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Prevalence of Problematic Internet Use during the COVID-19 Pandemic

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Abstract

The present paper reviews recent studies on problematic internet use (PIU) prevalence before and during the COVID-19 pandemic. Several pre-pandemic meta-analyses reported PIU prevalence estimates ranging from 6% to 9.7%. Experts in the field of online addictions speculated that PIU would increase during the pandemic because of increased time spent on the internet. However, it is still unclear if increased time on the internet resulted in higher PIU prevalence estimates during the pandemic. Prevalence estimates differed greatly across studies during the COVID-19 pandemic. Possible inconsistencies are outlined together with future directions for PIU prevalence studies.

Keywords problematic internet use, epidemiology, prevalence, COVID-19, assessment

Introduction

The introduction of the internet and global digitalisation has revolutionized the ways people interact with the world, and its use has become an essential activity in most individuals' lives. Nevertheless, internet use can also pose a threat on various areas of a minority of individuals' lives due to its potentially addictive features (e.g., accessibility, anonymity, convenience, etc.) and/or the online activities themselves (e.g., gaming, gambling, social media use, etc.) [1]. The first studies highlighting the addictive potential of the internet date from the mid-1990s [1-3]. Continued dedicated research on problematic internet use (PIU) has raised awareness of the potential negative effects of internet

use on individuals' mental health [4], which led to a great burden on health systems worldwide in terms of people's health and societal costs of PIU [5].

Currently, PIU is considered as a behavioural addiction because its use can result in dependence-like symptoms and does involve the ingestion of a psychoactive substance [1,6]. PIU is a term covering a wide range of problematic online behaviours including excessive social media use, gaming, gambling, streaming, pornography viewing, and impulsive buying [4], as well as newer behaviors such as cyberhoarding and cyberchondria [7•]. However, the term 'internet addiction' itself has been criticised and some scholars have suggested it should be replaced with the term 'addictions to the specific internet-related activities' [8]. The World Health Organisation's 11th revision of the *International Classification of Diseases* (ICD-11) now recognises three disorders that can primarily be engaged in online, namely gaming disorder, gambling disorder and compulsive sexual behaviour disorder [9]. The introduction of these diagnoses is considered an important step forward, as researchers now have a more precise way of defining, assessing, and studying such disorders worldwide [10].

There appears to have been an increase in internet use globally due to the coronavirus disease 2019 (COVID-19) given that individuals have had to work and/or be educated from home due to measures implemented to inhibit the spread of the virus (e.g., lockdowns, quarantines, self-isolation, etc.). As pandemic-related circumstances led to the apparent increased use of the internet, experts raised concerns over the possibility of increased PIU, including but not limited to problematic gaming, gambling, and pornography use [11••, 12••-14]. The concern was raised that as a behavioral addiction, PIU prevalence could significantly increase during the pandemic, similar to substance use addictions and other behavioural addictions [15,16]. Increase in general internet use might have its own positive and negative consequences. Positive consequences include the capacity to work and/or be educated from home, while the major negative consequence is the negative impact on mental health status [11,17]. Moreover, financial hardship [18] and isolation [19] may also have contributed to an increase in time spent online as it might have been used as coping mechanism to deal with the negative psychosocial consequences of the pandemic. Therefore, the aim of this short review was to overview the prevalence estimates of PIU among young adults before and during COVID-19 pandemic.

The Inconsistency of PIU Prevalence Estimates

The prevalence estimates of PIU significantly differ across studies. During 2021, several studies estimating the prevalence rates of PIU worldwide were published. The data for the studies discussed further in this paragraph were collected in 2019 (i.e., pre-pandemic). When examining these recent studies in more detail, there is still a great discrepancy in the prevalence estimates, even when using the same screening instrument to assess PIU, most noticeably, the Internet Addiction Test (IAT, cut score ≥ 50) [3]. For instance, Guo et al. [20] carried out a study with 30,581 Chinese university students and reported a PIU prevalence estimate of 8.4%. Another Chinese study [21] comprising 1956 adolescent school students reported a PIU prevalence estimate of 14.5%. In a recent Ethiopian cross-sectional study [22], a PIU prevalence estimate of 19.4% was reported among 761 university students. A similar PIU estimate (20.7%) was reported by Dib et al. [23] among 1810 Lebanese adolescents attending a private school. A Turkish study of 1558 high school students reported a PIU prevalence estimate of 21.1% [24]. However, one Indian study [25] reported a prevalence estimate of 47.0% among 470 nursing students. All of the aforementioned recent studies used the same instrument (IAT) and cut score (i.e., ≥ 50) but still produced inconsistent results which might be attributed – at least partially – to methodological and cultural differences as well as the non-representativeness of the different types of cohorts sampled.

Moreover, different screening instruments and different threshold levels were used in other recent studies. For example, a cross-sectional Hungarian study by Kotyuk et al. [26] comprising 3003

adolescents and young adults reported a PIU prevalence estimate of 13.3%. Here, the study utilized the Problematic Internet Usage Questionnaire (PIUQ) with a cut score of ≥ 15 . A cross-sectional Nepalese study by Sharma et al. [27] comprising 166 medical students reported a PIU prevalence estimate of 31.9% using the Generalized Problematic Internet Use Scale-2 with the cut score of ≥ 40 . In addition to the different screening instruments used in these studies, geographical and cultural differences may have also accounted for the variances in PIU prevalence estimate scores.

First, one of the most important aspects to consider when interpreting prevalence estimates of PIU is the sample heterogeneity and the relative lack of consistency in terms of the diagnostic criteria for PIU. Second, all of these studies relied on self-report screening instruments, which has been shown to inherently overestimate prevalence rates when a condition is rare [28]. Third aspect worth noting with regards to differences in PIU prevalence is that majority of studies used convenience samples. Convenience sampling is considered appropriate for descriptive analyses and explorations of potential associations, however, not valid for measures of uncertainty such as confidence intervals around prevalence estimates [29]. Consequently, careful consideration is needed when comparing prevalence estimates that have used different sampling methods. Fourth, there are also social, cultural, and demographical differences in internet access, use and attitudes in different studies that may result in these discrepancies in PIU prevalence estimates. Since PIU has been regarded as heterogeneous construct [8], the prevalence of PIU might also depend on the preferred type of online activity. In some countries, restrictions can potentially be imposed to control specific online activities, such as internet gambling which may affect the general prevalence of PIU. Moreover, the dynamics of change in the level of propensity to use the internet in European countries are well documented, as recent analysis showed high levels of diversity (with even further increase during the period from 2010 until 2019) and the highest changes recorded in Northern European countries [30]. However, the current literature lacks explanation regarding cross-cultural differences in terms of PIU. Therefore, further research on cultural variations, the nature of PIU in relation to prevalence estimates is recommended [4].

A recent meta-analysis examined data comprising 700,000 individuals from 113 epidemiological studies in 31 nations, and reported that 7.0% of the population may have PIU [31••]. Similarly, analysis conducted in 2014 [32] also including data from 31 nations (N=89,281) and reported a PIU prevalence estimate of 6.0%. In addition, a recent meta-analysis comprising 1818 healthcare professionals reported a slightly higher PIU prevalence estimate of 9.7% suggesting that specific professions might have an increased vulnerability to PIU [33•].

Prevalence of PIU during the COVID-19 Pandemic

Similar to the pre-COVID-19 pandemic studies, recently reported PIU prevalence estimates during the pandemic significantly differ, ranging from 4% to 43.8% [34••-43]. Considering these inconsistencies, it is assumed that cultural differences may also play a role in prevalence estimate discrepancies. These differences also largely depend on the screening instruments employed. For example, a Japanese study by Oka et al. [40] used the Compulsive Internet Use Scale (CIUS, a cut score of ≥ 29) and reported the prevalence of PIU to be 8%. However, a Spanish study by Romero-Rodriguez et al. [37] comprising 1013 university students reported a prevalence estimate of 12% (IAT, a cut score ≥ 50).

A Chinese cross-sectional study by Zhao et al. [38] comprising 11,254 university students estimated the PIU prevalence rate to be 28.4%. The data for the studies of Guo et al. [20] (prevalence estimate of PIU 8.4% in university students) and Wang et al. [21] (prevalence estimate of PIU 14.5% in adolescents) were collected in 2019, while Zhao et al. [38] collected data at the peak of the COVID-19 pandemic in 2020. All three studies assessed PIU with the IAT using a cut score of ≥ 50 . However, the studies of Guo et al. [20] and Wang et al. [21] were the only ones that used a multistage random sampling method to recruit study participants, whereas Zhao et al. [38] used an online convenience

sampling method. This might explain – at least partly – the discrepancy between the results. The most recent meta-analysis [31•] found that non-representative samples tend to have higher rates of PIU than representative samples (10.63% vs. 6.06%). However, general sample representativeness was not found to significantly explain variance in the rate of PIU [31•]. In addition, the increase in prevalence might also be attributed to possible lockdown restrictions. Furthermore, even in the two studies which were completed in the same country during the same year (2019), there was a 6% discrepancy in PIU prevalence estimates (although one study comprised adolescents and other cohort was older and comprised university students).

Some PIU prevalence estimates during the COVID-19 pandemic in Europe are relatively lower than those of Asian countries, although some are similar. Two Hungarian studies [39,42] estimated the PIU prevalence rate to be 3.9% (n=485 hospital staff members) and 5.2% (N=1817 high school teachers) using the PIUQ (with a cut score of ≥ 42). A Swiss study by Mohler-Kuo et al. [41] comprising 1627 young adults and 1146 children and adolescents estimated the PIU prevalence rate to be 21.3% for young adults and 30.1% for children and adolescents (CIUS-Short Form, cut score of ≥ 13).

However, to the best of the present authors' knowledge there are only two longitudinal studies. Oka et al. reported a PIU prevalence increase of 1.6 times during the pandemic among both adults and young people [40]. Another longitudinal study by Nakayama et al. [34••] assessing internet use among junior high school students after long-term school closure due to the COVID-19 pandemic confirmed these findings. This study examined changes of PIU prevalence estimates from 2018 to 2020, suggesting a slight increase from 4.6% to 5.2% which supports the findings of Oka et al. (although the reported increase was not statistically significant).

Summarizing the aforementioned studies, large inconsistencies are observed in PIU prevalence estimates. Consequently, the true prevalence rate of PIU during the COVID-19 pandemic is not known. The main determining factor regarding the apparent increased time individuals have spent on the internet in the past two years has been the COVID-19 pandemic, which is now also cited as the main contributory factor in a number of reported mental health problems (e.g., increased depression, anxiety, stress, etc.) [44-46]. Children, adolescents, and adults have had to use the internet more intensively than ever before. However, increase in internet use might not necessarily be problematic for mental health or PIU severity. There is evidence indicating that the purpose and motivation of internet use is more important for determining psychological well-being and severity of PIU [47] than the actual time spent online. Therefore, the prevalence of PIU may not be directly associated with the amount of time spent online but may be attributable to the context of PIU activity (e.g., time spent using social media vs. online shopping), which is especially true in gaming disorder (e.g., a recent study showed that comorbid psychiatric symptoms and playing to escape were associated with problematic use rather than the time spent gaming [48]). However, PIU severity could possibly be linked to the severity of avoidant coping to real life situations caused by the COVID-19 pandemic [49]. In this regard, it is expected that mental health problems (e.g., depression, anxiety) might mediate the relationship between the amount of time spent online and PIU severity. Furthermore, if these symptoms increased temporally due to the COVID-19 pandemic, a decrease in PIU prevalence estimates would be expected after the pandemic is over. While the studies discussed mostly focused on young adults, this is especially true for adolescents who are vulnerable group in terms of PIU risk. However, they might be the ones who overcome PIU faster than the other cohorts and age groups [50]. However, a recent meta-analysis [31•] did not consider age influence on PIU due to inconsistent reports or lack of reports of age. Future studies and meta-analyses should explore how PIU affects different age groups before, during, and after the COVID-19 pandemic.

However, an increase in time spent online was also reported before the COVID-19 pandemic. Therefore, the increased amount of time spent online observed during the pandemic might be independent from the pandemic itself. Another point to consider is the time that PIU takes to

develop. For example, in the ICD-11 [9], for a diagnosis of gaming disorder (a specific subtype of PIU), it should be present for 12 months. It is also possible that pandemic-associated increases in PIU will be seen in future studies if PIU takes up to a year to develop.

Conclusion

There is no doubt that the COVID-19 pandemic has posed a threat to mental health among millions of individuals worldwide, as the psychological impacts of this pandemic have been extensively reported in scientific literature during the past two years [44-46]. PIU can be a serious psychological issue threatening individuals' well-being and their level of everyday functioning [4, 11••, 12••]. Nevertheless, the assessment of PIU prevalence remains challenging, as there is still great methodological and cultural heterogeneity. Consequently, the prevalence estimates of PIU differ significantly worldwide. Even though some recent studies suggest increased prevalence estimates in PIU during the COVID-19 pandemic in comparison to the pre-pandemic period, more methodologically rigorous studies are needed to address the psychodiagnostic evaluation and cultural differences. It should also be noted that the research outlined here only examined studies examining generalized PIU rather than specific forms of problematic online use (e.g., internet gaming disorder, social media disorder). Future studies, and particularly meta-analyses, are needed to consider age, gender, sample representativeness, geographical location, and methodological differences (especially in terms of online behaviour type and screening method used) in analysing PIU prevalence before, during, and after the COVID-19 pandemic.

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Authors' contribution

JB and ZD took part in conceptualization and planning. JB, JGS, OK and MDG wrote the first draft. All authors commented and revised the manuscript, read, and approved the submitted version. All authors agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Conflict of interest and disclosures

JB has served as a consultant for Cogstate, Ltd in the past several years. JGS worked as a consultant for FACITtrans for the last 4 years. ELTE Eötvös Loránd University receives funding from the Szerencsejáték Ltd. to maintain a telephone helpline service for problematic gambling. ZD has also been involved in research on responsible gambling funded by Szerencsejáték Ltd. and the Gambling Supervision Board and provided educational materials for the Szerencsejáték Ltd's responsible gambling program. The University of Gibraltar receives funding from the Gibraltar Gambling Care Foundation. However, these funding aren't related to this study and the funding institution had no role or any influence on this publication. ZD has been member of a WHO advisory group on the public health consequences of addictive behaviors. In this capacity he has been eligible for travel support from WHO or the host center to attend advisory group meetings but have not been remunerated for their work. However, this funding is not related to this study and the funding institution had no role in the study design or the collection, analysis, and interpretation of the data, writing the manuscript, or the decision to submit the paper for publication.