

Introduction to the Special Issue on problematic behaviors related to Internet and digital technology use: Facts, conjectures, and oranges*

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The Internet and its negative consequences to mental health is one of the fastest growing research fields over the past decade. This editorial gives an overview of available knowledge on problematic behaviors related to Internet use. The current psychiatric terminology recognizes disorders due to substance use or addictive behaviors, with gaming disorder as the only mental disorder related to Internet use. There may be relationships between different mental disorders characterized primarily by impulsive, compulsive, and addictive behaviors and problematic Internet use (PIU) and disordered gaming. Marked variability was found in the prevalence of PIU and gaming disorder globally, with a myriad of factors that may lead to and/or maintain these behaviors. Research studies showed that individuals with PIU and gaming disorder may have distinctive psychological profiles with specific cognitive changes. Functional and structural neural and neurochemical abnormalities in the brain may also be present. Finally, treatments of these conditions have already emerged. Eleven selected articles for this Special issue dealing with specific aspects of problematic behaviors related to Internet use were also discussed.

Key words: addictive behaviors, gaming, smartphone, social networking sites, problematic internet use

Highlights:

- Gaming disorder is the first psychiatric condition originating from problematic Internet use (PIU).
- Gaming disorder and PIU may include functional and structural brain abnormalities.
- Different forms of PIU lead to specific psychological and cognitive changes.
- A relationship between mental disorders and different forms of PIU is not clear.

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My enlightenment due to Internet use has started in early 2000s, and thanks to it, my dedication to research was definite, aside from the other changes in my life. However, when I was preparing my psychiatry board examination in 2010–2012, I was encountering literature that, among new mental disorders proposed for next classification systems, also included Internet addiction. This was a hotly debated topic and very puzzling for me: how can such an enlightening habit be linked to a mental disorder? Years after that, our research group initiated an international project about Internet use among students and the Editors of *Psihologija* accepted my idea to publish a special issue related to the Internet, digital media, smartphones, and other technology usage and their potentially detrimental mental health effects. *But, why would Psihologija need such an issue?*

For the purpose of this editorial, I searched Scopus and PubMed. The Internet and its negative consequences to mental health is one of the fastest growing research fields. It started with the work of the psychologist Kimberly Young (Young, 1996). Till today, over 3341 publications have appeared in peer-reviewed journals, of which 2536 (76%) research articles, with about 80% of that number coming from China, South Korea, the United Kingdom, the United States of America (USA), and Germany, while only about 5% comes from low- and middle-income regions. Only, 9 articles have come from Serbia, for example. In this regard, we wanted to involve researchers from different parts of the world to contribute data to this topic. In addition, we wanted to present selected literature, which adds substantially to the current evidence and knowledge.

What is the current evidence on the topic?

The current psychiatric terminology recognizes disorders due to substance use and addictive behaviors. Excessive and problematic use of a substance or engagement in an activity with harmful and negative consequences is considered to be an addiction (e.g., Petry, Zajac, & Ginley, 2018). In classical terms, we are speaking about substance addictions, as pathological patterns of behavior related to the use of substances and the resulting impaired control, social impairments, risky behaviors, and pharmacological effects (American Psychiatric Association [APA], 2013). Over the past two decades excessive behavioral patterns, as groups of repetitive and restricted sets of behaviors, which some termed *behavioral addictions*, also started to be considered addictions (James & Tunney, 2017). The main feature of behavioral addictions is a failure to resist impulses, drives, or temptations, which may result in harmful consequences if engaged excessively (Derevensky, Hayman, & Gilbeau, 2019).

The 11th revision of the International Classification of Diseases (ICD–11; World Health Organization [WHO], 2018), as the most current psychiatric diagnostic system used worldwide, recognizes *disorders due to substance use or addictive behaviors* as mental and behavioral disorders developed as a result

of the use of psychoactive substances, namely episodes of harmful substance use, substance use disorders, and substance-induced disorders, and disorders due to addictive behaviors. Disorders due to addictive behaviors are recognizable and clinically significant syndromes associated with distress or interference with personal functions that develop as a result of repetitive rewarding behaviors other than the use of substances. With this recent advance, the road is paved for further research on which, how, and when addictive behaviors are or lead to psychiatric disorders.

Gambling and gaming disorder are the only mental disorders linked with Internet use. At present, disordered video gaming, including playing Internet games, and gambling disorder, including Internet gambling, are the only two such psychiatric diagnoses in the current classification system (APA, 2013; WHO, 2018). These two disorders are considered to be addictive behavior disorders. Importantly, potential *overpathologizing* with the ICD–11 gaming disorder is avoided with its explicit reference to functional impairment caused by gaming-related harms (Billieux et al., 2017).

Other behaviors linked to Internet use are still not psychiatric diagnoses. In 1996, the world's first study on computer/internet addiction was published (Young, 1996). Based on the conceptualization of substance addictions, problematic and risky behaviors linked to Internet use were considered for the first time to be behavioral addictions. However, Beard and Wolf (2001) proposed *problematic internet use*, which was a year later framed by Caplan (2002), as a multidimensional syndrome including cognitive and behavioral symptoms with social, academic, or professional difficulties. In the years to come, a great amount of research is considering problematic Internet usage as an umbrella term to encompass all potentially problematic Internet related behaviors (Fineberg et al., 2018). However, problematic Internet use, Internet use disorder, Internet addiction, Internet addiction disorder, Internet dependency or dependence, or Internet specific addictions, like cyberporn addiction or shopping addiction, smartphone addiction, social networks addiction or use disorder, or similar digital technology addictions and conditions appeared in the literature, which all refer to *disordered* and hazardous use of the Internet and/or digital technology and their mental and functional consequences are still not considered psychiatric disorders. I will collectively use the term problematic Internet use (PIU) to indicate all disordered behaviors related to Internet use if not otherwise specified, excluding disordered gambling.

Different nosological entities may exist under the umbrella of PIU. At present, we are facing challenges in the understanding and conceptualization of PIU. It was recognized early that individuals do not necessarily show problematic behaviors related to the Internet, but to the specific activities on the Internet (Griffiths, 2000). Thus, it is not clear yet whether there is PIU as a common condition or there are specific PIU entities, since these are suggested (Monta,

Wegmann, Sariyska, Demetrovics, & Brand, 2019). However, there is enough evidence that disordered gaming and PIU are clearly different nosological entities (Kircaburun, Pontes, Stavropoulos, & Griffiths, 2020). Within these entities, not all proposed symptoms or behaviors are equally important. For example, of the nine gaming disorder criteria by the APA (2013), *withdrawal*, *preoccupation*, *loss of control*, and *negative consequences* emerged as the most relevant diagnostic criteria (e.g., Pontes, Schivinski, Brzozowska-Woś, & Stavropoulos, 2019). Problematic smartphone use may be a separate nosological entity, due to excessive use, impulse control problems, and negative consequences evident in “disordered” cell-phone/smartphone use (e.g., Panova & Carbonell, 2018). Finally, problematic behaviors in relation to social networking sites (SNS) may be also a nosological entity with specific symptoms of a behavioral addiction (Kuss & Griffiths, 2017).

Variability in the presence of PIU globally. Disordered gaming is found to occur globally, but in representative samples the prevalence ranges 1%–5% (Kircaburun et al., 2020). The pooled global prevalence of disordered gaming among adolescents was 4.6% (Fam, 2018). Importantly, excessive online gaming with negative consequences likely affects a small proportion of those exposed to online games, which apparently has not increased in its prevalence to the extent that internet usage has increased over the past 20 years (Feng, Ramo, Chan, & Bourgeois, 2017). The prevalence rates of PIU excluding gaming disorder range from .6% to over 22% globally (Petry et al., 2018). These different numbers and variability in the prevalence rates across the globe may reflect differences in assessment methods across studies, social, cultural and demographic differences in Internet use, or different operating risks and protective factors present.

A myriad of factors may be related to PIU. The spectrum of Internet usage, from controlled – “adaptive” to uncontrolled – “maladaptive” is suggested (Billieux et al., 2017), with a small proportion of people developing problematic behaviors (Pontes et al., 2019). In this regard, there may be different factors operating in the development and maintenance of PIU. For example, there may be factors related to gaming solely, demographic and familial factors, interpersonal relations, and social and school functions, personality, psychiatric comorbidities, and physical health conditions in disordered gaming (Brand, Young, Laier, Wölfling, & Potenza, 2016; Mihara & Higuchi, 2017). In my view, of particular relevance is that gaming disorders, PIU, and excessive smartphone use including SNS often begin during childhood and adolescence (Derevensky et al., 2019) and therefore identifying PIU-related factors in this population is of the highest priority.

Relying on self-reports while assessing PIU. At present, assessments of disordered gaming and PIU are mostly based on self-reports and there are very few structured clinical interviews published with promising psychometric properties that focus specifically on gaming disorder (Peter, Ginley, & Pfund, 2020).

The nosological relationship between PIU and psychopathology is unclear. The relationship between disordered gaming, PIU and other mental disorders, including substance use disorders is extensively debated (Starcevic & Khazaal, 2017). For PIU, or any of its forms including gaming, to be a mental disorder, it must sufficiently differ from other psychiatric conditions, and if it is indeed a behavioral addiction, then it should be aligned more closely with substance use disorders and other behavioral addictions (i.e., gambling disorder) than other mental disorders such as attention deficit/hyperactivity disorder (ADHD; Fineberg et al., 2018). The presence of comorbidities in PIU in the clinical context appears to be the norm rather than an exception (Kuss & Lopez-Fernandez, 2016). It is, thus, questionable whether PIU is a separate nosological entity.

Behavioral addictions, including PIU and disordered gaming, have strong associations with depressive and anxiety disorders, particularly social anxiety disorder, ADHD, and substance use disorders (Starcevic & Khazaal, 2017). Excessive use, impulse control problems, and negative consequences are also evident in “disordered” usage of cell-phones/smartphones (Panova & Carbonell, 2018). There is an inverse relationship between psychological and psychiatric problems associated with problematic cell-phone use and mental health (De-Sola Gutiérrez, Rodríguez de Fonseca, & Rubio, 2016). Comorbidities reported include sleep affectations, anxiety, stress, and consumption of substances, such as alcohol or tobacco, particularly in adolescents. Furthermore, there are studies demonstrating phenotypic similarities to behavioral addictions for some forms of PIU, but also similarities with other disorders like social anxiety, impulse-control disorders, neurodevelopmental, or obsessive-compulsive and related disorders (Fineberg et al., 2018). Longitudinal studies found that problems in attention, depression, and anxiety may arise from excessive gaming, while impulsivity and low social competence appear to predict development of disordered gaming over time (Petry et al., 2018). Thus, there is a need for a greater understanding of the direction of the relationship between the Internet Gaming Disorder (IGD) and other psychiatric conditions.

A bidirectional relationship was also suggested, whereby problematic use may drive psychopathology, and psychopathology further drives problematic use (Yen et al., 2012). This particularly applies to depressive and anxiety disorders and may suggest that behavioral addictions are a maladaptive way of coping with primary states of depression or anxiety or that depressive and anxiety disorders occur as a consequence of various problems associated with behavioral addictions (Kardefelt-Winther, 2017; Starcevic & Khazaal, 2017).

Functional changes in anterior and posterior cingulate cortices observed in imaging studies are considered to be a common bio-marker across psychiatric disorders (McTeague et al., 2017). Considering similar changes in disordered gaming (Yao et al., 2017), it may point to a common vulnerability of the region, but also a common neurobiological vulnerability across PIU behaviors, including gaming (Ioannidis et al., 2019). Finally, similar neurobiological and psychological changes were found in PIU and substance use disorders (Park, Han, & Roh, 2017), and some researchers believe that due to biological

changes, substance-related addictions and behavioral addictions share common predisposing factors and may be a part of an addiction syndrome (Kuss, Pontes, & Griffiths, 2018).

Thus, researchers suggest nosological relationships between a range of mental disorders characterized primarily by impulsive, compulsive, habitual, and addictive behaviors and different forms of PIU (Fineberg et al., 2018; Starcevic & Khazaal, 2017).

Distinctive psychological profiles are associated with PIU. Individuals presenting with disordered gaming, PIU, or problematic smartphone use may have distinctive socio-emotional profiles, attachment and temperament characteristics, and coping strategies (Tonioni et al., 2014). Emotion dysregulation, loss of control, feelings of anger, symptoms of distress, social withdrawal, and family conflicts are some of the characteristics most readily observed in these individuals (Cerniglia et al., 2017; Mo, Chan, Chan, & Lau, 2018).

Cognitive alternations may exist in PIU. Individuals presenting with disordered gaming and PIU may have specific cognitive profiles with attention deficits, deficits in reward processing, reduced inhibitory control, changes in executive functions, and diminished decision-making skills (Brand et al., 2016; Kuss et al., 2018; Yao et al., 2017). In particular, PIU was associated with significant impairments in inhibitory control, decision-making, and working memory (e.g., Ioannidis et al., 2019).

Functional and structural neural alterations may exist in PIU. Compared with healthy controls, individuals with symptoms of disordered gaming have hyperactivation in the anterior and posterior cingulate cortices, caudate, posterior inferior frontal gyrus (IFG), hypoactivation in the anterior IFG, the posterior insula, somatomotor and somatosensory cortices, with reduced gray-matter volume in the anterior cingulate, orbitofrontal, dorsolateral prefrontal, and premotor cortices (i.e., fronto-striatal and fronto-cingulate regions; Yao et al., 2017). In PIU, structural or functional impairments in the orbitofrontal cortex, dorsolateral prefrontal cortex, anterior cingulate cortex, and posterior cingulate cortex were also observed (Park et al., 2017). To what extent these changes preexist, stream from, or lead to different forms of PIU is not known.

Neurochemical changes may also exist in PIU. Studies showed that PIU and disordered gaming are associated with impairments in dopaminergic pathways in the brain, but also serotonin/dopamine dysfunction (Park et al., 2017; Tian et al., 2014). As for the above, to what extent neurochemical changes preexist, stream from, or lead to different forms of PIU is not known.

Treatments of PIU already emerged. Over the past decade, clinical trials suggested that some psychotropic medication can be effective in treatments of disordered gaming and PIU, at least in severe cases (Zajac, Ginley, Chang, & Petry, 2017). There is some evidence for bupropion, escitalopram,

methylphenidate, and atomoxetine. In addition, cognitive-behavior and family interventions are found to be the best psychotherapeutic alternatives (Stevens, King, Dorstyn, & Delfabbro, 2019).

What is this special issue bringing?

We have selected eleven articles for two issues, which are dealing with specific aspects of PIU.

In a content analysis of 47 published studies, Almourad and his colleagues (2020) found that harm caused by behavior or usage patterns is the main theme of current conceptualizations of problematic digital device usage, which they termed *digital addiction*. Importantly, these authors found that the use of similar aspects of definitions were consistent across PIU, gaming, and smartphone use, what provides evidence that similar criteria are being used to define problematic digital technology use as a common entity. This study highlights that research studies indeed use the harm of problematic Internet use, which is necessary for any condition to be considered as a mental disorder (Petry et al., 2018).

The article by Kabukçu Başay and her colleagues (2020) presents data from a study with a clinical sample of children and adolescents. The authors report that when there is psychopathology, either internalizing or externalizing, screen use habits tend to become more problematic. This is an important finding since very few studies examined clinical populations thus far. However, in my view, one more important observation is the low interdependence between screen time, PIU, and levels of psychopathology. This finding may indicate that time spent on the Internet or digital devices is not necessarily linked to problematic use or psychopathology levels, but that specific activities may be (Griffiths, 2000). This was also one of the conclusions of Popadić, Pavlović, and Kuzmanović (2020), who studied the general population and found different operating predictors for intensive and excessive Internet use. Low correlations between time spent and psychopathology levels, may question assumptions that PIU is a coping strategy for psychopathology (Kardefelt-Winther, 2017) at least among children and adolescents.

Two articles report on the relationship between PIU and anxiety levels, together pointing on the nosological relationship between the two and the need that both should be evaluated together. The mentioned study by Popadić and his colleagues (2020) reports that excessive Internet use is mostly predicted by levels of anxiety in adolescents, while a study by Sertbaş and the colleagues (2020) reports on strong relationship between PIU and social anxiety among students.

The article by Maftai and Enea (2020) reports a study aimed to evaluate the prevalence of symptoms of Internet gaming disorder (APA, 2013) in a sample of Romanian adolescents. The main finding was that every fifth young adolescent is under a risk of having clinically relevant symptoms of gaming disorder. However, in my view, the importance of this study is in the finding that dominant permissive style of parenting is related to greater symptoms. Popadić and his colleagues (2020) also observed that active parental mediation is important for excessive

Internet use. Thus, parental involvement in both the prevention and development of different forms of PIU may be the main future focus.

Dias and his colleagues (2020) report on a bifactor model with one general and three specific factors – problematic online gaming, PIU and problematic Facebook use. However, problematic online gaming seems to have more distinctive characteristics than the other two. In my view, this study confirms that disordered gaming and PIU are different nosological entities (Kircaburun et al., 2020), but also reopens discussions on whether behavioral addictions share common predisposing factors and may be a part of an addiction syndrome (Kuss et al., 2018).

In a study within the general adolescent population of Serbia, Hinić and his colleagues (2020) report that pessimism could be a significant individual variable to explain PIU. For me, this is highly relevant for psychological interventions in different forms of PIU, since recurrent negative thinking (RNT), including pessimism, is already a recognized target in psychotherapies (Zetsche, Bürkner, & Schulze, 2018).

The article by Glumbić and his colleagues (2020) presents the frequency and predictors of problematic mobile phone use in adolescents with mild intellectual disability (MID). This is the first study to include MID and study problematic mobile phone use. One of the main findings is that adolescents with MID are very prone to problematic mobile phone use with almost every third having problematic or risky use. This finding directly points to a vulnerability of this population to develop and/or maintain PIU, what requires further research, but immediate clinical attention.

The article by Šincek, Duvnjak, and Tomašić-Humer (2020) reports a study about cyber-violence among Croatian youth. The authors observed that a higher level of cognitive and affective empathy is connected to lower levels of committing cyber-violence. This study did not consider PIU, but cyber-violence is especially relevant for further studying, as it could rather be a manifestation of psychopathology via Internet, then streaming from it.

Abłwi and his colleagues (2020) present that social networking sites (SNS) trigger procrastination and countermeasures could be introduced to counter it. I believe that this finding is a significant step forward in finding ways to prevent excessive Internet use. Considering that addictive behaviors on the Internet may be linked to exposure to reward-dependent cues and that some aspects of websites (i.e., form, content, and reinforcing schedules) are likely having important effects on rates of use (Fineberg et al., 2018), introducing countermeasures in general could be an excellent prevention strategy.

Finally, Marczak and her colleagues (2020) report on the media portrayal of PIU. They found that in many European countries throughout the recent years the tone of reporting remains predominantly neutral for PIU, but predominantly related to cyberbullying and excessive social media use. In my view, the media interests on specific types of PIU is necessary, because besides disseminating information and knowledge, it could have strong potentials to influence people's behavior and society at the final end.

And finally, why the oranges? In some cultures, orange (an orange as the personification of the color) is considered to be the color that gives you shelter in tough moments and brings positivism, encouragement, and motivation (<https://www.colorpsychology.org/orange/>). In my view, research on PIU is going through challenging times and it is blurred. For example, the current research has translated markers from gambling and substance use disorders to identify people with a behavioral addiction, thus it is unclear whether individuals identified as displaying indicators of an addiction are doing so as the polymorphous and multi-faceted expression of a general addiction syndrome or psychopathology, or whether it is linked to a specific behavior (James & Tunney, 2017). I agree that PIU and its forms could be considered on a psychopathology spectrum of impulsive, compulsive, and habitual behaviors, and to solely as addiction behaviors. Further, research on PIU is still not defining clearly the problem and it is not concerned with explaining why the problematic behavior occurs and why it persists (Karddefelt-Winther, 2017). It is not clear whether disordered gaming and PIU are more related to the vulnerability of individuals or the negative consequences of prolonged use. In addition, the measurement issue of the elusive concept such as PIU is a significant hinderance, since we may be actually diagnosing what we are measuring, and not what has ecological validity. And there are many other challenges in this fast-growing field. For me, the future needs some encouragement and motivation beyond simple expectations that it will be brighter anyway with many studies appearing. We need to advance the field by taking more control of where we are going and what we are delivering in our studies, beyond just satisfying our hunger or reward systems with repeated behaviors and bad Internet habits.

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Uvod u specijalni broj o problematičnim ponašanjima povezanim sa upotrebom Interneta i digitalne tehnologije: činjenice, pretpostavke i pomorandže

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Internet i njegove negativne posledice po mentalno zdravlje su jedno od polja istraživanja koje je najbrže raslo u protekloj deceniji. Ovaj uvodnik daje pregled dostupnih znanja o problematičnim ponašanjima povezanim sa upotrebom Interneta. Trenutna psihijatrijska terminologija prepoznaje poremećaje koji su posledica upotrebe supstanci ili zavisnička ponašanja, dok je poremećaj igranja kompjuterskih igara jedini mentalni poremećaj povezan sa upotrebom Interneta. Međutim, moguće je da postoji povezanost različitih mentalnih poremećaja koje primarno karakterišu impulsivna, kompulsivna, i zavisnička ponašanja i problematična upotreba Interneta (PUI), kao i poremećaja igranja kompjuterskih igara. Uočava se prilična varijabilnost u prevalenci PUI i poremećaja igranja kompjuterskih igara na svetskom nivou, sa mnoštvom faktora koji mogu da vode do ovih poremećaja ili da doprinosе njihovom održanju. Istraživanja su pokazala da postoji mogućnost da osobe kod kojih se registruje PUI i poremećaja igranja kompjuterskih igara imaju posebne psihološke profile sa specifičnim kognitivnim promenama. Moguće je da su kod ovih lica prisutne i funkcionalne i strukturne neuralne i neurohemijske moždane abnormalnosti. Pojavljuju se i različite vrste tretmana za pomenute probleme i poremećaje. Ovaj uvodnik razmatra i jedanaest radova koji su izabrani za ovaj specijalni broj, a koji se bave posebnim aspektima problematičnih ponašanja povezanih sa upotrebom Interneta.

Ključne reči: zavisnička ponašanja, igranje kompjuterskih igara, pametni telefon, društvene mreže, problematična upotreba Interneta

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