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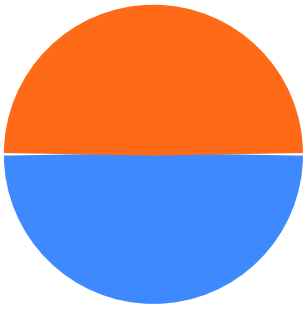


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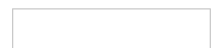
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Article preview

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Luz Carvajal, Caroline Schuppli

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Redouan Bshary, Zegni Triki

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Beyond the dichotomy between field and lab — the importance of studying cognition in context

Lisa Horn, Giulia Cimarelli, Palmyre H Boucherie, Vedrana Šlipogor, Thomas Bugnyar

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Cooperation and cognition in wild canids

Andreas Berghänel, Martina Lazzaroni, Giulia Cimarelli, Sarah Marshall-Pescini, Friederike Range

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Rohan Sarkar, Anindita Bhadra

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Article preview 

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Ian C Gilby, Zarin P Machanda

Article 101183

Article preview 

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A review of the genetic basis of problematic Internet use

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Matteo Vismara, Nicolaja Girone, Dario Conti, Gregorio Nicolini, Bernardo Dell'Osso

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Article preview 

Review article Abstract only

Problematic Internet use (PIU) in youth: a brief literature review of selected topics

Ruckwongpatr Kamolthip, Paratthakonkun Chirawat, Simin Ghavifekr, Wan Ying Gan, ... Chung-Ying Lin

Article 101150

Article preview 

Review article Abstract only

Health-policy approaches for problematic Internet use: lessons from substance use disorders

Dan J Stein, Anna Hartford

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Article preview 

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Pharmacological interventions for Problematic Usage of the Internet (PUI): a narrative review of current progress and future directions

Jeremy E Solly, Jon E Grant, Samuel R Chamberlain

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New challenges in facing cyberchondria during the coronavirus disease pandemic

Matteo Vismara, Alberto Varinelli, Luca Pellegrini, Arun Enara, Naomi A Fineberg

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Insights from an online self-help forum for people with gaming problems

Cam Adair, Heather Luna-Rose

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Prevalence of problematic Internet use during the coronavirus disease 2019 pandemic

Julius Burkauskas, Julija Gecaite-Stonciene, Zsolt Demetrovics, Mark D Griffiths, Orsolya Király

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STEM foundations, edited by Denes Szucs, Yiming Cao and Valeska Grau Cardenas

Review article Abstract only

Cultural differences in mindset beliefs regarding mathematics learning

Lianchun Dong, Yueyuan Kang

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Article preview 

Review article Abstract only

The Intelligence Quotient-math achievement link: evidence from behavioral and biological research

Shuang Song, Mengmeng Su

Article 101160

Article preview 

Review article Abstract only

Nature of mathematics tasks and what teachers do

Berinderjeet Kaur, Sze Looi Chin

Article 101169

Article preview 

Review article Abstract only

Individual differences in mathematical cognition: a Bert's eye view

Bert De Smedt

Article 101175

Article preview 

Review article Abstract only

Supporting mathematics learning: a review of spatial abilities from research to practice

Xin Cui, Kan Guo

Article 101176

Article preview 

Review article Abstract only

Core foundations of early mathematics: refining the number sense framework

Nancy C Jordan, Brianna L Devlin, Megan Botello

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Article preview 

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Social determinants of mathematics and science achievement in historical context

Benó Csapó

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Eric Stice, Sonja Yokum, Timothy D Nelson, Elliot Berkman, ... Natalia Lawrence

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Shinsuke Suzuki

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Problematic Internet use (PIU) in youth: a brief literature review of selected topics

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Chung-Ying Lin^{1,9,10,11}

We aimed to discuss several selected topics related to problematic Internet use (PIU), including fear of missing out, nomophobia, cyberchondria, cyberbullying, and certain health conditions (e.g. autism-spectrum disorder and schizophrenia) among youth. We also aimed to review some recent evidence examining PIU during COVID-19. The review was conducted using keywords relevant to the selected topics and searching in the PubMed database and Google Scholar. The results of this review indicate that PIU could be associated with health issues in a minority of the youth population. Moreover, the COVID-19 pandemic may lead to PIU and subsequent health problems. Information from this review could help healthcare providers to design individualized and appropriate interventions to tackle health issues related to PIU among youth.

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Introduction

The Internet has been widely used since the 1990s [1] and can be defined as a tool for information access and exchange that aids people in their daily lives [2]. Internet users can be categorized into two groups: adaptive Internet users and users with pathological behaviors [3]. Adaptive users use the Internet for different and various purposes, including and beyond connection and socialization. On the other hand, those with pathological behaviors spend a lot of time on online activities (i.e. excessive gaming, excessive online shopping) [3,4]. Excessive Internet use can lead to negative consequences such as psychological problems or a disturbed personal life [2,3]. The use of Internet and smartphone technologies has increased rapidly, along with Internet-based platforms and applications, and these new behaviors come with possible adverse outcomes, including health problems and risks of overuse and dependency [1,5]. For example, previous research has indicated that problematic Internet use (PIU) can lead to a lack of sleep among youth, which can cause negative health outcomes such as insomnia and physical weakness [3]. Additionally, overuse of the Internet can lead to psychosocial problems [5••]. Therefore, PIU has been defined

as excessive Internet use that causes a variety of psychosocial problems (e.g. impairments in academic, occupational, and social relationships) [6]. Moreover, due to lockdowns and remote learning, the COVID-19 pandemic has increased Internet use among youth, which may further exacerbate PIU [7,8]. Therefore, the present paper is a brief narrative review aimed at understanding PIU from a variety of viewpoints, including PIU during the COVID-19 pandemic.

The literature indicates that the characteristics of PIU do not meet the diagnostic criteria of a disorder, because there is no evidence for functional impairment in PIU. Researchers have reported that PIU is likely an addictive behavior [9]. However, the diagnostic criteria of Internet gaming disorder (IGD) in Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) and gaming disorder (GD) in International Classification of Diseases, eleventh revision (ICD-11) provide different diagnostic guidelines due to a lack of consensus, meaning that experts should further address the accurate diagnosis of these types of disorders [10]. In other words, both DSM-5 and ICD-11 need more evidence on PIU [11,12]; therefore, the topic of PIU should be investigated in future research [9].

Although the American Psychiatric Association does not support calling PIU a diagnosable disease [2,13], its discussion and investigation are of significant concern among healthcare providers. Apart from the negative consequences (e.g. psychological impairments [2]), several recent meta-analyses have found high prevalence of PIU among youth: 27.1% among young adults in Bangladesh [14], 34.5% among high school and university students in Africa [15], and 35% among 15–23-year-old Iranians [16]. Although only a minority of young adults suffer severely negative health consequences as a result of PIU, the issues of PIU have been revealed to be remarkable [3]. Therefore, the investigation of the potential risks of PIU is warranted [3].

This brief literature review covers generalized and specific PIU, PIU during the COVID-19 pandemic, PIU with a health condition (such as attention-deficit hyperactivity disorder (ADHD)), PIU and fear of missing out (FoMO), PIU and nomophobia, PIU and cyberchondria, and PIU and cyberbullying. Studies conducted before the pandemic found that PIU with the main feature of excessive use of the Internet could lead to psychological problems among young adults. Moreover, evidence shows that Internet overuse has risen among youth during the COVID-19 pandemic. In this review, we discuss the current research on Internet use and PIU. The research question is whether these current main topics might lead to uncontrolled Internet use and could be associated with PIU. Additionally, how PIU associates with adverse health consequences in these topics is

of interest. We believe that this review may encourage the development of strategies to prevent PIU and to raise public awareness regarding the related issues.

Methods

After determining the relevant topics mentioned in the Section ‘Introduction’, the first author searched both PubMed and Google Scholar using relevant keywords for each topic. Specifically, “Internet addiction”, “PIU”, “problematic use of Internet”, “problematic gaming”, “problematic social media use”, “problematic smartphone use (PSU)”, and “Internet dependence” were used together with “adolescent”, “adolescence”, “youth”, and “young adults” to search for all the topics. For specific topics, the topic terms (i.e. FoMO, nomophobia, cyberchondria, cyberbully, and COVID-19, generalized and specific) were additionally used to combine in the search, except for the topic on PIU with a health condition. For the topic on PIU with a health condition, keywords of “autism spectrum disorder”, “ADHD”, and “schizophrenia” were used. The publication period of the search was set between 2017 and 2022. The first author then worked with the corresponding author to decide which publications would be included for the present narrative review.

Review findings

Problematic Internet use during the COVID-19 pandemic

Since the outbreak of COVID-19 in 2019, governments around the world have taken many measures to control the rapid spread of the virus [17–22]. As one of the governments’ responses to COVID-19, lockdowns and school-closure policies were implemented in different countries [22•]. However, one result of these policies was that young people increased their Internet use, and this has been reported to have caused health problems [23,24]. Therefore, exploring the issue of youth Internet use during the COVID-19 pandemic is crucial for future policymaking and educational reforms.

In the face of sudden and dramatic changes during COVID-19 isolation, teenagers have been more prone to psychological problems, such as depression and anxiety, than adults [21]. Meanwhile, due to the need for online education, Internet-usage rates among youth have increased significantly. During the COVID-19 pandemic, adolescents have been at a high risk of PIU development [17]. Therefore, network-based problematic behavior during the COVID-19 pandemic and its impact have attracted the attention of many scholars. Islam et al. [22•] found a reciprocal relationship between PIU and psychological distress through a quantitative analysis. Similarly, Chen et al. [17–20] pointed out that COVID-19 has had a significant impact on the mental health of schoolchildren and has affected the relationship between PIU and psychological distress. To this end,

studies by Chen et al. [17–20] and Fung et al. [25] have determined the mediating effects of both generalized and specific PIU based on a screen time and a psychological-distress model.

However, evidence from Spain shows that increased Internet usage during the COVID-19 lockdown was not related to PIU, except for problematic video gaming and TV-series watching [26]. The researchers indicated that people may have changed their behaviors and adapted their coping strategies to deal with stress during COVID-19 [26]. Internet overuse during the pandemic may thus have both positive and negative effects on people. Therefore, more observations are required in future studies.

The impacts of COVID-19 on Internet use and mental health have recently become a focus of scholarly research. Given that the COVID-19 pandemic is ongoing worldwide, with different policies and treatments implemented across countries, comparing PIU across countries during the COVID-19 pandemic should be of interest for future research.

Generalized problematic Internet use and specific problematic Internet use of gaming, gambling, and social networking

In the literature, PIU is categorized into two subtypes. Generalized PIU refers to the general behavior of multidimensional Internet use. Specific PIU, meanwhile, refers to a particular type of Internet use, and the present review especially focuses on gaming, gambling, and social networking (i.e. other specific PIU such as pornography use and compulsive buying were not discussed in the present review) [1,2,5,6,27]. However, the literature indicated that it is relevant to differentiate between both subtypes [1,2,5,6,27]. For example, PSU is viewed as generalized PIU, while problematic social-media use and problematic gaming are examples of specific PIU. Moreover, one subtype of PIU (i.e. problematic gaming) has been listed as a tentative disorder: DSM-5 includes a section of “substance use disorder and IGD” and indicates this as an important direction for future study [9,26]. Additionally, GD in the ICD-11 is included as a “disorder due to substance use or addictive behavior” [9,28].

Several studies have proposed that both generalized and specific PIU should be evaluated independently, and that different treatments should be offered for them [27]. Specifically, one study found that both subtypes were associated with poor mental health outcomes such as risk of psychological distress [5••]. Studies have also shown that PIU is associated with dark-triad characteristics (i.e. Machiavellianism — indicating manipulativeness, callousness, and indifference to morality; psychopathy — indicating impaired empathy and

antisocial behavior; and narcissism — indicating extreme self-involvement) [6,29], suggesting that different characteristics are expressed in different forms of PIU [29]. One of the significant factors is gender differences, which are associated with both generalized and specific PIU. On the one hand, the male sex is associated with specific PIU, such as IGD; on the other hand, the female sex is often associated with chatting and social networking [27,30,31]. Furthermore, investigating the type of device, the application, and the circumstance (such as business or private) can improve our understanding on the effects of PIU and its negative consequences [32••]. However, there is a scarcity of studies on the specific characteristics that can help us distinguish between young people who have generalized and specific PIU. Moreover, investigating the remarkable external and structural factors of generalized and specific PIU may help us to differentiate between the two.

Problematic Internet use with a health condition

Individuals with a health condition such as autism-spectrum disorder (ASD), ADHD, and severe mental health disorders (e.g. schizophrenia) are vulnerable to PIU [33–38] because the Internet serves as a coping strategy to help them deal with their psychological problems and regulate their emotions [36,37]. Furthermore, those with alexithymia who have difficulties identifying, expressing, and communicating their emotions may also overuse the Internet for social interactions to cope with their negative feelings [39–42].

A cross-sectional study by Kawabe et al. [33] reported that Japanese adolescents with ASD had a 11.8% higher prevalence of PIU as compared with the general adolescent population. Their results further showed that ASD adolescents with ADHD symptoms had an even higher risk of PIU [33]. Paulus et al. [34] found that although boys with ASD utilized computer-mediated communication less frequently than those without ASD, they spent more time playing video games, in which they preferred to play alone rather than with others. Thus, people with ASD are likely to have specific PIU with regard to gaming [32]. Individuals with schizophrenia may use activities on the Internet (such as online gaming and social-media use) to cope with their symptoms and the adverse effects related to their psychological problems [36,37]. However, when they develop PIU, young people with schizophrenia had a higher risk of developing psychological distress [36,37]. Moreover, a recent study among Chinese undergraduate students with alexithymia suggested that mindfulness skills might be helpful for tackling PIU [40]. Similar findings have been reported by other studies on Chinese and Egyptian students [41,42]. However, evidence regarding the mechanism of comorbidity between PIU and different psychiatric problems (e.g. ASD, ADHD, and mental health disorders) is lacking. More information

regarding interventions for youth with comorbid ASD/ADHD/alexithymia and PIU is needed.

Problematic Internet use and fear of missing out

The definition of 'FoMo' is a feeling of fear, worry, or concern regarding missing out on what others are experiencing, which is perceived as being more socially rewarding, or of not obtaining useful information as compared with other individuals [43,44]. We found that most of the studies indicated a link between FoMO and various PIUs in adolescents and young adults (e.g. problematic usage of mobile or smartphones and problematic gaming). Many youth are especially attracted to the use of various social-media sites such as Facebook and Instagram, as well as engaging in Internet gaming activities through smartphone devices [43,45]. Engaging in such activities using gadgets can lead to various interferences at work, school, or even socially, making this a critical issue to be studied. FoMO seems to be one of the many reasons why youth are engaged in such problematic activities online, therefore, it is an important variable to be studied among youth. The link between FoMO and such problematic or addictive behaviors may be related to impulsivity. In addition, the urge to check one's phone for notifications on various social-media platforms is a characteristic of FoMO because of the concern of missing out on new opportunities or updates [46].

FoMO acts as a mediator of various factors that lead to PSU and IGD. A study that examined mental health variables in relation to PSU among 316 U.S. undergraduate students found that FoMO was a mediator of the relationship between depression severity and non-social-related smartphone use [47]. Another study conducted among 296 nonclinical participants in the United States also identified that FoMO acted as a mediator in the relationship between fear of negative/positive evaluation and problematic social smartphone use [48]. A mediating role of FoMO, however, was not fully supported by two other longitudinal studies [43,49]. Therefore, we should point out the caution of causal links between FoMO and PIU. Moreover, a gap in the literature exists regarding cultural differences in FoMO, as evidenced by the apparent causal relationship between FoMO and PIU and the association of FoMO with specific PIU.

Problematic Internet use and nomophobia

New technology brings many advantages to modern life, however, excessive use of technology such as smartphones may have negative effects on some people, especially students [50]. Excessive use of smartphones may jeopardize students' scholastic performance. In particular, when students feel anxious about being away from their smartphones, this may indicate that they are likely to experience nomophobia or NMP (no mobile

phone phobia) [51]. Nomophobia is defined as the fear of being deprived of a mobile phone and being unreachable. This fear is also accompanied by feelings of anxiety if one is unable to use a mobile phone or take advantage of the conveniences provided by these devices [52]. Individuals with nomophobia experience anxiety, distress, and fear when not able to use a device and keep up with messages, recent events, and various experiences shared on social media [53]. Therefore, nomophobia is a health problem because it negatively affects an individual's physical, mental, and social health.

Studies have shown that PIU, especially generalized PIU with smartphones, may cause nomophobia and that age may be a factor associated with nomophobia [53–55]. Specifically, the older an individual's age, the lower the risk of experiencing nomophobia [55]. Therefore, youth are at a high risk of developing nomophobia with negative impacts on their academic performance [51]. Regarding sex, studies have found no relationship with nomophobia [50,54]. Moreover, research has shown that there was a positive relationship between extraversion and nomophobia, which may be due to social interactions and the desire for sociability with others, especially in those with low self-esteem [50]. As a result, PIU has a significant relationship with nomophobia, given that the absence of the smartphone may trigger their nomophobia [54]. Nevertheless, there are no proper guidelines on smartphone use, which should be provided at home, in school, and in clinical settings to raise awareness about the risk of nomophobia. Therefore, more studies are needed to identify risk groups and to establish treatment programs and adequate prevention strategies. Moreover, classifying and differentiating PIU and anxiety disorder pose a challenge to defining nomophobia, therefore, more discussion on identifying nomophobia is needed.

Problematic Internet use and cyberchondria

There has been an exponential increase in the number of people engaging with digital technologies, particularly during the COVID-19 pandemic, including the use of Internet searches to find health information. Information-seeking by people who have become infected with COVID-19 or perceive themselves to be at high risk if infected has been associated with more psychological symptoms [56], and a higher level of anxiety has been reported in people related to the pandemic [57]. Excessive or repeated use of the Internet to seek health-related information, which leads to distress, typically in the form of health anxiety, is referred to as cyberchondria [58]. Two studies have offered substantial new observed evidence to add to the (limited) existing body of evidence on the relationship between PIU and cyberchondria [59,60]. Durak Batgün et al. [60•] found that PIU, together with anxiety, was a significant

mediator of the association between distress tolerance and cyberchondria in Turkey. Meanwhile, Fergus and Spada [59] found an association between cyberchondria and PIU among U.S. adults. Moreover, Fergus and Spada [59] indicated that metacognitive treatment approaches might be beneficial for treating cyberchondria when accounting for PIU. However, given that the current evidence on cyberchondria is limited, future studies investigating any aspect of cyberchondria associated with PIU (e.g. considerations of FoMO, nomophobia, or the COVID-19 pandemic) are needed.

Problematic Internet use and cyberbullying

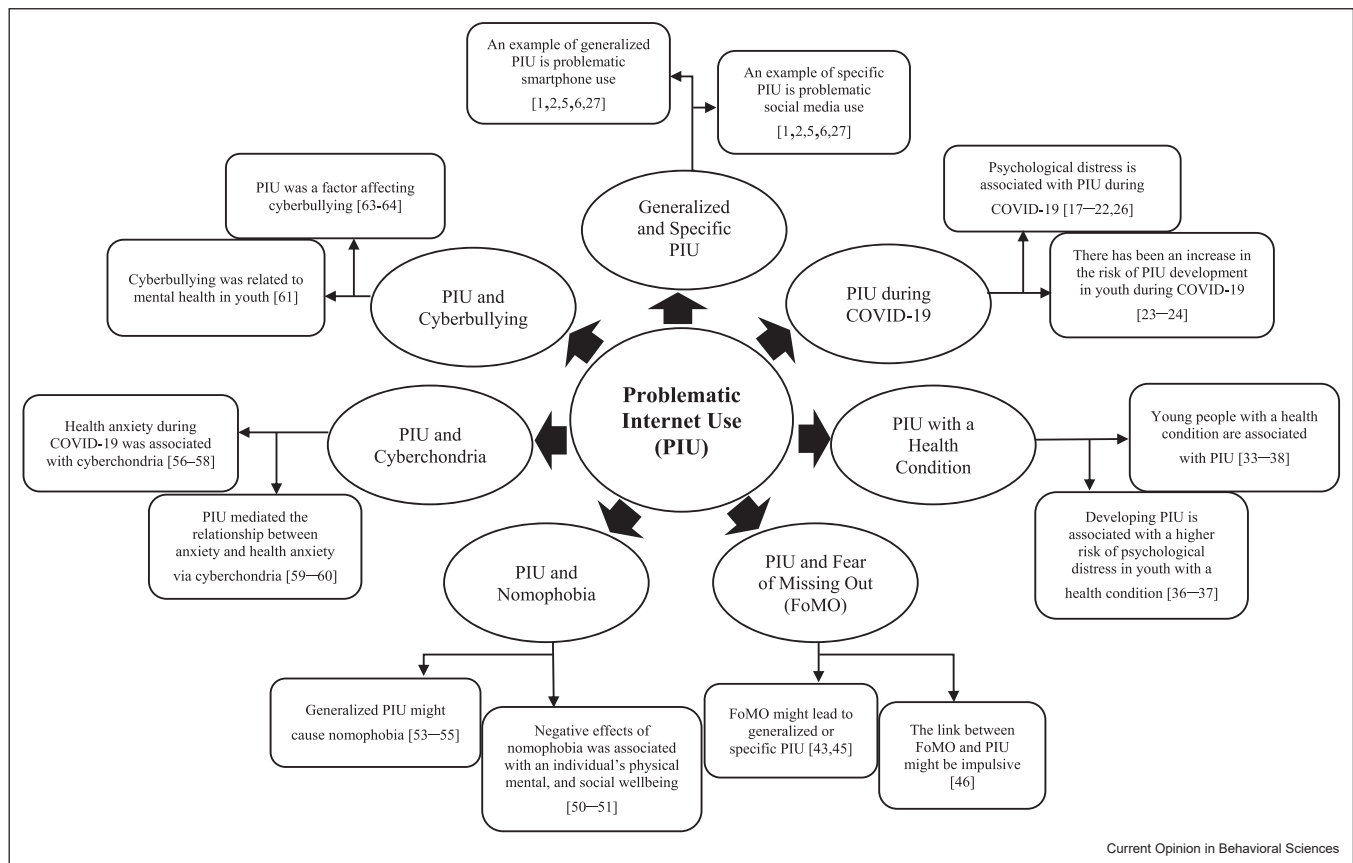
Cyberbullying (including forms of flaming, harassment, cyber stalking, denigration, impersonation, outing, trickery, and exclusion) has been found to be a serious issue that has impacted adolescents and students' mental health [61]. In a study conducted in the United States, the prevalence of cyberbullying ranged from 1% to 30% for suspected perpetrators and from 3% to 72% for suspected victims [62]. Cyberbullying may take the form of personal blogs, text messages, broadcast messages, and messages posted on websites (e.g.

YouTube, SnapChat, Instagram, or Tiktok) [62]. Cyberbullying has been found to be related to PIU [63,64]. In a Spanish study, PIU was associated with cyberbullying in several youth profiles, including low, moderate, high, and very high levels of intra- and interpersonal conflict [63]. A study also found that social-media use may trigger cyberbullying among adolescents [64]. Additionally, a study among Chinese adolescents found that rejection sensitivity significantly mediated the relationship between PIU and cyberbullying. Those with higher rejection sensitivity were more likely to have higher PIU [65]. However, the causality between PIU and cyberbullying is unclear, and future studies should investigate the potential causal relationships between them.

Discussion

The present review describes the issues of PIU among youth. The issues related to PIU among youth are summarized in Figure 1. We have observed increased Internet use among youth during the COVID-19 pandemic. Some studies have reported that Internet overuse

Figure 1



Overview of PIU and associated subtopics in the present brief review.

is not associated with increased PIU, and that, in fact, it acts as a coping strategy to prevent mental distress during the COVID-19 pandemic [17,66]. Although this evidence presents positive results, we should closely monitor the situation to prevent the negative consequences of PIU that can occur following Internet overuse. Additionally, we have demonstrated that no conclusion on the diagnostic criteria of PIU could be drawn from the literature because the specific characteristics of PIU are various. However, providing definitions of the different types of PIU might help promote precise diagnosis and accurate prognosis, in addition to increasing the success of interventions to decrease PIU [5••]. Moreover, our research highlighted the significant issues (i.e. health conditions (such as ADHD), FoMO, nomophobia, cyberchondria, and cyberbullying) that may be associated with uncontrolled Internet use. We found that these vulnerable populations might be prone to PIU and its adverse outcomes. However, little evidence has been published regarding issues of PIU among youth since the COVID-19 pandemic began. Future studies should explore the mechanisms of the association between these phenomena to reduce their potential risks.

Limitations

The current review has some limitations. First, we only selected literature published between 2017 and 2021 to review; thus, the present review was not comprehensive, given that the issue of PIU was initially raised in the 1990s. Second, the present review is not a systematic review, and the methodology of article selection does not follow the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses [67]. Instead, the review was mainly based on the expertise of the authors. Accordingly, some important topics were not discussed and reviewed. For example, definitions, assessment, validation of clinical tools, prevalence, etiology, socio–health–economic impacts, empirically validated interventions, and policies of PIU in youth were not discussed. A future review is needed to investigate the aforementioned topics. Third, the present review includes many references to studies from Asian countries, which may not have strong generalizability. However, the present review serves to provide some ideas for researchers on potential topics of interest related to PIU among youth. Therefore, a systematic review is needed in the future to provide a thorough and comprehensive understanding of the issues surrounding PIU among youth.

Conclusion

According to this current review, PIU, regardless of whether it is generalized PIU or specific PIU, is associated with significant issues, including FoMO, nomophobia, cyberchondria, and cyberbullying. Furthermore,

PIU is related to health conditions (i.e. ASD, ADHD, and schizophrenia). Moreover, the COVID-19 pandemic may exacerbate the issues of PIU among youth. This review could be helpful for investigating the prevalence and influencing factors, which are related to PIU and its negative health outcomes.

Conflict of interest statement

All the authors declare that there is no conflict of interest.

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