1828
AKADÉMIAI KIADÓ

Journal of Behavioral Addictions

DOI:
10.1556/2006.2025.00058

REVIEW ARTICLE

Forms of interventions for problematic usage of the internet: A scoping review

IRENE P. CARVALHO[1,2*], ARTEMISA R. DORES[3,4], ILARIA CATALDO[5], VALERIA CATALANI[6], LUCA PELLEGRINI[6,7,8,9], ELISABETH PREVETE[10], NATALIE HALL[6], THOMAS ZANDONAI[5,11], ANDRES ROMAN-URRESTARAZU[12], JULIUS BURKAUSKAS[13], ALESSANDRO CAROLLO[5], GIANLUCA ESPOSITO[5], JOSE M. MENCHON[14], HANS-JÜRGEN RUMPF[15], ZSOLT DEMETROVICS[16,17,18] and ORNELLA CORAZZA[5,6]

[1] Medical Psychology, Department of Clinical Neurosciences and Mental Health, Faculty of Medicine, University of Porto, Porto, Portugal

[2] RISE-Health, Faculty of Medicine, University of Porto, Porto, Portugal

[3] Escola Superior de Saúde, Politécnico do Porto, Porto, Portugal

[4] Faculty of Psychology and Education Sciences, University of Porto, Porto, Portugal

[5] Addiction Science Lab, Department of Psychology and Cognitive Science, University of Trento, Trento, Rovereto, Italy

[6] School of Life and Medical Sciences, University of Hertfordshire, Hatfield, United Kingdom

[7] Department of Medicine, Surgery and Health Sciences, University of Trieste, Trieste, Italy

[8] Azienda Sanitaria Universitaria Giuliano-Isontina – ASUGI, UCO Clinica Psichiatrica, Trieste, Italy

[9] Centre for Psychedelic Research and Neuropsychopharmacology, Imperial College London, London, UK

[10] Department of Human Neurosciences, Sapienza University of Rome, Rome, Italy

[11] Department of Pharmacology, Pediatrics, and Organic Chemistry, Miguel Hernández University of Elche, 03550, Sant Joan, Alicante, Spain

[12] Department of Psychiatry, University of Cambridge, Cambridge, UK

[13] Laboratory of Behavioral Medicine, Neuroscience Institute, Lithuanian University of Health Sciences, Palanga, Lithuania

[14] Department of Psychiatry, Bellvitge University Hospital-IDIBELL, Department of Clinical Sciences, University of Barcelona, CIBERSAM, Barcelona, Spain

[15] Department of Psychiatry and Psychotherapy, University of Lübeck, Lübeck, Germany

[16] College of Education, Psychology and Social Work, Flinders University, Adelaide, Australia

[17] Institute of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary

[18] Centre of Excellence in Responsible Gaming, University of Gibraltar, Gibraltar

Received: December 19, 2024 • Revised manuscript received: April 7, 2025 • Accepted: July 20, 2025

ABSTRACT

Background and aims: This scoping review aims to identify current forms of interventions for Problematic Usage of the Internet (PUI) to inform more effective intervention and policy-making initiatives grounded in robust empirical evidence. *Methods:* The search was conducted in the PubMed, Scopus, and PsycINFO databases until October 12, 2024. Empirical research presenting data on interventions for PUI and written in English was included without restrictions of age groups, types of interventions, or types of PUI. *Results:* Five main forms of interventions for PUI were identified in the 77 studies included in the review, namely,

*Corresponding author.
E-mail: irenec@med.up.pt

pharmacotherapy, transcranial direct current stimulation, physical exercise, electroacupuncture, and psychotherapy or educational programs. Most studies were conducted in Asian and Middle-Eastern countries, and various validated instruments were used to assess PUI. Psychotherapy and education were the most common interventions in research. Apart from time spent online, positive results of the various interventions were reported on the respective PUI scales in most studies. However, studies with rigorous designs showed non-significant changes, suggesting that methodological differences may influence the reported outcomes. *Discussion and conclusions:* The different interventions reflect the multidimensional nature and complexity of PUI treatment and prevention strategies. Although current interventions show potential, more robust and rigorous study designs are necessary to draw definite conclusions. Further investigation is needed to understand the influence of comorbidities and the impact of individuals actively seeking help on treatment outcomes. Additionally, more substantial evidence is required to evaluate the effectiveness of PUI prevention efforts, particularly considering varying levels of PUI severity.

KEYWORDS

problematic use of the internet, internet use, intervention modalities, psychotherapy, pharmacotherapy, time spent online, prevention, assessment tools, gaming, smartphone, internet addiction

INTRODUCTION

In the contemporary era, the digital landscape is integral to daily life, offering advantages like easy access to information, eHealth services, and new communication and entertainment methods. However, it also presents challenges for individuals and the civil society (Trittin-Ulbrich, Scherer, Munro, & Whelan, 2021), potentially contributing to Problematic Usage of the Internet (PUI), which is gaining increasing attention in research globally (Fineberg et al., 2022). The COVID-19 pandemic has exacerbated this issue, with the Internet becoming essential for social interactions, education, and work, increasing the risks of maladaptive use (Cataldo, Burkauskas, et al., 2022; Király et al., 2020).

PUI encompasses a range of behaviors characterized by excessive and detrimental online engagement, including compulsive social media use, gaming, cyberbullying, streaming, pornography, gambling, and cyberchondria (Bates & McVeigh, 2015). These behaviors involve a loss of control and risky Internet use, leading to significant adverse effects on health, well-being, and society (Cai et al., 2023; Dahl & Bergmark, 2020; Fineberg et al., 2018). In severe cases, online gaming and gambling qualify as behavioral addictions, recognized as mental disorders (Brand et al., 2022; Brand & Potenza, 2024; World Health Organization [WHO], 2023, 2024), underscoring the clinical significance of PUI.

The etiology of PUI is multifaceted, influenced by individual, relational, and societal factors (Ruckwongpatr et al., 2022; Wright, Heiman, & Olenik-Shemesh, 2021). The Person Affect-Cognition-Execution (I-PACE) model (Brand et al., 2019) highlights how psychopathology, cognitive processes, and digital environments interact to reinforce habitual usage, leading to detrimental outcomes. The digital environments amplify this risk through addictive design features such as "likes" and "views", exploiting psychological vulnerabilities. Additionally, weak regulations, such as the 13-year-old age limit for social media access, further contribute to early engagement and potential maladaptive use (Cataldo et al., 2021).

Adolescents are particularly vulnerable to PUI due to their developing cognitive control, making them more susceptible to digital platforms' engagement-driven designs. This risk is heightened in those with mental health challenges, like impulsivity or poor self-regulation (Geng et al., 2023; Suchá, Dolejš, Dostál, Pipová, & Pontes, 2024), leading to a disproportionate impact (Fineberg et al., 2022; Ruckwongpatr et al., 2022). PUI reflects disrupted self-management, where excessive online activity causes distress and functional impairment (Bisen & Deshpande, 2018). These aspects highlight the need for understanding and action to mitigate the widespread effects of PUI (Cataldo, Burkauskas et al., 2022; Király et al., 2020).

The societal causes of PUI go beyond individual vulnerability (Ramón-Arbués et al., 2021; Sánchez-Fernández, Borda-Mas, & Mora-Merchán, 2023) to include the broader digital landscape. Platforms designed for socialization, entertainment, and support often exploit addictive characteristics through attention-driven algorithms and social media metrics (Cataldo et al., 2021). Conditioned responses to notifications and powerful algorithm-based technologies represent significant challenges to the healthy management of online behavior. These challenges extend beyond personal health and well-being to the broader domain of human rights. The cycle of engagement prioritizes platform metrics over the user's well-being (Cataldo, Bilieux, et al., 2022).

The risks of digital technologies on the self-management of online behavior constitute a critical concern. Understanding how notifications and algorithms drive compulsive use is key to mitigating potential harm and shaping policies that protect digital rights. This understanding is crucial to ensure that technological progress does not compromise human well-being or human rights (Cataldo, Bilieux, et al., 2022; Király et al., 2018; Zhou, Liao, Gorowska, Chen, & Li, 2024).

Evidence links online activity to mental health issues and comorbidities like anxiety, depression, attention deficit hyperactivity disorder, obsessive-compulsive disorder, addiction, or body dysmorphic disorder (Dores et al., 2021; Ioannidis et al., 2019; Leo, Kewitz, Wartberg, & Lindenberg, 2021). Impairments in specific cognitive functions (e.g., affect regulation, inhibitory control) both predispose individuals to PUI and result from PUI (Brand et al., 2019). For instance, affect regulation has been proposed as an interventional target for forms of PUI, predicting remission at 12 months follow-up (Leo et al., 2021). Additionally, inhibitory cognitive control deficits (Ioannidis et al., 2019) are found to influence pandemic-related adjustment and behaviors, such as stress regulation (Fineberg et al., 2021), or vaccine uptake (Cao & Li, 2022). Enhancing digital self-management could improve psychosocial adaptation with wider societal benefits.

PUI affects a growing number of individuals, imposing considerable costs on families and society (Rumpf, Effertz, & Montag, 2022). During the COVID-19 pandemic, PUI rates surged, with online time increasing due to isolation, financial hardship, and mental health struggles, reaching 17.5% globally and up to 30% among European school children (Gjoneska et al., 2022; Mohler-Kuo, Dzemaili, Foster, Werlen, & Walitza, 2021).

PUI leads to mental health difficulties (e.g., mood and anxiety disorders, addiction, suicidal behavior), social conflicts, academic/work impairments, and societal problems like misinformation and conspiracy beliefs (Fineberg et al., 2018; Gjoneska et al., 2022; Gori et al., 2021; Lindenberg, Halasy, Szász-Janocha, & Wartberg, 2018). Emerging early in life, PUI often persists, underscoring the need for early detection and intervention (Fineberg et al., 2018; Leo et al., 2021). The European Parliament Scientific Foresight Unit (STOA) advocates for community and clinical interventions to manage PUI (European Parliament Scientific Foresight Unit [STOA], 2019). Establishing which forms of interventions have been implemented, and their efficacy, is thus necessary to address these recommendations.

A previous systematic review identified psycho-pharmacotherapy and psychological therapy as two forms of intervention for PUI (Kuss & Lopez-Fernandez, 2016). Additionally, a meta-analysis on Internet addiction treatments assessed the efficacy of various modalities of intervention for PUI in 29 articles published until 2017 (Chang, Chang, Yang, & Tzang, 2022). Subsequent reviews have focused on pharmacotherapies (e.g., Solly, Grant, & Chamberlain, 2022), the effectiveness of psychological interventions (e.g., Augner, Vlasak, Aichhorn, & Barth, 2022), namely with adolescents (e.g., Malinauskas & Malinauskiene, 2019), exercise and psychological interventions in East Asia (Liu, Nie, & Wang, 2017), namely with university students (Liu, Soh, Samsudin, Rattanakoses, & Qi, 2022), or transcranial stimulation interventions (Xu et al., 2022). Recent reviews and meta-analyses have provided overviews of treatment modalities and treatment effects for PUI in randomized controlled trials (Zhu, Chen, Li, Mei, & Wang, 2023), namely with children and adolescents (Ayub et al., 2023), or specifically regarding problematic gaming in studies that included control groups (Danielsen, Mentzoni, & Låg, 2024), as well as presenting preventive interventions for PUI among young children (Theopilus, Al Mahmud, Davis, & Octavia, 2024).

With a comprehensive scope beyond exclusively randomized controlled trials, online gaming, addiction, particular age groups, or specific (prevention, treatment, or other) purposes, the current scoping review aimed to map the variety of existing intervention modalities for PUI in the empirical research, also documenting their effectiveness. In the post-COVID-19 period, and to lay the groundwork for future evidence-based interventions aimed at addressing problematic Internet use, the goal of this scoping review was to identify, through the search of the main sources of evidence available, forms of interventions for PUI broadly that may be suitable for further systematic investigation (Mak & Thomas, 2022; Munn et al., 2018) and for the eventual formulation of policy recommendations that are grounded in robust empirical evidence.

METHODS

The search for this scoping review was conducted in the PubMed (including PubMed Central, or PMC), Scopus (article title, abstract, keywords), and PsycINFO databases until October 12, 2024. The initial review process involved a detailed examination of studies, reports, and theoretical models pertinent to PUI for a comprehensive understanding of problematic use of the Internet and of its therapeutic approaches. A widely comprehensive query, linked with Boolean operators, was used to ensure the retrieval of a high number of pertinent publications focusing on PUI (intervention OR treatment OR program) AND ("problematic use of Internet" OR "PIU" OR "PUI" OR "problematic internet use" OR "problematic internet usage" OR "problematic usage of the internet").

Articles were identified and assessed for eligibility by three independent reviewers (IC, VC, and LP), who independently decided which identified articles to include according to the eligibility criteria. Inclusion criteria were (1) original articles investigating interventions for PUI in humans, (2) published in peer-reviewed journals, (3) with available full text, and (4) written in English. Exclusion criteria were (1) articles with scarce information (e.g., missing reference list or abstract), and (2) articles focusing on aspects related to PUI other than interventions (e.g., etiology of the disorder or epidemiological studies). Unpublished studies, conference abstracts, or poster presentations were not included.

A total of 7,156 studies were retrieved. After removing duplicates and shortlisting the abstracts according to their potential pertinence regarding the topic of the scoping review, 604 articles were browsed and filtered following the inclusion and exclusion criteria. One study that appeared in the search (on a physical exercise intervention) has been retracted from publication, and the full text of another article could not be accessed (also after contacting the authors), thus, both were excluded. Of the 602 full-text articles assessed for eligibility, 525 focused on PUI-related aspects other than interventions, and were excluded. A final number of 77 studies were included in the review. Figure 1 depicts the selection process.

RESULTS

The 77 publications in this review comprised five main forms of interventions for PUI, namely, pharmacotherapy (n = 9 records), transcranial direct current stimulation (tDCS) applied over the dorsolateral prefrontal cortex (n = 4 records), physical exercise (n = 3 records), electroacupuncture (n = 2 records), and psychotherapy, counseling, or educational interventions (n = 61 records,

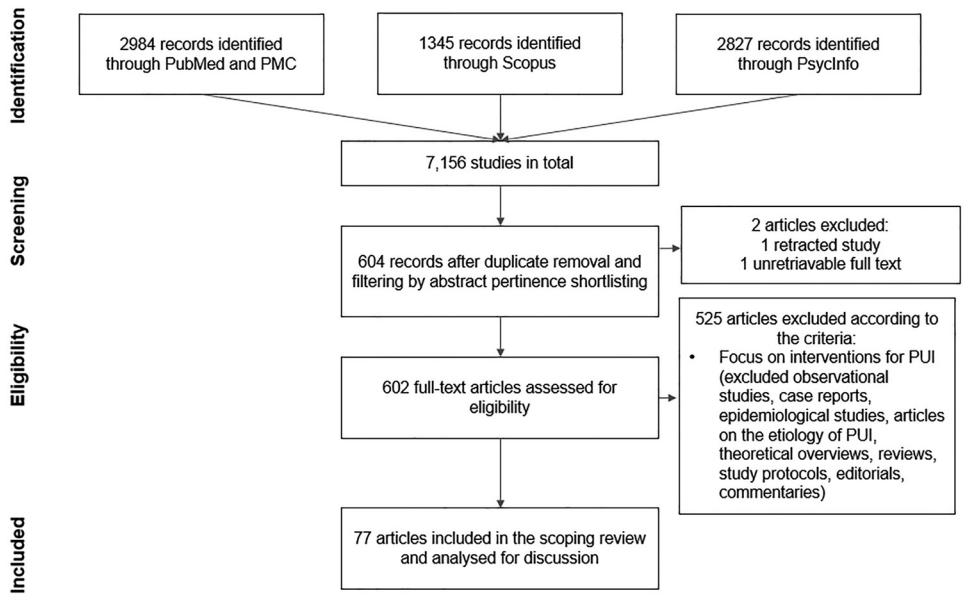

Fig. 1. Flow chart of the selection process (database screening conducted on October 12, 2024)

including the two electroacupuncture interventions mentioned above, which also involved psychotherapy). Pharmacotherapy for PUI was applied both in nonclinical samples ($n = 4$ studies) and with patients who had other comorbidities ($n = 5$ studies). The studies and their characteristics (authors, country, year, sample size, age, gender, intervention program, presence of comparison groups, main findings, and study title) are presented in Table 1 by type of intervention.

In presenting the information, the terms that the authors used in their articles for the concept of PUI are also used in this review. Despite the currently more accepted term of "PUI", "Internet addiction" is used in many articles.

Studies on pharmacotherapy ($n = 9$)

The effects of pharmacotherapy on PUI were investigated in nine studies, with both clinical (i.e., presenting other psychiatric comorbidities) and nonclinical (i.e., without other psychiatric comorbidities) samples.

Studies on PUI mostly in nonclinical samples ($n = 4$)

Study characteristics. Among four studies presenting results on PUI mostly in nonclinical samples (Bae, Hong, Kim, & Han, 2018; Dell'Osso et al., 2008; Han, Hwang, & Renshaw, 2010; Song et al., 2016), three were conducted in Korea and were specifically focused on Internet gaming disorder (IGD) (Bae et al., 2018; Song et al., 2016) and Internet-based gambling disorder (ibGD) (Bae et al., 2018) or Internet video game addiction (Han et al., 2010). The fourth study was conducted in the United States of America (US) and focused on impulsive-compulsive Internet usage disorder (IC-IUD; i.e., broad range of impulsive and compulsive online activities) with a few psychiatric comorbidities among some participants (Dell'Osso et al., 2008). All involved adult populations (Bae et al., 2018; Dell'Osso et al., 2008; Han et al., 2010) or adolescent and adult populations (Song et al., 2016) consisting of male-only participants (Bae et al., 2018; Han et al., 2010; Song et al., 2016) or a large proportion of male participants (12 out of 19 in Dell'Osso et al.'s, 2008, study). Sample sizes ranged from 19 (Dell'Osso et al., 2008; Han et al., 2010) to 122 (including the observation group) (Song et al., 2016).

Assessment of PUI was based on Young's Internet Addiction Scale (YIAS) (Bae et al., 2018; Han et al., 2010; Song et al., 2016) and the Yale-Brown Obsessive Compulsive Scale for pathologic gambling (YBOCS-PG) or the Yale-Brown Obsessive Compulsive Scale version for impulsive-compulsive Internet usage disorder (YBOCS - IC-IUD) (respectively, Bae et al., 2018; Dell'Osso et al., 2008). Self-report of craving on a specific seven-point Visual Analogue Scale (VAS) was also evaluated in a study (Han et al., 2010). Time spent on the Internet was assessed in two of these studies, namely, non-essential Internet use time (Dell'Osso et al., 2008), and time of game playing and Internet use (Han et al., 2010).

Some studies lacked comparison groups, "blank" or placebo groups, or proper group comparisons over time in the statistical analyses (Bae et al., 2018; Han et al., 2010; Song et al., 2016). One publication included a placebo control (with random assignment of the participants) in phase two of the study (Dell'Osso et al., 2008).

Types of interventions. Interventions for IGD, ibGD (Bae et al., 2018; Han et al., 2010; Song et al., 2016), and IC-IUD (Dell'Osso et al., 2008) were based on medication only, which was a dopaminergic antidepressant (e.g., bupropion sustained release - SR 150–300 mg/day) (Bae et al., 2018; Han et al., 2010; Song et al., 2016) or a serotonergic antidepressant (SSRI) (e.g., escitalopram 10–20 mg/day) (Dell'Osso et al., 2008; Song et al., 2016) administered for a period between six

Table 1. Articles included in the review by modality of intervention

No.	Authors	Year	Country	Sample	Intervention	Comparison group[1]	Main findings	Null/Mix results*	Title
Pharmacotherapy									
#1	Bae et al.	2018	Korea	*N* = 46 Mean age: ~25.33 ± 4.93 Male: 100%	Bupropion	No	Compared to before, severity of online gaming and online gambling decreased after the treatment		Bupropion shows different effects on brain functional connectivity in patients with Internet-based gambling disorder and Internet gaming disorder.
#2	Bipeta et al.	2015	India	*N* = 11 Mean age: 21.18 ± 3.09 Male: 81.8%	Selective serotonin reuptake inhibitor (SSRI) fluvoxamine or sertraline or fluoxetine or clomipramine	No	Compared to before, the treatment of underlying obsessive-compulsive disorder improved Internet addiction		Diagnostic stability of Internet addiction in obsessive-compulsive disorder: Data from a naturalistic one-year treatment study.
#3	Dell'Osso et al.	2008	US	*N* = 19 Mean age: 38.5 ± 12 Male: 63.2%	Escitalopram	No. Placebo only after 10 weeks of treatment (second phase)	Compared to before, there was a decrease in hours spent on the Internet and in impulsive-compulsive Internet usage disorder, without significant differences between placebo and EG in the second phase of the study	*	Escitalopram in the treatment of impulsive-compulsive Internet usage disorder: An open-label trial followed by a double-blind discontinuation phase.
#4	Han et al.	2009	Korea	*N* = 62 Mean age: 9.3 ± 2.2 Male: 83.9%	Concerta (OROS methylphenidate HCl)	No	Compared to before, Young's Internet Addiction Scale (Korean version) scores and video game use times decreased after the treatment		The effect of methylphenidate on Internet video game play in children with attention-deficit/hyperactivity disorder.
#5	Han et al.	2010	Korea	*N* = 19 Mean age: ~20.9 ± 4.85 Male: 100%	Bupropion	No	Compared to before, there was a decrease in Young's Internet Addiction Scale scores, craving for video games, total game time, and cue-induced brain activity in the dorsolateral prefrontal cortex		Bupropion sustained release treatment decreases craving for video games and cue-induced brain activity in patients with Internet video game addiction.
#6	Han and Renshaw	2012	Korea	*N* = 50 Mean age: ~20.15 ± 7.1 Male: 100%	Bupropion plus education	Yes	Compared to the placebo group, there was a decrease in Young's Internet Addiction Scale scores and mean time of online game playing, which (both) persisted at the four-week post-treatment follow-up period, although depression recurred		Bupropion in the treatment of problematic online game play in patients with major depressive disorder.

(continued)

Table 1. Continued

No.	Authors	Year	Country	Sample	Intervention	Comparison group[1]	Main findings	Null/Mix results*	Title
#7	Nam et al.	2017	Korea	*N* = 30 Mean age: ~23.4 ± 1.75 Male: N/A	Bupropion or escitalopram	Yes	There was an amelioration of Internet gaming disorder symptoms in both the bupropion and escitalopram groups, with bupropion showing greater effects than escitalopram on impulsivity and attentional symptoms		Comparing the effects of bupropion and escitalopram on excessive Internet game play in patients with major depressive disorder.
#8	Park et al.	2016	Korea	*N* = 86 Mean age: ~17.0 ± 1.3 Male: 100%	Methylphenidate or atomoxetine	Yes	The treatments reduced Young's Internet Addiction Scale and Behavioral Inhibition/Activation System (BIS/BAS) scales scores without significant differences between the methylphenidate and atomoxetine groups		Effectiveness of atomoxetine and methylphenidate for problematic online gaming in adolescents with attention deficit hyperactivity disorder.
#9	Song et al.	2016	Korea	*N* = 122 Mean age: ~19.8 ± 3.94 Male: 100%	Bupropion or escitalopram	Yes	Scores on Young's Internet Addiction Test decreased in both treatment groups compared to the observation group, with greater decreases in the bupropion group		Comparative study of the effects of bupropion and escitalopram on Internet gaming disorder.
Transcranial direct current stimulation (tDCS) over the dorsolateral prefrontal cortex (DLPFC)									
#10	Jeong et al.	2020	Korea	*N* = 26 Mean age: ~22.7 ± 1.65 Male: 57.7%	tDCS	Yes	There were non-significant Group*Time interaction effects on decreased time spent on gaming, Internet Addiction Test, and Behavioral Inhibition/ Activation Systems scores between the active and sham groups	*	Effects of transcranial direct current stimulation on addictive behavior and brain glucose metabolism in problematic online gamers.
#11	Lee et al.	2018	Korea	*N* = 15 Mean age: ~25.05 ± 4.45 Male: 56%	tDCS	No	There was a significant decrease in weekly gaming hours and Internet Addiction Test scores, and an increase in Brief Self-Control Scale scores		Transcranial direct current stimulation for online gamers: a prospective single-arm feasibility study.

(continued)

Table 1. Continued

No.	Authors	Year	Country	Sample	Intervention	Comparison group[1]	Main findings	Null/Mix results*	Title
#12	Lee et al.	2021	Korea	$N = 26$ Mean age: ~24.20 ± 7.36 Male: 100%	tDCS	Yes	The increased intra-hemispheric beta coherence of the sham group was suppressed in the active group at one-month follow up, but only the absolute gamma power in the left parietal region was decreased in the active group compared to the sham group, with non-significant differences between the groups on the Internet Addiction Test and on craving at baseline and follow up	*	Neuromodulatory effect of transcranial direct current stimulation on resting-state EEG activity in Internet gaming disorder: a randomized, double-blind, sham-controlled parallel group trial.
#13	Wu et al.	2021	China	$N = 33$ Mean age: N/A (adult IGD patients) Male: 100%	tDCS	Yes	Compared to the sham group, there was a decreased impact of gaming-related (versus non-gaming) images and improved inhibitory control over gaming distractions in the active tDCS group, however with no effect on cue-induced craving	*	Efficacy of Single-Session Transcranial direct current stimulation on addiction-related inhibitory control and craving: a randomized trial in males with Internet gaming disorder.
Physical exercise									
#14	Chen and Sun	2022	China	$N = 1,000$ Mean age: N/A (college students) Male: 48.6%	High-intensity intermittent exercise	No (unclear)	The results show that a high-intensity interval exercise intervention has a positive effect on the withdrawal of Internet addiction among college students		Psychological mechanism and exercise intervention of college students' problematic Internet use based on IoT technology.
#15	Yang, Shangguan, et al.	2022	China	$N = 60$ Mean age: 20.08 ± 1.94 Male: 50.0%	Acute moderate-intensity aerobic exercise with background music plus viewing mobile phone-relevant triggers	Yes	The visual analogue scale (VAS) score for mobile phone degree of craving was significantly lower in the exercise + music group compared to the music-only control group		The influence of acute aerobic exercise on craving degree for university students with mobile phone dependency: a randomized controlled trial.
#16	Zhang et al.	2023	China	$N = 93$ Mean age: ~20.12 ± 0.64 Male: 38.7%	Exercise or Tai Chi	Yes	There was a significant intervention effect, with the exercise group showing a decrease on the Internet addiction test (IAT) compared to the control group, but a non-significant difference emerging between the control and the Tai Chi groups		Effects of exercise or tai chi on Internet addiction in college students and the potential role of gut microbiota: a randomized controlled trial.

(continued)

Table 1. Continued

No.	Authors	Year	Country	Sample	Intervention	Comparison group[1]	Main findings	Null/Mix results*	Title
Psychotherapy or educational interventions									
#17	Brouzos et al.	2024	Greece	*N* = 47 Mean age: 21 ± 3 Male: 44.7%	CBT web-based group intervention	Yes	There was an improvement in Internet addiction levels for the intervention group, compared to the control group, that was maintained at the 1.5-month follow up		Effectiveness of a web-based group intervention for Internet addiction in university students.
#18	Choi et al.	2024	Korea	*N* = 61 Mean age: 11.24 ± 1.84 Male: 49.2%	CBT through mobile neurofeedback	Yes	The interaction effect of between-group factors and within-group factors was significant, and so was the within-group (pre- versus post-test) factor, but the between-group factor (mobile neurofeedback versus sham) was not significant		Impact of mobile neurofeedback on Internet addiction and neurocognitive function in neurotypical children: Double-blind, sham-controlled randomized clinical trial.
#19	Dunbar et al.	2024	Australia	*N* = 74 Mean age: 24.60 ± 7.15 Male: 44.6%	Online dynamics of self-regulation (commitment and progress frameworks) model with success/failure feedback	Yes	Internet Addiction Test (IAT) scores and daily hours on the Internet (DPI) decreased significantly more in the EG than in the active CG after the 21-day intervention, but the effects were non-significant at the six-week follow up and became significant, for the only 38 participants who remained, in the linear mixed-effects model estimated means controlling for baseline IAT or DPI	*	Problematic Internet usage: can commitment and progress frameworks help regulate daily personal Internet use?
#20	Favini et al.	2024	Italy	*N* = 462 Mean age: 15.2 ± 0.50 Male: 59%	Psychoeducation including self-regulatory self-efficacy and a positive focus	Yes	There was a significant decrease in both (social network and smartphone) addictions across time in the intervention group, compared to the control group		Smartphone and social network addiction in early adolescents: The role of self-regulatory self-efficacy in a pilot school-based intervention.

(continued)

Table 1. Continued

No.	Authors	Year	Country	Sample	Intervention	Comparison group[1]	Main findings	Null/Mix results*	Title
#21	Han et al.	2024	Korea	$N = 733$ Mean age: 12.6 ± 1.4 Male: 52.1%	Game literacy education and game coding education	Yes	Both game coding education and game literacy education significantly improved Young's Internet Addiction Scale scores compared to baseline, with a non-significant difference between the two groups after the interventions, but Internet use time did not change in either group. Positive attitudes toward Internet games increased without significant differences between the groups, whereas negative attitude scores decreased only in the coding education group, with a significant difference between the groups	*	Comparing the effectiveness of game literacy education and game coding education in improving problematic Internet gaming.
#22	Ma et al.	2024	China	$N = 145$ Mean age: 22.85 ± 3.86 Male: 21.4%	Photography and related essay written on the sense of control	Yes	A significant Time*Group interaction was observed, with the intervention group showing a notable reduction in Internet addiction and an increase in sense of control compared to the waiting group		Online photography intervention reduces Internet addiction during Covid-19: a randomised controlled trial.
#23	Ortega-Barón et al.	2024	Spain	$N = 726$ Mean age: 12.11 ± 0.89 Male: 45.6%	Psychoeducation (Safety.net)	Yes	Compared to the CG, the intervention group showed significant decreases in PUI, nomophobia, peer cybervictimization, and sexual solicitation/interaction with adults, and significantly smaller increases in cyber dating victimization, although the differences were non-significant for Internet gaming, online gambling, and sexting (the program preventing the increase of most Internet risks)	*	Efficacy of a multi-risk Internet prevention program: Safety.net.

(continued)

Table 1. Continued

No.	Authors	Year	Country	Sample	Intervention	Comparison group[1]	Main findings	Null/Mix results*	Title
#24	Xu et al.	2024	China	$N = 61$ Mean age: ~20.29 ± 1.71 Male: 50.8%	Mindfulness meditation and progressive muscle relaxation	Yes	Compared with progressive muscle relaxation, mindfulness meditation decreased the severity of addiction and game craving in Internet gaming disorder		Mindfulness meditation training reduces gaming cravings by reshaping the functional connectivity between the default mode network and executive control–related brain regions.
#25	Zhu	2024	China	$N = 334$ Mean age: ~18.53 ± 0.76 Male: 38%	Proximity to nature	Yes	Participants in the nature condition (NNI) reported significantly lower scores of problematic smartphone use, relative to their counterparts in the human-built (NHB) and (active) control conditions, without a significant difference between the NHB and (active) control conditions, and participants in the nature condition also reported less desire for using the smartphone than those in the urban (NHB) condition		Proximity to nature prevents problematic smartphone use: the role of mindfulness.
#26	Akgül-Gündoğdu and Selçuk-Tosun	2023	Turkey	$N = 128$ Mean age: ~11.66 ± 1.15 Male: 63.3%	Solution-focused approach plus parent education	Yes	There were statistically significant differences between the post-test (intervention and waiting) groups for mean Internet addiction		Effect of solution-focused approach on problematic Internet use, health behaviors in schoolchildren.
#27	Ding et al.	2023	China	$N = 90$ Mean age: N/A (college students) Male: 56.6%	Online self-help acceptance and commitment therapy (ACT program), mindfulness practice and meditation practice	Yes	Both interventions (the full ACT program *versus* only the value-based components of the ACT program) effectively reduced gaming disorder and weekly gaming frequency, although a non-significant change in daily gaming frequency emerged associated to the full ACT, whereas the value-based group exhibited a significant reduction in daily gaming hours		Online self-help acceptance and commitment therapy module for college students with higher gaming disorder during Covid-19: a pilot study.

(continued)

Table 1. Continued

No.	Authors	Year	Country	Sample	Intervention	Comparison group[1]	Main findings	Null/Mix results*	Title
#28	Dursun and Ceyhan	2023	Turkey	*N* = 36 Mean age: ~15.17 ± N/A Male: 36.1%	Reality therapy-based psychoeducation with a positive emotion ending	Yes	The program had a significant effect on decreasing problematic Internet usage levels (numerical data not presented)		The effectiveness of reality therapy based psycho-education program regarding decreasing the level of problematic Internet usage of adolescents.
#29	Ede et al.	2023	Nigeria	*N* = 40 Mean age: ~23 ± 4.00 Male: 75%	Group CBT and positive psychology	Yes	The intervention had a significant effect in decreasing the symptoms of pathological Internet use in the EG, compared to the wait-list CG, and the improvements were maintained at one-month follow up		Testing the efficacy of group cognitive-behavioral therapy for pathological Internet use among undergraduates in Nigeria.
#30	El-Ashry et al.	2023	Egypt	*N* = 60 Mean age: 19.83 ± 1.32 Male: 65%	Dialectical behavior therapy's development of distress tolerance skills	Yes	The mean score of problematic Internet use was significantly lower in the EG when compared to the CG immediately after the intervention and at the three-month follow up		The effect of distress tolerance training on problematic Internet use and psychological wellbeing among faculty nursing students: a randomized control trial.
#31	Ji and Wong	2023	China	*N* = 77 Mean age: 15.36 ± 0.93 Male: 88.3%	Integrated CBT and motivational interviewing	Yes	There was a significant effect of the CBT intervention for gaming disorder (GD) symptoms at T3, and for GD symptoms, gaming motivation, and maladaptive gaming cognition at T1, T2 and T3		Effectiveness of an integrated motivational cognitive–behavioral group intervention for adolescents with gaming disorder: A randomized controlled trial.
#32	Kaya et al.	2023	Turkey	*N* = 44 Mean age: ~15 ± 0.50 Male: 36.4%	Solution-focused education and counseling plus parent education	Yes	The median Internet Addiction Test scores in the intervention group were significantly lower than those of the controls at follow up		The effect of solution-focussed education and counselling on problematic Internet usage, sleep quality and school achievement: a randomized controlled trial
#33	Otsuka et al.	2023	Japan	*N* = 5,312 Mean age: N/A (high school students) Male: 49.7%	Psychoeducation on Internet addiction	Yes	In the generalized estimating equation models, no discernible evidence of differentiation was found between the groups for the Korean Scale for Internet Addiction (K-scale) scores, Smartphone Addiction Scale-short version (SAS-SV) scores, or Internet usage time	*	A school-based program for problematic Internet use for adolescents in Japan.

(continued)

Table 1. Continued

No.	Authors	Year	Country	Sample	Intervention	Comparison group[1]	Main findings	Null/Mix results*	Title
#34	Paschke et al.	2023	Germany	$N = 43$ Parents of adolescents Mean age: N/A (adolescents) Male: N/A	Group CBT, aspects of motivational interviewing, dialectic behavioral therapy and mindfulness-based stress reduction, plus sessions for parents (Res@t: Resource-strengthening training)	No	Conditional growth models revealed an improvement in family functioning, communication, and the application of media rules, with a reduction in problematic gaming (numerical data not provided), but the adolescents were receiving other types of treatment in parallel		Res@t: Resource-strengthening training for adolescents with problematic digital-media use and their parents.
#35	Shahrajabian et al.	2023	Iran	$N = 36$ Mean age: 20.27 ± 1.54 Male: 30.6%	Emotional working memory training	Yes	The training significantly reduced the symptoms of PIU, compared to the placebo group		Effects of emotional working memory training on problematic Internet use, inhibition, attention, and working memory among young problematic Internet users: a randomized control study.
#36	Stinson and Dallery	2023	US	$N = 9$ Mean age: 20.00 ± 1.22 Male: 11.1%	Package intervention including contingency management (money), automated notifications of application use, and selection of alternative activities	No	The package intervention was effective at reducing the daily duration of social media use, to goal levels or below, for all participants, with eight out of the nine participants showing a decrease in their Internet Addiction Test scores from pre- to postintervention, and, overall, participants did not show an increase in time spent engaged in their selected alternative activities		Reducing problematic social media use via a package intervention.
#37	Wu et al.	2023	Taiwan	$N = 868$ Mean age: N/A (elementary school students) Male: 49%	Positive interpersonal and life orientation training (PILOT) with life skills training, positive psychology and mindful meditation	Yes	Students exposed to high-level PILOT reported lower levels of Internet addiction tendency than students in low-level PILOT at the post-test stage		Effects of the positive interpersonal and life orientation training (PILOT) program among elementary school students in Taiwan.

(continued)

Table 1. Continued

No.	Authors	Year	Country	Sample	Intervention	Comparison group[1]	Main findings	Null/Mix results*	Title
#38	Bağatarhan & Siyez	2022	Turkey	*N* = 52 Mean age: N/A (10th grade students) Male: N/A	Group CBT psychoeducation program plus parent psychoeducation	Yes	There was a significant decrease in Young's Internet Addiction Test scores of EG1 (whose parents participated) and EG2 (whose parents did not participate) after the program, compared to the no-intervention CGs, and these decreases were maintained at the five-week follow up. There was a statistically significant difference between Young' Internet Addiction Test mean scores of EG1 (whose parents participated), compared to EG2 (whose parents did not participate), but this difference was not maintained in the follow-up assessment		The effectiveness of a cognitive-behavioral prevention program for Internet addiction.
#39	Besser et al.	2022	Germany	*N* = 36 Mean age: 33.51 ± 12.06 Male: 44.4%	Brief intervention: motivational interviewing and elements of CBT	Yes	In the two-month follow up, decrease of problematic Internet use was higher in the intervention group, although not statistically significant	*	Pilot study of a brief intervention to treating Internet use disorders.
#40	Brino et al.	2022	US	*N* = 28 Mean age: 14.2 ± 0.80 Male: 28.6%	Social media hygiene protocol including mindfulness, a positive self-affirming ending, plus an initial teen-family session	No	The intervention reduced the severity of PIU and screen time		Problematic Internet use in adolescents and implementation of a social media hygiene protocol.
#41	Canoğullari and Önder	2022	Turkey	*N* = 28 Mean age: 15.56 ± N/A Male: 60.7%	CBT plus family education	Yes	Compared to the no-intervention control group, the difference between pre- and post-test scores on the Internet Use Scale 2 (GPIUS2) was significant for the family-adolescent education group (also significant for its subscales of Online Social Interaction		The effect of the psychoeducation program and the family education for the problematic Internet prevention.

(continued)

Table 1. Continued

No.	Authors	Year	Country	Sample	Intervention	Comparison group[1]	Main findings	Null/Mix results*	Title
							Preference and Emotion Regulation levels), and for the adolescent education group (also significant for the subscale of Negative Results levels), but not for the family-education group		
#42	Haug et al.	2022	Switzerland	*N* = 1,351 Mean age: 17.3 ± 3.0 Male: 56.6%	Mobile app-based coaching (based on social-cognitive theory and normative feedback) and motivational interviewing (Ready4Life)	Yes	The results showed a stronger decrease of addictive behaviors between baseline and follow up in the intervention group compared to the assessment-only control group		Efficacy of a mobile app-based coaching program for addiction prevention among apprentices: a cluster-randomized controlled trial.
#43	Lindenberg et al.	2022	Germany	*N* = 422 Mean age: 15.11 ± 2.01 Male: 45.7%	Group CBT (PROTECT+)	Yes	Compared with the assessment-only group, the PROTECT group showed a significantly greater reduction in symptom severity of gaming disorder or unspecified Internet use disorder		Effectiveness of cognitive behavioral therapy–based intervention in preventing gaming disorder and unspecified Internet use disorder in adolescents: a cluster randomized clinical trial.
#44	Männikkö et al.	2022	Finland	*N* = 37 Mean age: 23.8 ± 2.84 Male: 83.8%	Brief group educational intervention including peer coaches (Limitless Gaming Bootcamp)	No	Gaming disorder symptoms decreased significantly during the post-intervention phase and six months after the intervention, but the decreased time spent on gaming and Internet use time was non-significant from pre- to post-intervention measurement and to the six-month follow up	*	Effectiveness of a brief group intervention program for young adults with gaming-related problems.
#45	Yang, Hu, et al.	2022	China	*N* = 43 Mean age: 19.7 ± 0.80 Male: 43.3%	Short-term intensive-type CBT, positive psychology, and Internet addiction training	Yes	The program reduced college students' Internet addiction but did not significantly reduce their average daily Internet use time (in the EG or the CG)	*	Impact of short-term intensive-type cognitive behavioral therapy intervention on Internet addiction among Chinese college students: a randomized controlled trial.

(continued)

Table 1. Continued

No.	Authors	Year	Country	Sample	Intervention	Comparison group[1]	Main findings	Null/Mix results*	Title
#46	Zheng et al.	2022	China	$N = 80$ Mean age: ~14.75 ± 1.53 Male: 100%	Combined behavioral intervention for reward sensitivity and rash impulsiveness	Yes	Compared with the no-intervention CG, only the subjects in the combined training (rash impulsiveness plus reward sensitivity *versus* single training on each) group had significantly lower Internet gaming disorder (IGD) scores at follow up, but there were non-significant changes on craving	*	Reduction of symptom after a combined behavioral intervention for reward sensitivity and rash impulsiveness in Internet gaming disorder: a comparative study.
#47	Affouneh et al.	2021	Palestina	$N = 30$ Mean age: N/A (university students) Male: 46.6%	Training program for social skills	Yes	The program reduced addictive Internet behaviors significantly in the EG when compared with a wait-list control group		The efficacy of a training program for social skills in reducing addictive Internet behaviors among Palestinian university students.
#48	Alavi et al.	2021	Iran	$N = 50$ Mean age: ~21.4 ± 3.95 Male: 75.6%	Group CBT	Yes	The Internet addiction scores decreased in both groups, but the CBT group showed significantly lower scores compared to the standard individual psychotherapy for Internet addiction group at the post-test stage		The effects of cognitive-behavioral group therapy for reducing symptoms of Internet addiction disorder and promoting quality of life and mental health.
#49	Bottel et al.	2021	Germany	$N = 73$ Mean age: 35 ± 12.49 Male: 83.6%	Short-term telemedicine motivation-based intervention	No	The intervention resulted in a significant reduction in symptom severity of Internet use disorder and duration of Internet use per day		Efficacy of short-term telemedicine motivation-based intervention for individuals with Internet use disorder – a pilot-study.
#50	Kent et al.	2021	Denmark	$N = 10$ Mean age: N/A (18–31 years) Male: 10.0%	Digital intervention: Smartphone Mobile app with behavioral suggestions, mindfulness suggestions, and personalized feedback	No	The intervention resulted in a reduction in self-reported problematic smartphone use (seven out of the 10 participants), but not in screen time, or Internet addiction	*	Digital intervention for problematic smartphone use.

(continued)

Table 1. Continued

No.	Authors	Year	Country	Sample	Intervention	Comparison group[1]	Main findings	Null/Mix results*	Title
#51	Liu et al.	2021	China	$N = 36$ Mean age: N/A (unclear if university students) Male: 100%	Behavioral intervention for craving	Yes	There was a Time*Group effect of the intervention on craving and on the Chinese Internet Addiction Scale (CIAS), but not on weekly gaming time at three- and six-month follow up, although group differences were all significant immediately after the intervention	*	Altered intrinsic connectivity distribution in Internet gaming disorder and its associations with psychotherapy treatment outcomes.
#52	Ortega-Barón et al.	2021	Spain	$N = 165$ Mean age: 12.11 ± 0.89 Male: 38.2%	Psychoeducation (Safety.net)	Yes	After the program, there were increases in Pui, Internet gaming, Internet gambling, cybervictimization, and sexting in both the EG and the CG, but the increases (Time*Group effects) were significantly greater in the CG compared to the EG regarding PUI and Internet gaming, although they were non-significant for online gambling, cybervictimization, and sexting, whereas online grooming and nomophobia decreased in the EG and increased in the CG (with a significant difference between the two groups for nomophobia), decreasing in both groups regarding cyber dating abuse, without significant differences (the program preventing the increase of most of the assessed risks)	*	Safety.Net: a pilot study on a multi-risk Internet prevention program.
#53	Tang et al.	2021	China	$N = 327$ Mean age: 15.37 ± 1.31 Male: 51.4%	Psychoeducation: health action process approach model (HAPA)	No	The HAPA model decreased the rate of average daily time spent online on weekends and the rate of daily game time, but not the rate of average daily time spent online on week days, and being online overnight at least once in the past 30 days, which did not change significantly	*	Application of the health action process approach model for reducing excessive Internet use behaviors among rural adolescents in China: a school-based intervention pilot study.

(continued)

Table 1. Continued

No.	Authors	Year	Country	Sample	Intervention	Comparison group[1]	Main findings	Null/Mix results*	Title
#54	Amini et al.	2020	Iran	$N = 40$ Mean age: 22.08 ± N/A Male: NA	Emotion-focused group therapy	Yes	Compared to the CG, the intervention reduced the Internet addiction symptoms significantly on Young's Internet Addiction test dimensions (i.e., social problems, impact on performance, lack of control, pathological use, and neglecting duties)		The effectiveness of emotion-focused group therapy on the reduction of negative emotions and Internet addiction symptoms.
#55	Choi et al.	2020	Korea	$N = 49$ Mean age: 16 ± N/A Male: 16.3%	Group mind subtraction meditation	Yes	The improvements regarding smartphone addiction were significant in the experimental group but non-significant in the control group after the intervention		The effect of mind subtraction meditation intervention on smartphone addiction and the psychological wellbeing among adolescents.
#56	Kuriala & Reyes	2020	Philippines	$N = 40$ Mean age: N/A (16–19) Male: N/A	Acceptance and cognitive restructuring intervention program (ACRIP) integrating cognitive-behavioral and mindfulness theories	Yes	The reduction in Internet gaming addiction (IGD) from pre-test to post-test scores was significant in the EG and non-significant in the CG		Efficacy of the acceptance and cognitive restructuring intervention program (ACRIP) on the Internet gaming disorder symptoms of selected Asian adolescents.
#57	Pornnoppadol et al.	2020	Thailand	$N = 52$ Mean age: 14.33 ± 1.29 Male: 78.8%	Psychosocial interventions (Siriraj therapeutic residential camp): group CBT, media literacy, workshops on how to use computer skills in more productive ways, sports, outdoor activities, plus parent education	Yes	All three groups (Siriraj therapeutic Residential Camp [S-TRC] alone, parent management training for game addiction [PMT-G] alone, and the two combined) showed improvement over the basic psychoeducation (control) group, with statistically significant mean differences among groups in Game Addiction Screening Test (GAST) scores one, three and six months after the intervention, but not between the S-TRC and PMT-G groups. Almost all participants in the CG were still classified as probably addicted or addicted at T3		A comparative study of psychosocial interventions for Internet gaming disorder among adolescents aged 13–17 years.

(continued)

Table 1. Continued

No.	Authors	Year	Country	Sample	Intervention	Comparison group[1]	Main findings	Null/Mix results*	Title
#58	Szász-Janocha et al.	2020	Germany	$N = 54$ Mean age: 13.48 ± 1.72 Male: 83.3%	Group CBT (PROTECT+)	No	The program reduced adolescents' severity of Internet use symptoms but did not significantly reduce the amount of time spent online	*	Treatment outcomes of a CBT-based group intervention for adolescents with Internet use disorders.
#59	Chau et al.	2019	Hong Kong	$N = 226$ Mean age: 10.13 ± 0.97 Male: 56%	Psychoeducation through a gamification intervention based on gamification principles and flow theory (Wise IT-Use [WIT] program)	No	Both the symptoms of Internet gaming disorder and the proportion of students at risk of the disorder were reduced after the program, but the proportion of participants classified as "high-risk gamers" remained the same (3%) and the reduction in the levels of risky online behavior was not significant across the period	*	Gamification for Internet gaming disorder prevention: Evaluation of a Wise IT-Use (WIT) program for Hong Kong primary students.
#60	Gholamian et al.	2019	Iran	$N = 127$ Mean age: 16.35 ± N/A Male: 0%	Educational intervention based on the BASNEF model (designed to investigate behavior, to plan for change and to determine the factors that affect individuals' decision making) plus parent education	Yes	The intervention group revealed a significant decrease in terms of using the Internet (based on time), and the difference compared to the CG was significant after the intervention		The effect of educational intervention based on BASNEF model for reducing Internet addiction among female students: a quasi-experimental study.
#61	Han et al.	2018	China	$N = 26$ Mean age: 16.81 ± 0.75 Male: 100%	CBT plus teacher and parent education	No	Weekly gaming time was significantly shorter, and the Chen Internet Addiction Scale (CIAS) scores were significantly lower than before the CBT		Resting-state activity of prefrontal-striatal circuits in Internet gaming disorder: changes with cognitive behavior therapy and predictors of treatment response
#62	Ke and Wong	2018a	Malaysia	$N = 45$ Mean age: N/A (13–18 years) Male: 64.4%	Group CBT and positive psychology (PIP-IU-Y)	No	Participants were able to reduce their Problematic Internet Use Questionnaire (PIUQ) scores (showing the program's effectiveness in preventing negative progression into more serious Internet addiction stages)		A healthy mind for problematic Internet use.

(continued)

Table 1. Continued

No.	Authors	Year	Country	Sample	Intervention	Comparison group[1]	Main findings	Null/Mix results*	Title
#63	Ke and Wong	2018b	Malaysia	$N = 157$ Mean age: 14 ± N/A Male: 46.5%	Group CBT and positive psychology (PIP-IU-Y)	No	Mean scores for participants' level of PIU were lower than at baseline both by the end of the intervention, and at the one-month follow up		Outcome of the psychological intervention program: Internet use for youth.
#64	Kim et al.	2018	Korea	$N = 17$ Mean age: N/A (12–17 years) Male: 41.2%	Group CBT	No	Young's Internet Addiction Scale (IAS) scores were significantly lower than before the program immediately after the program, and remained low at the one-month follow-up assessment		The effects of group cognitive behavioral therapy on the improvement of depression and anxiety in adolescents with problematic Internet use.
#65	Lan et al.	2018	China	$N = 54$ Mean age: 21.3 ± 1.3 Male: 47.6%	Group mindfulness-based CBT	Yes	Compared with the control group, the intervention group had significantly less smartphone use time at T2, T3, and T4, and significantly lower Mobile Phone Internet Addiction Scale (MPIAS) scores at T3, but the Time*Group interaction effect was not significant for smartphone use time or MPIAS score	*	A pilot study of a group mindfulness-based cognitive-behavioral intervention for smartphone addiction among university students.
#66	Torres-Rodríguez et al.	2018	Spain	$N = 31$ Mean age: ~15 ± 1.7 Male: 100%	CBT, motivational interviewing, plus family psychoeducation and communication modules (PIPATIC)	Yes	Both groups experienced a significant reduction in Internet Gaming Disorder (IGD) symptoms (on weekly gaming hours and on the IGD-20), although the PIPATIC group experienced higher significant improvements in the remainder of the variables examined (postponement: being able to stop gaming; and subjective addiction: scores relating to engagement/addiction) when compared to CBT focusing only on the IGD itself		Treatment efficacy of a specialized psychotherapy program for Internet gaming disorder.

(continued)

Table 1. Continued

No.	Authors	Year	Country	Sample	Intervention	Comparison group[1]	Main findings	Null/Mix results*	Title
#67	Lindenberg et al.	2017	Germany	*N* = 81 Mean age: 19.21 ± 6.46 Male: 97.5%	Integrated health care (psychotherapy if any comorbid psychopathology was present, or only addiction counseling)	No	Patients showed significant improvement in Compulsive Internet Use over time, Online Addiction Behavior, and Time spent online		An analysis of integrated health care for Internet use disorders in adolescents and adults.
#68	Turel et al.	2015	US	*N* = 223 Mean age: 22.5 ± N/A Male: 39.0%	Instructive videos	Yes	The videos were efficacious in improving viewers' attitudes toward reducing their Internet use		Preventing problematic Internet use through video-based interventions: a theoretical model and empirical test.
#69	Thorens et al.	2014	Switzerland	*N* = 57 Mean age: 24 ± N/A Male: 98%	Individual CBT and motivational components	No	Patients who remained in treatment (dropout rate 24%) showed an overall improvement of symptoms on the Clinical Global Impression (CGI) scale, with no patients worsening during treatment (38.6% showed significant or average improvement on their CGI score, 26.3% showed minimal improvement, and 14% showed no change)		Characteristics and treatment response of self-identified problematic Internet users in a behavioral addiction outpatient clinic.
#70	Wölfling et al.	2014	Germany	*N* = 37 Mean age: 26.1 ± 6.60 Male: 100%	Group CBT, individual therapy and motivational techniques (STICA)	No	After treatment, symptoms of Internet addiction decreased significantly on the Scale for the Assessment of Internet and Computer Game Addiction (AICA-S) and in hours spent online		Treatment outcomes in patients with Internet addiction: a clinical pilot study on the effects of a cognitive-behavioral therapy program (STICA).
#71	Du et al.	2010	China	*N* = 56 Mean age: ~16.01 ± 1.46 Male: 80.4%	CBT, teacher psychoeducation and parent cognitive behavioral training	Yes	Internet use decreased in both groups immediately after the intervention and six months later, but Internet Overuse Self-rating Scale scores did not differ between the EG and CG at baseline, immediately after the intervention, or six months later	*	Longer term effect of randomized, controlled group cognitive behavioural therapy for Internet addiction in adolescent students in Shanghai.

(continued)

Table 1. Continued

No.	Authors	Year	Country	Sample	Intervention	Comparison group[1]	Main findings	Null/Mix results*	Title
Combined interventions									
Music therapy combined with CBT									
#72	Bong et al.	2021	Korea	N = 138 Mean age: ~12.5 ± 1.80 Male: 49.3%	CBT-based music therapy	Yes	The total scores on Young's Internet Addiction Scale (IAT) and Smartphone Addiction Proneness Scale (SAPS) decreased significantly in both groups, but the decrements in the CBT + music therapy group were significantly greater than those in the CBT group		Effects of cognitive-behavioral therapy based music therapy in Korean adolescents with smartphone and Internet addiction.
Narrative therapy combined with Pilates exercise									
#73	Gong et al.	2022	China	N = 42 Mean age: N/A (adolescents) Male: N/A	Narrative therapy-based group psychological counseling and Pilates exercise	Yes	The scores of both groups decreased significantly after the intervention, but the decrement in the Internet addiction score of the intervention group was higher than that of the no-intervention CG		Effect of narrative therapy-based group psychological counseling on Internet addiction among adolescents.
CBT combined or contrasted with electroacupuncture									
#74	Dai et al.	2022	China	N = 60 Mean age: 22.44 ± 2.50 Male: 74.1%	Electroacupuncture, group psychotherapy and individual counselling	Yes	Electroacupuncture and psychological intervention effectively reduced Internet Addiction Test (IAT) scores		The modulation of mRNA levels of MAOA by electroacupuncture and psychotherapy in patients with pathological Internet use.
#75	Peng et al.	2021	China	N = 120 Mean age: 21.00 ± 1.97 Male: 60.8%	Electroacupuncture and CBT	Yes	The three treatments effectively reduced Internet addiction test (IAT) scores, and the intergroup comparison showed that electroacupuncture combined with CBT was superior to electroacupuncture, while electroacupuncture was superior to CBT		Effects of electroacupuncture combined with psychological intervention on depressive status and contingent negative variation in patients with Internet addiction disorder: a randomized controlled trial.
CBT combined or contrasted with pharmacotherapy									
#76	Santos et al.	2016	Brazil	N = 39 Mean age: 28.56 ± 5.93 Male: 30.8%	Pharmacotherapy, CBT and positive psychology	No	A significant improvement in mean Internet addiction scores was observed, showing problematic Internet use before treatment and medium Internet use after treatment		Treatment of Internet addiction with anxiety disorders: treatment protocol and preliminary before-after results involving pharmacotherapy and modified cognitive behavioral therapy.

(continued)

Table 1. Continued

No.	Authors	Year	Country	Sample	Intervention	Comparison group[1]	Main findings	Null/Mix results*	Title
#77	Kim et al.	2012	Korea	$N = 65$ Mean age: ~16.05 ± 1.50 Male: 100%	Bupropion and CBT plus family therapy	Yes	Young's Internet Addiction Scale scores in the CBT-Med group were reduced compared to those of the Med group, and the intervention combining CBT and medication showed superior results, comparing to the medication-only intervention, in the reduction of mean time of online game playing		Combined cognitive behavioral therapy and bupropion for the treatment of problematic on-line game play in adolescents with major depressive disorder.

Note. [1]Comparison group: presence only if compared to the interventions specifically for PUI.
CBT: cognitive and behavioral therapies; CG: control group; EG: experimental group; IGD: Internet gaming disorder; Mean age with a ~ symbol represents the calculated composite when authors provide separate mean ages for the different groups under study; N/A: not available; PIU: problematic Internet use; T: assessment times; US: United States of America.

(Han et al., 2010; Song et al., 2016), 12 (Bae et al., 2018), and 10 (open-label phase) to 19 (double blind phase of the study) weeks (Dell'Osso et al., 2008).

Intervention results. The six- (Han et al., 2010; Song et al., 2016) and 12-week bupropion SR treatment (Bae et al., 2018) decreased craving for Internet gameplay, total game play time, and video game cue-induced brain activity in patients with Internet video game addiction (Han et al., 2010), the severity of online gaming (Bae et al., 2018; Song et al., 2016), and gambling (Bae et al., 2018). The six- (Song et al., 2016) and the 10-week escitalopram treatment (Dell'Osso et al., 2008) decreased the hours spent on the Internet, ameliorating PUI symptoms (Dell'Osso et al., 2008), and the severity of online gaming (Song et al., 2016). However, most of these studies lacked an appropriate control group or placebo control group (Bae et al., 2018; Han et al., 2010; Song et al., 2016), and non-significant group differences were found in the second phase of Dell'Osso et al.'s (2008) study, that divided the participants between an intervention and a placebo group.

Studies on PUI with other comorbidities (clinical samples; n = 5)

Study characteristics. Five studies presented results on clinical samples with PUI and psychiatric comorbidities. In these studies, participants had Internet addiction (IA) associated with obsessive-compulsive disorder (OCD) (Bipeta, Yerramilli, Karredla, & Gopinath, 2015) or presented excessive online game play (EOP) (Han & Renshaw, 2012) or IGD (Han et al., 2009; Nam, Bae, Kim, Hong, & Han, 2017; Park, Lee, Sohn, & Han, 2016) and attention deficit hyperactivity disorder (ADHD) (Han et al., 2009; Park et al., 2016) or major depression disorder (MDD) (Han & Renshaw, 2012; Nam et al., 2017).

All these studies were conducted in Asian countries (Korea and India) and involved adults with OCD (Bipeta et al., 2015) or MDD (Han & Renshaw, 2012; Nam et al., 2017), but also children and adolescents with ADHD (Han et al., 2009; Park et al., 2016) or MDD (Han & Renshaw, 2012). Some of these studies were conducted with male-only participants (Han & Renshaw, 2012; Park et al., 2016) or with a large proportion of male participants (e.g., 52 out of 62 in Han et al.'s, 2009, study; 9 out 11 in Bipeta et al.'s, 2015, study). Sample sizes ranged from 11 (Bipeta et al., 2015) to 86 (Park et al., 2016) participants.

Assessment of PUI was based on Young's Diagnostic Questionnaire (YDQ) (Bipeta et al., 2015), the Internet Addiction Test (IAT; Bipeta et al., 2015), and Young's Internet Addiction Scale (YIAS; Han & Renshaw, 2012; Nam et al., 2017; Park et al., 2016), including its Korean version (YIAS-K; Han et al., 2009). Time spent on the Internet was assessed in two studies (Han et al., 2009; Han & Renshaw, 2012).

In a few studies, participants were randomly assigned to different intervention groups (Han & Renshaw, 2012; Nam et al., 2017; Park et al., 2016), without an inert or "blank"

group (Nam et al., 2017; Park et al., 2016). The other studies lacked comparison groups or proper statistical analyses comparing the groups over time (Bipeta et al., 2015; Han et al., 2009).

Types of interventions. Most interventions for Internet addiction with OCD (Bipeta et al., 2015) and for IGD with ADHD (Han et al., 2009; Park et al., 2016) were based on medication only, consisting of SSRI (fluvoxamine or sertraline 150–200 mg/day, or fluoxetine 60 mg/day) or clomipramine (200 mg/day) (Bipeta et al., 2015), the stimulant methylphenidate (MPH, 10–40 mg/day) or atomoxetine (ATM, 10–60 mg/day) (Han et al., 2009; Park et al., 2016). In the remaining two studies, an antidepressant medication (bupropion SR 150–300 mg/day, or escitalopram 10–20 mg/day) was combined with education for Internet use (EDU), referring to weekly education sessions focused on both healthy Internet use and related adverse consequences. Interventions combining medication with education were used for EOP or IGD with MDD (Han & Renshaw, 2012; Nam et al., 2017). The education was applied to both the intervention and the comparison groups. All the interventions were administered for a period between eight weeks (Han et al., 2009) and 12 months (Bipeta et al., 2015).

Intervention results. These studies showed that the pharmacological treatment improved PUI or IGD symptoms in clinical samples with ADHD (Han et al., 2009; Park et al., 2016), MDD (Han & Renshaw, 2012; Nam et al., 2017), or OCD (Bipeta et al., 2015). Specifically, the antidepressant treatment of OCD was associated with an improvement of IA symptoms (Bipeta et al., 2015). The eight-week (Han et al., 2009) or the three-month MPH treatment (Park et al., 2016) and the three-month ATM treatment (Park et al., 2016) improved both ADHD and IGD (Han et al., 2009; Park et al., 2016) symptoms, with MPH being more effective in ADHD symptoms when compared to ATM, whereas no significant differences were found between MPH and ATM in terms of impact on IGD severity (Park et al., 2016). Similarly, the eight-week bupropion treatment plus EDU (Han & Renshaw, 2012) and the 12-week bupropion or escitalopram treatment plus EDU (Nam et al., 2017) improved both MDD and online game addiction symptoms, when compared to an education-only group (Han & Renshaw, 2012), or IGD symptoms (Nam et al., 2017), with bupropion having a greater impact when compared to escitalopram on the Korean ADHD Rating Scale (K-ARS) and Behavioral Inhibitory System Behavioral Activation System (BIS-BAS) scores (Nam et al., 2017).

Studies on transcranial direct current stimulation (tDCS) for PUI ($n = 4$)

Four studies focused on the effects of transcranial direct current stimulation (tDCS) on PUI (Jeong et al., 2020; Lee et al., 2018, 2021; Wu et al., 2021). These studies are based on the premise that impaired inhibitory control is associated with hypoactivation of the prefrontal cortex and may lead to compulsive Internet use. Stimulating the dorsolateral prefrontal cortex (DLPFC) with tDCS could enhance this inhibitory control.

Study characteristics. Among the tDCS studies, three were conducted in Korea (Jeong et al., 2020; Lee et al., 2018, 2021) and one in China (Wu et al., 2021). All were specifically focused on IGD (Lee et al., 2021; Wu et al., 2021), problematic online gaming (Jeong et al., 2020), or EOP (Lee et al., 2018). All involved adult populations and two were conducted with male-only participants (Lee et al., 2021; Wu et al., 2021). Sample sizes included less than 50 participants, ranging from 15 (Lee et al., 2018) to 33 (Wu et al., 2021).

Assessment of PUI was mainly based on the IAT, whereas cue-induced craving for Internet gaming and inhibitory control were described in one study (Wu et al., 2021). Three studies assessed the time spent on Internet gaming (Jeong et al., 2020; Lee et al., 2018, 2021).

In three studies, participants were randomly assigned to an active tDCS or to a sham (i.e., only mimicking the sensations of the active) tDCS group (Jeong et al., 2020; Lee et al., 2021; Wu et al., 2021). One study lacked a proper comparison group (Lee et al., 2018).

Types of interventions. The tDCS treatment for problematic online gaming (Jeong et al., 2020; Lee et al., 2018) consisted of 12 active tDCS sessions (three times per week for four weeks) applied over the dorsolateral prefrontal cortex. The treatment options for IGD included 10 sessions (two sessions per day for five consecutive days) of active repetitive tDCS with anode/cathode electrodes over the left and right DLPFC (Lee et al., 2021) or active tDCS (1.5 mA for 20 min) and sham tDCS applied one week apart (Wu et al., 2021).

Intervention results. The studies on tDCS interventions for PUI showed mixed results. Compared to the control group, the active treatment had a significant effect in enhancing inhibitory control over gaming-related distractors in IGD (Wu et al., 2021) and decreased both IAT scores and time spent on gaming, while increasing self-control, in a study that lacked a control group (Lee et al., 2018). However, in Jeong et al.'s (2020) study, non-significant group-by-time interaction effects were found for both IAT scores and time spent on gaming, and the tDCS had no effect on IAT scores also in Lee et al.'s (2021) study, although it stabilized fast-wave activity. In addition, the tDCS intervention had no effect on cue-induced craving in Wu et al.'s (2021) study.

Studies on physical exercise for PUI ($n = 3$)

Three studies on physical exercise for PUI were conducted with college students in China, and the authors reported positive effects of physical exercise on PUI in all. One of these studies was based on Internet of Things (IoT) technology and consisted of an IoT experiment with a questionnaire distributed to 1,000 college students (Chen & Sun, 2022). The authors concluded that moderate-intensity (50%–80% VO_2 max) aerobic and anaerobic exercise for more than 30 min each time showed a positive effect on the

college students' Internet addiction and argued for the adaptation of the exercises, intensity, time, frequency and other exercise prescriptions specifically to participants' characteristics associated with their Internet addiction (e.g., lack of confidence, of communication with others, or of control of time, among others). This publication contained a detailed description about the IoT technology procedures and lacked the data pertaining to PUI, including numerical results on the effects of physical exercise on PUI, and information on the presence or absence of comparison groups. In the second study (Yang, Shangguan et al., 2022), the authors tested the effects of an acute moderate-intensity aerobic (treadmill) exercise program with background music (for 30 min) on craving for mobile phones with 60 undergraduate students (50% men), comparing to a music-only control group (without the exercise), with positive results on a 1- to 10-point Visual Analogue Scale for craving. However, this was a single-factor design study and the groups were compared only after the intervention. In contrast, in the third study, participants were randomly assigned to an exercise group, a Tai Chi group, and an inactive control group, and the groups were compared over time (Zhang et al., 2023). In this study, significantly superior decreases on the Internet Addiction Test after the eight-week intervention were obtained for the exercise group when compared to each of the other two groups, although a non-significant effect was observed for the Tai Chi group when compared to the control group.

Studies on psychotherapy, counseling, or education for PUI (n = 61)

Study characteristics. All 61 publications on psychotherapy, counseling, or education in the empirical research were aimed at either treating PUI, preventing PUI, or both. Most studies were conducted in Asian and Middle-Eastern countries, whereas 19 were from Western countries, one was conducted in Brazil, one in Nigeria, and another one in Australia. About a half of the interventions were administered to adolescent populations, 26 were administered to adult populations (e.g., university students or patients signing up at centers for the treatment of PUI), one study included both adolescent and adult participants who signed up for diagnosis and treatment of PUI at a health care center (Lindenberg, Szász-Janocha, Schoenmaekers, Wehrmann, & Vonderlin, 2017), and another five included elementary school children and/or middle-school adolescents (Bong, Won, & Choi, 2021; Chau, Tsui, & Cheng, 2019; Choi, Yang, & Kim, 2024; Han, Park, Yurgelun-Todd, Renshaw, & Han, 2024; Wu, Lee, & Chang, 2023). Sample sizes ranged from 9 (Stinson & Dallery, 2023) to 5,312 (Otsuka, Kaneita, Itani, & Matsumoto, 2023) participants, with most studies (32 out of the total 61, or 52.5%) containing 57 or less participants.

PUI was assessed with a variety of instruments across studies (Table 2). In one study, the Game Addiction Screening Test (GAST) was applied only to the parents (Pornnoppadol et al., 2020). In another, the authors assessed participants' belief-based attitudes toward reducing their Internet use, rather than the actual PUI behavior (Turel, Mouttapa, & Donato, 2015). In a different study, Han et al. (2024) used the Internet Game Literacy Scale (IGLS) to assess positive or negative attitudes toward Internet games.

Most studies on psychological or educational interventions (n = 44) comprised some form of comparison group, including with and without randomized designs (Table 3). The comparison groups generally received no intervention, with a few exceptions (e.g., Alavi et al., 2021; Choi et al., 2024; Dunbar, Proeve, & Roberts, 2024; Pornnoppadol et al., 2020; Shahrajabian, Hasani, Griffiths, Aruguete, & Emadi Chashmi, 2023; Yang, Hu et al., 2022; Zhu, 2024), or received an alternative intervention in studies that, in turn, lacked an inert, "blank", or placebo control group proper (e.g., Alavi et al., 2021; Bong et al., 2021; Dai, Zhang, Zhang, Wen, & Zhu, 2022; Ding et al., 2023; Han et al., 2024; Kim, Han, Lee, & Renshaw, 2012; Peng et al., 2021; Torres-Rodríguez, Griffiths, Carbonell, & Oberst, 2018; Turel et al., 2015; Xu et al., 2024). An exception was Dursun and Ceyhan's (2023) reality therapy-based psychoeducation intervention, which included a placebo group and also a control group that received no intervention, although numerical data supporting the description of the results were not presented in this study. In some of the studies, the comparison was a wait-list group (e.g., Affouneh, Mahamid, Berte, Shaqour, & Shayeb, 2021; Akgül-Gündoğdu & Selçuk-Tosun, 2023; Ede, Okeke, Igbo, & Aye, 2023; Ji & Wong, 2023; Ma et al., 2024; Otsuka et al.'s, 2023; Pornnoppadol et al., 2020), although analyses of the effects after the wait-list group also received the intervention were not reported in any. In addition, the comparison groups were not always equivalent to the intervention groups at baseline, and statistical analyses properly comparing the groups over time were often lacking. The remaining 17 publications consisted of studies without control groups as compared to psychotherapy or educational interventions, half of which were conducted in Western countries.

Types of interventions. Table 4 summarizes the main types of psychotherapy, counseling, or education interventions in the 61 publications. Education-based interventions typically consisted of provision of information followed by activities aimed at encouraging reflection (e.g., group discussion and exercises, role-playing) frequently delivered and guided by previously trained class teachers or health care professionals. Alternatively, in the "Limitless Gaming Bootcamp", the educational intervention was guided by the social or healthcare professional and by a trained "peer coach" (i.e., adult volunteers with a personal history of problematic gaming) (Männikkö, Mustonen, Tanner, Vähänikkilä, & Kääriäinen, 2022). In one school-based educational program, a game literacy intervention (for students to develop a conceptual understanding of the games) was compared with a coding education intervention (for students to create their own games) with the goal of improving PUI (Han et al., 2024).

In turn, among psychological interventions, cognitive and behavioral therapies (CBT) were the most commonly

Table 2. Examples of PUI instruments and of studies using them in psychotherapy, counseling, and education interventions in the review

Instrument	Examples of studies
Young's Internet Addiction Test, or versions of this test	Affouneh et al. (2021), Akgül-Gündoğdu and Selçuk-Tosun (2023), Alavi et al. (2021), Amini et al. (2020), Bağatarhan and Siyez (2022), Bong et al. (2021), Bottel et al. (2021), Brouzos et al. (2024), Dai et al. (2022), Dunbar et al. (2024), Han et al. (2024), Kaya et al. (2023), Kim et al. (2012), Kim et al. (2018), Ma et al. (2024), Peng et al. (2021), Santos et al. (2016), Shahrajabian et al. (2023), Stinson and Dallery (2023), Thorens et al. (2014), Xu et al. (2024), and Yang, Hu et al. (2022)
Compulsive Internet Use Scale (CIUS)	Besser et al. (2022), Haug et al. (2022), Lindenberg et al. (2017), and Szász-Janocha et al. (2020)
Problematic Internet Use Questionnaire (PIUQ)	El-Ashry et al. (2023), Ke and Wong (2018a), and Ke and Wong (2018b)
Problematic Internet Usage Scale-Adolescent Form (PIUS-A)	Dursun and Ceyhan (2023)
Internet Overuse Self-Rating Scale	Du et al. (2010)
Generalized Problematic Internet Use Scale 2 (GPIUS2)	Brino et al. (2022), Canoğullari and Cenkseven Önder (2022), Ede et al. (2023), Ortega-Barón et al. (2021), and Ortega-Barón et al. (2024)
Scale for the Assessment of Internet and Computer Game Addiction (AICA-S)	Lindenberg et al. (2017), and Wölfling et al. (2014)
German Video Game Dependency Scale (CSAS)	Lindenberg et al. (2022), and Szász-Janocha et al. (2020)
Smartphone Addiction Proneness Scale	Bong et al. (2021), and Choi et al. (2020)
Mobile Phone Problem Use Scale (MPPUS)	Kent et al. (2021)
Versions of the Smartphone Addiction Scale	Favini et al. (2024), Otsuka et al. (2023), and Zhu (2024)
Bergen Social Media Addiction Scale (BSMAS)	Favini et al. (2024)
Internet Gaming Disorder Test (IGD-20 and IGDS9-SF)	Ding et al. (2023), Kuriala and Reyes (2020), Torres-Rodríguez et al. (2018), Ortega-Barón et al. (2021), and Ortega-Barón et al. (2024)
Online Game Addiction Scale (OGAS)	Zheng et al. (2022)
Game Addiction Screening Test (GAST)	Pornnoppadol et al. (2020) (applied only to the parents)
Problematic Online Gaming Questionnaire (POGQ)	Männikkö et al. (2022)
Online Gambling Disorder Questionnaire (OGD-Q)	Ortega-Barón et al. (2021), and Ortega-Barón et al. (2024)
Internet Game Literacy Scale (IGLS)	Han et al. (2024)
Nomophobia Questionnaire (NMP-Q), which evaluates the irrational, disproportionate fear of possibly not being able to use the mobile phone or running out of signal or battery	Ortega-Barón et al. (2021), and Ortega-Barón et al. (2024)
Questionnaires developed for the projects to assess craving, such as the Online Game Cue Exposure Craving Questionnaire, or based on questionnaires for tobacco craving, and the desire for the smartphone	Liu et al. (2021), Xu et al. (2024), Zheng et al. (2022), and Zhu (2024)
Other project-specific instruments	Tang et al. (2021)

used types of interventions for PUI. In one CBT-based neurofeedback program, the participating children and adolescents learned to self-regulate their brainwaves by perceiving them as sounds or animations through headsets and monitoring equipment (Choi et al., 2024). Some interventions were based on specific behavioral training for impulsivity (Zheng, He, Fan, & Qiu, 2022) or for Internet gaming-related craving (Liu et al., 2021). Others consisted of behavioral training for emotional working memory (eWMT), focusing on both emotion and cognition (Shahrajabian et al., 2023), or emotion-focused group therapy to reduce PUI (Amini, Lotfi, Fatemitabar, & Bahrampouri, 2020), or, still, dialectical behavior therapy (Paschke, Cloes, & Thomasius, 2023) including for the development of distress tolerance skills (El-Ashry, Atta, Alsenany, Abdelaliem, & Khedr, 2023). Cognitive restructuring was the main component in some programs (Kuriala & Reyes, 2020), namely, in Turel et al.'s (2015) intervention premised on an information-processing perspective consisting of instructive videos about Internet addiction created to alter the users' beliefs about PUI and change their attitudes toward reducing their Internet use. Some CBT-based programs focused on the development of social anxiety and stress coping (interpersonal) skills to be used in in-person social interactions (e.g., Ke & Wong, 2018a; Ke & Wong, 2018b), and several included the enhancement of such skills as emotion regulation, problem solving, self-esteem, self-control, social skills, interpersonal communication, and assertiveness (e.g., Affouneh et al., 2021; Brouzos, Papadopoulou, & Baourda, 2024; Ede et al., 2023; Paschke et al., 2023; Santos et al., 2016; Szász-Janocha, Vonderlin, & Lindenberg, 2020; Torres-Rodríguez et al., 2018; Yang, Hu et al., 2022), which were also part of education-based programs (e.g., Wu et al., 2023).

A positive psychology component was incorporated in some CBT interventions, consisting of introducing positive

Table 3. Studies in psychotherapy, counseling, or education programs with some form of comparison group (with or without randomized designs), and without control groups as compared to the interventions

With comparison group (n = 44 studies)	Without comparison group (n = 17 studies)
Affouneh et al. (2021)	Bottel et al. (2021)
Akgül-Gündoğdu and Selçuk-Tosun (2023)	Brino et al. (2022)
Alavi et al. (2021)	Chau et al. (2019)
Amini et al. (2020)	Han et al. (2018)
Bağatarhan and Siyez (2022)	Ke and Wong (2018a)
Besser et al. (2022)	Ke and Wong (2018b)
Bong et al. (2021)	Kent et al. (2021)
Brouzos et al. (2024)	Kim et al. (2018)
Canoğullari and Cenkseven Önder (2022)	Lindenberg et al. (2017)
Choi et al. (2020)	Männikkö et al. (2022)
Choi et al. (2024)	Paschke et al. (2023)
Dai et al. (2022)	Santos et al. (2016)
Ding et al. (2023)	Stinson and Dallery (2023)
Du et al. (2010)	Szász-Janocha et al. (2020)
Dunbar et al. (2024)	Tang et al. (2021)
Dursun and Ceyhan (2023)	Thorens et al. (2014)
Ede et al. (2023)	Wölfling et al. (2014)
El-Ashry et al. (2023)	
Favini et al. (2024)	
Gholamian et al. (2019)	
Gong et al. (2022)	
Han et al. (2024)	
Haug et al. (2022)	
Ji and Wong (2023)	
Kaya et al. (2023)	
Kim et al. (2012)	
Kuriala and Reyes (2020)	
Lan et al. (2018)	
Liu et al. (2021)	
Lindenberg et al. (2022)	
Ma et al. (2024)	
Ortega-Barón et al. (2021)	
Ortega-Barón et al. (2024)	
Otsuka et al. (2023)	
Peng et al. (2021)	
Pornnoppadol et al. (2020)	
Shahrajabian et al. (2023)	
Torres-Rodríguez et al. (2018)	
Turel et al. (2015)	
Wu et al. (2023)	
Xu et al. (2024)	
Yang, Hu et al. (2022)	
Zheng et al. (2022)	
Zhu (2024)	

Table 4. Types of interventions for PUI in psychotherapy, counseling, or education programs

Education-based interventions	
Provision of information followed by activities aimed at encouraging reflection (e.g., group discussion, exercises, role-playing)	
Game literacy intervention (to develop a conceptual understanding of the games) and coding education intervention (for students to create their own games) with the goal of improving PUI	
Guided by previously trained class teachers or health care professionals	
Guided by trained "peer coaches"	
Psychological interventions	
Cognitive and behavioral therapies (CBT)	With neurofeedback
	Including for the development of social anxiety and stress coping (interpersonal) skills, emotion regulation, problem solving, decision making, self-esteem, self-control, social skills, interpersonal communication, assertiveness
Behavioral training	For impulsivity
	For Internet gaming-related craving
	For emotional working memory
Cognitive restructuring	
Feedback-based programs/ rewards/apps	Premised on a self-regulation model or on social-cognitive and social norms approaches
	Including contingent money rewards
Motivational interviewing	
Emotion-focused therapy	
Dialectical behavior therapy	Including for the development of distress tolerance skills
Positive psychology	
Photography	
Proximity to nature	
Reality therapy	
Mindfulness	
Mind subtraction meditation	
Narrative therapy and Pilates exercise	
Music therapy	
Family therapy and family sessions	
Occupational activities	Including sports, outdoor activities

emotions into daily activities to develop social skills (Santos et al., 2016), or encouraging positive thinking by having participants acknowledging their own achievements (Ke & Wong, 2018a, 2018b), or discovering the broad meaning and power of life as the key to counseling success (e.g., Yang, Hu et al., 2022). A positive focus (e.g., emphasizing the population's resources, such as self-regulation abilities, rather than focusing solely on negative aspects) was also integrated in education-based interventions (e.g., Brino, Derouin, & Silva, 2022; Favini et al., 2024; Wu et al., 2023).

Feedback-based programs were premised on a dynamics of self-regulation (DSR) model consisting of online provision of success/failure feedback followed by commitment framing (Dunbar et al., 2024), or were delivered through mobile phone applications (Haug, Boumparis, Wenger, Schaub, & Paz Castro, 2022; Kent, Masterson, Ali, Parsons,

& Bewick, 2021; Stinson & Dallery, 2023), namely, the "ready4life" program, which was based on social-cognitive theory (e.g., goal-setting, self-monitoring) and social norms (e.g., normative feedback) approach (Haug et al., 2022). Alternatively, money payments were used as contingent rewards, whenever participants met their goals, in a study that included nine undergraduate students who wanted to reduce their social media use and were identified as addicted to social media (Stinson & Dallery, 2023).

Motivational interviewing, or motivational techniques, were used as a complement to CBT (e.g., Besser et al., 2022; Ji & Wong, 2023; Paschke et al., 2023; Thorens et al., 2014; Torres-Rodríguez et al., 2018; Wölfling, Beutel, Dreier, & Müller, 2014) and also as part of the "ready4life" mobile app-based coaching program (Haug et al., 2022). Motivational interviewing was the core intervention of a pilot study that was delivered through two individual webcam sessions to adults with PUI (Bottel et al., 2021).

Other interventions included photography (Ma et al., 2024), reality therapy (Dursun & Ceyhan, 2023), group mind subtraction meditation (Choi, Chun, Lee, Yoo, & Kim, 2020), proximity to nature (Zhu, 2024), and mindfulness, which was used alone (Xu et al., 2024), as part of cognitive-behavioral interventions (e.g., Kuriala & Reyes, 2020; Lan et al., 2018; Paschke et al., 2023), and in a mobile app-delivered program (Kent et al., 2021). Mindfulness was part of the self-help program developed within an acceptance and commitment therapy (ACT) framework, which was compared against a different version of this ACT program (focused on values and committed action) in a study in China (Ding et al., 2023). Mindfulness was also integrated in education-based programs (e.g., Brino et al., 2022; Wu et al., 2023).

Music therapy was combined with CBT (Bong et al., 2021), and narrative therapy was combined with Pilates exercise (Gong, Gong, Zhang, He, & Tang, 2022). In addition, CBT was combined or contrasted with electro-acupuncture (Dai et al., 2022; Peng et al., 2021) and with pharmacotherapy among patients with depression (Kim et al., 2012) or with anxiety (Santos et al., 2016).

Some programs consisted of comprehensive interventions involving psychotherapy, counseling, or education sessions also with the parents and/or the teachers (e.g., Bağatarhan & Siyez, 2022; Brino et al., 2022; Canoğullari & Cenkseven Önder, 2022; Han et al., 2018; Kim et al., 2012; Paschke et al., 2023; Pornnoppadol et al., 2020; Torres-Rodríguez et al., 2018). Several of these programs integrated family therapy (or elements of family therapy) with the CBT intervention (e.g., Han et al., 2018; Kim et al., 2012; Pornnoppadol et al., 2020; Torres-Rodríguez et al., 2018). Occupational activities, such as sports, outdoor activities, walk rallies, trekking, and family activities were also part of comprehensive programs, namely, in CBT-based camp therapy (Pornnoppadol et al., 2020). Within education-based approaches, comprehensive programs were premised, for example, on a solution-focused strategy (Akgül-Gündoğdu & Selçuk-Tosun, 2023; Kaya, Seviğ, & Zincir, 2023) or on the BASNEF construct (Gholamian, Shahnazi, & Hassanzadeh, 2019).

Mode of administration. The interventions were administered mostly in group sessions, or in group plus individual sessions, less frequently in individual-only sessions (e.g., Besser et al., 2022; Bottel et al., 2021; Dunbar et al., 2024; El-Ashry et al., 2023; Haug et al., 2022; Kent et al., 2021; Santos et al., 2016; Shahrajabian et al., 2023; Stinson & Dallery, 2023; Thorens et al., 2014; Torres-Rodríguez et al., 2018).

Strategies of administration. Considering only the employment of strategies of administration alternative to classical forms of administration (and in addition to the online administration of several programs both within and outside the COVID-19 pandemic) (Table 5), neurofeedback was provided with recourse to games, headsets, and monitoring equipment (Choi et al., 2024). Behavioral training was conducted through recourse to specific tasks (e.g., the Go/No-go training task) to reduce impulsivity (Zheng et al., 2022). In their CBT-based intervention, Turel et al. (2015) used instructional videos to alter participants' beliefs about PUI. The CBT intervention in Bong et al.'s (2021) study was delivered in the form of home daily journal writing. Some programs were delivered as personalized mobile app-based interventions (Haug et al., 2022; Kent et al., 2021; Stinson & Dallery, 2023), or included online-built feedback (Dunbar et al., 2024). In the ACT self-help program, the self-guided online sessions were based on self-help videos and manuals that included exercises (Ding et al., 2023). Some programs were conducted as camp interventions, namely, the therapeutic residential camp comprising CBT and education sessions for adolescents and family sessions for their parents (Pornnoppadol et al., 2020), and the "Limitless Gaming Bootcamp" educational intervention for adult participants, involving trained "peer coaches" (Männikkö et al., 2022). In an education-based intervention with children (the "Wise IT-use" – WIT), the authors constructed a gamified learning system encompassing play-based activities conveying messages about the undesirable consequences of Internet

Table 5. Alternative strategies of administration of the interventions for PUI in psychotherapy, counseling, or education programs (alternative to classical forms of administration)

Online administration of several programs both within and outside the COVID-19 pandemic
CBT through neurofeedback with recourse to games, headsets, and monitoring equipment
Behavioral training through recourse to specific tasks (e.g., the Go/No-go training task) to reduce impulsivity
CBT-based instructional videos to alter participants' beliefs about PUI
CBT in the form of home daily journal writing
Personalized mobile app-based interventions with feedback
Self-help program with self-help videos, manuals and exercises
Camp interventions
Gamified learning system created with play-based activities conveying messages about the undesirable consequences of Internet gaming disorder and risky online behaviors to foster immersion and make learning fun

gaming disorder and risky online behavior to foster immersion in the games and make learning playful and fun (Chau et al., 2019). An adaptation of the intervention according to the presence or absence of comorbid psychopathology was also made, with participants either receiving psychotherapy (if comorbid psychopathology was present) or only addiction counseling, if comorbid psychopathology was absent (Lindenberg et al., 2017).

Intervention results. In nearly all the published research on psychotherapy-based and education-based programs, PUI decreased significantly after the interventions, both in studies with and without comparison groups. These significant PUI decreases occurred regardless of region, specific components of the interventions, strategies used to administer them, scope of the programs (whether involving only the PUI population or in comprehensive programs involving also parents and/or teachers), (prevention or treatment) purpose, and targeted behavior (e.g., whether PUI in general or problematic Internet game playing specifically).

The significant PUI decreases occurred also in programs that combined interventions, such as narrative therapy combined with Pilates exercise, comparing to a no-intervention control group (Gong et al., 2022). PUI decreased both after music therapy plus (homework journal writing-delivered) CBT and after its CBT-only comparison group (this study lacked a placebo or inert control group) (Bong et al., 2021). It also decreased after CBT plus pharmacotherapy among patients with anxiety, compared to before the intervention (this study also lacked a placebo or inert control group) (Santos et al., 2016). Studies in which psychotherapy was compared against other treatments showed significant PUI decreases in both types of treatments, i.e., both in the psychotherapy group and in the electroacupuncture group (Dai et al., 2022; Peng et al., 2021), although, in one study, greater decreases were observed when electroacupuncture was combined with psychotherapy, comparing to electroacupuncture alone and to psychotherapy alone (Peng et al., 2021). Greater PUI decreases also occurred when psychotherapy was combined with medication (bupropion) among patients with depression, comparing to a medication-only intervention (Kim et al., 2012). In these three studies in which psychotherapy was compared to other types of treatments (Dai et al., 2022; Kim et al., 2012; Peng et al., 2021), the participants were randomly assigned to one or the other type of intervention, but all studies lacked inert or placebo control groups. Without such comparison groups, it is not possible to definitely determine whether the PUI decreases were due to the interventions or to other intervening variables that were not controlled (including, for example, PUI's self-healing nature).

Null or mixed results. Only four publications on psychotherapy-based and education-based programs showed null results of the respective interventions on PUI when the experimental groups were compared to the control groups (Besser et al., 2022; Du, Jiang, & Vance, 2010; Lan et al., 2018; Otsuka et al., 2023), even though significant improvements were observed in other measured parameters (e.g., emotional, cognitive and behavioral symptoms, or transtheoretical model changes) in some of these same studies (Du et al., 2010; Otsuka et al., 2023). Among these four studies with null results, the participants were randomly assigned to the intervention and comparison groups in all except one, in which the participants were assigned according to their schedule (Lan et al., 2018). In addition, mixed results were obtained in another four studies (Chau et al., 2019; Kent et al., 2021; Ortega-Barón et al., 2021, 2024).

In the first of the four publications with null results, the program consisted of a group mindfulness-based cognitive-behavioral intervention (eight sessions) with 54 university students in China (47.6% men) who were identified as having smartphone addiction (Lan et al., 2018). Both experimental and control groups received a pre-program educational lecture on smartphone addiction prevention and flyers. In this study, a non-significant time-by-group interaction effect was found on both Mobile Phone Internet Addiction Scale (MPIAS) scores and smartphone use time after the intervention. The second study (Besser et al., 2022) referred to a brief intervention (average of 2.9 sessions) consisting of personalized motivational interviewing and elements of CBT applied to a sample of 36 unemployed adults in Germany (44.3% men) who were identified as having PUI. Participants in the control group received a letter containing information about online support services for Internet use disorder. In the two-month follow-up, the decrease in problematic Internet use on the Compulsive Internet Use Scale (CIUS) was higher in the intervention group than in the comparison group, but the difference was statistically non-significant.

In the third study (Du et al., 2010), a school-based comprehensive program was applied to 56 adolescent students who were identified as having Internet addiction from 10 secondary schools in China (80.4% boys). The eight-session program consisted of group CBT for the adolescents, CB training for their parents, and psycho-education for their teachers. No intervention was applied to the comparison group. In this study, there was a significant decrease in the Internet Overuse Self-Rating Scale scores over time in both (treatment and control) groups, without significant differences between the groups at baseline, immediately after the intervention or six months later. Finally, the fourth study (Otsuka et al., 2023) referred to an education-based program (10 sessions) consisting of nursing or class teachers providing information on Internet addiction and related health problems in class, followed by interactive discussions and exercises. The program had preventive purposes and was applied to all the students using the Internet and their parents who were willing to participate from 13 high schools in Japan (N = 5,312 adolescents in the 10th through 12th grades, 49.7% boys). Comparing the experimental to the wait-list control group in generalized estimating equation models, the intervention had null effects on Internet usage time, on the Korean Scale for Internet Addiction scores, and on the Smartphone Addiction Scale-Short Version scores.

Among the additional four studies that showed mixed results, one consisted of provision of feedback plus mindfulness and behavioral suggestions delivered through a smartphone application to college students with PUI (Kent et al., 2021). The other three consisted of education-based programs with preventive purposes delivered to children or young adolescents (Chau et al., 2019; Ortega-Barón et al., 2021, 2024), two of which were the test of the same "safety.net" program by the same team (Ortega-Barón et al., 2021, 2024). Two lacked comparison groups (Chau et al., 2019; Kent et al., 2021) and the other two included smaller control groups (when compared to the intervention groups) without randomized assignment (Ortega-Barón et al., 2021, 2024).

In the first of these four studies with mixed results, the intervention was delivered through a smartphone application to 10 undergraduate students with PUI in Denmark (one man), who were contemplating change (Kent et al., 2021). The intervention consisted of provision of feedback (based on participants' ongoing smartphone usage), mindfulness suggestions and behavioral suggestions (with 21 total messages received at a rate of one per day throughout these three intervention phases). The intervention had null results on participants' screen time (objectively collected with the smartphone application) and also on the Internet Addiction Test (IAT), although there was a reliable reduction in problematic smartphone use on the Mobile Phone Problem Use Scale (MPPUS). This study had the second smallest sample of all the publications included in this review.

Among the three programs with prevention purposes, one (the "Wise IT-use" – WIT) was delivered to 226 children (56% boys) from four primary schools in Hong Kong, whether without any symptoms of Internet gaming disorder, at risk for such a disorder, or already presenting such symptoms (Chau et al., 2019). The intervention consisted of a three-month psycho-education program to enhance students' awareness of Internet gaming disorder and an array of common risky online behaviors (e.g., sharing, cyberbullying, violent content, pornography, meeting strangers), and to provide knowledge for students to handle such problems through the use of a gamified learning system (to make learning playful) plus facilitator-guided reflection activities. Although both the symptoms of Internet gaming disorder and the proportion of students at risk of the disorder (on the Korean Internet Addiction Proneness Scale) were reduced after the intervention, the proportion of participants classified as "high-risk gamers" remained the same (3%), and a non-significant reduction in the levels of risky online behavior was observed across the study's period. The results of this study suggested that, while this program might help to prevent the escalation of Internet gaming behaviors, it may be inappropriate to treat IGD when it is already present (Chau et al., 2019).

The other education-based intervention also with preventive purposes (the "safety.net" program) was conducted with young adolescents (ages 11–14 years old, 38.2% boys) in Spain and was aimed at preventing eight Internet risks, namely, problematic Internet use, Internet gaming disorder, online gambling disorder, nomophobia (i.e., the irrational, disproportionate fear of possibly not being able to use the mobile phone or running out of signal or battery), and Internet relational risks, such as cybervictimization (consisting of intentional violent behaviors repeatedly enacted through technologies against victims who cannot easily defend themselves), sexting (i.e., sending sexual content, including as photographs or videos), online grooming (by which an adult enters into contact with, and gains the confidence of a minor through technologies to create or maintain some kind of sexual interaction), and cyber dating abuse, including threats, insults, humiliation or denigration with the intent of controlling, isolating, and causing suffering to the partner (Ortega-Barón et al., 2021). After the four-month education program administered by trained school teachers, scores actually increased on the Generalized and Problematic Internet Use Scale (GPIUS2), on the Internet Gaming Disorder Scale-Short Form (IGDS9-SF) and on the Online Gambling Disorder Questionnaire (OGD-Q) in both the intervention and comparison groups. Because the increases were greater in the control group when compared to the intervention group, with significant time-by-group interaction effects for problematic Internet use and for Internet gaming (though with a non-significant interaction effect for Internet gambling), the results were thought to positively address the program's purpose of preventing Internet use from escalating. In a later, post-COVID-19 confirmation test of this same "safety.net" educational program with a larger sample of young adolescents ($N = 726$; 45.6% boys), the significant effects remained for PUI (this time, scores decreasing in the experimental group and increasing in the comparison group) but not for Internet gaming (scores decreasing in both the intervention and control groups), and remained non-significant for online gambling (Ortega-Barón et al., 2024). Significant effects of the intervention were observed for nomophobia, in favor of the experimental group in both studies, with mixed results obtained for the other relational risks (Ortega-Barón et al., 2021, 2024).

Prevention studies. In sum, considering school-based education programs universally applied to children or young adolescent students with prevention purposes, four studies showed either null (Otsuka et al., 2023) or mixed results (Chau et al., 2019; Ortega-Barón et al., 2021, 2024), although, in one non-randomized study with children in Taiwan ($N = 868$, mean age of about 10 years old), the children who recognized 60% or more of the PUI intervention program's contents as having been delivered by the teachers reported lower PUI levels (on the Chinese Internet Addiction Scale) than did the children who recognized less than 60% of the program's contents (Wu et al., 2023). Another school-based program with prevention purposes administered universally to 15-year-old adolescents in a school in Italy ($N = 462$) yielded positive results on PUI (on the Bergen Social Media Addiction Scale and on the Smartphone Addiction Scale) in another non-randomized study (Favini et al., 2024). In addition, a randomized study

on an individualized program with prevention purposes targeting older adolescents in schools in Switzerland (N = 1,351, mean age of about 17 years old) had positive effects on PUI (on the Short Compulsive Internet Use Scale). This intervention was the "ready4life" mobile application (four-month) program consisting of coaching on responsible use of social media and gaming, providing feedback on current use and life skills, and also tailored information (Haug et al., 2022). In another prevention program targeting an adult population (223 undergraduate students in the United States of America), the videos created to modify PUI-related beliefs effectively improved the viewers' attitudes toward reducing Internet use (Turel et al., 2015), although the actual PUI behavior or level was not assessed in this study. Other studies on programs with prevention purposes have been reported as yielding positive results on PUI (e.g., Akgül-Gündoğdu & Selçuk-Tosun, 2023, 93; Canoğullari & Önder, 2022; Ke & Wong, 2018a; Ke & Wong, 2018b; Lindenberg, Kindt, & Szász-Janocha, 2022), but the participants in these studies were already selected for having elevated PUI levels on the studies' respective scales, which broadens the notion of "prevention".

Time spent on the internet. Among the publications in this review that presented results on time spent online after the psychotherapy-based or education-based interventions, participants' screen time frequently failed to decrease even when significant reductions were observed in the respective studies' PUI scales. For example, in their program with 74 university students who were interested in decreasing the amount of their Internet usage, and who scored 40 or more points on the IAT (Dunbar et al., 2024), mean daily hours spent on the Internet (excluding for study or work purposes) decreased more in the experimental than in the control group after the 21-day intervention (consisting of provision of success/failure feedback and commitment framing), but increased to previous levels at the six-week follow-up, without significant differences between the two groups, despite the differences simultaneously observed on the Internet Addiction Test in favor of the experimental group at this time.

Failure to reduce screen time occurred after various types of interventions, whether CBT (e.g., Du et al., 2010; Szász-Janocha et al., 2020; Yang, Hu et al., 2022), mindfulness-based cognitive-behavioral interventions (e.g., Lan et al., 2018), including those delivered via smartphone applications (e.g., Kent et al., 2021), or education-based programs (e.g., Han et al., 2024; Männikkö et al., 2022; Otsuka et al., 2023; Tang et al., 2021). It occurred when screen time referred specifically to Internet game playing, for example, in Liu et al.'s (2021) behavioral intervention for craving with 36 men screened for PUI and spending more than 14 h per week engaged in Internet gaming, or in Männikkö et al.'s (2022) bootcamp educational intervention with 37 adult participants reporting excessive gaming. Hours spent online were generally based on self-reported data, in the studies, with only a few exceptions using objective collection of these data through smartphone applications (Brino et al., 2022; Kent et al., 2021; Stinson & Dallery, 2023).

In general, significant reductions in screen time occurred in samples showing a mean time spent on the Internet nearing seven hours per day or more, irrespective of the type of intervention (e.g., Bottel et al., 2021; Brino et al., 2022; Gholamian et al., 2019; Kim et al., 2012; Lindenberg et al., 2017; Torres-Rodríguez et al., 2018; Wölfling et al., 2014), with few exceptions showing significant Internet-use time decreases among samples spending less than five hours on the Internet (Ding et al., 2023; Han et al., 2018). Nevertheless, several of these studies lacked proper comparison groups (including the latter two), thus the decreases could be due to other factors occurring over time. Also, post-intervention screen time results were not reported in most publications in this review.

DISCUSSION

Different types of interventions for PUI have been tested in the scientific literature, namely, pharmacotherapy, transcranial direct current stimulation (tDCS) applied over the dorsolateral prefrontal cortex, physical exercise, electroacupuncture, and psychotherapy, counseling, or education programs (Table 1). Most publications referred to psychotherapy, counseling, or education interventions for PUI, whether for prevention purposes, treatment purposes, or both (61 records). A comparatively smaller number of publications (nine) referred to pharmacotherapy interventions consisting of medication for the treatment of non-clinical samples with PUI (i.e., without other psychiatric comorbidities) and of clinical samples of participants with PUI and other comorbidities (e.g., depression, ADHD, OCD). Fewer studies focused on the effects on PUI of transcranial direct current stimulation (tDCS) (four publications), and of physical exercise on PUI (three publications). In addition, within psychotherapy-based interventions, two studies focused on the effects of electroacupuncture. These different types of interventions reflect the multidimensional nature of PUI treatment and prevention efforts. So far, the vast majority of the studies have been conducted in Asian or Middle-Eastern countries, perhaps reflecting the high prevalence rates of PUI in these regions (Thomas, Gaspar, Al Beyahi, Al Bassam, & Aljedawi, 2024). Efforts to advance the therapeutic neurophysiological mechanisms by which the interventions affect PUI are also under way (e.g., Li, Wu, Tang, Chen, & Liu, 2020) and have been included in empirical studies combining the interventions with neuroscience (e.g., Dai et al., 2022; Han et al., 2018; Peng et al., 2021; Xu et al., 2024).

Interventions that combine psychotherapy with other types of treatments (e.g., medication for depression, or electroacupuncture for depressed PUI patients) show superior results, comparing, respectively, to pharmacotherapy alone (Kim et al., 2012), to electroacupuncture alone, and to psychotherapy alone (Peng et al., 2021). Combining therapies has the potential to improve participants' physiological, psychological and behavioral conditions (Qiao, Li, & Liu, 2020), and the superior results of therapy combination over

pharmacotherapy alone has been noted before (Chang et al., 2022). However, studies combining therapies are scarce, and more research that also includes inert or placebo comparison groups is needed for corroboration of these results, as well as more studies on CBT combined with music therapy (Bong et al., 2021), and therapy combined with exercise, also for inspection of the effects of the specific modalities (Gong et al., 2022).

Studies on pharmacological interventions are suggestive of positive effects of pharmacotherapy on PUI, particularly with the dopaminergic antidepressant bupropion. Other tested medications include escitalopram, fluvoxamine, sertraline or fluoxetine, methylphenidate, atomoxetine, and clomipramine. Bupropion is the medication for which most evidence is available. However, the studies have small samples and several lack proper control conditions, which limits the possibility of drawing definite conclusions about the effects of the medication on PUI. Interventions based on transcranial direct current stimulation also show some positive results on PUI. However, these results are limited to very few studies, and the small sample sizes, mixed results, or absence of control groups require cautious interpretation of the findings. Similarly, in the three studies focusing on the effects of physical exercise, the authors suggest positive results of the interventions on PUI. However, two lacked numerical data, a control group, or the assessment of group differences over time, and more studies are necessary for any conclusions to be drawn about the effects of physical exercise on PUI. Electroacupuncture alone also has been reported as significantly reducing PUI in both publications dealing with this type of intervention, but more studies that also include inert or placebo control groups are needed for corroboration of these results.

Among the studies on psychotherapy, counseling, or education programs, education-based interventions typically consist of the provision of information followed by activities aimed at encouraging reflection (e.g., group discussion, exercises and activities, such as role-playing), some of which also include parents and/or teachers. In turn, in psychotherapy-based programs, cognitive and behavioral therapies (CBT) are the most commonly used types of psychological interventions for PUI in the empirical research.

In brief, psychological interventions for PUI that have been tested (summarized in Table 4) include cognitive restructuring, neurofeedback for the regulation of brainwaves, behavioral training to reduce impulsivity or gaming-related craving, behavioral training for emotional working memory, emotion-focused therapy, and dialectical behavior therapy, including for the development of distress tolerance skills. Several CBT and education-based interventions explicitly incorporate a positive psychology component, or a positive focus, namely, stressing the development of life skills as a counterpoint to emphasizing solely negative outcomes. They include the development of social anxiety and stress coping skills to be used in in-person social interactions, with various integrating the enhancement of aspects such as emotion regulation, problem solving, self-esteem, self-control, social skills, communication and assertiveness. Some digitally-delivered programs consist of (online) provision of feedback followed by commitment framing, premised on a self-regulation model, or of (mobile app-based) coaching with provision of feedback, premised on social-cognitive and social norms approaches. Contingent money rewards have also been used. Motivational interviewing or techniques were used alone, as were mind subtraction meditation, photography, reality therapy, and proximity to nature, or as part of CBT. Mindfulness was used alone and was also integrated in both cognitive-behavioral programs and education-based interventions (including in self-help-based therapy). Comprehensive programs that included also the parents and/or teachers were used in both psychotherapy-based and education-based interventions. Some programs included family therapy and also occupational activities, such as sports, namely, in camp therapy. In addition, and as mentioned earlier, music therapy has been combined with CBT (Bong et al., 2021), narrative therapy has been combined with Pilates exercise (Gong et al., 2022), and CBT has been combined or contrasted with pharmacotherapy (Kim et al., 2012; Santos et al., 2016) and with electroacupuncture (Dai et al., 2022; Peng et al., 2021).

Alternative means of administration of the psychological or educational interventions (summarized in Table 5) have included games and simultaneous use of monitoring equipment with headsets, video presentations to alter participants' beliefs, the use of specific tasks (e.g., the Go/No-go training task) for behavioral training of impulsivity, mobile app-based coaching and feedback, residential camp therapy and bootcamp-based education with "peer coaches", self-guidance in online self-help therapy, gamified learning environments to make learning fun, and delivery of CBT in the form of home daily journal writing (in addition to the online administration of several of the programs).

Explicit adaptations of the interventions for PUI according to whether or not participants had comorbid psychopathology was infrequent in psychological- or education-based research (Lindenberg et al., 2017), and typically involved psychotherapy combined with medication, namely, for depression (e.g., Kim et al., 2012) or anxiety (e.g., Santos et al., 2016). Adapting the interventions to the presence of comorbid psychopathology might make a difference in the resulting effects of the interventions (Basenach et al., 2024). For example, in Brown et al.'s (2021) observational study, the rate of drop out in a sample of patients seeking treatment for PUI was significantly greater among participants presenting a high psychopathological comorbidity profile than among those presenting a low comorbidity profile. In Lindenberg et al.'s (2017) intervention, the lack of significant differences in the observed positive outcomes between the group of participants with PUI presenting other psychopathologies (who received psychotherapy), and the group of participants with PUI without comorbid psychopathologies (who received addiction counseling), could be indicative of the need to adapt each intervention to the respective type of population.

Both psychotherapy-based and education-based interventions were largely reported as having positive effects on PUI, regardless of the type of intervention or the particular components that the intervention included, mode of administration (in group, individually, or combining both modes), format of administration (in presence, at distance, through games with monitoring equipment, through mobile applications, with instructional videos, in camp therapy or camp-based education with "peer coaches", and through self-guidance in self-help therapy), whether or not the programs involved also the parents and/or the teachers, and regardless of the region where they were conducted, target (e.g., children, adolescent, or adult) population, the (prevention or treatment) purpose of the program, or the PUI outcome (e.g., PUI in general or Internet gaming specifically).

Despite the large amount of evidence in the published research indicating that both psychotherapy-based and education-based interventions effectively reduced PUI on the respective studies' scales, several studies were conducted with small samples, frequently without randomized assignment of the participants, or group equivalence, and many lacked proper control groups or proper statistical analyses comparing the groups over time, which limits the possibility of drawing robust conclusions about the efficacy of the psychotherapy, counseling, or education interventions on PUI. For example, PUI frequently decreased also in the no-intervention control groups during the period of the respective studies, including in pharmacotherapy and tDCS programs as well (e.g., Besser et al., 2022; Choi et al., 2020; Du et al., 2010; Han & Renshaw, 2012; Jeong et al., 2020; Ji & Wong, 2023 Liu et al., 2021; Ma et al., 2024; Pornnoppadol et al., 2020; Zhang et al., 2023; among others), suggesting that other factors could be influencing the results over time, including eventual seasonal aspects that could affect the entire participating sample, such as exams or vacation periods among student populations, for example. Assessment timings, along with other aspects (e.g., inadvertent general awareness raising, or even a possible self-healing nature of PUI), could be confounding the results and should be carefully pondered and controlled in the studies. These aspects reinforce the importance of having rigorous comparisons to proper control groups in research, including active control groups and placebo or inert groups, namely, in studies testing two different types of interventions.

The fact that the only four studies showing null results of psychotherapy-based or education-based interventions on PUI included comparison groups (Besser et al., 2022; Du et al., 2010; Lan et al., 2018; Otsuka et al., 2023), with randomized designs in three of them, lends support to these methodological considerations. These four studies were otherwise different from each other, without a common discernible pattern among them. They were varied in the type of intervention employed (including group CBT, group mindfulness and CBT, personalized motivational interviewing and CBT, and an education-based program, respectively), sample composition (involving adolescent or adult participants in different regions of the world, and with varying degrees of PUI), scope (some also involving the parents and teachers), and mode of (group *versus* individual) administration, although the short duration of Besser et al.'s (2022) intervention could explain this program's lack of effectiveness. Another brief intervention that, like in Besser et al.'s (2022) study, was based on motivational interviewing, and also with adult participants, significantly reduced PUI symptom severity and duration of Internet use after two webcam sessions (Bottel et al., 2021), but this study lacked a comparison group. Even without comparison groups or randomization, some interventions yielded mixed results regarding the effects of the psychotherapy-based or education-based interventions on PUI (Chau et al., 2019; Kent et al., 2021; Ortega-Barón et al., 2021, 2024), although the small sample size in Kent et al.'s (2021) study could explain the mixed results, at least in part. These findings reinforce the importance of the methodological considerations mentioned above.

Prevention programs

Whereas non-psychological interventions, such as pharmacotherapy or tDCS, were implemented mainly for treatment purposes, some studies on psychological or educational interventions had explicit prevention purposes. Based on two studies (Chau et al., 2019; Ortega-Barón et al., 2021), it is possible that educational interventions applied universally (e.g., to all students in schools) with preventive purposes might be more effective in preventing Internet use from escalating than in reducing the Internet behaviors (including Internet gaming), especially when these behaviors are already excessive, at least among children and young adolescents. However, conflicting results exist in research on psychotherapy-based and education-based prevention efforts targeting school populations universally (e.g., Favini et al., 2024; Haug et al., 2022; Ortega-Barón et al., 2024; Otsuka et al., 2023; Turel et al., 2015; Wu et al., 2023), and more studies with robust designs, including proper control groups, are necessary for confirmation of this hypothesis. In a recent systematic review focusing on prevention interventions for PUI among young children (Theopilus et al., 2024), conflicting results also emerged across the studies that used physical activity programs for prevention purposes. Positive results on PUI emerged in only one of the four studies on parenting strategies (the Positive Parenting Program, or Triple P), although this study lacked a control group. In addition, some studies with prevention purposes (e.g., Akgül-Gündoğdu & Selçuk-Tosun, 2023; Canoğullari & Cenkseven Önder, 2022; Ke & Wong, 2018a; Ke & Wong, 2018b; Lindenberg et al., 2022) target only populations already presenting some level of PUI to prevent it from increasing even more. For example, in a recent systematic review only of school-based programs for PUI conducted on studies published until 2021 (Martínez-Hernández & Lloret-Irles, 2024), several of the included studies had some level of PUI as a requirement for participant inclusion, whereas others had not. However, PUI levels decreasing after these interventions make such programs more similar to those that have treatment, rather than prevention, purposes.

Whether the same programs can be effective across various (e.g., prevention or treatment) purposes or, alternatively, different types of programs are necessary depending on the purpose and targeted population (e.g., populations without PUI *versus* populations already presenting PUI) remains open to further investigation. The delineation of the levels of PUI is important for the definition of the target population (Kuss & Lopez-Fernandez, 2016), although this can pose challenges, namely, considering the variety of PUI levels and instrument heterogeneity used across the studies. Additionally, populations seeking help at treatment centers for PUI or resorting to self-help interventions might already be more alerted to, or more motivated for, change. Thus, considering the context of the intervention (whether directed at self-admitting participants or offered to participants who did not request help) is also of importance.

Time spent on the internet

The additional provision of the number of hours spent in online activities other than work- or school-related tasks could be a possible way to make the data more uniform across studies, especially if time spent on the Internet were to be collected objectively (for example, through smartphone applications), although this collection method is not without problems (Stinson & Dallery, 2023). Screen time would have to be used as an addition to other measures of PUI also because research indicates that PUI more likely relates to how the Internet is used and/or the relationship with it than to the time spent using it (Kent et al., 2021), and the adverse health effects of PUI may not simply be due to prolonged Internet use (Chen, Chen, Wu, & Wu, 2022). However, the number of hours spent in online activities other than work- or school-related tasks could help to specify the activities (and the respective time spent on them), also possibly helping to distinguish between different types of users, for example, participants who are professional players (who will spend long hours playing online professionally) from non-professional players with PUI.

In this review, a pattern in the publications suggests that, despite possible decreases in PUI levels, as assessed through the studies' respective PUI scales, actual time spent on the Internet tended to decrease significantly after the interventions only when the mean time of Internet use neared seven hours per day or more (e.g., Bottel et al., 2021; Brino et al., 2022; Gholamian et al., 2019; Kim et al., 2012; Lindenberg et al., 2017; Torres-Rodríguez et al., 2018; Wölfling et al., 2014), with few exceptions showing decreases in screen time when mean Internet time was less than five hours per day (e.g., Ding et al., 2023; Han et al., 2018). This occurred irrespective of the (psychotherapy-based or education-based) type of intervention used, and also when the Internet activities referred specifically only to gaming, or when Internet work- or study-related activities were excluded. It also occurred among pharmacotherapy-based interventions (Dell'Osso et al., 2008; Han et al., 2010; Han & Renshaw, 2012), with few exceptions showing a decrease when mean Internet time was less than five hours per day (Han et al., 2009), although one study based on transcranial direct current stimulation (tDCS) showed a significant decrease in screen time in a sample that presented a baseline mean of 16.8 (SD = 11.7) hours per week spent on Internet games (Lee et al., 2018). Nevertheless, most studies lacked results on participants' post-intervention screen time, and, in several of those that provided this information, the online activities (e.g., whether related to school, work, or others) were not specified. In addition, several of these studies lacked proper control groups, and time spent online was mostly based on self-reported data (Brino et al., 2022; Kent et al., 2021; Stinson & Dallery, 2023 are exceptions, having collected these data objectively through smartphone applications). Together, these aspects leave the observed pattern concerning the effects of the interventions on time spent on the Internet open to confirmation and further specification in future studies.

Limitations

This scoping review has some limitations. Despite its broad scope as regard modalities of intervention, forms of PUI, even possible absence of PUI (e.g., in interventions conducted in schools, universally), and age groups, it included only publications written in English. Also, the choice of the term problematic Internet usage (PUI) in the search was intended to capture the broad spectrum of this phenomenon and focus on problematic consequences on people's emotional, psychological, or behavioral well-being, even in the absence of an evident pathological use. However, this search without other related terms, such as Internet addiction or prevention, might limit the review's comprehensiveness concerning the existing literature. Few studies were found for some types of interventions, and many were lacking in quality (e.g., without proper comparison groups, proper statistical analyses, or presentation of numerical data), which limits the findings and the conclusions. The nearly universal use of self-report instruments for assessing PUI can also pose threats to the findings in the studies, namely, due to social desirability or lack of introspection.

Overall, the published research shows promising effects of pharmacological, tDCS, physical exercise, electroacupuncture, and psychotherapy-based or education-based interventions on PUI, with few null or mixed results reported in the literature. However, definite conclusions about these interventions will only be possible when more studies are based on more robust designs. For example, in a previous meta-analysis only on psychological interventions for PUI among adolescents (Malinauskas & Malinauskiene, 2019), the authors did not conclude that CBT had a significant effect on PUI severity, even though, like in the present review, they observed that CBT was the most frequently used of all psychotherapies (Yang, Hu et al., 2022). Thus, this review extends the conditional conclusions of a previous review on gaming disorder (Danielsen et al., 2024) to other forms of PUI.

More research with rigorous designs can further illuminate the contributions of the various types of interventions,

including with specific medications, tDCS, physical exercise, electroacupuncture, and psychological or educational programs, namely, narrative therapy, emotion-focused therapy, motivational strategies, mind subtraction therapy, photography, reality therapy, nature proximity, mindfulness, the role of family involvement and of family therapy, as well as of the different components of the interventions (e.g., positive psychology, emotional intelligence, self-esteem, problem solving, communication, social interaction skills), for which few (and few rigorous) studies still exist. More robust research also could contribute to more actionable results by helping to clarify which interventions are suited for different PUI profiles, namely by age, gender, and psychological characteristics. Attention should be paid to the presence of comorbidities (e.g., anxiety, depression or others) and also to whether participants seek help or are offered the program without asking for it themselves, which could influence the results. Further research is also warranted on psychological and educational programs with prevention purposes and on whether populations with different PUI levels require intervention modalities or components that differ depending on the (prevention or treatment) purpose of the program.

Despite these limitations, this review mapped the modalities of intervention for PUI that have been tested in empirical research, showing the variety of efforts that have been endeavored to prevent and treat PUI. In tandem, a joint effort from societal and regulatory bodies can further help to mitigate the negative consequences of digital products. This includes advocating for enhanced corporate responsibility, re-evaluating the business models underpinning digital service provision, and exploring potential regulatory frameworks. Initiatives such as the European Commission's Digital Services Act (European Commission, n.d.a) and Digital Markets Act (European Commission, n.d.b), along with the UK's Online Safety Bill (United Kingdom, 2023), represent important steps toward reducing the harms associated with digital products (Montag et al., 2024). However, effectively bridging the divide between evolving transnational policies and the practices of both private and public stakeholders presents an ongoing challenge.

The need for clear, enforceable international standards that govern the conduct of digital service providers is paramount. Such standards should ensure corporate transparency and offer effective remedies for individuals affected by PUI, thus safeguarding the fundamental human rights of vulnerable groups. This comprehensive review underscores the multifaceted nature of PUI and the critical importance of adopting a holistic approach that encompasses further empirical research, societal engagement, and regulatory oversight. Together, these efforts are essential for effectively addressing PUI and mitigating its wide-ranging impacts on individuals and society at large.

Funding sources: COST Action CA16207 European Network for Problematic Usage of the Internet, Erasmus + (EPCSTE) Grant No. 40104609. ARD was supported by Fundação para a Ciência e Tecnologia (FCT) through R&D Units funding (UIDB/05210/2020). We thank the COST Action CA16207 European Network for Problematic Usage of the Internet, supported by COST (European Cooperation in Science and Technology: www.cost.eu) for the inspiration to explore this topic.

Authors' contribution: Conceptualization: IPC, ARD, JB, JMM, HJR, ZD, OC. Data collection: ARD, IC, VC, LP, EP, GE. Analysis: IPC, IC, EP. Funding acquisition: ARD, LP, NH, TZ, JB, GE, JMM, HJR, ZD, OC. Validation: IC, VC, LP, TZ, VC, LP, TZ, AC, GE. Writing-original draft preparation: IPC, ARD, IC, EP. Writing-review and editing: IPC, ARD, IC, EP, NH, TZ, ARU, JB, AC, JMM, HJR, ZD, OC. Supervision: IPC, OC.

Conflict of interest: Hans-Jürgen Rumpf is an Associate Editor, while Zsolt Demetrovics is the Editor-in-Chief of the journal. The other authors declare that they have no conflict of interest.

REFERENCES

Affouneh, S., Mahamid, F. A., Berte, D. Z., Shaqour, A. Z., & Shayeb, M. (2021). The efficacy of a training program for social skills in reducing addictive Internet behaviors among Palestinian university students. *Psicologia: Reflexão e Crítica*, *34*(19). https://doi.org/10.1186/s41155-021-00185-w

Akgül-Gündoğdu, N., & Selçuk-Tosun, A. (2023). Effect of solution-focused approach on problematic internet use, health behaviors in schoolchildren. *Journal of Pediatric Nursing*, *68*, e43–e49. https://doi.org/10.1016/j.pedn.2022.11.002

Alavi, S. S., Ghanizadeh, M., Mohammadi, M. R., Jannatifard, F., Alamuti, S. E., & Farahani, M. (2021). The effects of cognitive-behavioral group therapy for reducing symptoms of internet addiction disorder and promoting quality of life and mental health. *Trends Psychiatry Psychotherapy*, *43*(1), 47–56. https://doi.org/10.47626/2237-6089-2020-0010

Amini, M., Lotfi, M., Fatemitabar, R., & Bahrampouri, L. (2020). The effectiveness of emotion-focused group therapy on the reduction of negative emotions and internet addiction symptoms. *Practice in Clinical Psychology*, *8*(1), 1–8. https://doi.org/10.32598/jpcp.8.1.1

Augner, C., Vlasak, T., Aichhorn, W., & Barth, A. (2022). Tackling the 'digital pandemic': The effectiveness of psychological intervention strategies in problematic internet and smartphone use—A meta-analysis. *Australian & New Zealand Journal of Psychiatry*, *56*(3), 219–229. https://doi.org/10.1177/00048674211042793

Ayub, S., Jain, L., Parnia, S., Bachu, A., Farhan, R., Kumar, H., … Ahmed, S. (2023). Treatment modalities for internet addiction in children and adolescents: A systematic review of randomized controlled trials (RCTs). *Journal of Clinical Medicine*, *12*(9), 3345. https://doi.org/10.3390/jcm12093345

Bağatarhan, T., & Siyez, D. M. (2022). The effectiveness of a cognitive-behavioral prevention program for internet addiction. *Journal of Rational-Emotive & Cognitive-Behavior Therapy*, *40*, 767–792. https://doi.org/10.1007/s10942-021-00439-7

Bae, S., Hong, J. S., Kim, S. M., & Han, D. H. (2018). Bupropion shows different effects on brain functional connectivity in

patients with Internet-based gambling disorder and Internet gaming disorder. *Frontiers in Psychiatry*, *9*, 130. https://doi.org/10.3389/fpsyt.2018.00130

Basenach, L., Rumpf, H.-J., Dreier, M., Salbach, H., Renneberg, B., Gnauert, O., & Wölfling, K. (2024). Symptoms and functional impairments in patients with internet use disorders participating in an online short-term therapy. *Comprehensive Psychiatry*, *131*, 152471. https://doi.org/10.1016/j.comppsych.2024.152471

Bates, G., & McVeigh, J. (2015). *Image and performance enhancing drugs: 2015 survey results*. CPH, Faculty of Education, Health and Community, Liverpool John Moores University. National IPED INFO Survey. Retrieved from http://www.ipedinfo.co.uk/resources/downloads/2015%20National%20IPED%20Info%20Survey%20report.pdf.

Besser, B., Bischof, G., Bischof, A., Brandt, D., Orlowski, S., Hoffmann, H., & Rumpf, H.-J. (2022). Pilot study of a brief intervention to treating internet use disorders. *SUCHT*, *68*(1), 41–49. https://doi.org/10.1024/0939-5911/a000746

Bipeta, R., Yerramilli, S. S., Karredla, A. R., & Gopinath, S. (2015). Diagnostic stability of Internet addiction in obsessive-compulsive disorder: Data from a naturalistic one-year treatment study. *Innovations in Clinical Neuroscience*, *12*(3–4), 14–23. https://pmc.ncbi.nlm.nih.gov/articles/PMC4420165/.

Bisen, S. S., & Deshpande, Y. M. (2018). Understanding internet addiction: A comprehensive review. *Mental Health Review Journal*, *23*(1). https://doi.org/10.1108/MHRJ-07-2017-0023

Bottel, L., Brand, M., Dieris-Hirche, J., Herpertz, S., Timmesfeld, N., & Te Wildt, B. T. (2021). Efficacy of short-term telemedicine motivation-based intervention for individuals with internet use disorder: A pilot-study. *Journal of Behavioral Addictions*, *10*(4), 1005–1014. https://doi.org/10.1556/2006.2021.00071

Bong, S. H., Won, G. H., & Choi, T. Y. (2021). Effects of cognitive-behavioral therapy based music therapy in Korean adolescents with smartphone and internet addiction. *Psychiatry Investigation*, *18*(2), 110–117. https://doi.org/10.30773/pi.2020.0155

Brand, M., & Potenza, M. N. (2024). Behavioral addictions in the ICD-11: An important debate that is anticipated to continue for some time. *Journal of Behavioral Addictions*, *12*(3), 585–589. https://doi.org/10.1556/2006.2020.00035

Brand, M., Rumpf, H.-J., Demetrocvics, Z., Müller, A., Stark, R., King, D. L., & Goudriaan, A. E. (2022). Which conditions should be considered as disorders in the International Classification of Diseases (ICD-11) designation of 'other specified disorders due to addictive behaviors'? *Journal of Behavioral Addictions*, *11*(2), 150–159. https://doi.org/10.1556/2006.2020.00035

Brand, M., Wegmann, E., Stark, R., Müller, A., Wölfling, K., Robbins, T. W., & Potenza, M. N. (2019). The Interaction of Person-Affect-Cognition-Execution (I-PACE) model for addictive behaviors: Update, generalization to addictive behaviors beyond internet-use disorders, and specification of the process character of addictive behaviors. *Neuroscience and Biobehavioral Reviews*, *104*, 1–10. https://doi.org/10.1016/j.neubiorev.2019.06.032

Brino, K. A. S., Derouin, A. L., & Silva, S. G. (2022). Problematic internet use in adolescents and implementation of a social media hygiene protocol. *Journal of Pediatric Nursing*, *63*, 84–89. https://doi.org/10.1016/j.pedn.2021.10.011

Brouzos, A., Papadopoulou, A., & Baourda, V. C. (2024). Effectiveness of a web-based group intervention for internet addiction in university students. *Psychiatry Research*, *336*, 115883. https://doi.org/10.1016/j.psychres.2024.115883

Brown, T., Stavropoulos, V., Christidi, S., Papastefanou, Y., & Matsa, K. (2021). Problematic internet use: The effect of comorbid psychopathology on treatment outcomes. *Psychiatry Research*, *298*, 113789. https://doi.org/10.1016/j.psychres.2021.113789

Cai, Z., Mao, P., Wang, Z., Wang, D., He, J., & Fan, X. (2023). Associations between problematic internet use and mental health outcomes of students: A meta-analytic review. *Adolescent Research Review*, *8*, 45–62. https://doi.org/10.1007/s40894-022-00201-9

Canoğullari, Ö., & Cenkseven Önder, F. (2022). The effect of the psychoeducation program and the family education for the problematic internet prevention. *Hacettepe University Journal of Education*, *37*(4), 1438–1456. https://doi.org/10.16986/HUJE.2022.456

Cao, Y., & Li, H. (2022). Toward controlling of a pandemic: How self-control ability influences willingness to take the COVID-19 vaccine. *Personality and Individual Differences*, *188*, 111447. https://doi.org/10.1016/j.paid.2021.111447

Cataldo, I., Billieux, J., Esposito, G., & Corazza, O. (2022). Assessing problematic use of social media: Where do we stand and what can be improved? *Current Opinion in Behavioral Sciences*, *45*, 101145. https://doi.org/10.1016/j.cobeha.2022.101145

Cataldo, I., Burkauskas, J., Dores, A. R., Carvalho, I. P., Simonato, P., De Luca, I., … Corazza, O. (2022). An international cross-sectional investigation on social media, fitspiration content exposure, and related risks during the COVID-19 self-isolation period. *Journal of Psychiatric Research*, *148*, 34–44. https://doi.org/10.1016/j.jpsychires.2022.01.032

Cataldo, I., De Luca, I., Giorgetti, V., Cicconcelli, D., Bersani, F. S., Imperatori, C., … Corazza, O. (2021). Fitspiration on social media: Body-image and other psychopathological risks among young adults. A narrative review. *Emerging Trends in Drugs, Addictions and Health*, *1*, 100010. https://doi.org/10.1016/j.etdah.2021.100010

Chang, C.-H., Chang, Y.-C., Yang, L., & Tzang, R.-F. (2022). The comparative efficacy of treatments for children and young adults with Internet addiction/internet gaming disorder: An updated meta-analysis. *International Journal of Environmental Research and Public Health*, *19*(5), 2612. https://doi.org/10.3390/ijerph19052612

Chau, C.-L., Tsui, Y. Y., & Cheng, C. (2019). Gamification for internet gaming disorder prevention: Evaluation of a Wise IT-Use (WIT) program for Hong Kong primary students. *Frontiers in Psychology*, *10*, 2468. https://doi.org/10.3389/fpsyg.2019.02468

Chen, B.-C., Chen, M.-Y., Wu, Y.-F., & Wu, Y.-T. (2022). The relationship of social media addiction with internet use and perceived health: The moderating effects of regular exercise intervention. *Frontiers in Public Health*, *10*, 854532. https://doi.org/10.3389/fpubh.2022.854532

Chen, Z., & Sun, P. (2022). Psychological mechanism and exercise intervention of college students' problematic internet use based on IoT technology. *Mathematical Problems in Engineering*, *2022*, 3615217. https://doi.org/10.1155/2022/3615217

Choi, E.-H., Chun, M. Y., Lee, I., Yoo, Y.-G., & Kim, M.-J. (2020). The effect of mind subtraction meditation intervention on smartphone addiction and the psychological wellbeing among adolescents. *International Journal of Environmental Research and Public Health*, *17*(9), 3263. https://doi.org/10.3390/ijerph17093263

Choi, J.-W., Yang, S., & Kim, J. W. (2024). Impact of mobile neurofeedback on internet addiction and neurocognitive function in neurotypical children: Double-blind, sham-controlled randomized clinical trial. *Neuropsychiatric Disease and Treatment*, *20*, 1097–1106. https://doi.org/10.2147/NDT.S454881

Dahl, D., & Bergmark, K. H. (2020). Problematic internet use: A scoping review – longitudinal research on a contemporary social problem, 2006–2017. *Nordic Studies on Alcohol and Drugs*, *37*(6), 497–525. https://doi.org/10.1177/1455072520941997

Dai, Y., Zhang, C., Zhang, L., Wen, C., & Zhu, T. (2022). The modulation of mRNA levels of MAOA by electroacupuncture and psychotherapy in patients with pathological internet use. *Frontiers in Psychiatry*, *13*. https://doi.org/10.3389/fpsyt.2022.918729

Danielsen, P. A., Mentzoni, R. A., & Låg, T. (2024). Treatment effects of therapeutic interventions for gaming disorder: A systematic review and meta-analysis. *Addictive Behaviors*, *149*, 1–17. https://doi.org/10.1016/j.addbeh.2023.107887

Dell'Osso, B., Hadley, S. J., Allen, A., Baker, B., Chaplin, W. F., & Hollander, E. (2008). Escitalopram in the treatment of impulsive-compulsive internet usage disorder: An open-label trial followed by a double-blind discontinuation phase. *Journal of Clinical Psychiatry*, *69*(3), 452–456. https://doi.org/10.4088/jcp.v69n0316

Ding, D., Pan, M., Wang, W., Wang, X., Ma, S., Yang, Y., … Wu, Y. (2023). Online self-help acceptance and commitment therapy module for college students with higher gaming disorder during COVID-19: A pilot study. *Behaviour Change*, *40*, 278–296. https://doi.org/10.1017/bec.2023.18

Dores, A. R., Carvalho, I. P., Burkauskas, J., Simonato, P., De Luca, I., Mooney, R., … Corazza, O. (2021). Exercise and use of enhancement drugs at the time of the COVID-19 pandemic: A multicultural study on coping strategies during self-isolation and related risks. *Frontiers in Psychiatry*, *12*, 648501. https://doi.org/10.3389/fpsyt.2021.648501

Du, Y., Jiang, W., & Vance, A. (2010). Longer term effect of randomized, controlled group cognitive behavioural therapy for internet addiction in adolescent students in Shanghai. *Australian & New Zealand Journal of Psychiatry*, *44*(2), 129–134. https://doi.org/10.3109/00048670903282725

Dunbar, D., Proeve, M., & Roberts, R. M. (2024). Problematic internet usage: Can commitment and progress frameworks help regulate daily personal internet use? *Australian Journal of Psychology*, *76*(1), 131–141. https://doi.org/10.1080/13284207.2024.2322940

Dursun, A., & Ceyhan, A. A. (2023). The effectiveness of reality therapy-based psycho-education program regarding decreasing the level of problematic internet usage of adolescents. *Turkish Psychological Counseling and Guidance Journal*, *13*(69), 146–159. https://doi.org/10.17066/tpdrd.1319657

Ede, M. O., Okeke, C. I., Igbo, J. N., & Aye, E. (2023). Testing the efficacy of group cognitive-behavioral therapy for pathological internet use among undergraduates in Nigeria. *Trends in Psychiatry and Psychotherapy*, *45*, e20210348. https://doi.org/10.47626/2237-6089-2021-0348

El-Ashry, A. M., Atta, M. H. R., Alsenany, S. A., Abdelaliem, S. M. F., & Khedr, M. A. (2023). The effect of distress tolerance training on problematic internet use and psychological wellbeing among faculty nursing students: A randomized control trial. *Psychological Research and Behavioral Management*, *16*, 4015–4032. https://doi.org/10.2147/PRBM.S423194

European Commission (n.d.a). The EU's digital services act. Retrieved from https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/digital-services-act_en [accessed 12 October 2024].

European Commission (n.d.b). The digital markets act. Retrieved from https://digital-markets-act.ec.europa.eu/index_en [accessed 12 October 2024].

European Parliament Scientific Foresight Unit (STOA) (2019, January). Harmful internet use: Part I: Internet addiction and problematic use (PE 624.249). Retrieved from https://www.europarl.europa.eu/RegData/etudes/STUD/2019/624249/EPRS_STU(2019)624249(ANN1)_EN.pdf [accessed 10 January 2023].

Favini, A., Culcasi, F., Cirimele, F., Remondi, C., Gomez Plata, M., Caldaroni, S., … Luengo Kanacri, B. P. (2024). Smartphone and social network addiction in early adolescents: The role of self-regulatory self-efficacy in a pilot school-based intervention. *Journal of Adolescence*, *96*(3), 551–565. https://doi.org/10.1002/jad.12263

Fineberg, N., Demetrovics, Z., Stein, D., Ioannidis, K., Potenza, M., Grünblatt, E., … Chamberlain, S. (2018). Manifesto for a European research network into problematic usage of the internet. *European Neuropsychopharmacology*, *28*(11), 1232–1246. https://doi.org/10.1016/j.euroneuro.2018.08.004

Fineberg, N. A., Menchón, J. M., Hall, N., Dell'Osso, B., Brand, M., Potenza, M. N., … Zohar, J. (2022). Advances in problematic usage of the internet research – A narrative review by experts from the European network for problematic usage of the internet. *Comprehensive Psychiatry*, *118*, 152346. https://doi.org/10.1016/j.comppsych.2022.152346

Fineberg, N. A., Pellegrini, L., Wellsted, D., Hall, N., Corazza, O., Giorgetti, V., … Laws, K. R. (2021). Facing the "new normal": How adjusting to the easing of COVID-19 lockdown restrictions exposes mental health inequalities. *Journal of Psychiatric Research*, *141*, 276–286. https://doi.org/10.1016/j.jpsychires.2021.07.001

Geng, X., Zhang, J., Liu, Y., Xu, L., Han, Y., Potenza, M. N., & Zhang, J. (2023). Problematic use of the internet among adolescents: A four-wave longitudinal study of trajectories, predictors and outcomes. *Journal of Behavioral Addictions*, *12*(2), 435–447. https://doi.org/10.1556/2006.2023.00021

Gholamian, B., Shahnazi, H., & Hassanzadeh, A. (2019). The effect of educational intervention based on the BASNEF model for reducing internet addiction among female students: A quasi-experimental study. *Italian Journal of Pediatrics*, *45*, 164. https://doi.org/10.1186/s13052-019-0749-0

Gjoneska, B., Potenza, M. N., Jones, J., Corazza, O., Hall, N., Sales, C. M., … Demetrovics, Z. (2022). Problematic use of the

Internet during the COVID-19 pandemic: Good practices and mental health recommendations. *Comprehensive Psychiatry*, *112*, 152279. https://doi.org/10.1016/j.comppsych.2021.152279

Gong, Y., Gong, N., Zhang, Z., He, Y., & Tang, H. (2022). Effect of narrative therapy-based group psychological counseling on internet addiction among adolescents. *Iranian Journal of Public Health*, *51*(6), 1331–1338. https://doi.org/10.18502/ijph.v51i6.9678

Gori, D., Durazzi, F., Montalti, M., Di Valerio, Z., Reno, C., Fantini, M. P., & Remondini, D. (2021). Mis-tweeting communication: A vaccine hesitancy analysis among Twitter users in Italy. *Acta Biomedica*, *92*(Supplement 6), e2021416. https://doi.org/10.23750/abm.v92iS6.1225

Han, D. H., Hwang, J. W., & Renshaw, P. F. (2010). Bupropion sustained release treatment decreases craving for video games and cue-induced brain activity in patients with internet video game addiction. *Experimental and Clinical Psychopharmacology*, *18*(4), 297–304. https://doi.org/10.1037/a0020023

Han, D. H., Lee, Y. S., Na, C., Ahn, J. Y., Chung, U. S., Daniels, M. A., … Renshaw, P. F. (2009). The effect of methylphenidate on internet video game play in children with attention-deficit/hyperactivity disorder. *Comprehensive Psychiatry*, *50*(3), 251–256. https://doi.org/10.1016/j.comppsych.2008.08.011

Han, E. S., Park, Y., Yurgelun-Todd, D., Renshaw, P. F., & Han, D. H. (2024). Comparing the effectiveness of game literacy education and game coding education in improving problematic internet gaming. *Frontiers in Psychiatry*, *15*, 1377231. https://doi.org/10.3389/fpsyt.2024.1377231

Han, D. H., & Renshaw, P. F. (2012). Bupropion in the treatment of problematic online game play in patients with major depressive disorder. *Journal of Psychopharmacology*, *26*(5), 689–696. https://doi.org/10.1177/0269881111400647

Han, X., Wang, Y., Jiang, W., Bao, X., Sun, Y., Ding, W., … Zhou, Y. (2018). Resting-state activity of prefrontal-striatal circuits in internet gaming disorder: Changes with cognitive behavior therapy and predictors of treatment response. *Frontiers in Psychiatry*, *9*, 341. https://doi.org/10.3389/fpsyt.2018.00341

Haug, S., Boumparis, N., Wenger, A., Schaub, M. P., & Paz Castro, R. (2022). Efficacy of a mobile app-based coaching program for addiction prevention among apprentices: A cluster-randomized controlled trial. *International Journal of Environmental Research and Public Health*, *19*(23), 15730. https://doi.org/10.3390/ijerph192315730

Ioannidis, K., Hook, R., Goudriaan, A. E., Vlies, S., Fineberg, N. A., Grant, J. E., & Chamberlain, S. R. (2019). Cognitive deficits in problematic internet use: Meta-analysis of 40 studies. *British Journal of Psychiatry*, *215*(5), 639–646. https://doi.org/10.1192/bjp.2019.3

Jeong, H., Oh, J. K., Choi, E. K., Im, J. J., Yoon, S., Knotkova, H., … Chung, Y.-A. (2020). Effects of transcranial direct current stimulation on addictive behavior and brain glucose metabolism in problematic online gamers. *Journal of Behavioral Addictions*, *9*(4), 1011–1021. https://doi.org/10.1556/2006.2020.00092

Ji, Y., & Wong, D. F. K. (2023). Effectiveness of an integrated motivational cognitive-behavioral group intervention for adolescents with gaming disorder: A randomized controlled trial. *Addiction*, *118*(11), 2093–2104. https://doi.org/10.1111/add.16292

Kaya, Ş. Ş., Seviğ, E. Ü., & Zincir, H. (2023). The effect of solution-focussed education and counselling on problematic internet usage, sleep quality and school achievement: A randomized controlled trial. *International Journal of Nursing Practice*, *29*(1), e13097. https://doi.org/10.1111/ijn.13097

Ke, G. N., & Wong, S. F. (2018a). A healthy mind for problematic internet use. *Cyberpsychology, Behavior, and Social Networking*, *21*(10), 637–645. https://doi.org/10.1089/cyber.2018.0072

Ke, G. N., & Wong, S. F. (2018b). Outcome of the psychological intervention program: Internet use for youth. *Journal of Rational-Emotive & Cognitive-Behavior Therapy*, *36*, 187–200. https://doi.org/10.1007/s10942-017-0294-2

Kent, S., Masterson, C., Ali, R., Parsons, C. E., & Bewick, B. M. (2021). Digital intervention for problematic smartphone use. *International Journal of Environmental Research and Public Health*, *18*(24), 13165. https://doi.org/10.3390/ijerph182413165

Kim, S. M., Han, D. H., Lee, Y. S., & Renshaw, P. F. (2012). Combined cognitive behavioral therapy and bupropion for the treatment of problematic online game play in adolescents with major depressive disorder. *Computers in Human Behavior*, *29*(6), 2506–2512. https://doi.org/10.1016/j.chb.2012.05.015

Kim, S.-H., Yim, H.-W., Jo, S.-J., Jung, K.-I., Lee, K., & Park, M.-H. (2018). The effects of group cognitive behavioral therapy on the improvement of depression and anxiety in adolescents with problematic internet use. *Soa Chongsonyon Chongsin Uihak*, *29*(2), 73–79. https://doi.org/10.5765/jkacap.2018.29.2.73

Király, O., Griffiths, M. D., King, D. L., Lee, H. K., Lee, S. Y., Bányai, F., … Demetrovics, Z. (2018). Policy responses to problematic video game use: A systematic review of current measures and future possibilities. *Journal of Behavioral Addictions*, *7*(3), 503–517. https://doi.org/10.1556/2006.6.2017.050

Király, O., Potenza, M. N., Stein, D. J., King, D. L., Hodgins, D. C., Saunders, J. B., … Demetrovics, Z. (2020). Preventing problematic internet use during the COVID-19 pandemic: Consensus guidance. *Comprehensive Psychiatry*, *100*, 152180. https://doi.org/10.1016/j.comppsych.2020.152180

Kuriala, G. K., & Reyes, M. E. S. (2020). Efficacy of the acceptance and cognitive restructuring intervention program (ACRIP) on the internet gaming disorder symptoms of selected Asian adolescents. *Journal of Technology in Behavioral Science*, *5*, 238–244. https://doi.org/10.1007/s41347-020-00135-4

Kuss, D. J., & Lopez-Fernandez, O. (2016). Internet addiction and problematic internet use: A systematic review of clinical research. *World Journal of Psychiatry*, *6*(1), 143–176. https://doi.org/10.5498/wjp.v6.i1.143

Lan, Y., Ding, J.-E., Li, W., Li, J., Zhang, Y., Liu, M., & Fu, H. (2018). A pilot study of a group mindfulness-based cognitive-behavioral intervention for smartphone addiction among university students. *Journal of Behavioral Addictions*, *7*(4), 1171–1176. https://doi.org/10.1556/2006.7.2018.103

Lee, S. H., Im, J. J., Oh, J. K., Choi, E. K., Yoon, S., Bikson, M., … Chung, Y.-A. (2018). Transcranial direct current stimulation for online gamers: A prospective single-arm feasibility study. *Journal of Behavioral Addictions*, *7*(4), 1166–1170. https://doi.org/10.1556/2006.7.2018.107

Lee, J.-Y., Jang, J. H., Choi, A. R., Chung, S. J., Kim, B., Park, M., … Choi, J.-S. (2021). Neuromodulatory effect of transcranial direct current stimulation on resting-state EEG activity in internet gaming disorder: A randomized, double-blind, sham-controlled parallel group trial. *Cerebral Cortex Communications*, *2*(1), tgaa095. https://doi.org/10.1093/texcom/tgaa095

Leo, K., Kewitz, S., Wartberg, L., & Lindenberg, K. (2021). Depression and social anxiety predict internet use disorder symptoms in children and adolescents at 12-month follow-up: Results from a longitudinal study. *Frontiers in Psychology*, *12*, 787162. https://doi.org/10.3389/fpsyg.2021.787162

Li, S., Wu, Q., Tang, C., Chen, Z., & Liu, L. (2020). Exercise-based interventions for internet addiction: Neurobiological and neuropsychological evidence. *Frontiers in Psychology*, *11*, 1296. https://doi.org/10.3389/fpsyg.2020.01296

Lindenberg, K., Halasy, K., Szász-Janocha, C., & Wartberg, L. (2018). A phenotype classification of internet use disorder in a large-scale high-school study. *International Journal of Environmental Research and Public Health*, *15*, 733. https://doi.org/10.3390/ijerph15040733

Lindenberg, K., Kindt, S., & Szász-Janocha, C. (2022). Effectiveness of cognitive behavioral therapy–based intervention in preventing gaming disorder and unspecified internet use disorder in adolescents: A cluster randomized clinical trial. *JAMA Network Open*, *5*(2), e2148995. https://doi.org/10.1001/jamanetworkopen.2021.48995

Lindenberg, K., Szász-Janocha, C., Schoenmaekers, S., Wehrmann, U., & Vonderlin, E. (2017). An analysis of integrated health care for internet use disorders in adolescents and adults. *Journal of Behavioral Addictions*, *6*(4), 579–592. https://doi.org/10.1556/2006.6.2017.065

Liu, J., Nie, J., & Wang, Y. (2017). Effects of group counseling programs, cognitive behavioral therapy, and sports intervention on internet addiction in East Asia: A systematic review and meta-analysis. *International Journal of Environmental Research and Public Health*, *14*(12), 1470. https://doi.org/10.3390/ijerph14121470

Liu, L., Potenza, M. N., Lacadie, C. M., Zhang, J.-T., Yip, S. W., Xia, C.-C., … Fang, X.-Y. (2021). Altered intrinsic connectivity distribution in internet gaming disorder and its associations with psychotherapy treatment outcomes. *Addiction Biology*, *26*(2), e12917. https://doi.org/10.1111/adb.12917

Liu, H., Soh, K. G., Samsudin, S., Rattanakoses, W., & Qi, F. (2022). Effects of exercise and psychological interventions on smartphone addiction among university students: A systematic review. *Frontiers in Psychology*, *13*, 1021285. https://doi.org/10.3389/fpsyg.2022.1021285

Ma, J., Zhu, H., He, W., Qiang, X., Li, F., & Gan, Y. (2024). Online photography intervention reduces internet addiction during COVID-19: A randomised controlled trial. *International Journal of Psychology*, *59*(5), 726–737 Advance online publication. https://doi.org/10.1002/ijop.13138

Mak, S., & Thomas, A. (2022). Steps for conducting a scoping review. *Journal of Graduate Medical Education*, *14*(5), 565–567. https://doi.org/10.4300/JGME-D-22-00621.1

Malinauskas, R., & Malinauskiene, V. (2019). A meta-analysis of psychological interventions for Internet/smartphone addiction among adolescents. *Journal of Behavioral Addictions*, *8*, 613–624. https://doi.org/10.1556/2006.8.2019.72

Männikkö, N., Mustonen, T., Tanner, N., Vähänikkilä, H., & Kääriäinen, M. (2022). Effectiveness of a brief group intervention program for young adults with gaming-related problems. *International Journal of Mental Health and Addiction*, *20*, 2956–2972. https://doi.org/10.1007/s11469-021-00634-7

Martínez-Hernández, N., & Lloret-Irles, D. (2024). Are school-based interventions effective in preventing internet misuse? A systematic review. *Journal of Prevention*, *45*(2), 193–212. https://doi.org/10.1007/s10935-023-00757-9

Mohler-Kuo, M., Dzemaili, S., Foster, S., Werlen, L., & Walitza, S. (2021). Stress and mental health among children/adolescents, their parents, and young adults during the first COVID-19 lockdown in Switzerland. *International Journal of Environmental Research and Public Health*, *18*(9), 4668. https://doi.org/10.3390/ijerph18094668

Montag, C., Schulz, P. J., Marciano, L., Roman-Urrestarazu, A., Rumpf, H.-J., & Becker, B. (2024). Safeguarding young users on social media through academic oversight. *Nature Reviews Psychology*, *3*(6), 368–369. https://doi.org/10.1038/s44159-024-00311-2

Munn, Z., Peters, M. D. J., Stern, C., Tufanaru, C., McArthur, A., & Aromataris, E. (2018). Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. *BMC Medical Research Methodology*, *18*, 143. https://doi.org/10.1186/s12874-018-0611-x

Nam, B., Bae, S., Kim, S. M., Hong, J. S., & Han, D. H. (2017). Comparing the effects of bupropion and escitalopram on excessive internet game play in patients with major depressive disorder. *Clinical Psychopharmacology and Neuroscience*, *15*(4), 361–368. https://doi.org/10.9758/cpn.2017.15.4.361

Ortega-Barón, J., González-Cabrera, J., Machimbarrena, J. M., & Montiel, I. (2021). Safety.Net: A pilot study on a multi-risk internet prevention program. *International Journal of Environmental Research and Public Health*, *18*(8), 4249. https://doi.org/10.3390/ijerph18084249

Ortega-Barón, J., Machimbarrena, J. M., Díaz-López, A., Caba-Machado, V., Tejero, B., & González-Cabrera, J. (2024). Efficacy of a multi-risk internet prevention program: Safety.net/Eficacia de un programa de prevención multirriesgo en internet: Safety.net. *Psicología Educativa*. https://doi.org/10.1016/j.psicoe.2024.02.001

Otsuka, Y., Kaneita, Y., Itani, O., & Matsumoto, Y. (2023). A school-based program for problematic internet use for adolescents in Japan. *Children*, *10*(11), 1754. https://doi.org/10.3390/children10111754

Park, J. H., Lee, Y. S., Sohn, J. H., & Han, D. H. (2016). Effectiveness of atomoxetine and methylphenidate for problematic online gaming in adolescents with attention deficit hyperactivity disorder: A randomized controlled trial. *Human Psychopharmacology: Clinical and Experimental*, *31*(6), 427–432. https://doi.org/10.1002/hup.2559

Paschke, K., Cloes, J.-O., & Thomasius, R. (2023). Res@t: Resource-strengthening training for adolescents with problematic digital-media use and their parents. *Sucht*, *69*(3), 1–10. https://doi.org/10.1024/0939-5911/a000810

Peng, W., Wang, Y., Hao, Q., Wang, J., Chen, Y., Qiu, M., … Zhu, T. (2021). Effects of electroacupuncture combined with psychological intervention on depressive status and contingent negative variation in patients with internet addiction disorder: A randomized controlled trial. *Frontiers in Psychiatry*, *12*, 722422. https://doi.org/10.3389/fpsyt.2021.722422

Pornnoppadol, C., Ratta-apha, W., Chanpen, S., Wattananond, S., Dumrongrungruang, N., Thongchoi, K., … Vasupanrajit, A. (2020). A comparative study of psychosocial interventions for internet gaming disorder among adolescents aged 13–17 years. *International Journal of Mental Health and Addiction*, *18*, 932–948. https://doi.org/10.1007/s11469-018-9982-5

Qiao, S., Li, Y., & Liu, L. (2020). A network meta-analysis of the intervention effect of various measures on adolescents' Internet addiction. *Chinese Journal of School Health*, *41*(8), 1167–1173. https://doi.org/10.16835/j.cnki.1000-9817.2020.08.013

Ramón-Arbués, E., Granada-López, J. M., Martínez-Abadía, B., Echániz-Serrano, E., Antón-Solanas, I., & Nash, M. (2021). Prevalence and factors associated with problematic internet use in a population of Spanish university students. *International Journal of Environmental Research and Public Health*, *18*(14), 7620. https://doi.org/10.3390/ijerph18147620

Ruckwongpatr, K., Chirawat, P., Ghavifekr, S., Gan, W. Y., Tung, S. E. H., Nurmala, I., … Lin, C.-Y. (2022). Problematic internet use (PIU) in youth: A brief literature review of selected topics. *Current Opinion in Behavioral Sciences*, *46*, 101150. https://doi.org/10.1016/j.cobeha.2022.101150

Rumpf, H.-J., Effertz, T., & Montag, C. (2022). The cost burden of problematic internet usage. *Current Opinion in Behavioral Sciences*, *44*, 101107. https://doi.org/10.1016/j.cobeha.2022.101107

Sánchez-Fernández, M., Borda-Mas, M., & Mora-Merchán, J. (2023). Problematic internet use by university students and associated predictive factors: A systematic review. *Computers in Human Behavior*, *139*, 107532. https://doi.org/10.1016/j.chb.2022.107532

Santos, V. A., Freire, R., Zugliani, M., Cirillo, P., Santos, H. H., Nardi, A. E., & King, A. L. (2016). Treatment of internet addiction with anxiety disorders: Treatment protocol and preliminary before-after results involving pharmacotherapy and modified cognitive behavioral therapy. *JMIR Research Protocols*, *5*(1), e46. https://doi.org/10.2196/resprot.5278

Shahrajabian, F., Hasani, J., Griffiths, M. D., Aruguete, M., & Emadi Chashmi, S. J. (2023). Effects of emotional working memory training on problematic internet use, inhibition, attention, and working memory among young problematic internet users: A randomized control study. *Addictive Behaviors*, *141*, 107659. https://doi.org/10.1016/j.addbeh.2023.107659

Solly, J. E., Grant, J. E., & Chamberlain, S. R. (2022). Pharmacological interventions for problematic usage of the internet (PUI): A narrative review of current progress and future directions. *Current Opinion in Behavioral Sciences*, *46*, 101158. https://doi.org/10.1016/j.cobeha.2022.101158

Song, J., Park, J. H., Han, D. H., Roh, S., Son, J. H., Choi, T. Y., … Lee, Y. S. (2016). Comparative study of the effects of bupropion and escitalopram on internet gaming disorder. *Psychiatry and Clinical Neurosciences*, *70*(11), 527–535. https://doi.org/10.1111/pcn.12429

Stinson, L., & Dallery, J. (2023). Reducing problematic social media use via a package intervention. *Journal of Applied Behavior Analysis*, *56*(2), 323–335. https://doi.org/10.1002/jaba.975

Suchá, J., Dolejš, M., Dostál, D., Pipová, H., & Pontes, H. M. (2024). Internet gaming disorder and risky behaviours among Czech adolescents: A nationally representative study. *Journal of Behavioral Addictions*, *13*(3), 742–750. https://doi.org/10.1556/2006.2024.00045

Szász-Janocha, C., Vonderlin, E., & Lindenberg, K. (2020). Treatment outcomes of a CBT-based group intervention for adolescents with internet use disorders. *Journal of Behavioral Addictions*, *9*(4), 978–989. https://doi.org/10.1556/2006.2020.00089

Tang, C., Raat, H., Yan, M., Zhang, Q., Li, K., Jiang, M., … Liu, Q. (2021). Application of the health action process approach model for reducing excessive internet use behaviors among rural adolescents in China: A school-based intervention pilot study. *BMC Public Health*, *21*, 986. https://doi.org/10.1186/s12889-021-10957-y

Theopilus, Y., Al Mahmud, A., Davis, H., & Octavia, J. R. (2024). Preventive interventions for internet addiction in young children: Systematic review. *JMIR Mental Health*, *11*, e56896. https://doi.org/10.2196/56896

Thomas, J., Gaspar, C. M., Al Beyahi, F., Al Bassam, B., & Aljedawi, Y. (2024). International comparison of gaming disorder symptomatology: Analysis of Ithra's 30-nation digital wellbeing survey. *Computers in Human Behavior*, *150*, 1–6. https://doi.org/10.1016/j.chb.2023.107993

Thorens, G., Achab, S., Billieux, J., Khazaal, Y., Khan, R., Pivin, E., … Zullino, D. (2014). Characteristics and treatment response of self-identified problematic internet users in a behavioral addiction outpatient clinic. *Journal of Behavioral Addictions*, *3*(1), 78–81. https://doi.org/10.1556/JBA.3.2014.008

Torres-Rodríguez, A., Griffiths, M. D., Carbonell, X., & Oberst, U. (2018). Treatment efficacy of a specialized psychotherapy program for internet gaming disorder. *Journal of Behavioral Addictions*, *7*(4), 939–952. https://doi.org/10.1556/2006.7.2018.111

Trittin-Ulbrich, H., Scherer, A. G., Munro, I., & Whelan, G. (2021). Exploring the dark and unexpected sides of digitalization: Toward a critical agenda. *Organization*, *28*(1), 8–25. https://doi.org/10.1177/1350508420968184

Turel, O., Mouttapa, M., & Donato, E. (2015). Preventing problematic internet use through video-based interventions: A theoretical model and empirical test. *Cyberpsychology, Behavior, and Social Networking*, *34*(4), 349–362. https://doi.org/10.1080/0144929X.2014.936041

United Kingdom (2023). Online safety act 2023. Retrieved from https://www.legislation.gov.uk/ukpga/2023/50/contents [accessed 12 October 2024].

Wölfling, K., Beutel, M. E., Dreier, M., & Müller, K. W. (2014). Treatment outcomes in patients with internet addiction: A clinical pilot study on the effects of a cognitive-behavioral therapy program. *Biomed Research International*, *2014*, 425924. https://doi.org/10.1155/2014/425924

World Health Organization (2023). *International statistical classification of diseases and related health problems* (11th revision). Retrieved from https://icd.who.int/browse11/l-m/en#/http%3a%2f%2fid.who.int%2ficd%2fentity%2f1041487064 [accessed 10 May 2024].

World Health Organization (2024). *Clinical descriptions and diagnostic requirements for ICD-11 mental, behavioural and neurodevelopmental disorders (CDDR)*. Geneva: World Health Organization.

Wright, M. F., Heiman, T., & Olenik-Shemesh, D. (2021). Chapter 2 – Problematic internet use: Causes, consequences, and future directions. In M. F. Wright, & L. B. Schiamberg (Eds.), *Child and adolescent online risk exposure* (pp. 13–32). Academic Press. https://doi.org/10.1016/B978-0-12-817499-9.00002-8

Wu, W.-C., Lee, M.-J., & Chang, Y. (2023). Effects of the positive interpersonal and life orientation training (PILOT) program among elementary school students in Taiwan. *Children and Youth Services Review*, *155*, 1–11, 107212. https://doi.org/10.1016/j.childyouth.2023.107212

Wu, L.-L., Potenza, M. N., Zhou, N., Kober, H., Shi, X.-H., Yip, S. W., … Zhang, J.-T. (2021). Efficacy of single-session transcranial direct current stimulation on addiction-related inhibitory control and craving: A randomized trial in males with internet gaming disorder. *Journal of Psychiatry and Neuroscience*, *46*(1), E111–E118. https://doi.org/10.1503/jpn.190137

Xu, L.-X., Geng, X.-M., Zhang, J.-L., Guo, X.-Y., Potenza, M. N., & Zhang, J.-T. (2022). Neuromodulation treatments of problematic use of the Internet. *Current Opinion in Behavioral Sciences*, *48*, 101215. https://doi.org/10.1016/j.cobeha.2022.101215

Xu, X., Ma, X., Ni, H., Wang, H., Wang, T., Liu, C., … Dong, G.-H. (2024). Mindfulness meditation training reduces gaming cravings by reshaping the functional connectivity between the default mode network and executive control–related brain regions. *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, *9*(8), 827–836. https://doi.org/10.1016/j.bpsc.2024.04.011

Yang, W., Hu, W., Morita, N., Ogai, Y., Saito, T., & Wei, Y. (2022). Impact of short-term intensive-type cognitive behavioral therapy intervention on internet addiction among Chinese college students: A randomized controlled trial. *International Journal of Environmental Research and Public Health*, *19*(9), 5212. https://doi.org/10.3390/ijerph19095212

Yang, G., Shangguan, R., Ke, Y., & Wang, S. (2022). The influence of acute aerobic exercise on craving degree for university students with mobile phone dependency: A randomized controlled trial. *International Journal of Environmental Research and Public Health*, *19*(15), 8983. https://doi.org/10.3390/ijerph19158983

Zhang, X., Yang, H., Zhang, K., Zhang, J., Lu, X., Guo, H., … Zhang, Z. (2023). Effects of exercise or tai chi on internet addiction in college students and the potential role of gut microbiota: A randomized controlled trial. *Journal of Affective Disorders*, *327*, 404–415. https://doi.org/10.1016/j.jad.2023.02.002

Zheng, Y., He, J., Fan, L., & Qiu, Y. (2022). Reduction of symptoms after a combined behavioral intervention for reward sensitivity and rash impulsiveness in internet gaming disorder: A comparative study. *Journal of Psychiatric Research*, *153*, 159–166. https://doi.org/10.1016/j.jpsychires.2022.06.056

Zhou, X., Liao, M., Gorowska, M., Chen, X., & Li, Y. (2024). Compliance and alternative behaviors of heavy gamers in adolescents to Chinese online gaming restriction policy. *Journal of Behavioral Addictions*, *13*(2), 687–692. https://doi.org/10.1556/2006.2024.00021

Zhu, S. (2024). Proximity to nature prevents problematic smartphone use: The role of mindfulness. *Current Psychology*, *43*, 16699–16710. https://doi.org/10.1007/s12144-023-05062-8

Zhu, Y., Chen, H., Li, J., Mei, X., & Wang, W. (2023). Effects of different interventions on internet addiction: A systematic review and network meta-analysis. *BMC Psychiatry*, *23*(1). https://doi.org/10.1186/s12888-023-05400-9