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CHAPTER 2

AN OVERVIEW OF PROBLEMATIC GAMING

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INTRODUCTION

Over the last decade, as the video game industry has grown to $93billion worldwide (Gartner, 2013) and as the average age of gamers has increased to 30 (Entertainment Software Association, 2013), "video game addiction" has become a topic of increasing research interest. But despite the growth in published studies, there is a lack of consensus as to whether problematic gaming exists and whether it constitutes an "addiction." A wide range of different terms have been used to describe what is essentially the same phenomenon, including problem video game playing (King et al., 2011c), problematic online game use or gaming (Kim and Kim, 2010; Demetrovics et al., 2012), video game addiction (Griffiths and Davies, 2005; King et al, 2010a; Skoric et al., 2009), pathological video game use or gaming (Gentile, 2009; Lemmens et al., 2011), online gaming addiction (Charlton and Danforth, 2007; Griffiths, 2010), compulsive Internet use (van Rooij et al., 2011), Internet gaming addiction (Kuss and Griffiths, 2012), and Internet gaming disorder (American Psychiatric Association, 2013).

Prior to the publication in 2013 of the Fifth Edition of the Diagnostic and Statistical Manual (DSM-5; American Psychiatric Association, 2013), there had been some debate as to whether "Internet addiction" should be introduced into the text as a

separate disorder (Petry and O'Brien, 2013). In parallel, there has also been debate as to whether those conducting online addiction research should be studying general Internet use or the potentially addictive *specific* activities that can be engaged in online (e.g., gambling, video gaming, sex, shopping, etc.). Ultimately, the Substance Use Disorder Work Group recommended that the DSM-5 include a subtype of problematic Internet use (i.e., Internet gaming disorder [IGD]) in Section III ("Emerging Measures and Models") as an area that required further research before possible inclusion in future editions of the DSM (Petry and O'Brien, 2013). The implications of this decision will be returned to later in the chapter.

For the sake of consistency, we will use the term "problematic gaming" as the umbrella term to describe the phenomenon of problematic video game use. It comprises both online and offline manifestations. The chapter briefly examines a number of key areas in the study of problematic gaming, including: (i) history of problematic gaming research; (ii) offline vs. online problematic gaming; (iii) prevalence of problematic gaming; (iv) factors associated with problematic gaming; and (v) the treatment of problematic gaming. This chapter does not address the instruments developed to assess problematic gaming as those are reviewed elsewhere (see Chapter 3).

HISTORY OF PROBLEMATIC GAMING

The first reports of problematic gaming predate the Internet. They appeared in the psychological literature in the early 1980s and included cases of "*Space Invaders* obsession" (Ross et al., 1982), "computer catatonia" (Nilles, 1982), and "video game addiction" (Soper and Miller, 1983). Other early articles on the topic also reported the use of cognitive-behavioral therapy (CBT) to treat adolescents addicted to arcade

video games (Kuczmierczyk et al., 1987; Keepers, 1990). However, these reports were mostly observational, anecdotal case studies that were primarily based on teenage males and that featured a particular type of video game in a particular medium (i.e., “pay-to-play” arcade video games). Shotton (1989) conducted the first empirical study of problematic gaming in a sample of male teenagers and young adults (N = 127) who claimed to be “hooked” on video console games. The study’s only criterion for being “addicted” to gaming was the individual’s own admission of being “hooked.” Shotton reported only few negative consequences in her sample. However, given that no instrument was used to assess problematic gaming, it is possible that participants were preoccupied with gaming rather than addicted to it.

In the 1990s, research into problematic gaming became more systematic, but almost all the published studies were relatively small surveys conducted in British schools and involving children and teenagers aged 10 to 15 years (e.g., Brown and Robertson, 1993; Fisher, 1994; Griffiths and Hunt, 1995, 1998; Phillips et al., 1995; Griffiths, 1997). These studies mainly examined non-arcade video games (i.e., home console games, handheld games, PC gaming). However, these studies had many methodological limitations, especially the use of non-psychometrically validated scales to assess problematic gaming (typically, scales adapted from the DSM-III-R [American Psychiatric Association, 1987] or DSM-IV [American Psychiatric Association, 1994] criteria for pathological gambling). These studies were later criticized by Charlton (2002) as more likely assessing gaming preoccupation rather than gaming addiction.

Since 2000, the academic gaming field has seen substantial growth in studies of problematic gaming. This is most likely due to the rise of online gaming (e.g., massively multiplayer online role playing games [MMORPGs] such as *World of*

Warcraft and *Everquest*). Unlike traditional offline video games that are typically played alone and against the computer, online video games are usually played with, or against, other gamers (i.e., multiplayer games) in large, sophisticated, detailed, and evolving worlds based in different narrative environments (Griffiths et al., 2004). These games offer a rich three-dimensional world that is populated by thousands of players. In MMORPGs, the focus is on role-play and these games usually allow the player to choose from a variety of races, professions, moralities, and genders (Ghuman and Griffiths, 2012) and provide vast virtual environments in which to explore. Game play is based around gaining skills and abilities through completing quests and defeating opponents. The player is encouraged to "level-up" the character to broaden the environment of the game. Social interactions are a big part of the game and may be considered obligatory in order to complete objectives (Ghuman and Griffiths, 2012).

Between 2000 and 2010, approximately 60 empirical studies were published on various aspects of (mainly) MMORPG addiction (Kuss and Griffiths, 2012). Unlike previous studies, most gamers were adults (i.e., over 18 years of age) and some studies were nationally representative. Also, researchers tended to collect their data online or via non-self-report methods, including: polysomnographic measures and visual and verbal memory tests (Dworak et al., 2007); medical evaluations, including the patient's history and physical examination and radiologic, intraoperative or pathologic findings (Cultrara and Har-El, 2002); functional magnetic resonance imaging (Hoeft et al., 2008; Ko et al., 2009; Han et al., 2010); electroencephalography (Thalemann et al., 2007); and genotyping (Han et al, 2007).

OFFLINE VS. ONLINE PROBLEMATIC GAMING

As noted earlier, video gaming that is problematic, pathological or addictive lacks a widely accepted definition. In a recent review, Király et al. (2014) argued that some researchers considered video games as the starting point for examining the characteristics of this specific disorder, while others considered the Internet as the main platform that united different and disparate addictive Internet activities, including online games. Recent studies (Kim and Kim, 2010; Demetrovics et al., 2012) have made an effort to integrate both approaches. Consequently, online problematic gaming can be viewed as a specific type of video game addiction, as a variant of Internet addiction, or as an independent condition.

Griffiths (2005) has argued that although all chemical and behavioral addictions have specific and idiosyncratic characteristics, they share more commonalities than differences (i.e., salience, mood modification, tolerance and withdrawal symptoms, conflict, and relapse), and that these commonalities most likely reflect a common etiology for addictive behavior. Consequently, online game addiction is viewed as a specific type of video game addiction. Similarly, Porter et al. (2010) do not differentiate between problematic video game use and problematic online game use. They conceptualize problematic video game use as excessive use of one or more video games (regardless of platform), resulting in a preoccupation with, and a loss of control over, playing video games, along with various negative psychosocial or physical consequences. However, unlike Griffiths (2005), their criteria for problematic video game use do not include other features commonly associated with dependence or addiction, (e.g., tolerance, physical symptoms of withdrawal), as they do not see clear evidence that problematic gaming is associated with such phenomena. Other researchers (e.g., Young, 1998) view online problematic gaming as a subtype of Internet addiction. They see the Internet itself as providing

situation-specific characteristics that can make gaming problematic or addictive (i.e., the fact that players can theoretically play all day every day is a situational characteristic that may facilitate excessive gaming).

Kim and Kim's (2010) Problematic Online Game Use Model takes a more integrative approach and sees both the game and the medium as contributory factors in the development of problematic gaming. It claims that neither of the approaches outlined above adequately captures the unique features of online games such as MMORPGs. They argue that the Internet itself has features that may facilitate excessive use but also that the Internet is just one channel where people may access the content they want (e.g., gambling, shopping, sex, etc.) and that such users may become addicted to the particular content rather than the channel itself. This is analogous to the argument by Griffiths (2000) that there is a fundamental difference between addiction *to* the Internet and addictions *on* the Internet. However, MMORPGs differ from traditional stand-alone video games as there are social and/or role-playing dimensions that allow interaction with other gamers. The Problematic Online Game Use Model stresses five underlying dimensions of addictive game play: euphoria, health problems, conflict (with other activities or relationships), failure of self-control, and preference of virtual relationship.

Demetrovics et al. (2012) also support the integrative approach and stress the need to include all types of online games in addiction models in order to make comparisons between genres and gamer populations possible, such as those who play online real-time strategy (RTS) games and online first person shooter (FPS) games, in addition to the widely researched MMORPG players. First person shooter games portray 3D environments that are viewed as if through the eyes of the character, with usually only the weapon being depicted. The majority of FPS games produced (e.g.,

Return to Castle Wolfenstein) have both a “single player mode” and a “multiplayer mode” (Ghuman and Griffiths, 2012). The RTS genre differs from “turn-based” strategy games (such as chess) in that players have to respond to events as they occur. Real-time strategy games differ from FPS games in that the camera angle is positioned in a “birds-eye view” of the virtual environment. Players control many characters (units) at the same time. Similar to FPS games, these games often have both a “single player mode” and a “multiplayer mode.”

The model by Demetrovics et al. (2012) comprises six dimensions: preoccupation, overuse, immersion, social isolation, interpersonal conflicts, and withdrawal. But irrespective of approach or model, the components and dimensions for online problematic gaming outlined above are very similar to the criteria for IGD in Section III of the DSM-5. For instance, Griffiths’ (2005) six addiction components (in brackets below) directly map onto the nine proposed criteria for IGD (of which five or more need to be endorsed, resulting in clinically significant impairment). They are as follows: (1) *preoccupation with Internet games* [salience]; (2) *withdrawal symptoms when Internet gaming is taken away* [withdrawal]; (3) *the need to spend increasing amounts of time engaged in Internet gaming* [tolerance]; (4) *unsuccessful attempts to control participation in Internet gaming* [relapse/loss of control]; (5*) loss of interest in hobbies and entertainment as a result of, and with the exception of, Internet gaming* [conflict]; (6) *continued excessive use of Internet games despite knowledge of psychosocial problems* [conflict]; (7) *deception of family members, therapists, or others regarding the amount of Internet gaming* [conflict]; (8) *use of the Internet gaming to escape or relieve a negative mood* [mood modification]; and (9) *loss of a significant relationship, job, or educational or career opportunity because of participation in Internet games* [conflict].

THE PREVALENCE OF PROBLEMATIC GAMING

Table 1 presents a summary of prevalence studies examining problematic gaming (or its conceptual equivalent). The studies were selected on the basis of (i) having at least 300 subjects and (ii) using a screening instrument to assess problematic gaming (rather than self-diagnosis). The results show large variation in the prevalence rates ranging from 0.2% to 34%. However, the populations differ widely in type of gaming played (i.e., some studies just examined online gaming whereas others examined console gaming or a mixture of both), size, age range, type (i.e., some studies assessed gamers only, whereas others assessed general population), and instrument used to assess gaming. These differences are the likely reason for the variation in rates. Five of the published studies, all of which were conducted in adolescents, used nationally representative samples. The prevalence rates in these studies were as follows: 1.7% in Germany (Rehbein et al., 2010); 4.2% in Norway (Brunborg et al., 2013); 4.6% in Hungary (Pápay et al., 2013); 8.5% in the United States (Gentile, 2009); and 9% in Singapore (Gentile et al., 2011). The studies also indicate that males are significantly more likely than females to develop problematic gaming. However, many studies failed to assess prior problematic gaming (i.e., lifetime prevalence) and the presence of comorbid psychopathology (King et al., 2012). Further, because they used different screening instruments or cut-off criteria, it cannot be ascertained that prevalence differences are real.

The instruments used to assess problematic gaming, discussed elsewhere, represent a key challenge in the field (see Chapter 3). A recent comprehensive review by King et al. (2013) of 63 quantitative studies comprising 58,415 participants reported that the main weaknesses among the 18 screens they identified were: (i)

inconsistency of core addiction indicators across studies; (ii) a general lack of any temporal dimension; (iii) inconsistent cut-off scores relating to clinical status; (iv) poor and/or inadequate inter-rater reliability and predictive validity; and (v) inconsistent and/or untested dimensionality. There are also questions about the appropriateness of certain screens for certain settings, as those used in clinical practice milieus may require a different emphasis than those used in epidemiological, experimental, or neurobiological research settings (Koronczai et al., 2011; King et al., 2013).

Table 1 about here

With regard to the demographic characteristics, the data allow for some basic conclusions. As mentioned, adolescent males and young male adults appear to be at greater risk for problematic gaming. However, the course and severity of their symptoms is not well known (King et al., 2012), and the finding that this group is more at risk may be a consequence of sampling bias and the fact that this group plays video games more frequently than other sociodemographic groups. It has also been suggested that university students may be vulnerable to developing problematic video gaming (King et al., 2012). Reasons for this include their flexible timetables and study hours (i.e., non-standard working days), ready access to high-speed broadband around the clock, and multiple stressors associated with adjusting to new social obligations or living out-of-home for the first time (Young, 1998; King et al., 2012).

FACTORS ASSOCIATED WITH PROBLEMATIC GAMING

A number of studies have examined the association between problematic gaming and various personality factors, comorbidity factors, and biological factors. Although some studies have examined the relationship between personality traits and Internet

addiction, studies specifically examining online problematic gaming have shown it to be associated with neuroticism (Peters and Malesky, 2008; Mehroof and Griffiths, 2010), aggression and hostility (Chiu et al., 2004; Kim et al., 2008; Caplan et al., 2009; Mehroof and Griffiths, 2010), avoidant and schizoid tendencies (Allison et al., 2006), loneliness and introversion (Caplan et al., 2009), social inhibition (Porter et al., 2010), boredom inclination (Chiu et al., 2004), sensation-seeking (Chiu et al., 2004; Mehroof and Griffiths, 2010), diminished agreeableness (Peters and Malesky, 2008), diminished self-control and narcissistic personality traits (Kim et al., 2008), low self-esteem (Ko et al., 2005), state and trait anxiety (Mehroof and Griffiths, 2010), and low emotional intelligence (Parker et al., 2008). It is difficult, however, to assess the etiological significance of these associations as they may not be unique to problematic gaming. Further research is therefore needed to understand their true relevance.

Research has also shown online problematic gaming to be associated with a variety of comorbid disorders, including attention deficit and hyperactivity disorder (Allison et al., 2006; Chan and Rabinowitz, 2006; Batthyány et al., 2009; Han et al., 2009), symptoms of generalized anxiety disorder, panic disorder, depression, and social phobia (Allison et al., 2006), and various psychosomatic symptoms (Batthyány et al., 2009). The much discussed association with offline violence is addressed in Chapter 5.

Through use of functional magnetic resonance imaging, biological research has shown that online gaming addicts show similar neural processes and activity in brain areas associated with substance use disorders and behavioral addictions such as pathological gambling (significant activation in the left occipital lobe, parahippocampal gyrus, dorsolateral prefrontal cortex, nucleus accumbens, right orbitofrontal cortex, bilateral anterior cingulate, medial frontal cortex, and the caudate

nucleus (Hoeft et al., 2008; Ko et al., 2009; Han et al., 2010). It has also been reported that gaming addicts, like substance addicts, have a higher prevalence of two specific polymorphisms of the dopaminergic system: Taq1A1 allele of the dopamine D2 receptor and the Val158Met in the Catecholamine-O-Methyltransferase enzyme (Han et al., 2007). Most biological data, however, come from small non-representative studies and should be considered preliminary. More research is needed to replicate them, understand their relevance, and ascertain that they are not byproducts of co-occurring conditions (see also Chapter 4).

TREATMENT OF PROBLEMATIC GAMING

The evidence base on the treatment of problematic or addictive gaming is limited. Clinical interventions vary considerably in the literature, but most of the very few published studies (Table 2) employ some type of CBT, pharmacotherapy, or self-devised psychological interventions (Griffiths and Meredith, 2009; Han et al., 2009, 2010; King et al., 2010b, 2012; Young, 2013; Thorens et al., 2014). The lack of consistent approaches to treating problematic gaming makes it difficult to produce definitive conclusions about efficacy and, consequently, to generate treatment guidelines, although CBT does appear to show good preliminary support. There remains a need for controlled, comparative studies of psychological and pharmacological treatments, administered individually and in combination with each other, to determine the optimal treatment approach.

Table 2 about here

The lack of comparative treatment studies might suggest that there is a general lack of demand for psychological and psychiatric services for problematic gaming (King et al., 2010b), but this is not necessarily the case. For instance, Woog (2004)

surveyed a random sample of 5,000 US mental health professionals. Although only 229 participants completed the questionnaire, two-thirds had treated someone with excessive computer use problems in the year prior to the survey. Survey results showed that problematic gaming was most common among 11- to 17-year old clients. However, this client group may be more likely to present in therapy, as anecdotal evidence suggests that they are typically forced by concerned parents to seek treatment. Adult gaming addicts may not seek treatment, or seek treatment at a later stage for other psychological problems, such as depression, which may develop after experiencing the negative consequences of gaming.

There appears to be significant demand for treatment of online-related problems, including problematic gaming, in Southeast Asia. Besides governmental funds for research into problematic gaming, this is evidenced by the government-supported establishment in South Korea of a network of over 140 counseling centers devoted to treating online addiction (Kim, 2008). Problematic gaming clinics have also started to emerge in Western countries such as Holland and the United Kingdom (Griffiths and Meredith, 2009; King et al., 2011b). Treatment groups modeled on 12-step self-help programs (e.g., Online Gamers Anonymous) have also appeared (Griffiths and Meredith, 2009), but little is known about their treatment protocols or efficacy.

CONCLUSION AND FUTURE DIRECTIONS

Based on available data, and particularly studies published over the last decade, it appears that in extreme cases, excessive gaming displays compulsive or addictive properties similar to more traditional addictions, and can have damaging effects on individuals. However, the field continues to be seriously hindered by the use of

inconsistent and non-standardized criteria to identify and assess addictive gaming, and by research recruitment methods that have sampling biases due to over-reliance on self-selected samples. The result is significant gaps in our understanding of the incidence and demographic characteristics of problematic gaming. For epidemiological purposes, Koronczai et al. (2011) assert that the most appropriate measures in assessing problematic Internet use (including Internet gaming) should meet six requirements: (i) brevity (to help overcome question fatigue); (ii) comprehensiveness (to examine all core aspects of problematic gaming); (iii) reliability and validity across age groups (e.g., adolescents, adults); (iv) reliability and validity across data collection methods (e.g., online, face-to-face interview, paper-and-pencil); (v) reliability and validity across cultures; and (vi) clinical validation. More research is needed to arrive at such an instrument as it could yield more accurate prevalence rates and better-quality phenomenological data. Other deficits in our knowledge of problematic gaming relate to its comorbidity with other disorders, neurobiology, natural course, and treatment.

Moreover, studies tend to examine addictive gaming from the perspective of the gamer. Yet a small body of research suggests that structural characteristics of the video games themselves may have a role in the development and maintenance of problematic gaming (Wood et al., 2004; Westwood and Griffiths, 2010; King et al., 2011). More empirical research into those characteristics might help explain why some individuals may be protected from developing excessive playing habits or simply mature out of their problematic gaming behavior, while others may be vulnerable to addiction and relapse. Further, the suspected strong links between online gaming, gambling, non-gambling fantasy games, role-playing games, board games, and card games remain largely unexplored (Griffiths et al., 2014a). These deserve

close study, in part due to the concern that youths may migrate from free gaming sites to online gambling.

Finally, the recent explosion in mobile gaming is transforming the gaming landscape but has received little research scrutiny so far. Given the growth in mobile technology, including mobile gaming apps, it is important for future research to focus on those as well. But despite these shortcomings, several promising trends can be drawn from the research conducted so far.

- There has been a significant increase in empirical research decade by decade since the early 1980s.
- A noticeable shift in researching the mode of video game play has occurred in an attempt to keep up with rapidly advancing technology. In the 1980s, research mainly concerned “pay-to-play” arcade video games. In the 1990s, research focus shifted to stand-alone (offline) video games played at home on consoles, personal computers, or handheld devices. In the 2000s, research mainly concerned online massively multiplayer video games.
- Survey study sample sizes have generally increased. In the 1980s and 1990s, sample sizes were typically in the low hundreds. In the 2000s, sample sizes in their thousands – even if unrepresentative – are not uncommon.
- There has been a diversification in the way data are collected, including experiments, physiological investigations, secondary analysis of existing data (such as that collected from online forums), and behavioral tracking studies.
- Research in adult (i.e., non-child and non-adolescent) samples has increased, reflecting the fact that the demographics of gaming have changed.
- The assessment and measurement of problematic gaming has become more sophisticated. In recent years, instruments with more robust psychometric

properties, including better reliability and validity, have been developed. However, many of the most widely used screening instruments were adapted from adult screens of non-gaming behaviors, while much of the gaming literature has examined children and adolescents.

Together, these trends point toward progress in our understanding of problematic gaming. Inclusion of IGD in Section III of the DSM-5 has come as a result of this progress. This inclusion appears to have been well received by researchers and clinicians in the problematic gaming field (Griffiths et al., 2014b) and by those who have sought treatment for such disorders and who may now feel more validated and less stigmatized. However, for problematic gaming to be included in the section on substance-related and addictive disorders, alongside the newly included "gambling disorder," the problematic gaming field must unite around a diagnostic definition and assessment measures so that comparisons can be made across different demographic groups and cultures. According to Petry and O'Brien (2013), problematic gaming will not be included as a separate mental disorder until (i) its defining features have been identified, (ii) reliability and validity of the specific criteria have been obtained cross-culturally, (iii) prevalence rates have been determined in representative epidemiological samples across the world, and (iv) etiology and associated biological features have been evaluated. Fortunately, research does appear to be leading toward an emerging consensus. For example, King et al. (2013) note that across many different studies, problematic gaming is commonly defined by (i) *withdrawal*, (ii) *loss of control*, and (iii) *conflict.* More such examples of unity and methodological consistency are required for sufficient empirical evidence to accumulate in support of an official DSM problematic gaming diagnosis.

DISCLOSURE STATEMENT

The authors disclose no relationships with commercial entities and professional activities that may bias their views.

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Table 1. Prevalence of problematic gaming in the largest survey studies

Study	Year	Country	Sample	Age (years)	Assessment screen	Problematic gaming prevalence (%)	Gender ratio
Fisher	1994	England	467 secondary school children	11-16	DSM-IV*	6.0	M=F
Phillips et al.	1995	England	868 secondary school children	11-16	DSM-III-R	5.7	M=F
Griffiths and Hunt	1998	England	387 adolescents	12-16	DSM-III	19.9	M>F (3:1)
Johansson and Götestam	2004	Norway	3,237 adolescents	12-18	Young's DQ	2.7	M=F
Grüsser et al.	2005	Germany	323 schoolchildren	11-12	DSM-IV-TR*/ICD-10**	9.3	M>F (3:1)
Grüsser et al.	2007	Germany	7,069 gamers	15+	ICD-10 criteria**	11.9	Not reported
Lee and Han	2007	South Korea	2,584 students	$5^{th}/6^{th}$ grade	DSM-IV-TR	2.5	Not reported
Wan and Chiou	2007	Taiwan	416 adolescents	17-24	OAST	34.0	Not reported
Gentile	2009	USA	1,178 students	8-18	DSM-IV-TR criteria*	8.5	M>F (4:1)
Batthyány et al.	2009	Austria	1,068 students	13-18	CSVK-R	2.7	M>F (3:1)
Lemmens et al.	2009	Holland	721 adolescents	12-18	GASA	1.4-9.4	Not reported
Arnesen	2010	Norway	2,500 young adults	16-40	DSM-IV-TR	0.6-4.0	M>F (4:1)
Choo et al.	2010	Singapore	2,998 children and adolescents	9-13	DSM-IV	8.7	M>F (3:1)
Rehbein et al.	2010	Germany	15,168 schoolchildren	14-16	KFN-CSAS-II	1.7	M=F

Thomas and Martin	2010	Australia	1,326 school students; 705 university students	12-54	Young DQ (adaptation)	5.0	M=F M<F (1:3)
Porter et al.	2010	Australia	1,945 gamers	14-40+	DSM-IV-TR criteria* and others	8.0	M>F (9:1)
Zamani et al.	2010	Iran	564 students	“Students”	QACG	17.1	M>F (ratio not reported)
Wölfling et al.	2010	Germany	1,710 students	13-18	ICD-10**	7.5-8.4	Not reported
Van Rooij et al.	2011	Holland	3,048 adolescent gamers	13-16	DSM-IV-TR*	3.0	M>F (4:1)
Achab et al.	2011	France	448 MMORPG gamers	18-54	DSM-IV-TR Substance Dependence Adapted Scale (DAS)	27.5	M>F (4:1)
Jeong and Kim	2011	South Korea	600 students	12-18	IAT (adapted version)	2.2	M=F
Lemmens et al.	2011	Holland	543 adolescent gamers	11-17	GASA	4.0-6.0	M>F (7:3)
Mentzoni et al.	2011	Norway	816 individuals	15-40	GASA	4.1 problem 0.6 addicted	M>F
Gentile et al.	2011	Singapore	3,034 students	12-18	DSM-IV-TR criteria*	9.0	M>F (3:1)
Stetina et al.	2011	Germany	486 online gamers	11-67	ISS-20 (adapted version)	8.0	M>F (9:1)
Zanetta Dauriat et al.	2011	Switzerland	696 gamers	13-54	Self-developed MMORPG addiction scale (no name)	11.2	M>F (9:1)
Hussain et al.	2012	England	1,420 gamers	12-62	DSM-IV	3.6 (monothetic)	M>F (4:1)

Demetrovics et al.	2012	Hungary	3,415 online gamers	21 (mean)	POGQ	3.4	M>F (9:1)
Xu et al	2012	China	623 adolescents	13-18	DSM-IV and others	21.5	Not reported
Walther et al.	2012	Germany	2,553 students	12-25	KFN-CSAS-II	3.3 at risk 1.1 addicted	M=F
Brunborg et al.	2013	Norway	1,320 adolescents	14 (mean)	GASA	4.2	M=F
Festl et al.	2013	Germany	4,382 adolescents and adults	14-90	GASA	3.7 problem 0.2 addicted	M>F (3:2)
Pápay et al.	2013	Hungary	5,045 adolescents	16 (mean)	POGQ-SF	4.6	M=F
Spekman et al.	2013	Holland	1,004 secondary school adolescents	11-18	Components model of addiction	8.6	Male only

* Specific DSM-IV-TR criteria varied across studies. Adapted DSM-IV criteria for pathological gambling were used in several studies.

** Refers to symptoms of dependence described in the ICD-10.

Note: CSVK-R = Fragebogen zum Computerspielverhalten bei Kindern und Jugendlichen; GASA = Game Addiction Scale for Adolescents; IAT = Internet Addiction Test; ISS-20 = Die Internetsuchtskala-20; KFN-CSAS-II = Video Game Dependency Scale; POGQ = Problematic Online Gaming Questionnaire; POGQ-SF = Problematic Online Gaming Questionnaire Short Form; QACG = Questionnaire of Addiction to Computer Games; Young’s DQ = Young’s Diagnostic Questionnaire

Table 2. Selected characteristics of treatment studies for problematic online gaming (or Internet use)

Study	Assessment instrument and/or criteria for inclusion	Extent of gaming problem	Treatment conditions	N	Age range (years)	Treatment outcome	Treatment effect size
Young (2007)	IAT (score not specified)	10% reported a video gaming problem	1. CBT (12 sessions)	114	Not reported	CBT reduced most clients' thoughts and behaviours related to compulsive Internet use at 6-month follow-up.	Not reported
Kim (2008)	K-IAS (score not specified)	Unclear	1. R/T group counselling (5 weeks) 2. Control	25	Not reported	10 counselling sessions reduced addiction symptoms and increased self-esteem, as compared to the control group.	Not reported
Han et al. (2009)	YIAS-K score ≥50	100% reported a video gaming problem	1. Methylphenidate (8 weeks)	62	8-12	Methylphenidate significantly reduced severity of Internet addiction symptoms and overall Internet usage.	Not reported
Shek et al. (2009)	YIAS-10 score of 4; YIAS-8 score of 5; YIAS-7 score of 3; CIAS score of 3	Unclear	1. Multi-modal counselling (15 to 19 months)	59	11-18	Counselling produced a decrease in symptoms of Internet addiction. Participants reported high satisfaction with the program.	Not reported
Du et al. (2010)	Beard's Diagnostic Questionnaire	Unclear	1. CBT (8 sessions) 2. Control	56	12-17	CBT reduced Internet overuse and associated symptoms and improved time management skills. Treatment gains were observed at 6-month follow-up.	Cohen's d = 1.08 (post) and 1.35 (6-month follow-up)
Han et al. (2010)	>4 hrs per day/30 hrs per week; YIAS score ≥50; DSM-IV criteria for substance abuse	100% reported a video gaming problem	1. Bupropion (6 weeks) 2. Control (Placebo)	19	17-29	Bupropion reduced cravings for video game play, total game play time, and cue-induced brain activity.	Not reported
Su et al. (2011)	YDQ score of 5; Internet use ≥14 hours per week	Unclear	1. HOSC-NE (one session) 2. HOSC-LE (one	65	Not reported	All treatment groups demonstrated significant decreases in online activity and YDQ scores after 1-month. The	Cohen's d = 0.72-0.82 (YDQ score);

			session) 3. HOSC-NI (one session) 4. Control			"expert system" treatments were the most effective.	Cohen's d = 0.75-0.98 (activity)
Han et al. (2012)	>30 hrs per week; YIAS score >50; impaired behaviors/ distress due to gaming measured by modifying the DSM-IV criteria for substance abuse	Not reported	1. Family Therapy (7 sessions) 2. Control	30	Not reported	Family therapy over seven sessions reduced gaming addiction severity.	Not reported
Han and Renshaw (2013)	>4 hrs per day/30 hrs per week; YIAS score >50; impaired behaviours/distress due to gaming measured by modifying the DSM-IV criteria for substance abuse	100% reported video gaming problem	1. Bupropion (8 weeks) + education for Internet use 2. Placebo (8 weeks) + education for Internet use	50	13-42	Bupropion significantly reduced levels of gaming addiction during the 8 weeks and also at a follow-up period of 4 weeks.	Not reported
Marco and Choliz (2013)	TDV (score not specified); DSM-IV-TR criteria for substance abuse	Patient (100%) reported a video gaming problem	1. CBT (19 sessions)	1	22	CBT improved patient's sense of control over games and decreased the level of gaming addiction. Positive outcomes were not steady during the 19 sessions. The positive results of CBT lasted during a 3-month follow-up period.	Not reported
Taquet and Hautekeete (2013)	PVP (score not specified); QAJV (score not specified)	Patient (100%) reported a video gaming problem	1. CBT (17 sessions over 11 months)	1	19	After 6 months of CBT, the patient could effectively control his game behaviour and after 10 months, PVP score was 0 (out of 9) and QAJV score was 6 (out of	Not reported

380).

Abbreviations: CBT = Cognitive-behavior therapy; CIAS = Chinese Internet Addiction Scale; DSM-IV = Diagnostic and Statistical Manual of Mental Disorders (4th Edition); HOSC = Healthy Online Self-Helping Center [NE = Natural Environment; LE = Learning Environment; NI = Non-Interactive]; IAT = Internet Addiction Test; K-IAS = Korean Internet Addiction Scale; PVP = Problem Video Gaming Playing; QAJV = Questionnaire sur l'addiction aux JV; R/T = Reality Training; TDV = Test de Dependencia de Videojuegos; YDQ = Young's Diagnostic Questionnaire; YIAS = Young Internet Addiction Scale; YIAS-K = Young Internet Addiction Scale – Korean Version.