

Prevention of Internet addiction: A systematic review

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Background and aims: Out of a large number of studies on Internet addiction, only a few have been published on the prevention of Internet addiction. The aim of this study is provide a systematic review of scientific articles regarding the prevention of Internet addiction and to identify the relevant topics published in this area of interest. **Methods:** The Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines were adopted. The EBSCO, ProQuest Central, and PubMed databases were searched for texts published in English and Spanish between January 1995 and April 2016. A total of 179 original texts were obtained. After de-duplication and topic-relevance review, 108 texts were systematically classified and subjected to descriptive analysis and subsequent content analysis. **Results:** The results of the content analysis yielded the following thematic areas: (a) target groups, (b) the improvement of specific skills, (c) program characteristics, and (d) environmental interventions. **Discussion and conclusion:** Literature on the prevention of Internet addiction is scarce. There is an urgent need to introduce and implement new interventions for different at-risk populations, conduct well-designed research, and publish data on the effectiveness of these interventions. Developing prevention interventions should primarily target children and adolescents at risk of Internet addiction but also parents, teachers, peers, and others who are part of the formative environment of children and adolescents at risk of Internet addiction. Newly designed interventions focused on Internet addiction should be rigorously evaluated and the results published.

Keywords: prevention, Internet addiction, online gaming addiction, Internet use, interventions

INTRODUCTION

Internet addiction can be defined as overuse of the Internet leading to impairment of an individual's psychological state (both mental and emotional), as well as their scholastic or occupational and social interactions (Beard & Wolf, 2001). Since its emergence in the scientific literature, this phenomenon has been accompanied by controversy concerning its definition and conceptualization. There is considerable discussion as to whether people are addicted to the Internet itself or on the Internet, specifically to the activities realized in the Internet environment, and whether to use the term Internet addiction or addictions to specific online activities such as online gambling, online gaming, or cybersex addiction (Davis, 2001; Griffiths, Kuss, Billieux, & Pontes, 2016; Pontes, Kuss, & Griffiths, 2015; Starcevic, 2013). In this paper, we use the term Internet addiction to denote excessive use of the Internet and addictive behavior related to the Internet.

In studies using representative general population samples, the prevalence rates range from 1% in Germany (Rumpf et al., 2014) to 3.4% in the Czech Republic (Šmahel, Vondráčková, Blinka, & Godoy-Etcheverry, 2009). Internet addiction prevalence rates among adolescents tend to be the highest, ranging from 0.8% in Italy to 26.7% in Hong Kong (Kuss, Griffiths, Karila, & Billieux, 2014). These numbers are rather indicative because Internet addiction rates vary according to which definitions of

Internet addiction, assessment tool, and cut-off are used (Douglas et al., 2008; Kuss, Griffiths, et al., 2014; Vondráčková, 2015; Vondráčková & Šmahel, 2015).

The attention of researchers has focused on the treatment of Internet addiction and some treatment studies have been published in recent years; however, the majority of them are of rather poor quality (King, Delfabbro, Griffiths, & Gradisar, 2011). Very few studies report on the prevention of Internet addiction and this area has only recently started to receive more attention from researchers. Clinicians, educators, and policymakers agree that treatment strategies for tackling the Internet addiction problem need to be accompanied by prevention strategies that address risk factors before addiction evolves into a more serious form (Kwon, 2011; Yu & Shek, 2013).

Prevention science represents a systematic transdisciplinary approach to the study of (a) etiology and epidemiology of various preventable health and social problems and (b) intervention and research designs, efficiency and effectiveness, implementation of effective interventions at the individual, social and societal systems of the family,

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education, workplace, community, in the areas of social welfare, planning, environment, urban design, and (fiscal) policy (Gabrhelik, 2016; SPAN, 2015; SPR, n.d.). This definition is framing the general scope of scientific approach to prevention that is further specified by other key terms and concepts (e.g., levels of prevention; universal, selective, indicated, early diagnostics and intervention; specific target groups; prevention models, etc.)

The objectives of this study were to review relevant literature on the prevention of Internet addiction published between January 1995 and April 2016 and to perform content analysis in order to identify relevant topics which are discussed in this context in the literature utilizing the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The unique contribution of this paper lies in the fact that this is, to the best of our knowledge, the first review focused on the prevention of Internet addiction.

METHODS

A systematic search of research texts was conducted following the PRISMA recommendations (Higgins & Green, 2011; Moher, Liberati, Tetzlaff, Altman, & The PRISMA Group, 2009). The protocol for this review was not previously registered.

Eligibility criteria

In this systematic review, all relevant papers having the prevention of Internet addiction as a main topic or as at least partially topic were included. Further criteria adopted were

- (a) publication between January 1995 and April 2016,
- (b) written in English or Spanish language, and
- (c) published as journal articles, book chapters, and original manuscripts. Additionally, the texts where prevention was only a general topic were excluded.

Information sources and search

Studies were identified by searching relevant papers via EBSCO, ProQuest Central, and PubMed databases, employing the following search terms: “prevent*,” “intervene*,” “program*,” “parent*,” “school*,” “family*,” “peer*,” “communit*” in combination with “Internet addiction,” “gaming addiction,” “online gambling,” “cybersex addiction,” “online sex addiction,” “Internet sex addiction,” “Facebook addiction,” “social network addiction,” “compulsive Internet use,” “excessive Internet use,” “problem Internet use,” and “pathological Internet use.”

Selection and data collection process

Using the above criteria, a total of 179 original texts (see Figure 1) were obtained. After de-duplication and topic-relevance review of all the abstracts, 145 texts were selected for further analysis. Finally, the texts where prevention was only a general topic were excluded. The remaining 108 texts were further systematically classified and subjected to descriptive analysis. The texts included in this study were divided into two categories. In the first category, we analyzed all of the 100 texts that had the prevention of Internet addiction as a partial topic. The majority of them focused on research in some areas of Internet addiction, for example, prevalence or correlates of Internet addiction (Ang, Chong,

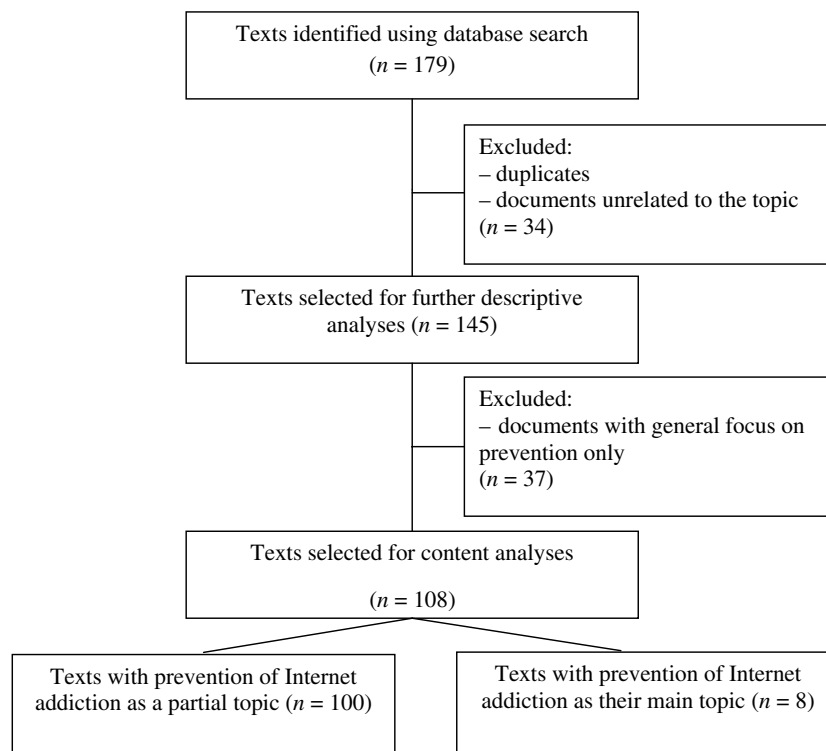


Figure 1. The PRISMA flow diagram of the selection process

Chye, & Huan, 2012; Huang et al., 2009; Park, Kim, & Cho, 2008). Typical recommendations regarding the prevention of Internet addiction were based on their specific results, such as “These findings emphasize the importance of prevention and early intervention work with early adolescents and their parents with respect to adolescent loneliness and generalized problematic Internet use (Ang et al., 2012).” These were often part of the abstract, discussion, or conclusion sections. The remaining texts were reviews or theoretical papers, again with general recommendations for the prevention of Internet addiction. For the purpose of this study, we included these recommendations regarding Internet addiction prevention in the analysis.

In the second category, we analyzed eight texts that had the prevention of Internet addiction as their main topic. Six of them (Table 1) described and/or evaluated specific prevention interventions (Busch, de Leeuw, & Schrijvers, 2013; de Leeuw, de Bruijn, de Weert-van Oene, & Schrijvers, 2010; Korkmaz & Kiran-Esen, 2012; Shek, Ma, & Sun, 2011; Turel, Mouttapa, & Donato, 2015; Walther, Hanewinkel, & Morgenstern, 2014). For the purpose of the study, we extracted data relevant to these areas: (a) country in which were data collected, (b) key characteristics of the participants (sample size and segment of the population assessed), (c) intervention characteristic, (d) risk of bias in individual studies, and (e) methodological features (objectives, assessment methods, type of study, and design).

For assessing risk of bias was used the Cochrane Collaboration's tool for assessing risk of bias (Higgins & Green, 2011). The following risks of bias were observed: (a) selection bias (sequence generation and allocation sequence concealment), (b) performance bias (blinding of participants and personnel), (c) detection bias (blinding of outcome assessment), (d) attrition bias (incomplete outcome data), and (e) reporting bias (selective outcome reporting).

The subsequent content analysis of all texts was focused on the identification of relevant thematic areas and their content. One reviewer (PV) screened the titles/abstracts and analyzed the full texts of the identified texts.

Ethics

This article does not contain any studies with human participants or animals performed by any of the authors.

RESULTS

On the basis of the content analysis of these 108 texts, we identified four basic areas of interest: (a) target groups, (b) the improvement of specific skills, (c) program characteristics, and (d) environmental interventions.

Target groups

The target groups in our texts are defined on the levels of (a) universal prevention and (b) selective and indicated prevention.

Universal prevention. On the level of universal prevention, we identified four main target groups for prevention interventions: (a) children and adolescents, (b) college

students, (c) parents and those close to them, and (d) gambling employees and employees with regular access to the Internet.

The majority of researchers (e.g., Jang & Ji, 2012; Lan & Lee, 2013) are in agreement that preventive interventions should focus mainly on children and adolescents. Children and adolescents are in their formative years, when values and standards develop, and they have the highest prevalence rates of Internet addiction (Šmahel et al., 2009). For this reason, prevention programs should be implemented in the school environment, especially in elementary school settings that are often on the front line of the identification of potentially life-threatening behaviors (Jang & Ji, 2012; Lan & Lee, 2013). The South Korean government launched its plan for Internet addiction prevention and treatment with components starting with prevention interventions even with preschool children (Romano, 2014). College students are the second group on which Internet addiction prevention interventions should be focused (Lin, Ko, & Wu, 2011) because of the high prevalence rates (e.g., Chou & Hsiao, 2000; Huang et al., 2009; Lin et al., 2011) and easy accessibility (Anwar & Seemamunaf, 2015). In addition to children, adolescents, and college students, attention should also be paid to their close formative surroundings, especially the family, the school environment, and extracurricular activities (e.g., Lin & Gau, 2013; Park et al., 2008). Young (2010), on the other hand, stresses the potential for the prevention of Internet addiction at work for employees with regular access to the Internet because regular access to the Internet may be a risk factor in the development of Internet addiction. Gray, Tom, Laplante, and Shaffer (2015) describe responsible gambling training programs, which train online gambling employees about gambling and gambling-related problems.

Selective and indicated prevention. At the level of selective and indicated prevention, there are at-higher-risk individuals because of the presence of specific biopsychosocial factors and factors related to Internet use patterns. The risk factors (or characteristics) found in the literature relate to: (a) *psychopathological factors*: ADHD, depressive and anxiety disorders, and social phobia (e.g., Alavi et al., 2012; Ang et al., 2012; Ko, Yen, Chen, Yeh, & Yen, 2009; Lin et al., 2011; Oh, 2003; Yen et al., 2008), substance use (Ko, Yen, Yen, Chen, & Chen, 2012), or obsessive compulsive symptoms (Jang, Hwang, & Choi, 2008); (b) *personality characteristics*: hyperactivity and impulsivity (Wu et al., 2013), high novelty seeking and low reward dependence (Dalbudak et al., 2015; Ko et al., 2006), introversion, low conscientiousness and agreeableness and high neuroticism/low emotional stability (Kuss, Shorter, van Rooij, van de Mheen, & Griffiths, 2014; Kuss, van Rooij, Shorter, Griffiths, & van de Mheen, 2013), hostility (e.g., Alavi et al., 2012; Ang et al., 2012; Ko et al., 2009; Lin et al., 2011; Oh, 2003; Yen et al., 2008), or a low level of self-control and self-regulation (Blachnio & Przepiorka, 2015); (c) *physiological characteristics*: stronger blood volume pulse and respiratory response and a weaker peripheral temperature (Lu, Wang, & Huang, 2010); (d) *patterns of Internet use*: a large number of hours spent online (Kuss et al., 2013), engagement in different video games (Donati, Chiesi, Ammannato, & Primi, 2015),

Table 1. Texts describing prevention interventions

| Text | Objective | Method | Measure of Internet addiction | | Sample | Target population | Outcome | Country |
|-------------------------------|---|---|---|--|--|------------------------------------|--|-----------------|
| | | | | | | | | |
| Busch et al. (2013) | To study secondary school-based, health promoting intervention that simultaneously targets a range of adolescent health behaviors via a whole-school approach | Pilot study with two assessments (baseline, after intervention is completed – 3 years) | CIUS | | 336 students in the 4th grade (15- to 16-year olds) | Students, family, school, teachers | The intervention successfully changed the health behaviors of the students in many areas (smoking, excessive use of alcohol and drugs, sedentary behavior, and bullying) but had no effect on excessive Internet use, including online gaming. | The Netherlands |
| de Leeuw et al. (2010) | To investigate the preliminary effect of an Internet/game prevention program | Pilot study with two assessments (baseline and 12-month follow-up) | CIUS | | 367 students in the 1st, 2nd, and 3rd grades (11- to 16-year olds) | Students | The time spent on the Internet (hours/day) and the number of pathological Internet users increased during the study. The number of game users decreased but heavy game use increased. | The Netherlands |
| Korkmaz and Kiran-Esen (2012) | To examine the effects of peer training about secure Internet use on adolescents | Randomized controlled trial with two assessments (baseline, 2 week posttest) | IUHS | | 825 students in the 6th, 7th, and 8th grades (13- to 15-year olds) | Students | The peer program was beneficial for the students who attended the lecture. Their Internet use was influenced in a positive manner in comparison to the members of the control group. | Turkey |
| Turel et al. (2015) | To examine the effects of instructional videos on users' attitudes toward Internet use | Randomized trial with three assessments (baseline, posttest, 1 week posttest) | 14-item scale by Van Rooij, Schoenmakers, Vermulst, Van Den Eijnden and Van De Mheen (2011) and Meerkerk, Van Den Eijnden, Vermulst, and Garretsen (2009) | | 223 university students (18- to 49-year olds) | Students | The intervention was efficacious in improving viewers' attitudes toward reducing their Internet use. | USA |
| Walther et al. (2014) | To evaluate the effects of a four-session school-based media literacy curriculum on adolescent computer gaming and Internet use behavior | Cluster randomized controlled trial with three assessments (baseline, posttest, and 12-month follow-up) | IAS and KFNCSAS-II | | 2,303 students in the 6th and 7th grades (13- to 15-year olds) | Students | The results revealed a significant effect of the intervention in terms of a smaller increase in their self-reported gaming frequency and gaming time and a smaller proportion of excessive gamers in the intervention group. | Germany |
| Shek et al. (2011) | To outline design of a new curriculum in a positive youth development program | n.a. | n.a. | | Students in the 1st, 2nd, and 3rd grades (12- to 16-year olds) | Students, school | n.a. | China |

Note. CIUS: Compulsive Internet Use Scale; IUHS: Internet Use Habit Scale; IAS: Internet Addiction Scale; KFN-CSAS-II: Video Game Dependency Scale; n.a.: not available.

or excessive weekend Internet use (Xu, Shen, et al., 2012); (e) *sociodemographic factors* such as gender (Ha & Hwang, 2014; Shek & Yu, 2016) or family economic disadvantage (Shek & Yu, 2016); and (f) the *current situation*: loneliness and stress (Alavi et al., 2012; Ang et al., 2012; Ko et al., 2009; Lin et al., 2011; Oh, 2003; Yen et al., 2008) or affiliation with peers who have lower levels of social acceptance or young people situated in a class with higher levels of Internet addiction (Zhou & Fang, 2015).

Interventions focusing on improvement of specific skills

Researchers recommend counselors, teachers, or employers to focus on the development of specific skills in (a) individuals who are at risk of Internet addiction, but also in (b) their significant others, particularly parents, teachers, and peers.

Individuals at risk of Internet addiction. The specific skills for preventing Internet addiction can be divided into four basic areas: (a) *skills associated with Internet use*, such as the reduction of the positive outcome expectancy of Internet use, self-control, self-efficacy, or abstinence from addictive online applications (e.g., Echeburúa & de Corral, 2010; Kim, Namkoong, Ku, & Kim, 2008; Li, Wang, & Wang, 2009; Lin, Ko, & Wu, 2008; Lin et al., 2011; Oh, 2003; Wang, Wu, & Lau, 2016), and the ability to identify the maladaptive thoughts connected with addictive behavior (Peng & Liu, 2010); (b) *skills associated with coping with stress and emotions*: particularly the development of individual coping strategies (e.g., Li et al., 2009; Rehbein & Baier, 2013), improvement of the capacity to regulate and process emotions (Lin et al., 2008, 2011), diminution of hostility (Ko, Yen, Yen, Lin, & Yang, 2007), encouragement of positive personality traits (Yu & Shek, 2013), and the enhancement of self-esteem (Ko et al., 2007); (c) *skills associated with interpersonal situations*: the diminution of interpersonal sensitivity (Ko et al., 2007), reinforcement of emotional intelligence (García del Castillo, García del Castillo-López, Gázquez Pertusa, & Marzo Campos, 2013), strengthening of social competence in order to reinforce the rules of fairness and tolerance within the class group in schools (Rehbein & Baier, 2013), and the ability to communicate face to face and carry out group activities and free-time activities with peers (Echeburúa & de Corral, 2010; Yang, Zhu, Chen, Song, & Wang, 2016); and (d) *skills associated with one's daily regime and use of free time*: keeping a sleep schedule (Lin & Gau, 2013), carrying out group activities and free-time activities (Echeburúa & de Corral, 2010), and encouraging participation in creative, exploratory, and exciting healthy activities (Ko et al., 2007).

Significant others. Some researchers also point out the presence of certain factors or parenting styles that promote the development of Internet addiction and they stress the need to work not only with vulnerable individuals but also with their loved ones, especially their parents. Most of the recommendations in the literature are focused on the parents of children at risk. Some of them are focused on peers, teachers, and employers (Gray et al., 2015; Chen, Lee, & Yuan, 2013; Zhou & Fang, 2015).

In contact with the loved ones of vulnerable individuals, experts primarily recommend focusing on two basic skills: (a) *skills encouraging closer relationships*, in particular the

improvement of parent–child communication, the amount of time spent with their children, understanding their child's needs, and the improvement of parental mental health (e.g., Echeburúa & de Corral, 2010; Ko et al., 2007; Lam, 2015; Lin & Gau, 2013). In companies with a regular Internet connection, Young (2010) recommends supporting employees' responsibility and ethical integrity; (b) *skills connected with the monitoring of Internet use*, such as understanding their child's needs regarding Internet usage (Kalmus, Blinka, & Ólafsson, 2013; Wu et al., 2013), knowledge and awareness of their child's online activities (Ang et al., 2012), and monitoring of the child's Internet use (Li, Li, & Newman, 2013). This may be done, for example, by establishing rules regulating the content of online activities and/or by criticizing excessive Internet use but without setting strict time limits for Internet use (van den Eijnden, Spijkerman, Vermulst, van Rooij, & Engels, 2010), by the mediation of Internet use to children in the form of discussions and joint Internet use together with them (Xiuqin et al., 2010), and by the use of restrictive strategies with regard to Internet use (Kalmus et al., 2013; Xiuqin et al., 2010). Liu, Fang, Deng, and Zhang (2012) also point to the adoption of adaptive norms of Internet use and consistent adherence to them among parents. Indirectly, the literature also indicated work with teachers on how to conduct effective prevention interventions (Walther et al., 2014). Regarding employees, Young (2010) encourages company management to teach employees how to detect the first signs of Internet addiction and factors that contribute to its development early on. In this context, Frangos and Sotiropoulos (2010) recommend the organization of educational seminars and the monitoring of Internet use by employers.

The skills introduced above were found to be relevant in the prevention of other risk behaviors. These skills and their role in the prevention of Internet addiction were not specifically studied and thus are not evidence-based. Only Xu, Turel, and Yuan (2012) monitored the impact of six prevention factors/specific skills (switching attention to other beneficial activities, the perceived financial cost of online gaming, dissuasion by others, rationalization/education, parental monitoring, and regulation and restriction of resources, such as money or equipment) in preventing online game playing and addiction on the basis of the self-reports of 623 adolescents in China. The data suggest that switching attention had a significant negative impact on game playing and addiction. Rationalization/education and the perceived cost had a significant negative influence on game playing but not on online game addiction and parental monitoring had a negative influence on online game addiction. Surprisingly, the adolescents reported that dissuasion was positively associated with game playing and addiction, and the regulation and restriction of resources correlated positively with online game addiction.

Program characteristics

In the texts published on Internet addiction prevention interventions, we identified the following three dimensions: (a) information-providing versus interactive interventions, (b) single versus complex interventions, and (c) empirical studies of Internet addiction prevention.

Information-providing versus interactive interventions.

The most widespread form of the prevention of Internet addiction is based on providing basic information regarding Internet addiction, with an emphasis on factual information concerning its adverse consequences (Alavi et al., 2012; Kwon, 2011). Educators usually invite experts to give a presentation to students about Internet addiction and provide some advice on how to control Internet use. Furthermore, these interventions may be a part of media education at primary and secondary schools.

Recently, four Internet addiction prevention interventions based on providing information have been published. Korkmaz and Kiran-Esen (2012) investigated the effect of a peer program on control and experimental groups of 825 students who attended the 6th to 8th grades in two primary schools in Turkey. Future peer activists attended a 10-hr educational program to learn how to inform their peers in two 40-min lectures about the Internet, Internet addiction, and types of online applications with safe and risk potential. According to the results of the study, the peer program was beneficial for the students who attended the lecture. Their Internet use was influenced in a positive manner in comparison to the members of the control group. The second publication introduced a program aimed at increasing media literacy among 2,303 German children aged 11–13 years, who were divided into experimental and control groups. The program consisted of four lectures regarding Internet use in general, online communication, and online gaming and gambling, and was implemented by trained teachers during class time. The effectiveness of the program was monitored in 1,843 respondents 12 months after the delivery of the intervention. The results revealed a significant effect of the intervention in terms of a smaller increase in their self-reported gaming frequency and gaming time and a smaller proportion of excessive gamers in the intervention group (Walther et al., 2014). de Leeuw et al. (2010) describe a health promotion program delivered to 367 children aged 11–16 years; the intervention focused on education on health issues (Internet and gaming behavior was among the seven health behaviors addressed) and delivered in blocks of 2 hr a week within three school years (the authors did not present the total number of hours). The results were rather inconsistent. The time spent on the Internet (hours/day) and the number of pathological Internet users increased during the study. The number of game users decreased but heavy game use increased. Turel et al. (2015) conducted an empirical test of an Internet addiction intervention based on two short video interventions (one educational and informative and the other less informative and more humorous and surprising). A sample of 233 university students was exposed to one of the two videos. The researchers measured Internet addiction and attitudes toward reducing their use of the Internet in three waves (one week before the intervention, immediately after the intervention, and one week after the intervention). The intervention was efficacious in improving viewers' attitudes toward reducing their Internet use.

Single versus complex interventions. Single interventions focus on a single type of risk behavior, for example, Internet addiction.

On the other hand, complex interventions focus either on: (a) different types of risk behaviors simultaneously, or

(b) different types of environments that are relevant to Internet addiction. The multi-risk-behavior-focused programs also aim, besides Internet addiction, at other types of risk behaviors, mostly substance use (e.g., Gong et al., 2009; Ko et al., 2008; Yen, Yen, Chen, Chen, & Ko, 2007; Jie et al., 2009). The assumption that the reduction of risk behavior in one area may reduce risk behavior in other areas has been confirmed by numerous studies (e.g., Cuijpers, 2002; Miovský, Šťastná, Gabrhelík, & Jurystová, 2011). Regarding multiple environments or settings, we identified the following environments that such a preventive intervention should aim at: the individual, the family, peers, school, work, and the community (Frangos & Sotiropoulos, 2010; Hur, 2006; Jang et al., 2008).

Busch et al. (2013) introduced a pilot version of a school intervention aimed at promoting health (healthy nutrition, physical exercise, sexual health, reducing alcohol and drug use, smoking, bullying behaviors, excessive sedentary behavior – watching television and computer use – and excessive Internet use, including online gaming) in primary schools in the Netherlands. Data were collected from 336 students aged 15–16 years, who were divided into experimental and control groups. Individual interventions were carried out on the following four levels: (a) application of healthy school policies (no smoking or use of drugs and alcoholic beverages), (b) parental activities with children and their participation in creating a healthy school environment, (c) the active development of life skills in students, and (d) addressing local health experts to provide teachers with basic information about the areas that were monitored. The intervention successfully changed the health behaviors of the students in many areas (smoking, excessive use of alcohol and drugs, sedentary behavior, and bullying) but had no effect on excessive Internet use, including online gaming. This intervention fulfilled both aspects of complexity, that is, a focus on various types of risk behavior (healthy nutrition, physical exercise, sexual health, reducing alcohol and drug use, smoking, bullying behaviors, excessive sedentary behavior – watching television and computer use – and excessive Internet use, including online gaming) and on four types of setting (the individual, family, community levels). Shek et al. (2011) present the curriculum of a positive youth development program (Project P.A.T.H.S.) which consists of 120 teaching units designed with reference to the 15 positive youth development constructs identified in successful positive youth development programs. In the extension phase of the project, a new curriculum with an additional 60 teaching units was developed with specific reference to five major adolescent developmental issues (substance abuse, the issue of sexuality, Internet addiction, bullying, and money and success issues). Besides the students, families (e.g., encouraging parental involvement) and schools (e.g., school improvement and reorganization initiatives) were also targeted.

Empirical studies of Internet addiction prevention. We identified five empirical studies describing the implementation and/or evaluation of preventive intervention (see Table 1). Majority of studies (Busch et al., 2013; Korkmaz & Kiran-Esen, 2012; de Leeuw et al., 2010; Walther et al., 2014) were carried out in Europe (the Netherlands, Germany, and Turkey), only one in the USA (Turel

et al., 2015). Majority of studies (Busch et al., 2013; Korkmaz & Kiran-Esen, 2012; de Leeuw et al., 2010; Walther et al., 2014) were focused on the change of Internet addiction behavior among secondary school students 11- to 16-year-olds and only one (Turel et al., 2015) targeted on university students aged 18–49 years. Only Busch et al. (2013) targeted beside students their families, school environment and teachers in their preventive interventions. The rest of studies intervened in students' population. Two studies were conducted as pilot studies with assessments (Busch et al., 2013; de Leeuw et al., 2010) and the rest used the randomized trial with baseline and two follow ups (Korkmaz & Kiran-Esen, 2012; Turel et al., 2015; Walther et al., 2014).

In terms of risk of bias in individual studies (Table 2), most studies (Busch et al., 2013; Korkmaz & Kiran-Esen, 2012; de Leeuw et al., 2010; Turel et al., 2015) were assessed as high risk in the first four categories (selection bias, performance bias, detection bias, and attrition bias) and low risk in the reporting bias category. Walther et al. (2014) was assessed “high risk” bias only in the selection and attrition categories. We applied strict criteria in the assessment. However, it must be noted that the performance bias (due to knowledge of the allocated interventions by participants and personnel during the study; Higgins & Green, 2011) and detection bias (due to knowledge of the allocated interventions by outcome assessors; Higgins & Green, 2011) are, in general, not controlled for in prevention studies. Regarding the overall quality of methodology, we assess the study conducted by Walther et al. (2014) as high compared to the remaining studies.

Environmental interventions

Countries in which Internet addiction is considered a serious health problem are starting to introduce Internet addiction prevention interventions on the environmental level, particularly regulations related to Internet addiction. For example, the Chinese government has implemented tighter control mechanisms on Internet cafés and an anti-addiction or fatigue system. The regulations, for example, state that no Internet café is allowed within 200 meters of an elementary or middle school or that the business hours of Internet cafés must be limited to between 8 a.m. and midnight (Guosong, 2010). An anti-addiction or fatigue system is a monitoring system that watches the number of hours a user spends on online game playing and the user's game character will lose power and experience points after the limit on game playing has been exceeded (Hsu, Wen, & Wu, 2009). In this context,

Yani-de-Soriano, Javed, and Yousafzai (2012) urge policy-makers and regulators to become more involved in the corporate social responsibility practices of online gambling companies that are aimed at preventing or minimizing the harm associated with their activities.

DISCUSSION

In the review, we focused on four basic areas regarding the prevention of Internet addiction: (a) the target groups, (b) the improvement of specific skills, (c) the program characteristics, and (d) environmental interventions.

The target group is usually split into two subgroups, using a population criterion: the universal level of prevention and the selective and indicated level of prevention. At the level of universal prevention four main subgroups were identified: (a) children and adolescents, (b) university students, (c) parents and others close to the member of the target group, and (d) gambling employees and employees with regular access to the Internet. Currently, most attention is paid to children and adolescents, who are responsive to positive influences on their values and beliefs (Bém & Kalina, 2003) and easily accessible in the school environment. The prevention of Internet addiction in adults and seniors, as well as the unemployed and mothers on parental leave, who are endangered to a great extent by Internet addiction (Müller, Glaesmer, Brähler, Woelfling, & Beutel, 2013; Young, 1998), has received very little or no attention. These are not yet mentioned in the literature on preventive interventions because such populations are difficult to access or, for example, Internet addiction might be hidden among other problematic behaviors such as workaholism (Quinones, Griffiths, & Kakabadse, 2016). To address the needs of these groups, the type and extent of their problems and developing appropriate interventions for them represent more of a challenge for the future.

Regarding selective and indicated prevention, we identified six sub-groups with specific biopsychosocial risk factors: (a) psychopathological factors, (b) personality characteristics, (c) physiological characteristics, (d) patterns of Internet use, (e) sociodemographic factors, and (f) the current situation. Only factors on the individual level were mentioned in the prevention literature; factors on the environmental level, such as the family, peer, school, and community level, are missing (Charvát & Nevoralová, 2012). Therefore, future studies should focus on identifying at-risk groups on the environmental level.

Table 2. Assessment of risk of bias in individual studies

| Study | Selection bias | Performance bias | Detection bias | Attrition bias | Reporting bias |
|-------------------------------|----------------|------------------|----------------|----------------|----------------|
| Busch et al. (2013) | H | H | H | H | L |
| de Leeuw et al. (2010) | H | H | H | H | L |
| Korkmaz and Kiran-Esen (2012) | U | H | H | H | L |
| Turel et al. (2015) | H | H | H | H | L |
| Walther et al. (2014) | L | H | H | L | L |

Note. H: high risk of bias; L: low risk of bias; U: unclear bias. We applied strict criteria in the assessment. However, it must be noted that, for example, performance and detection biases are, in general, rather uncommon in these types of studies. Perhaps, in these studies, U could also be used for performance and detection biases.

Future prevention interventions should also focus on people who are part of the formative environment of children and adolescents who are at risk of Internet addiction: parents, teachers, peers, and others close to them. Literature describing any specific Internet addiction prevention interventions focused on those close to potential Internet addicts is scarce (Busch et al., 2013).

The development of prevention interventions that increase specific (life) skills in specific subgroups is recommended for: (a) individuals who are at risk of Internet addiction (skills associated with Internet use, with coping with stress and emotions, with interpersonal situations, and with one's daily regime and use of free time), and also for (b) those close to them (skills encouraging closer relationships and skills connected with the monitoring of Internet use). All these skills fall into the category of life skills, which are defined as a group of psychosocial competencies and interpersonal skills that help people make informed decisions, solve problems, think critically and creatively, communicate effectively, build healthy relationships, empathize with others, and cope with and manage their lives in a healthy and productive manner (WHO, 2003). In general, the adoption of relevant life skills leads to healthy lifestyles and the prevention of risk behaviors or other mental and somatic health problems (Manee, Khouiee, & Zaree, 2011; Pharaoh, Frantz, & Smith, 2011). Although we can find many recommendations in the literature on how specific skills should be developed to prevent Internet addiction, there is only one study (Xu, Turel, et al., 2012) that evaluated the impact of some specific skills in the prevention of Internet addiction. Therefore, researchers should design, conduct, and publish scientifically rigorous evaluations of specific skills that are relevant in the prevention of Internet addiction.

In Internet addiction prevention interventions, we identified three basic dimensions: (a) programs aimed at providing information versus interactive interventions, (b) single versus complex interventions, and (c) empirical studies of Internet addiction prevention. According to the literature, the general recommendations that should lead to the intended effective prevention outcomes are: (a) the mere provision of information about the negative consequences of risk behavior is ineffective and it needs to be complemented by interactive interventions aimed at changing attitudes and the development of selected skills for life (Soole, Mazerolle, & Rombouts, 2008) and (b) the effective prevention interventions should be complex and focused on Internet addiction and other forms of risk behavior (Gong et al., 2009) and should be a combination of interventions targeting vulnerable people with an Internet addiction, their parents and other loved ones, and the community, school, or work environment (Frangos & Sotiropoulos, 2010). In our search, we found only five studies describing and evaluating prevention interventions for Internet addiction. A comparison of the results from these Internet addiction prevention interventions (Busch et al., 2013; Korkmaz & Kiran-Esen, 2012; de Leeuw et al., 2010; Turel et al., 2015; Walther et al., 2014) suggests that the findings are not fully in line with the current school-based prevention recommendations based on evidence (e.g., Cuijpers, 2002; Miovský et al., 2011; Soole et al., 2008). The study of Busch et al. (2013) was complex

in both dimensions but had limited effectiveness in terms of its effect on Internet addiction; the studies of Korkmaz and Kiran-Esen (2012), Turel et al. (2015), and Walther et al. (2014) used informative single-type interventions but were effective. Only the study results of de Leeuw et al. (2010) were rather inconsistent. This contradiction may be caused by the limited number of studies (five), the sample size, short-term follow ups, the different instruments used for the measurement of Internet addiction, high risk of bias in individual studies, and the emphasis on the nature of the outcome rather than the specificity of the topic of Internet addiction.

To illuminate the reasons for these contradictory findings, it is necessary to carry out more studies of the effectiveness of prevention programs focused on Internet addiction.

The above-mentioned six interventions are examples of universal prevention programs. The authors found no evidence of studies describing prevention interventions that fell within the area of selective and indicated prevention, even though in the scientific literature there are specific recommendations for the prevention of Internet addiction, especially in the area of indicated and selective prevention (e.g., Echeburúa & de Corral, 2010; Ko et al., 2007; Lin & Gau, 2013). Therefore, we recommend researchers, consultants, and educators who are planning the creation and evaluation of specific programs of selective or indicated prevention to draw inspiration from the prevention of other risk behaviors (e.g., the prevention of substance use).

We would also like to comment on the environmental interventions. Environmental interventions can be induced by providers [e.g., the owners of Internet cafés (Guosong, 2010) or online gambling companies (Hsu et al., 2009; Yani-de-Soriano et al., 2012)]. Very few countries implement such interventions in practice. No efficacy or effectiveness studies have been conducted and no results published. We encourage policymakers and researchers to implement and study interventions on the environmental level.

The strength of this review is that it is (to the authors' best knowledge) the first review focused on the prevention of Internet addiction and that also included texts written not only in English but also in Spanish. Several limitations are worth noting: first, the majority of the texts had the prevention of Internet addiction as a partial topic, while only eight texts (seven studies and one theoretical chapter) had it as the main topic; second, each of the records included in our study used different conceptualization and different measures of Internet addiction, and had different objectives; therefore, this study is more descriptive than comparative.

CONCLUSION

To the best of our knowledge, this is the first detailed review on the prevention of Internet addiction. Our findings showed that the literature on research into the prevention of Internet addiction is scarce. There is an urgent need to introduce and implement new interventions for different at-risk populations, conduct well-designed research, and publish data on the effectiveness (or lack thereof) of these interventions.

Developing prevention interventions should primarily target children and adolescents at risk of Internet addiction but also parents, teachers, peers, and others who are part of the formative environment of children and adolescents at risk of Internet addiction. These interventions should cover all three levels of prevention: universal, selective, and indicated, and should address risk factors on the family, peer, school, community, and environmental levels that contribute to the onset and development of Internet addiction. Newly designed interventions focused on Internet addiction should be rigorously evaluated and the results published.

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