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PLAINTIFFS' OMNIBUS OPPOSITION TO DEFENDANTS' MOTIONS FOR SUMMARY JUDGMENT

Chapter 2

Problematic internet use: causes, consequences, and future directions

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Adolescents have fully embraced digital technologies, utilizing social media almost daily and reporting that they are oftentimes constantly connected (Lenhart, 2015). Digital technologies enable various opportunities for adolescents, including quick communication at any time of the day, knowledge of leisure, school assignments, and entertainment. There is also a darker side to adolescents' involvement with digital technologies, including exposure to negative online situations, exposure to unwanted, gory, and sexually explicit content through videos, images, and text, identity theft, sexual predation, and cyberbullying (Smahel, Wright, & Cernikova, 2014). Problematic internet use (PIU) is another consequence associated with adolescents' digital technology use.

PIU is defined as the desire or compulsion for and use of the internet and/or other digital technologies characterized by symptoms of withdrawal (Young, 1998). The purpose of this chapter is to review multidisciplinary literature on PIU among adolescents, with a focus on cross-sectional, longitudinal, qualitative, quantitative, and mixed-methods research designs. The chapter is divided into eight major sections:

1. Trends in digital technology use—discusses the benefits and risks associated with digital technology use.
2. Description of behavioral addictions—outlines the current literature on the criteria of behavioral addictions.
3. Problematic internet use—defines PIU and describes the prevalence, characteristics, symptoms, and measurement of PIU.
4. Correlates of PIU—describes the predictors of PIU, including demographic, biological and genetic, behavioral, psychological, and social predictors.

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5. Consequences of PIU—explains the physical and behavioral, psychological and social, and academic outcomes of PIU.
6. Etiological models of PIU—discusses different models related to why adolescents develop PIU.
7. Recommendations for future research and practice—describes our recommendations for future research and practice, specifically what schools and parents should do about PIU.
8. Conclusion—provides concluding remarks about the state of the literature on PIU.

Trends in digital technology use: benefits and risks

The new era of digital technologies has impacted the lives of people of all ages and from around the world. Digital technologies have redefined work and career, social interactions and communication, and leisure time. Access to the internet through the use of high-speed connection has dramatically changed people's lives, triggering cultural change (Odlyzko, 2003). The increasing number of people connected to the internet has been triggered by the diminishing cost of cellular technology and hardware (Diamandis & Kotler, 2012). In developed nations, such as the United States, digital technologies saturation continues. Considering how quickly the world has become saturated with digital technology, it is not surprising that some people spend a lot of time interacting with these technologies (Newell, Pilotta, & Thomas, 2008). The United States has one of the largest online markets in the world, with more than 76.2% of the population accessing the internet, regardless of gender, though online use is much higher among demographic groups with higher income (The Statistical Portal, 2018). Furthermore, the United States ranks fourth in the Freedom House Index of 2017, suggesting that the population has more freedom in terms of online content. In the United States, 98% of adults between the ages of 18 and 29 access the internet daily, representing the age group with the highest internet use. All schools, primary and secondary schools, along with colleges and universities, have adopted high-speed internet access. Given adolescents from the United States spend an incredible amount of time engaged in online activities, it is important to focus on their online experiences as their experiences might impact their psychological, behavioral, and academic outcomes. Such a focus is incredibly important given the unique developmental context of adolescence.

The internet has afforded many opportunities in the lives of adolescents, including instantaneous access to online databases of information, social and entertainment media, and the ability to communicate with just about anyone at any time and in any location. Online content is also engaging the learning community, with an increasing desire to implement technologies to instill students with 21st-century skills (Voogt, Erstad, Dede, & Mishra, 2013). Studies have also found positive correlations between internet use for

academic purposes (e.g., research, reading, learning) and academic achievement (Kumar & Manjunath, 2013; Zhu, Chen, Chen, & Chern, 2011).

Despite these benefits associated with the internet and digital technology use, researchers, educators, and clinicians are concerned with the psychological risks and addictive potential of excessive internet and digital technology use among adolescents (Kuss, Griffiths, & Binder, 2013; Young, 1998). In the literature, problems associated with excessive internet use include depression, anxiety disorders, attention disorders, and obsessive behaviors (Huang, Wang, Qian, Zhong, & Tao,2007; Kuss et al., 2013; Weinstein & Lejoyeux, 2010). Researchers have recognized the direness of addressing the risks associated with excessive internet and digital technology use, although removing the internet and digital technology is not a feasible solution to mitigate these risks. The benefits of internet and digital technology use for adolescents outweigh abstinence of these technologies as a solution for reducing risks.

Description of behavioral addictions

Behavioral addiction is nonchemical, does not involve the consumption of substances, and was first described in the 1970s, gaining prominence during the 1980s and 1990s, due to attention being given to addictive behaviors, including gambling and videogame playing, exercise, eating, and sex (Griffiths, 1996; Marks, 1990). According to Griffiths (1996, 1998), behavioral addiction shares many of the same psychological, social, and cultural characteristics associated with substance addiction. Psychologically, both behavioral and substance addictions are reinforced by use and individuals acquire tolerance and experience dependency, withdrawal, and affective mood changes. Socially, both types of addiction are experienced by individuals, including adolescents, and result from comparable perceptions of what behaviors are deemed meaningful or due to the pursuit of similar lifestyles. Similar contextual factors are more prominent among certain groups of users when compared to other groups. Cultural perceptions of behavioral and substance addictions are comparable such that excessive use is deemed undesirable and something to be forbidden. Furthermore, cultural perceptions of these addictions involve the perception that users experience long-term negative consequences.

The terminology of "addiction" in the clinical field usually involves ingestion of chemicals or substances, such as alcohol or drugs (Griffiths, 1998). Debate among scholars exists concerning the classification of behavioral addiction as a "true" form of addiction (Erickson, 2007). The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) replaced "addiction" with "dependence," limiting the conceptualization to the involvement of substances only. Given the reclassification of the clinical perspective of addiction, the terminology of "internet addiction" might be considered inappropriate because it does not involve the ingestion of chemicals or

substances (Erickson, 2007). Internet addiction does not involve intoxicating drugs, is an impulse control disorder, and is defined as any online-related, compulsive behavior that interrupts normal living and contributes to stress in individuals' relationships and employment (Young, 2004). Internet addiction involves compulsive behavior that dominates an individual's life and results in the internet given priority over family, friends, work, and sometimes hygiene.

Despite this debate, some researchers argue for the need to reduce the strict clinical conceptualization of addiction by considering "behaviors" as a possible source of addiction (Griffiths, 1996; Holden, 2001). Indeed, the inclusion of gambling disorder as a behavioral addiction and the descriptions of Internet Gaming Disorder and Internet Use Disorder in the appendix of the DSM-V provide strong clinical legitimacy of these problems and highlights the international recognition of addictions, particularly internet addiction (Griffiths, 1998; Petry & O'brien, 2013).

Evidence from the field of neuroscience also provides justification for considering behavioral addictions. For example, functional magnetic resonance imaging of gamblers' brains showed brain activity and biochemistry similar to individuals with substance addiction and dependencies, suggesting that gambling can be addictive without ingesting any chemicals and that these behaviors can trigger neural activities just like chemicals do (Holden, 2001; Ko et al., 2009). Numerous neuroimaging studies have shown similarities in brains of individuals with behavioral and substance addiction, specifically concerning molecular (e.g., decreased dopaminergic activity), neuroadaptive (e.g., structural changes in the brain), and cognitive (e.g., behaviors constricted to similar areas in the brain) correlates (Kuss & Griffiths, 2012). The debate between the strict clinical perspective on addiction and the expanded concept of addiction has led to the development of different terms for internet addiction, such as *excessive internet use, maladaptive internet use, and internet overuse*, with no consensus on an accepted terminology (Beard, 2005; Caplan, 2010; Davis, Flett, & Besser, 2002; Whang, Lee, & Chang, 2003).

Problematic internet use

This chapter employs the term of PIU because it is less controversial and is a broader term encompassing excessive attachment to the internet and specific uses of the internet, including chatting, gaming, online pornography, shopping, gambling, and social media, which increases psychological and emotional distress and interferes with individuals' daily life (Griffiths, 1996; Kuss et al., 2013; Young, 1998). Among adolescents and adults in India, Goel, Subramanyam and Kamath (2013) found that 74.5% of their sample ($n = 987$) were moderate users of the internet, 24.8% were classified as possible addicts, and 0.7% were classified as addicted. In a more recent study,

Sinkkonen, Puhakka, and Merilainen (2014) found that 14.3% of the 475 Finnish adolescents and adults in their sample were normal users of the internet, 61.5% were mild overusers, 22.9% were moderately addicted, and 1.3% were seriously addicted. Differences in prevalence rates are attributable to the sample, sampling techniques, measurement of PIU, and potentially country of origin (Byun et al., 2009).

PIU emerged as a new disorder in 1996 and is conceptualized as an addiction that does not involve the use of intoxicants (Griffiths, 1996; Young, 2004). The behaviors of PIU might include short-term rewards for users and can result in persistent effects, although often users acknowledge and are aware of adverse effects (Grant, Potenza, Weinstein, & Gorelick, 2010; Griffiths, 1996). Individuals with PIU might prefer online social interaction over face-to-face interactions, spend time online for mood regulation, experience cognitive preoccupation with internet use, and have an inability to regulate or adjust their internet use (Caplan, 2010). Researchers have concluded that excessive use of the internet might be a medium to decrease boredom, reduce feelings of loneliness and sadness, boost morale, increase mood, and/or avoid face-to-face contact (Kuss, Griffiths, Karila, & Billieux, 2014). When confronted with the excessive amount of time they spend online, individuals with PIU might display resentment, anger, and rage.

There are five subtypes of PIU, including (1) cyber sexual addiction (i.e., excessive use of adult websites to view cyberporn and/or engage in cybersex), (2) cyber-relationship addiction (i.e., excessive amount of online relationships and/or obsesses about making online relationships), (3) net compulsions (e.g., online gambling, shopping, or day-trading done at an obsessive rate), (4) information overload (i.e., compulsion to surf the internet or search databases), and (5) computer addiction (i.e., playing computer games at obsessive rates; Young, 1999). Classified as a behavioral addiction disorder, PIU can also be classified as an impulse control disorder. Similar to impulse control disorder, PIU develops during adolescence or young adulthood, affects individuals from different cultures and geographical areas, and can be persistent across the lifespan, resulting in negative psychological, emotional, behavioral, and academic outcomes (Young & de Abreu, 2012). Research suggests that PIU is associated with functional impairment uniquely and independently from other psychopathological conditions in both cross-sectional and longitudinal research studies (Tokunaga, 2015). Therefore PIU is conceptualized as a genuine condition and distinctive from the consequences of another underlying and/or psychopathological condition, suggesting the need for diagnostic criteria of PIU.

Measurement of problematic internet use

The literature on PIU includes various proposals for diagnostic criteria and PIU screening tools, focusing mostly on diagnosing PIU in adolescents and

adults, usually young adults of college age (ages 18–25; Beard, 2005). Various problems exist for diagnosing PIU, including a lack of standard definitions, clear clinical evidence supporting criteria for PIU, and clinically validated scales with comparable cutoff points; these problems make it difficult for researchers and clinicians to estimate the prevalence rates of PIU. One of the first screening tools developed for PIU is Young's *Internet Addiction Diagnostic Questionnaire* (IADQ; Young, 1998). This questionnaire includes eight criteria and considers nonessential use of both the internet and computers. The screening tool has been validated in multiple samples from different geographical regions (Gong, Chen, Zeng, Li, Zhou, & Wang, 2009; Yang & Tung, 2007). The *Internet Addiction Test* (IAT) was developed for adults and is a widely used scale (Young, 1998). This instrument includes 20-items, rated on a 5-point Likert scale and asks participants about the frequency of their recreational use of the internet during a period of 1 year. Scores are summed, with higher scores indicating greater severity of internet compulsivity and addiction. Patterns of symptomatic complaints include salience, excessive use, neglect of work, anticipation, lack of control, and neglect of relationships or social life. These symptoms correspond to the criteria for diagnosing pathological gambling in the DSM-IV. The IAT has been validated, as well as adapted, to include 12-items and four categories of PIU severity, including normal, mild, moderate, and severe (Pawlikowski, Altstoetter-Gleich, & Brand, 2013; Widyanto & McMurran, 2004). Other validated PIU scales include *Pathological Internet Use Scale* (Morahan-Martin & Schumacher, 2000), the *Internet Related Problem Scale* (Armstrong, Phillips, & Saling, 2000), the *Internet Addiction Scale* (Nichols & Nicki, 2004), and the *Internet Over-Use Scale* (Jenaro, Flores, Gomez-Vela, Gonzalez-Gil, & Caballo, 2007).

Most of these screening tools for PIU include preoccupation, regulation problems, functional and social impairment, and experiences, suggesting tolerance or withdrawal, with some instruments including secretive uses and the role of internet use in distraction from daily life (Armstrong et al., 2000; Davis et al., 2002; Young, 1998). The screening tools described thus far have been validated exclusively with adolescents and adults and in one culture, except for the IADQ, and do not consider the use of various data collection methods, such as online administration.

Koronczai et al. (2011) described the six basic requirements for assessing PIU, including (1) comprehensive by examining all aspects of PIU, (2) concise as possible such that the survey is time-limited, (3) reliable and valid for different methods of data collection (e.g., online, face-to-face), (4) appropriate for different age groups, such as for both adolescents and adults, (5) appropriate in different cultural settings, and (6) incorporate cutoff scores. The *Problematic Internet Use Questionnaire* (PIUQ) addresses several of the six criteria described by Koronczai et al. (2011). As a comprehensive measure of PIU, the PIUQ considers obsession (i.e., obsessive thoughts regarding

the internet and withdrawal symptoms when not using the internet), neglect (i.e., failing to attend to basic needs and everyday activities), and control disorder (i.e., difficulties with regulating or controlling internet use). The PIUQ has reliable factor structures and is validated with different data collection methods on adults and adolescents (Demetrovics, Szeredi, & Rozsa, 2008; Koronczai et al., 2011).

Correlates of problematic internet use

Along with understanding the prevalence of PIU, some researchers have focused on the variables associated with PIU. Given the number of correlates associated with PIU, this section is organized into demographic correlates, followed by biological, behavioral, psychological, and social correlates.

Demographic correlates

Older, male adolescents and young adults were more likely to compulsively use the internet than younger, female adolescents and adults (Bakken, Wenzel, Gotestam, Johansson, & Oren, 2009; Durak & Senol-Durak, 2014). The individuals who reported the highest levels of PIU in one study were adolescents (Goel, Subramanyam & Kamath, 2013). These individuals with highest levels of PIU reported that the technology of their most excessive use was social networking websites. Other research has revealed that there are twice as many adolescents affected by PIU when compared to children and adolescents between the age of 9 and 17 (Kwon, 2011).

Biological and genetic correlates

Few studies have focused on the genetic correlates of PIU. In one study on this topic, Lee, Han, Kim, and Renshaw (2013) found that adolescents diagnosed with PIU had genetic polymorphisms of the serotonin transporter gene when compared to healthy control adolescents. They also found that PIU was associated with higher frequencies of the long-arm allele. The conclusion of this study was that adolescents with PIU had similar genetic and personality traits to depressed adolescents and adults. Brain areas associated with general reward sensitivity are activated in adults with PIU (Dong, Lu, & Zhao, 2011). Although studies on the biological correlates of PIU are in its infancy, there are a handful of studies linking sleep patterns and PIU. For example, sleeping difficulties, specifically insomnia, snoring, sleep apnea, nightmares, and difficulty staying awake during the daytime were related to PIU among adolescents (Choi et al., 2009).

Behavioral correlates

Research studies regarding the associations between attention deficit/hyperactivity disorder (ADHD) and PIU have revealed that ADHD is associated with PIU among adolescents, along with problematic alcohol use (Ko et al., 2009). In addition, greater self-harm tendencies among adolescents and adults were found to be related positively to PIU (Bakken et al., 2009; Lam, Peng, Mai, & Jing, 2009; Montag, Jurkiewicz, & Reuter, 2010). Another study focused on the association of internet-related behaviors and the development of PIU. In a longitudinal study of 663 adolescents (12–15 years old) from the Netherlands, van den Eijnden, Meerkerk, Vermulst, Spijkerman, and Engels (2008) found a positive relationship between the use of internet applications in real-time conversations (e.g., instant messenger, chat rooms) and PIU 6 months later. Increases in using the internet privately were related to higher levels of PIU among German adolescents and adults, between the ages of 14 and 63 (Guertler, Rumpf, Bischof, & Kastirke, 2014). Research among adolescents with PIU also indicated that time spent on leisurely internet activities is linked positively to PIU (Bakken et al., 2009; Montag et al., 2010).

Psychological correlates

Ample research attention has been given to the psychological correlates of PIU among adolescents. High levels of anxiety and depression, feeling sad, low self-esteem, poor social skills, social phobias, and higher levels of shyness were found to be related to higher levels of PIU among adolescents (Armstrong et al., 2000; Caplan, 2002; Meerkek, van den Eijnden, Franken, & Garretsen, 2010). Young (1998) explains that PIU involves an impulse control problem. As an impulse control problem, PIU involves the inability to resist the impulse, desire, and temptation to avoid excessively using the internet, even if it causes harm to oneself. Self-control might be an important indicator of PIU. Research evidence links low levels of self-control to PIU and that self-control was more strongly associated with PIU (Kim, Namkoong, Ku, & Kim, 2008; Li et al., 2013).

Higher self-control and resiliency were negatively associated with PIU among adolescents (Li et al., 2013; Nam, Lee, Lee, & Choi, 2018; Park, Kang, & Kim, 2014). Furthermore, higher levels of hostility and impulsivity were associated with PIU (Bakken et al., 2009; Montag et al., 2010). Lower meaning of life was linked to higher levels of PIU and lower self-efficacy. Other research has focused on the linkage between PIU and sexual behaviors among adults. In this research, a higher level of online pornography consumption is associated with PIU (Meerkerk et al., 2006). In particular, they found that adults who spent large amounts of time searching for sexual stimuli online were more likely to have higher levels of PIU 1 year later than

those who did not. These findings were also replicated in a sample of adolescents (Tsitsika et al., 2009).

Social correlates

Many of the studies on the social correlates of PIU focus on adolescents as well. This research has revealed that PIU is often associated with insecure attachment style, parental use of psychological control, strict parental rules, poor quality parent-teen communications about internet use, weakened family unit, and higher levels of parent–adolescent conflict and family conflict (Kuss et al., 2014; Park et al., 2014; van den Eijnden et al., 2008; Yen, Yen, Chen, Chen, & Ko, 2007). Research has also focused on the role of parent–children relationship quality and its relationship to PIU. Taiwanese adolescents ($n = 555$) with lower-quality relationships with their parents were more likely to engage in PIU (Liu & Kuo, 2007).

Research on the role of peers in adolescents' PIU is developing. Much of this literature focuses on the relationship between peers' internet use and PIU, with the belief that peer pressure to excessively use the internet will increase PIU among adolescents (Liu & Kuo, 2007). Ballarotto, Volpi, Marzilli, and Tambelli (2018) found that peer attachment was unrelated to adolescents' internet abuse. Contradictory finding exists regarding the relationship between friendship quality and PIU. In one study, friendship quality and peer acceptance were not predictive of internet addiction (Zhou, Cao, Li, & Zhang, 2018). However, research by Willoughby (2008) indicated that higher friendship quality predicted higher PIU. Considering the conflicting findings regarding peer correlates of PIU, more research is needed to better understand the role of peers in adolescents' development of PIU.

Consequences of problematic internet use

Given the variety of consequences associated with PIU, this section is organized in the following order: Physical and behavioral, psychological and social, and academic outcomes.

Physical and behavioral outcomes

Physical *and behavioral* symptoms of PIU include developing Carpal tunnel syndrome (i.e., condition characterized by squeezing or compressing nerves that cause pain, numbness, and tingling), weight gain or weight loss, headaches, neckaches, back problems, and dry and red eyes. PIU is also associated with unhealthy patterns in routine activities, such as bedtimes and diet, among adolescents (Lam et al., 2009). Research has revealed that PIU is linked to sleep issues among adolescents, such as insomnia, snoring, apnea, teeth grinding, nightmares (Choi et al., 2009), and poor sleep quality

(Nalwa & Anand, 2003). Furthermore, PIU was related positively to lifetime smoking, lifetime marijuana use, other drug use, aggression, getting into serious fights, and carrying a weapon among adolescents (Liu, Desai, Krishnan-Sarin, Cavallo, & Potenza, 2011).

Few cross-sectional and longitudinal studies have been conducted on the negative physical outcomes associated with PIU. In one study on this topic, adolescents and adults with PIU exercised at lower rates when compared to adolescents and adults without PIU (Li, O'Brien, Snyder, & Howard, 2016). PIU was positively associated with sleep disturbances (i.e., insomnia, fragmented sleep, premature awakening) 1 year later (Thomee, Eklor, Gustafsson, Nilsson, & Hagberg, 2007; Thomee, Harenstam, & Hagberg, 2011).

Psychological and social outcomes

For adolescents unable to regulate their online activities, the use of technologies can lead to adverse effects on self-esteem, psychological well-being, problems in family relationships, and quality of family and social relationships (Kuss et al., 2013; Nalwa & Anand, 2003; Stieger & Burger, 2010). Furthermore, Indian adolescents with higher levels of PIU self-reported higher levels of depression and anxiety (Goel, Subramanyam & Kamath, 2013). Chinese adolescents reported greater pathological issues and loneliness when they had higher levels of PIU (Cao, Sun, Wan, Hao, & Tao, 2011). Sinkkonen et al. (2014) found that PIU increased Finnish adolescents' reliance on online life and diminished their self-control and preference for real-life social relationships. In addition, Mexican adolescents with higher rates of PIU reported that they had difficulties regulating their mood and their self-regulation of online activities (Gamez-Guadix, Villa-George, & Calvete, 2012). These adolescents also had difficulties managing their daily life. Furthermore, adolescents with PIU self-reported higher levels of victimization (Kuss et al., 2013).

Wang and Qi (2017) found that harsh parenting indirectly contributed to PIU among adolescents through the mediator of adolescents' emotional dysregulation. In addition, they found that forgiveness moderated the indirect relationship of harsh parenting to PIU through emotional dysregulation, with lower levels of forgiveness having the most impact. In another study with adolescents, Li and colleagues (2010) found that effortful control buffered against the risk of maladaptive cognitions for PIU. In another study, Park and colleagues (2014) examined found that self-esteem was a mediator and self-control was a moderator in the relationship between adolescents' social relationships and PIU.

Much of the research reviewed in this section so far are cross-sectional, although longitudinal designs are yielding similar patterns of results to cross-sectional designs. For example, the link between PIU and depression and anxiety has been replicated in longitudinal studies as well and with

adolescent samples (Dong et al., 2011). Dong et al. (2011) found that higher rates of PIU among adolescents was associated with higher rates of depression, anxiety, and hostility 1 year later, after controlling for previous levels of depression, anxiety, and hostility.

Academic outcomes

Adolescents with PIU were more likely to have academic problems compared with unaffected adolescents (Nalwa & Anand, 2003; Sfieger & Burger, 2010). In addition, Sinkkonen et al. (2014) found that PIU increased Finnish adolescents' neglect of schoolwork. Furthermore, adolescents with PIU have greater absenteeism in school and declines in official and self-reported grades (Austin & Totaro, 2010; Lin, Ko, & Wu, 2011). Not only did Marin Vila and colleagues (2018) find that adolescents with PIU had lower test scores, but they also had failed more classes when compared to adolescents without PIU. Li et al. (2013) were interested in examining whether deviant peer affiliation mediated the relationship between school connectedness and PIU, and whether adolescents' self-control moderated the indirect association between school connectedness and PIU. They found that the relationship between school connectedness and PIU was partially mediated by deviant peer affiliation and that the indirect link was stronger when adolescents had lower self-control.

Etiological models of problematic internet use

In this section, models will be described to explain the relationship between PIU and the consequences of PIU.

Impulse control disorder model

Young (2004) proposed the impulse control disorder model. She explained that individuals who suffer from PIU have similar symptoms as those individuals who suffer from pathological gambling and the dependency on alcohol and drugs. Considering PIU as a type of impulse control disorder suggests that PIU involves pathological PIU. To further conceptualize PIU as an impulse control disorder, Shapira, Lessig, Goldsmith, and Szabo (2003) explained that PIU is uncontrollable, markedly distressing, time-consuming, or resulting in social, occupational, or financial difficulties, and not the result of hypomania or manic symptoms. Using the DSM-IV criteria, Shapira and colleagues classified 17 of the 20 adults in their study as having an impulse control disorder not otherwise specified. The other three adults met criteria for obsessive-compulsive disorder. Because of these findings, Shapira et al. concluded that PIU is characterized by unspecified impulse control disorder than obsessive-compulsive disorder. Similar results were found by Treuer,

Fabian, and Furedi (2001). They met the criteria for impulse control disorder, including an urge to be online if the internet is not available, thoughts that a world without the internet was dull and empty, daytime fantasies about internet use, nervousness when the internet connection is slow, depressive mood and guilty feelings after using the internet for prolonged periods, and aggressive behaviors when their use of the internet is interrupted. As a consequence of these findings, Treuer et al. argued that PIU should be considered a new subtype of impulsive control disorder. Ultimately, proposing that PIU is a type of impulsive control disorder suggests that individuals take risky actions not because they are seeking risky reward but because they have an inability to foresee such risks (Shapira et al., 2003).

Cognitive-behavioral model

According to the cognitive-behavioral model for understanding the etiology of PIU, PIU occurs from problematic cognitions as well as behaviors that intensify or maintain maladaptive responses (Davis, 2001). Davis (2001, 2002) proposed the cognitive-behavioral model, and he categorized individuals with PIU into two groups. The first group is drawn to the internet for specific services or contents, called specified problematic internet users; the second group is attracted to the internet itself, called generalized problematic internet users. According to Davis, generalized problematic internet users are more vulnerable to internet-related problems as they are unable to stop using the internet regardless of the services or content. Specified problematic internet users are able to stop using the internet because they are able to find alternative sources of content. Davis distinguishes between these two groups because specific pathological internet use involves individuals engaging in activities that are commonly conducted offline as well as online, suggesting that they are "addicted on the internet" versus "addicted to the internet" (Davis, 2001; King, Haagsma, Delfabbro, Gradisar, & Griffiths, 2013). Generalized pathological internet use is characterized by engaging in behaviors that occur only online.

In his model, Davis (2001) suggests that psychopathology is present or has previously occurred. Although he states that the underlying psychopathology is not a symptom of PIU, it is important for understanding the development of PIU; consequently, the symptoms specifically associated with PIU should be investigated independently of the psychopathology. The use of the internet does not mitigate the symptoms of the underlying psychopathology and instead is a contributory factor for triggering the process of PIU. Reinforcement from stimuli, such as the tactile sensation of typing on a keyboard, has a role in the development of PIU and contributes to the maintenance of the associated symptoms. Rumination is also a feature of PIU and can involve constantly trying to figure out why one is overusing the internet, reading and researching PIU, and talking to friends about overusing the

internet. Another way an individual can ruminate involves the individual recalling reinforced memories about the internet, leading to the maintenance of the cycle of PIU. Furthermore, Davis suggests that internet services, including gambling, pornography, and shopping, involve the same services offline which people become addicted.

Caplan (2002, 2010) expanded Davis's research by integrating research on interpersonal communication in face-to-face settings with interpersonal computer-mediated communication. He integrated his own research on online social interaction and the socio-cognitive model of unregulated internet use (Kim, LaRose, & Peng, 2009; LaRose, Lin, & Eastin, 2003). The revised cognitive-behavioral model of PIU includes four core components, including preference for online social interaction, mood regulation, deficient self-regulation, and negative outcomes (Caplan, 2010). The preference for online social interactions is defined as the belief that one is safer, more efficacious, and more confident with engaging in online interpersonal interactions than face-to-face interactions. Caplan proposed that the preference for online social interaction explains why some individuals exhibit cognitive and/or behavioral indicators of PIU, including using the internet to regulate mood and failure to regulate their use of the internet. In Caplan's (2002) research on this topic, he found that adults with higher social anxiety and low social support had higher preferences of online interpersonal interactions because they considered the online environment safer and more comfortable than face-to-face interactions. Another component of this model is the motivation to utilize the internet to diminish distressing feelings for mood regulation (Kim et al., 2009; LaRose et al., 2003). The use of the internet for mood regulation is linked to the failure to monitor the use of the internet, resulting in behavioral symptoms and ultimately in negative outcomes (Caplan, 2010).

Empirical support has been found for the basic tenets of the cognitive-behavioral model. Research evidence suggests that compulsive use is a core principle of PIU and that preference for online social interactions is linked to higher incidences of PIU (e.g., Caplan, 2010; Fioravanti, Dettore, & Casale, 2012; Kim et al., 2009; van den Eijnden et al., 2008). Furthermore, researchers have found that mood regulation was a predictor of the negative consequences related to PIU, especially when cognitive preoccupation is increased (Caplan, 2002; Caplan & High, 2006; Gamez-Guadix et al., 2012).

Recommendations for research and practice

One of the biggest gaps that is clear from this review of the literature is the lack of longitudinal studies regarding the implications of PIU. Follow-up research with longitudinal designs is needed to better understand the temporal ordering of PIU, its correlates, and consequences. Studies also need to follow adolescents when they are young children and just start utilizing

digital technologies. This design will allow for a better understanding about the potential risks associated with developing PIU during adolescence. A lot of the research also focuses on the individual risk factors associated with PIU, with little attention to the contextual predictors. More attention to the role of parents/family, peers, and schools is needed to understand how these contexts might mitigate or exacerbate PIU.

It is critical that digital skills program not only includes units on negative online interactions, such as cyberbullying, cyberstalking, and cyberhate, but such programs should also increase adolescents' awareness of the problems associated with PIU. These programs should explain how to recognize the symptoms of PIU and discuss appropriate use of digital technologies.

Moderation should be discussed in these programs, as abstaining completely from digital technologies does not train adolescents on how to use technology for an appropriate amount of time. Parents should also receive training for increasing their awareness of PIU, in order to recognize the symptoms associated with PIU. Being able to recognize "red flags" concerning digital technology overuse could help them mitigate negative outcomes associated with PIU, as well as seek treatment for their child sooner rather than later. Parents could also plan "no digital technology" days in their households in which parents also disengage from technology. Modeling such behaviors might help adolescents to diminish their use as well.

Educational teams, including principals, teachers, and counselors, should also be informed and gain knowledge about PIU. A strong cooperation is needed with parents and knowledge about the symptoms of PIU. School staff may help school administrators and teachers identify "red flags" and receive treatment for any adolescents affected. Furthermore, schools should also encourage moderation of technology use in their assignments. Excessive amount of assignments which utilize digital technologies or assignments that require large amounts of time online should be diminished. If this is not possible, it might be better for segments of the assignments to be completed at school in which teachers and school staff (e.g., librarians) can better monitor adolescents' use of digital technologies.

Conclusion

The purpose of this chapter was to review literature on PIU among adolescents by discussing the literature on behavioral addictions and the correlations and outcomes associated with PIU. We also provide recommendations for future research, prevention, intervention, and public policy. There are still gaps in the literature on PIU. Much of the research is cross-sectional, and longitudinal designs might provide a better understanding of the temporal ordering of the correlates and outcomes of PIU among adolescents. Future research should also aim to consider the contextual predictors of PIU, especially the role of parents, schools, peers, and communities.

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