A Brief Review of Addictive Tendencies Related to Technology Use: Conceptualization, Treatment, and Future Directions

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Abstract

Addictive tendencies relating to technology use entail the overuse and misuse of physical and digital devices to the point of maladjustment. Such tendencies, which can arise from video game use, mobile phone use, Internet use, and media streaming/television use, have major implications regarding people's physiological and psychological states. Although prior research helped with the conceptual and empirical understanding of technology use, these had major limitations. Such limitations included inconsistent terminology (e.g., technology use disorder versus technological addictions), a lack of standardized criteria to diagnose or recognize addictive tendencies of technology use, differences in methodology (e.g., longitudinal studies, experimental studies, case studies, correlational studies), and construct proliferation (e.g., smartphone addiction, young adult attachment to phone). In addition, little research has been conducted regarding the effectiveness of treatments (e.g., psychopharmacological treatments) for tendencies of technology use. Studies regarding treatment efficacy have primarily been limited to case studies with small sample sizes. Ultimately, it is recommended that researchers form a unified front to address these addictive tendencies through consistent theoretical models, research, and criteria.

Keywords: technology use, video games, mobile phones, Internet, addictive behavior, mental health

Introduction

Technology has long served as a vital aspect of human existence, from the invention of the wheel to the Industrial Revolution. In present times, technology exists in everyday life with video games, the Internet, and mobile phones used by millions (Kuss & Billieux, 2014). Although aspects of technology have noted benefits, such as increasing happiness, it can also be addictive and contribute to psychological maladjustment (Davis & Pimpleton-Gray, 2017). Recent theory and research have addressed addictive tendencies related to technology, once referred to as technological addictions (Griffiths, 1995). This is one type of non-substance-related addictive tendencies, occasionally featured in journals such as *Journal of Behavioral Addictions* and *Addictive Behaviors* (e.g., Kuss & Billieux, 2014; Young, 2013).

However, debates are ongoing regarding the degree to which addictive tendencies of technology use should be addressed. For example, the scientific community had mixed reactions when the American Psychiatric Association (APA, 2013) proposed Internet gaming disorder as a condition for further study in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). This was also the case for the scientific community and the gaming community when the World Health Organization (WHO, 2018) established gaming disorder as an official diagnosis for inclusion in its upcoming revision of the International Classification of Diseases (ICD-11). Much of the controversy addressed by both communities involve broad criteria, inconsistent data, and the risk of marginalizing gamers via misdiagnosing and excessively diagnosing (Aarseth et al., 2017; Chen, 2018; Sarkar, 2018). Such concerns were intended to raise awareness that not all instances of technology use are problematic. Additionally, little research has been conducted to observe the impact and effectiveness of treatments for addictive tendencies of technology use that warrant clinical concern; this is especially the case for psychotropic medications, with prior research primarily limited to a few case studies of individuals with addictive tendencies toward Internet use and video games (Huang, Li, & Tao, 2010).

The purpose of this conceptual paper is to provide a brief overview of prior research regarding the potential effects of technology use on people's psychological and physiological processes (e.g., addictive tendencies). It is also important to recognize the lack of consensus on methodological approaches, clinical treatments, and societal implications within the study of technology use. This discourages the use of a meta-analysis at this time. Instead, it is a critical time to ask important questions about this matter. Should one distinguish between addictive tendencies related to technology and a formal diagnosis of technology use disorder? Where should one draw the line between the two when considering "persistent and recurrent...behavior leading to clinically significant impairment or distress?" (APA, 2013, p. 585). What types of technology should be considered? What types of treatments would be of benefit to people with such tendencies? It is paramount to ask these questions while reflecting on prior theory and research related to addictive tendencies of technology use.

Addiction, Addictive Behaviors, and Addictive Tendencies

Historically, the concept of addiction has been traditionally studied in the context of substance use (Glickstein, 2017). Although it has been referred to by different names (e.g., addiction, addictive behaviors, addictive tendencies), the phrase "addictive tendencies" will mostly be used in this conceptual paper. It has been described as creating emotional highs, misguided logic, and predictable behaviors that entail the avoidance of issues such as stress (Goeders, 2009; Nakken, 1996). Physiological features have also been researched, such as the

impact of substances (e.g., alcohol) on the brain (Crombag & Robinson, 2009). For example, such substances commonly share the characteristic of activating the brain's reward neural circuitry when excessively used (APA, 2013; Koob & Moal, 2005). The impact of withdrawal from said substances is also of great interest to researchers and clinicians (Baker, Japuntich, Hogle, McCarthy, & Curtin, 2009; Garb, 2010).

Substance Use Disorders and Non-Substance-Related Disorders

In the context of clinical diagnoses, the DSM-5 recognizes 10 classes of substances (e.g., opioids) that can contribute to the presence of substance-related and addictive disorders; the APA intentionally refrained from using the word "addiction" due to its negative connotation (APA, 2013). The diagnostic criteria address issues related to "impaired control, social impairment, risky use, and pharmacological criteria" (APA, 2013, p. 483). With impaired control, people may spend a substantial amount of time obtaining a substance while also regretting it and attempting to refrain from it. With social impairment, people's obligations within society (e.g., work) and their miscellaneous activities may be unfulfilled and abandoned because of substance use. Likewise, their interpersonal relationships may be impeded by their substance use. With risky use, physiological and psychological issues may arise due to persistent substance use and dangerous ways in which a substance is used. With pharmacological criteria, issues related to tolerance and withdrawal may arise due to extended substance use (APA, 2013).

In contrast, the DSM-5 officially recognizes just one non-substance-related disorder because it deemed current data on the matter to be adequately consistent: gambling disorder (APA, 2013). It features certain diagnostic criteria comparable to that of substance use disorders; interpersonal relationships can be impeded (i.e., social impairment), and restlessness and irritability can arise when attempting to quit (i.e., impaired control). However, in contrast to requiring broad issues related to interpersonal relationships, gambling disorder includes criteria that specifically involves risking or losing relationships or jobs. Furthermore, it requires that gambling behaviors not be part of or better explained by a manic episode (APA, 2013).

Conceptualization of Addictive Tendencies Related to Technology Use

Despite much progress being made within research on addictive tendencies, there is continued debate regarding its focus. This includes the focus of addictive tendencies beyond the scope of formal diagnoses (Ingersoll & Rak, 2016). In addition to non-clinical studies of gambling (Grant, Potenza, Weinstein, & Gorelick, 2010; Taormina & Chong, 2015), various academic journals feature research studies that address addictive behaviors not formally recognized as disorders. This includes within the context of technology use.

Clinical and Non-Clinical Paradigms

In modern times, interest in research regarding the overuse and misuse of technology has increased. Broad umbrella phrases created by researchers have attempted to capture this concept. This includes technological addictions (Griffiths, 1995) and technology use disorders (Laboratory for Experimental Psychopathology, 2018). Broadly, addictive tendencies relating to technology use entail interacting with physical and digital devices in ways comparable to that of substance use and gambling. Such tendencies include salience,

euphoria, tolerance to excessive amounts of time with technology, and withdrawal when time cannot be spent using technology (Griffiths, 1995; Nakken, 1996).

It should be noted, however, that there is no formal recognition of technology use as an all-encompassing clinical diagnosis that addresses addictive tendencies relating to technology in general. Furthermore, not all instances of technology use are maladaptive and of clinical concern. Nonetheless, it may be of interest to broadly consider examples of how the substance-related and addictive disorders' diagnostic criteria (APA, 2013) may present within the context of maladaptive technology use. Impaired control could potentially contribute to individuals struggling to curb their technology-related spending (e.g., microtransactions in video games; King & Delfabbro, 2019), as well as struggling to be without such technology for extended periods of time (e.g., nomophobia; Yildirim & Correia, 2015). Social impairment may potentially contribute to individuals being unable to communicate with others in-person or ignoring those around them in favor of technology (e.g., phubbing; Balta, Emirtekin, Kircaburun, & Griffiths, 2018). Risky use may include using technology while in dangerous situations (e.g., playing on the mobile phone app *Pokémon GO* while driving; Faccio & McConnell, 2018). Finally, pharmacological concerns may contribute to increases in obesity and decreases in sleep as a result of keeping more food nearby during prolonged technology use (e.g., within children and adolescents; Robinson et al., 2017).

However, these relationships are limited in scope and may be more correlational than causal. Nonetheless, although the literature is still fairly new and exploratory in nature, possible demographic trends and potential predictors have been observed. For example, the results of one study suggested that addictive tendencies of Internet use (i.e., "Internet addiction") may present more often in people who report higher scores of external loci of control and shyness. This may also be the case for full-time college students, due to open access and time management issues (Chak & Leung, 2004). Furthermore, younger age and a male gender identity have been observed as potential demographic predictors of higher addictive tendencies of video game use (i.e., "Internet gaming disorder"). Higher tendencies of depression, social isolation, impulsivity, and attention problems may also relate, as do decreases in gray matter (Petry, Rehbein, Ko, & O'Brien, 2015). This is further supported in other research that has suggested addictive tendencies of video game use, Internet use, and mobile phone use all significantly predict decreases in social connectedness (Savci & Aysan, 2017). Lastly, various samples in different countries have been studied and have found comparable addictive tendencies (e.g., Shao et al., 2018). However, as mentioned previously, further research must be conducted.

Types of Technology Use

Ultimately, there is an inadequate amount of consistent theory, research, and application regarding the topic of technology use. This has resulted in contentious debates about the matter (e.g., Aarseth et al., 2017). Despite such concerns, gaming disorder (i.e., addictive tendencies specifically relating to video game use) is an expected addition to the upcoming ICD-11 (WHO, 2018). Reflecting on different types of technology that have been subjected to the potential of addictive tendencies may help steer the dialogue within debates on the matter. Examples of potential sources that warrant consideration include video games, the Internet, mobile phones, and video streaming/television. Given the differences between these pieces of technology, it is important to examine theoretical backgrounds and empirical research relating to each.

Video Game Use

Video games as a mainstream aspect of society emerged during the 1970s with the introduction of the game *Pong* on home video game consoles. Since then, video games have appeared in the homes and pockets of millions of people (Smithsonian Institute, n.d.). Anecdotally, gaming increasingly became accepted and valued by the public; in recent years, some parents have hired tutors to improve their children's game play in hope of increasing college scholarship and e-sport career opportunities (e.g., the video game *Fortnite*; Fagan, 2018). Video games have also inspired the creation of digital communities within media platforms (e.g., YouTube channels, Twitch livestreaming) that are dedicated to watching people play games (Bowles, 2018; Sjöblom & Hamari, 2017). Some people have even found love as a result of online game play (Smith, 2010).

Positive effects of gaming have also been empirically researched, although such research has been overshadowed in comparison to research on negative effects (Segev et al., 2016). For instance, prior research investigated whether playing video games correlate to increases in tendencies of hyperactivity/inattention and low self-esteem (Wartberg, Kriston, Zieglmeier, Lincoln, & Kammerl, 2018). Video games have also been studied in the context of aggression, with some researchers observing potential neural markers of desensitization to violence in video games (Engelhardt, Bartholow, Kerr, & Bushman, 2011). Aggression research shifted in this direction in an attempt to understand the psychology behind increased acts of violence which ensued at various schools throughout the United States (e.g., school shootings; Wofford, 2015). However, violent video game research is largely controversial and continues to be debated (Ferguson, 2015). Political biases have potentially impeded research in academia and debates regarding gun rights, prompting meta-analyses and public commentaries (Anderson, 2018; Ferguson, 2007; Lishner, Groves, & Chrobak, 2015; Segev et al., 2016).

Video games' addictive properties have been researched, as well. This includes the inability to control excessive gaming, fantasizing about gaming, irritability and restlessness about not being able to play, and the ignoring of biological needs in extreme cases (Király, Griffiths, & Demetrovics, 2015). Certain physiological effects have also been found among certain samples, including "poorer response-inhibition and emotion regulation, impaired prefrontal cortex (PFC) functioning and cognitive control, poorer working memory and decision-making capabilities, decreased visual and auditory functioning, and a deficiency in their neuronal reward system, similar to those found in individuals with substance-related addictions" (Kuss, Pontes, & Griffiths, 2018, n.p.). Within children, specifically, some research noted alterations to gray and white matter within the brain; comparably to substance use disorders, such alterations may contribute to reduced impulse control, motor control, perception, memory, and emotion regulation (Weinstein & Lejoyeux, 2015). Furthermore, prolonged use by children may correlate with cortical thickness and changes within the salience network of the brain, which can impact attention and decision making (Han, Kim, Bae, Renshaw, & Anderson, 2015; Kühn et al., 2014).

Despite advances in empirical knowledge related to video games and its potential addictive tendencies, the methodology used has been inconsistent. Although proposed criteria for gaming disorder exists within the DSM-5 (APA, 2013) and the upcoming ICD-11 (WHO, 2018), there is a notable lack of formal, established criteria on which researchers can base their studies (King & Delfabbro, 2014). The WHO (2018) noted that to receive such a diagnosis, "the behaviour pattern must be of sufficient severity to result in significant impairment in personal, family, social, educational, occupational or other important areas of

functioning and would normally have been evident for at least 12 months" (n.p.). In contrast, the DSM-5 detailed a blend of more detailed criteria from substance use disorders and non-substance-related disorders; this included withdrawal symptoms and tolerance, as well as social impairment and impaired control (APA, 2013). Furthermore, the APA (2013) mentioned that Internet use disorder and gaming disorder have been interchangeably used. This may not be a proper representation of the literature, given that video gaming can occur offline and that Internet use encompasses a variety of activities unrelated to gaming (e.g., accessing social media). Ultimately, as noted by Aarseth and company (2017), the data may be insufficient to warrant the creation of a clinical diagnosis at this time. However, it will be important to study such matters further by engaging in continuous, consistent research.

Mobile Phone Use
Mainstream use of mobile phones emerged during the 1990s to 2000s, allowing people to call and text message people wherever they are at whatever time they want. This was a major shift for telecommunications, after decades of being restricted to landlines (Baym, 2016; Ray, 2015). Like with any technological device, though, pros and cons can be noted. In the context of addictive tendencies, the earliest of research suggested the potential for mobile phone use to become problematic to the extent of texting while driving, cyberbullying, and maladjustment (Bianchi & Phillips, 2005). However, conflicting results have emerged in other studies; one study found a lack of significant association between mobile phone overuse and tendencies of substance use (Jenaro, Flores, Gómez-Vela, González-Gil, & Caballo, 2007).

Telecommunications were once again revolutionized with the production of smartphones, such as the Apple iPhone (Ray, 2015). Since then, mobile phone use massively increased (Pew Research Center, 2018). Research regarding mobile phone use also increased, but a series of issues arose as a result. A lack of agreement regarding the focus and direction of research regarding addictive tendencies related to mobile phones created potential instances of construct proliferation (see Shaffer, DeGeest, & Li, 2016). In other words, multiple researchers have created different measures of what is ultimately the same concept: addictive tendencies relating to mobile phone use (Billieux, 2012). Examples include self-report surveys that measure smartphone addiction (Kwon et al., 2013; Lin et al., 2014), smartphone dependency (Chen, 2015), and young adult attachment to phone (Trub & Barbot, 2016). Additionally, different scales have been created for different subjects, such as the Problematic Mobile Phone Use Scale for Turkish adolescents (Güzeller & Coşguner, 2012) and the Mobile Phone Use Scale for university students (Pamuk & Alti, 2016).

These constructs share consistent themes related to anxiety about being away from mobile phones, dependency and attachment, and maladjustment in people's everyday lives. This is supported within the literature; for example, one study by Ching and Tak (2017) found significant relationships between parenting style, attachment style, self-regulation, and addictive tendencies relating to smartphone use within a sample of university students in Hong Kong. Via structural equation modeling, the parenting style perceivably received by participants (e.g., authoritative style) positively correlated with participants' attachment style (e.g., secure attachment), which positively correlated with their tendencies of self-regulation (e.g., impulse control). Tendencies of self-regulation, meanwhile, negatively correlated with addictive tendencies of smartphone use (e.g., overuse; Ching and Tak, 2017). Nonetheless, the literature remains largely inconclusive. Researchers should be conscious of presently existing conceptual models (e.g., biomedical versus biopsychosocial) and inconsistent methods of measurement when conducting future research (Kuss & Billieux, 2016).

Internet Use
The Internet reached mainstream usage in the 1990s, setting the stage for worldwide connectivity (Baym, 2016; Leiner et al., 1997). Although it can contribute to positive feelings, the Internet can be a digital platform on which psychological maladjustment develops among its users (Davis & Pimpleton-Gray, 2017). As people increasingly began to use computers and the Internet, concern about addictive behaviors emerged (Griffiths, 1995). One significant component of Internet use in modern day is social media, allowing for people to digitally connect with one another; it can reconnect people who have not encountered one another in years, and it can bring together people who have never met and never will (Van Dijck, 2013). The rise of social media has prompted a continuing debate regarding its impact on people's lives (Marino, 2018; Twenge, Joiner, Martin, & Rogers, 2018).

Addictive tendencies of Internet use have been empirically investigated in a variety of contexts. Various samples have been studied, including medical students (Zhang, Lim, Lee, & Ho, 2017), college students in China (Shao et al., 2018), and adolescents in South Korea (Choi, Chun, Lee, Han, & Park, 2018). Past research indicated that as tendencies of shyness increase, addictive tendencies of Internet use increase to reduce feelings of loneliness (Ang, Chan, & Lee, 2017). Additionally, in comparison to other types of non-substance-related addictive tendencies, possible relationships exist between fatigue, impulse control, and addictive tendencies of Internet use (Bener et al., 2018; Othman, Lee, & Kueh, 2017).

Comparably to research on addictive tendencies of video game use and mobile phone use, research on Internet use has been limited. Although Internet use disorder was considered for inclusion as a behavioral addiction in the DSM-5 (APA, 2013), the research was ultimately deemed inconclusive and was therefore excluded (Huang et al., 2010; Kuss & Billieux, 2016). Comparable to research about mobile phones, construct proliferation is present in the form of different but similar constructs. Such constructs include Internet addiction, pathological Internet use, and problematic Internet use. Sampling and assessment methods have also greatly varied (Huang et al., 2010). Ultimately, further research is warranted to determine whether addictive tendencies related to Internet use can eventually be classified formally.

Media Streaming and Television Use
Comparable to the welcoming of video game consoles into the home, humanity welcomed the projection of pre-recorded media in the form of television. This small screen revolution engrossed people, having previously experienced entertainment by attending theaters and by listening to their radios. Regularly, people follow the lives of fictional characters and real-life celebrities through television series plots and (theoretically) unscripted activities (Thompson & Allen, 2017). This was further revolutionized by media streaming, in which people could access such media on even smaller screens (e.g., mobile phones). With the introduction of media streaming services such as Netflix, people no longer had to wait for regularly scheduled broadcasting (Kang, 2015). Instead, they could access media at their convenience whenever and wherever; this introduced the phenomenon of binge-watching, in which episodes (and even seasons) of shows are watched consecutively; given the negative connotations, media streaming services have attempted to distance themselves from such terminology (Lynch, 2018).

Although it is less researched in terms of addictive tendencies, media streaming and television use should briefly be recognized as another possible source of future directions in research. Limited previously to anecdotal support, the topic expanded in the 1990s. It has

since covered biological, psychological, and sociological correlates (McIlwraith, 1998). A review of the literature found potential correlations with social biases, academic impairment, insomnia, lower life satisfaction, and obesity. In addition, potential relationships were found between television use/media streaming and addictive tendencies related to alcohol use, gambling, and Internet use (Sussman & Moran, 2013).

It is apparent that addictive tendencies related to technology use have been empirically investigated in multiple ways and using multiple constructs. Theoretically, any given piece of technology can contribute to addictive behaviors, and prior research has attempted to encompass as much as possible. This is comparable to the DSM-5 featuring multiple substances within its substance use disorders (APA, 2013). If a substantial amount of research were to support the creation of technology use disorders as a non-substance-related disorder, disorders such as Internet use disorder and gaming disorder could eventually be recognized as formal clinical diagnoses. As the WHO (2018) noted, only a small amount of the population would classify as having gaming disorder. However, debates remain ongoing regarding the risk of misdiagnosing and excessively diagnosing such a disorder (Aarseth et al., 2017).

The informal recognition of addictive tendencies relating to technology use also warrants further research. Internet use and gaming are commonplace in the lives of millions, so its potential non-clinical effects and correlates are just as important. For instance, consideration regarding whether certain terminology should encompass various pieces of technology. Sussman and Moran (2013), in a footnote, mentioned "screen addiction" as a theoretical encompassing of video game use, social networking, and texting; they, however, acknowledge that this was hypothetical and beyond the scope of their literature review at the time. A thorough meta-analysis may help enlighten the field, after an adequate amount of research is conducted.

Treatment of Addictive Tendencies Related to Technology Use

In addition to the need for broader research on technology use, the need for research on potential treatments is notable given that many people seek clinical treatment for having these tendencies (King, Delfabbro, & Griffiths, 2012). Research on addictive tendencies related to technology use is in its infancy (Griffiths, 1995), and research on potential treatments is even newer. Studies about addictive tendencies like gambling have suggested neurobiological changes in the brain comparable to that of people who are addicted to substances (Kuss & Billieux, 2016). Likewise, there are comparable behavioral and psychological properties between the two (Nakken, 1996). As a result, some research suggests the possibility that treatments for substance use may be successful in cases of non-substance-related addictive tendencies; this includes technology use (Kuss & Billieux, 2016). Examples of treatments include psychotropic medications (King et al., 2012) and therapy (Young, 2007).

Although there are instances of empirical support for using psychopharmacological treatments, there are noteworthy limitations due to the lack of studies about their effectiveness in the context of technology use. Such research has primarily been conducted as case studies of individuals with addictive tendencies of Internet use and gaming disorder. These case studies provided exploratory support of selective serotonin reuptake inhibitors (SSRIs) and naltrexone (i.e., Vivitrol) helping alleviate such tendencies (Huang et al., 2010). This is particularly enlightening, since naltrexone is traditionally used to treat alcohol use and opioid use (Substance Abuse and Mental Health Services Administration, 2016). Studies that

used bupropion (i.e., Wellbutrin) and methylphenidate (i.e., Ritalin) for treatment of gaming disorder, meanwhile, yielded conflicting results. In one study, no significant differences were found between the success of treatment using psychotropics versus therapy (King & Delfabbro, 2014); in contrast, Weinstein and Lojoyeux (2015) found that their sample not only saw improvements in their mood but also saw significant reductions in the amount of time they played video games.

These contradictory results should be of little surprise, given the methodological limitations present within the studies. Few studies have been conducted up to this point regarding psychotropic treatments (Huang et al., 2010). Also, sample sizes were too small within those studies to adequately reflect the intended population of interest (King et al., 2012). Additionally, it could be argued that the population of interest is presently unknown. Without clear and consistent criteria for different types of technology use, establishing treatments for those with addictive tendencies may remain challenging (Kuss & Billieux, 2016).

Therapeutic treatments have also been researched but with similar limitations to that of research on psychopharmacological treatments. In a case study by Graham (2014), narrative therapy was implemented during sessions with an academically advanced teenage boy who presented with social anxiety and excessive video game use. He increasingly fell behind in schoolwork and lacked confidence in the real world, whereas he was able to recognize his strengths in the gaming world. Using narrative therapy, the counselor and the client were able to craft the story of the client and his perceptions of lacking control socially. He was able to tell a story about a time in which he felt a sense of control and confidence in his abilities during game play, and through ongoing sessions, he was able to eventually shift those strengths into his real life. This approach avoided the portrayal of video game use as a problem and instead built upon the client's positive traits that were underutilized in the real world but were fully utilized in the gaming world (Graham, 2014). Given the anecdotal support of successful treatment, future studies that utilized narrative therapy would be of benefit to observe whether this is the case with other adolescents.

Other studies have indicated support for cognitive behavioral therapy (CBT) as a treatment method for addictive tendencies related to Internet use. In one study, adults who received CBT were able to manage their Internet use after six sessions and were able to continue doing so six months after completing treatment (Young, 2007). From this research emerged a specialized form of CBT: cognitive behavioral therapy for Internet addiction (CBT-IA). Comparable results were found, in which clients saw significant reductions in their addictive tendencies after twelve weeks and maintained their management of such usage six months after completing their sessions (Young, 2013). Ultimately, as with research on psychopharmacological treatments, more must be conducted. This should include research on treatments relating to other forms of technology use, as well as replication studies and studies using different types of samples.

Future Directions of Addictive Tendencies Related to Technology Use

Researchers and clinicians have spent several decades studying addictive tendencies relating to technology use in a variety of manners, whether problematic or otherwise. This includes different types of studies, different types of focuses, and different types of samples. Certainly, researchers and clinicians should be commended for their contributions to the literature. Nonetheless, it is worth considering potential future directions to advance the literature even further. As mentioned previously, it is also recommended that meta-analyses be conducted

about technology use in general and types of treatments for technology use; this, of course, is after an adequate amount of research has been conducted. Although the purpose of the present manuscript was to provide a brief review of prior research, it was not done using empirical methods.

After more research is conducted, and after meta-analyses are conducted to observe potential commonalities among research studies, it will be important for researchers to form a unified front to thoroughly address the addictive side of technology use. Such addictive tendencies have the potential to create a serious health care problem and thus warrants better understanding (Pontes, Kuss, & Griffiths, 2015). Ideally, consistent criteria for diagnosing such addictive tendencies should eventually be established. More studies about treatments will also be paramount, potentially warranting additional training for researchers and clinicians.

Associations for clinicians and researchers in mental health-related fields promote ethical guidelines that require an appropriate understanding of issues that people experience (e.g., the American Psychological Association, the American Counseling Association, the National Association of Social Workers). This has included education and training about issues relating to diversity and social justice, and it should also include addictive tendencies related to technology use. As part of this ideal pursuit of knowledge, task forces and research grants should be established. By promoting a plethora of research that increases understanding and better training, the people that mental health professionals serve will benefit greatly in this digital era of human existence.

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