social facilitative outcome expectancies and beliefs of low self-efficacy to self-regulate can facilitate substance consumption in certain social situations (Gilles et al., 2006).
In the context of Internet use, SCT assumes: (a) users actively seek out applications that fulfill or gratify particular needs and (b) self-reflective beliefs around one's efficacy and self-regulation capacities influence the nature of use (LaRose, 2001; LaRose et al., 2001). SCT highlights that goal-directed Internet consumption to obtain desired gratifications is based on personal standards, social norms, and psychosocial functioning. This reciprocal transaction between the self, society, and behavior forms the crux of SCT.

SCT researchers begin with identifying common Internet uses, then computing the frequency or importance of those uses among users, and finally treating the data using factor analysis to secure gratification factors that correlate with PIU. Song et al. (2004) identified seven gratifying effects of Internet use: Virtual Community, Information Seeking, Aesthetic Experience, Monetary Compensation, Diversion, Personal Status, and Relationship Maintenance. Stafford et al. (2004) identified three groups of Internet use gratifications: Process (related to online resources, search engines, surfing, technology), Content (related to education, information, learning), and Social (related to chatting, interacting, making friends).

Thus, the SCT model of uses-and-gratifications (U&G), until the early 2000s, focused on motivations underlying the choice of media use while failing to focus on the effects of media use (So, 2012). Also, U&G research did not consider the role of emotions in media use. Building on these lacunae, SCT-based models of Internet use started connecting motivations to functional outcomes and considering the role of emotions in PIU.

Pourrazavi et al. (2014), using the SCT approach, identified that: (a) higher self-efficacy to avoid problematic mobile phone use (MPU) decreased the chance of excessive mobile phone use (EMPU), and (b) poor self-control, positive attitude towards MPU, observing others overuse, and poor self-regulation predicted EMPU. Wegmann et al. (2015) reported psychopathologies (depression and anxiety) and gratifications experienced through relief from negative emotions as predictive of SNS addiction. Caplan & High (2007), adopting a cognitive-behavioral approach based on social-cognitive literature, explained how interpersonal problems predispose one to prefer online social interactions leading to maladaptive emotions, poor self-regulation, and other adverse psychosocial outcomes. SCT has also influenced comprehensive models of PIU built by Brand et al. (2014, 2016, 2019) that need extensive empirical testing.

The U&G research has not yet related cognitive and affective mentalizing to one's interpersonal and emotional needs offline, whose gratification one seeks through specific online activities. Decoding mentalizing domains and their related psychological functions within the context of U&G theory might contribute to understanding the distal and proximal mechanisms underlying problematic and non-Problematic Internet Use.

**A Mentalization-Based Conceptualization: Proposing Pathways to Social vs. Non-Social PIU**

So far, the two primary motivators of PIU highlighted are: (a) emotional (i.e., to cope with negative affect) and (b) social (i.e., to compensate for offline interpersonal deficits; Kardefelt-Winther, 2014a; Musetti et al., 2021). Developmentally, a person's socio-emotional functioning is influenced by their capacity to mentalize, a crucial reflective mechanism for inferring internal psychological states that guide behavior. As seen in the above sections, studies exploring mentalizing correlates and predictors of PIU are gaining impetus. However, interactions between the proximal motivations and distal developmental factors in the context of PIU have not yet been unified. Further, the possibility of differential psychosocial pathways leading to two variants of PIU: predominantly social vs. predominantly non-social, needs to be examined.

As discussed earlier, cognitive and affective mentalizing play crucial roles in interpersonal functioning by enabling one to connect behaviors to intentions, beliefs, and desires in self and others (Bateman & Fonagy, 2011). Likewise, an adequate ability to mentalize affect in self and others is necessary for affect regulation and empathy (Schwarzer et al., 2021; Shamay-Tsoory et al., 2010). Faulty decoding of internal states, in self and others, inadvertently makes affect regulation and interpersonal functioning difficult. Inter and intra-personal deficiencies are associated with SPIU and GPlU (Laier et al., 2018; Musetti, Corsano, et al., 2020). A unique qualitative exploration of IA/PIU, using a focus group approach, reported negative affective states (including sadness, depression, boredom, and stress) as triggers, and physical (including disturbed sleep and reduced exercise) and interpersonal problems as outcomes of PIU (Li et al., 2015). What might connect socio-emotional problems to Internet use problems are the positive expectancies one has from Internet use (Laier et al., 2018; LaRose et al., 2001). For example, certain individuals turn to online applications such as SVA to distract from emotional pain or turn to SNS to overcome experienced challenges of face-to-face interactions.
Reflecting on previously discussed PIU models, specific understandings have emerged. Pre-existing personality deficits have been hypothesized to interact with biological, psychological, and social-cognitive factors in predicting specific forms of PIU (e.g., Brand et al., 2016). Psychodynamic-oriented work has shown that mentalizing deficits embedded in early attachment wounds predispose one to emotion dysregulation and interpersonal problems leading to behavioral pathologies like PIU (e.g., Borghesi et al., 2022; Musetti, Brazzi, et al., 2020). Cognitive-behavioral theorists have contemplated the role of faulty cognitions like perceived lack of social support and social-skill deficits in developing a preference for online social interactions (Caplan, 2003, 2005; R. A. Davis, 2001). Social-cognitive models show how expectations of gratification from online applications, once obtained, increase the chances of frequent usage when coupled with faulty self-efficacy beliefs and deficient self-regulation (LaRose & Eastin, 2004).

The current authors take vital constructs of the proposed conceptual model from gaps in existing models. The new model collates psychosocial factors not previously tested as part of a unified framework. The model begins with mentalizing deficits that exist distally and develop through childhood and adolescence, resulting in emotional and interpersonal deficits reflected in habitual behavior patterns. However, these variables alone are not enough to explain PIU. Socio-emotional problems that give rise to unfulfilled needs lead to faulty choices of coping and managing unpleasant states via one of two routes: (a) an emotional route characterized by the overvaluation of negative emotional states leading to expressive suppression, emotional avoidance, escapism as coping strategies (Velotti et al., 2021), and (b) a social route characterized by the perception of low social support, the experience of social isolation, and loneliness leading to maladaptive behaviors to compensate for the social lacuna (Caplan, 2005, 2007). The authors hypothesize that the emotional route inclines one towards predominantly non-social and the social route to predominantly social Internet usage. They are not air-tight compartments; one might also exhibit mixed social and non-social use patterns. Thus, social-cognitive deficits could help one draw unique profiles of Internet users and understand the psychosocial mechanisms involved in PIU. When individuals exhibiting mentalizing deficits and unmet socio-emotional needs go online and experience short-term relief from their concerns, their behaviors get reinforced. Such gratifications and unrealistically high or low self-efficacy beliefs about one's ability to control online engagement become ingredients for PIU.

No single model to date has considered the differential role of mentalizing deficits in developing social vs. non-social types of PIU. Also, studying users' motivations in the context of socio-emotional deficits would explain why a person chooses a particular application and whether underlying psychological processes differ between GPIU and SPIUs (such as SNS, SVA viewing, binge-watching, and online shopping, among others). Based on the above discussion, a novel model, which is a testable integration of existing evidence, is schematically explained in Figure 1.

**Figure 1. Proposed Mentalization-Based Social-Cognitive Model of PIU.**

Note. (A) distal mentalizing deficits including poor RF, low cognitive empathy, and poor PT as developmental factors predisposing one to difficulties in interpersonal functioning and emotion regulation, causing (B) dissatisfaction of socio-emotional needs, which when combined proximally with expected gratifications from specific online activities and faulty self-efficacy beliefs, result in maladaptive Internet-use, predominantly social or non-social, as a means of compensating for or maladaptively coping with existing social or emotional difficulties respectively.
Conclusion

Any new technology developed with human progress in mind has the potential of being misused, thereby overriding positive impacts with negative ones. The Internet has not been an exception to this. A growing number of online applications have inflated the dependence on mobile phones, laptops, tablets, and other gadgets connected to the World Wide Web. An addiction to or on the Internet has been identified with caution. Researchers worldwide are increasingly acknowledging the Internet's pathological nature while being careful not to over-pathologize an everyday behavior. The emerging line of research is replete with addiction models being applied to PIU. There is a need for an entirely new line of research to develop psychosocial models unique to specific Internet use patterns. Internet users are often responding to underlying socio-emotional needs by projecting themselves into a virtual world. There are several implications for studying self-reflective functions in determining these behavioral choices, and the current article suggests one potential conceptualization. The implication of mentalizing in self-organization, agency, impulse control, affect regulation, and behavioral regulation places the multidimensional construct at the core of various behavioral pathologies. Strengthening one's ability to reflect and regulate thoughts, emotions, and behaviors might preserve one's mental health while engaging in online social or non-social activities.

Finally, a psychosocial yardstick for identifying individuals at risk of developing PIU might be developed by correlating social-cognitive functioning to biomarkers (i.e., observed structural and functional changes in the brain) and digital markers (i.e., Internet use patterns including duration, timings, and types of use) of PIU (Fineberg et al., 2022). Future research focusing on delineating psychosocial markers of PIU could help develop guidelines for safe and adaptive technology use in a world where the Internet has become an almost indispensable part of everyday life.

Conflict of Interest

The authors have no conflicts of interest to declare.

Authors' Contribution

Diya Chatterjee: conceptualization, methodology, investigation, resources, writing—original draft, writing—review & editing, visualization. Rishabh Rai: resources, writing—review & editing, supervision.

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References


He, Q., Turel, O., & Bechara, A. (2017). Brain anatomy alterations associated with social networking site (SNS) addiction. *Scientific Reports, 7*(1), Article 45064. https://doi.org/10.1038/srep45064


Ilzarbe, D., Lukito, S., Moessnang, C., O’Daly, O. G., Lythgoe, D. J., Murphy, C. M., Ashwood, K., Stoenecheva, V., Rubia, K., & Simonoff, E. (2020). Neural correlates of theory of mind in autism spectrum disorder, attention-


mediation model of problematic social media use among Italian young adults. *Journal of Clinical Medicine, 11*(1), Article 188. https://doi.org/10.3390/jcm11010188


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