# Internet Gaming Disorder Treatment: A Review of Definitions of Diagnosis and Treatment Outcome

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**Objective:** Internet gaming disorder (IGD) is a new disorder currently positioned in the appendix of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. Few clinical studies report that psychological and pharmacological interventions can significantly reduce the severity of IGD symptomatology. The aim of this review was to assess current knowledge of the short- and long-term benefits of IGD interventions. This review presents a systematic evaluation of definitions of diagnosis and treatment outcomes employed in IGD treatment studies, including an assessment of goodness of fit with the DSM-5 classification. **Method:** A computer database search of Academic Search Premier, PubMed, PsychINFO, ScienceDirect, Web of Science, and Google Scholar was conducted to identify all available research evidence on Internet gaming disorder treatment ($N = 8$ studies). Diagnostic and treatment outcome parameters were systematically evaluated. **Results:** Several weaknesses of IGD treatment literature were identified. Only 2 treatment studies have employed an equivalent method of diagnosis for IGD. Studies have not assessed formative change in diagnostic status at post-treatment or follow-up. Duration of follow-up has been inadequate to assess relapse and remission. Posttreatment assessment has been predominantly limited to IGD symptomatology, comorbidity, and frequency of gaming behavior. **Conclusion:** Currently, there is insufficient evidence to warrant suggestion that trialled IGD interventions confer a long-term therapeutic benefit. Several improvements to study design and reporting are proposed to guide future studies of IGD. © 2014 Wiley Periodicals, Inc. J. Clin. Psychol. 70:942–955, 2014.

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Clinical presentations of excessive Internet gaming behavior are increasingly recognized as an issue of psychiatric relevance due to the negative effect of Internet gaming on multiple domains of functioning (Ferguson, Coulson, & Barnett, 2011; King, Delfabbro, Zwaans, & Kaptsis, 2013; Kuss & Griffiths, 2012; Mentzoni et al., 2010; van Rooij, Schoenmakers, Vermulst, van de Eijnden, & van de Mheen, 2010). However, problematic Internet gaming behavior has historically proven difficult to classify consistently, whether as an emerging primary mental health disorder or as a maladaptive coping mechanism of another mental health disorder such as social anxiety (Weinstein & Lejoyeux, 2010). In May 2013, Internet gaming disorder (IGD) was included in the appendix of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5; American Psychiatric Association, 2013) as a condition warranting further study. This has marked the first occasion of excessive Internet gaming being recognized as a mental health disorder in psychiatric nomenclature and will, it is hoped, encourage greater clarity in conceptualization (King and Delfabbro, 2013a).

The IGD classification is most similar in nature to pathological gambling (or "gambling disorder" in the DSM-5) and contains nine criteria: (A) preoccupation with Internet games; (B) withdrawal symptoms when Internet gaming is discontinued; (C) tolerance: the need to spend increasing amounts of time engaged in Internet gaming; (D) unsuccessful attempts to control participation in Internet gaming; (E) loss of interest in hobbies and entertainment as a result

of, and with the exception of, Internet gaming; (F) continued excessive use of Internet games despite knowledge of psychosocial problems; (G) deception of family members, therapists, or others regarding the amount of Internet gaming; (H) use of Internet gaming to escape or relieve a negative mood; and (I) loss of a significant relationship, job, or educational or career opportunity because of participation in Internet games.

Inconsistent conceptualization and measurement are arguably the greatest methodological weaknesses of extant quantitative and clinical studies of IGD (King, Delfabbro & Griffiths, 2012; Lortie & Guitton, 2013; Sim, Gentile, Bricolo, Serpollini, & Gulamoydeen, 2012). These inconsistencies have primarily resulted from the lack of formal criteria for Internet-related pathologies and the tendency of researchers to compensate by adapting the criteria of other disorders (e.g., pathological gambling) on the assumption of adequate conceptual overlap or similarity (Winkler, Dörsing, Rief, Shen, & Glombiewski, 2013). The IGD literature features multiple formulations and assessment tools, although many lack justification of their inclusion and use and/or acknowledgement of other approaches (Griffiths, King, & Demetrovics, 2014; Starcevic, 2013).

A systematic review by King, Haagsma, Delfabbro, Gradisar, and Griffiths, (2013) reported that, across 18 assessment tools employed in 63 studies of problematic Internet video-gaming, no two measures were alike in their conceptualization and ability to "map out" diagnostic features. An important advantage of the DSM-5 classification, therefore, is its potential to improve consistency across future studies and enable a more direct comparison of findings, and perhaps eventually reach a consensus on status of the disorder (see Petry et al., in press).

There is also a growing demand for evidence-based recommendations for treatment of IGD. Although there is a paucity of clinical trials on IGD (see King, Delfabbro, Griffiths, & Gradisar, 2011), it has been reported that, internationally, many individuals who may attract an IGD diagnosis have received some form of treatment from a mental health or medical service provider (Baer, Bogusz, & Green, 2011; Block, 2008). In this context, the question is raised: What is the most efficacious treatment for IGD? Currently, there are no published systematic reviews on IGD prevention and/or treatment available in the Cochrane Collaboration library (see www.cochrane.org). Similarly, there are no available guidelines related to Internet pathologies provided by the National Institute for Health and Care Excellence (see www.nice.org.uk), with the exception of recommendations on limiting Internet use to reduce risk of obesity (CG43) and promote physical activity (PH17).

Winkler et al. (2013) have conducted the most recent meta-analysis on "Internet addiction" (IA: a generalized form of IGD that includes all types of Internet activities). Their review included 16 studies, three of which employed a drug-based intervention, published as of April 2011. They reported that treatment effect size estimates indicated that psychological and pharmacological interventions were "highly effective" (p. 317) for reducing IA symptoms, time spent using the Internet, and comorbid depression and anxiety. They concluded that these effect sizes were "high, robust, unrelated to study quality or design, and maintained over follow-up" (p. 317). However, a significant caveat of their review was that only 4 of the 16 reviewed studies had actually conducted a follow-up assessment of treatment outcome.

Additionally, most of the reviewed studies lacked adherence to the CONSORT statement (see King et al., 2011), thereby raising concerns about the adequacy of the studies for meta-analysis. Winkler et al., acknowledged these limitations, and commented that their analysis should be regarded only as preliminary. On this basis, although limited research evidence suggests that certain interventions may have some benefit for individuals with IGD, there remains a need to properly qualify such benefits within a critical examination of how clinical status and treatment outcomes in IGD studies are determined. As noted in a recent commentary by King and Delfabbro (2013b):

> Few studies in this research area have looked beyond clinical criteria in assessing treatment outcomes. Future clinical trials may wish to consider and assess change more broadly and across several outcome areas, including: (i) the level of

endorsement of Internet Use Disorder criteria; (ii) the actual frequency of video-gaming; (iii) changes in participation in other hobbies or interests; (iv) the quality of family-based or other social relationships; and (v) overall functioning and life satisfaction.

With the introduction of the IGD classification in the DSM-5, it seems timely to re-examine the extant treatment literature on IGD in terms of its conceptual "goodness of fit" with the proposed psychiatric definition. The aim of this review was therefore twofold. The first aim was to assess definitions of IGD status, and particularly the degree of consistency between the diagnostic status of participants in IGD treatment studies and the DSM-5 classification. The second aim of this review was to examine the definitions of treatment outcome employed in IGD intervention studies. A holistic framework was rationalized to be most appropriate for evaluating the potential benefits of intervention approaches, i.e., to consider recovery and relapse in relation to several clinical markers and known correlates of IGD.

Although past reviews of the IGD literature have examined limitations and/or inconsistencies in relation to etiology and risk factors (Kuss & Griffiths, 2012), prevalence rates (Ferguson et al., 2011), assessment tools (King, Haagsma, et al., 2013; Lortie & Guitton, 2013), and treatment study design (King et al., 2011), this review is novel because of its primary focus on definitions of diagnosis and treatment outcomes. No previous reviews have focused specifically on these two important issues, which have significant bearing on the rigour and consistency of clinical trials.

Additionally, this review is somewhat unique in its focus on studies of IGD (as opposed to many recent reviews which predate the IGD category and which have included studies on problematic *general* Internet use, e.g. Winkler et al., 2013), therefore granting this review a greater degree of applicability to treatment of IGD. Although IGD treatment is an emerging clinical research topic with limited available studies, it was hoped that this review would yield a qualified statement of current knowledge of the short- and long-term benefits of such interventions, thereby providing practical methodological guidelines and new directions for future clinical studies.

## Method

### Study Selection

A computer database search of Academic Search Premier, PubMed, PsychINFO, ScienceDirect, Web of Science, and Google Scholar was conducted, using the following search terms and logic: "(patholog* OR problem* OR addict* OR compulsive OR dependen*) AND (video OR computer) gam* AND treat*)." All searches were limited to full-text papers published from 2000 to 2013 because studies conducted in this era of "Internet gaming"[1] are most relevant to the IGD classification. These database search parameters yielded a total of 1,530 hits, which included the following results in each database: Academic Search Premier (142 results), PubMed (19 results), PsychINFO (290 results), ScienceDirect (264 results), and Web of Science (820 results). The reference lists of systematic reviews of pathological online video gaming were also examined (i.e., Ferguson et al., 2011; King, Haagsma, et al., 2013; Kuss & Griffiths, 2012; Lortie & Guitton, 2013; Sim et al., 2012; Winkler et al., 2013), as well as the references of the included studies. Given the large number of results on Google Scholar (over 15,000 results), only the first 30 pages of results were examined.

Studies were selected on the basis of containing a treatment study of either IGD or an otherwise classified disorder involving Internet gaming (e.g., "pathological video gaming" or "online video game addiction"). Because the purpose of this study was to identify all available

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[1] From 1999, video-gaming had expanded significantly into the online medium, notably with the emergence of Massively Multiplayer Online Role Playing Games (MMORPGs) (e.g., *Ultima Online* [1997], *Everquest* [1999], and *Asheron's Call* [1999]) (Griffiths, Kuss, & King, 2012).

research evidence on Internet gaming disorder treatment, studies were not necessarily excluded on the basis of methodological shortcomings such as low sample size or lack of a control group. However, studies were excluded if they were contained only case note material or anecdotal evidence ($n = 3$). Additionally, studies that referred only to general Internet use (i.e., no specific reference to gaming; e.g., Dell'Osso et al., 2008) or studies where Internet gaming was not the primary online activity (e.g., Young, 2007, 2013) were not considered for inclusion ($n = 12$). As per the DSM-5, online gambling activities were not considered equivalent to Internet gaming. A total of eight studies were identified and selected for review.

### *Study Assessment*

Selected studies were first assessed in terms of their reported definitions of diagnostic status. Table 1 presents a summary of the reviewing framework for diagnostic status. Indicators of diagnostic status included IGD symptomatology (including whether these symptoms were aggregated in some way to yield a diagnosis) and time spent engaged in Internet gaming activity. Specific instruments used to assess IGD symptoms were compared in terms of their consistency with DSM-5 IGD criteria. This analysis was conducted with reference to King, Haagsma, et al.'s (2013) review of IGD psychometric tools (see Table 2 in King, Haagsma, et al., 2013). The diagnostic parameters for IGD employed in each study were also recorded. The second task of this review was to assess treatment outcome definitions.

Table 2 provides a summary of posttreatment outcome assessment, which encompassed IGD symptoms, cognitive symptoms (IG-related thoughts and self-esteem), behavioral symptoms (time spent gaming), comorbidities (anxiety, depression, and attention difficulties), substance use, time management, adaptive functioning across school, work, social and leisure domains, neurovegetative symptoms (diet, exercise, and sleep), and perceived quality of life.

Table 3 provides a summary of treatment outcomes as defined at the follow-up stage of IGD studies. The duration of the follow-up period, where applicable, was recorded. Both cognitive and behavioral indicators of recovery and relapse were examined: (a) qualitative changes in diagnosis (i.e., meeting the requisite number of criteria for IGD); (b) severity of IGD symptoms (irrespective of clinical thresholds); and (c) frequency of Internet gaming activity (e.g., daily hours of Internet gaming use).

## Results

### *Definitions of Diagnosis*

Table 1 summarizes the definitions of diagnostic status employed in IGD treatment studies. General observations with respect to diagnosis are as follows: (a) the majority of studies (Du, Jiang, & Vance, 2010; Han, Hwang, & Renshaw, 2010, 2009; Kim et al., 2012; Li & Wang, 2013; Shek, Tang, & Lo, 2009) have employed a clinical sample of adolescents; (b) type of intervention has varied greatly across studies, with cognitive-behavioral therapy (CBT) being the most common type of therapy (Du et al. 2010; Kim et al., 2012; Li & Wang, 2013); and (c) the suite of assessment tools developed by Young are the most frequently used measures (Han et al., 2010, 2009; Kim et al., 2012; Shek et al., 2009; Su, Fang, Miller, & Wang, 2011).

With regard to "conceptual fit" of assessment tools with the DSM-5 criteria, the majority of studies employed measures that demonstrated good (but not complete) coverage of the IGD criteria. Six of the eight studies assessed seven of the nine criteria, and one study assessed eight criteria (see Table 1). Specifically, the Beard Diagnostic Questionnaire (Beard, 2005) does not assess criterion E of the DSM-5 IGD classification: Loss of interest in previous hobbies and entertainment as a result of, and with the exception of, Internet games. Similarly, the Young Internet Addiction Test (YIAT) and the Young Diagnostic Questionnaire (YDQ) assess neither criterion E nor criterion F (i.e., continued excessive use of Internet games despite knowledge of psychosocial problems). A copy of the K-Internet Addiction Scale, employed by Kim (2008), was not available on the Korean Ministry of Information and Communication website, or by formal request. Therefore, its alignment with the IGD classification could not be assessed.

Table 1
*Definitions of Diagnostic Status in IGD Treatment Studies*

| Study | Population | Intervention | Assessment tool | IGD consistency[1] | IG activity | Diagnostic status |
|---|---|---|---|---|---|---|
| Du et al. (2010) | Clinical: Adolescent | CBT | Beard's Diagnostic Questionnaire (BDQ); Internet Overuse Self-Rating Scale (IOSRS) | 8/9 | Daily hours | 6/8 on BDQ |
| Han et al. (2010) | Clinical: Adolescent | Bupropion | Young Internet Addiction Scale (YIAS) | 7/9 | Daily/weekly hours | 50 + on YIAS + > 4hr/day; 30hr/week; subjective distress |
| Han et al. (2009) | Clinical: Adolescent | Methylphenidate | YIAS | 7/9 | Daily hours | ND |
| Kim (2008) | General: Adult | Reality therapy | Korean Internet Addiction Scale (K-IAS) | NR | NA | ND |
| Kim et al. (2012) | Clinical: Adolescent | CBT + bupropion | YIAS | 7/9 | Daily/weekly hours | 50 + on YIAS + > 4hr/day; 30hr/week; subjective distress |
| Li & Wang (2013) | Clinical: Adolescent | CBT | Online Gaming Cognition-Addiction Scale (OGCAS); Internet Addiction Scale (IAS-CR) | 7/9 | Daily/weekly hours | 35 + on OGCAS; >3 on IAS-CR; > 4hr/day; 30hr/week; subjective distress |
| Shek et al. (2009) | Clinical: Adolescent | Multimodal counselling | YIAS; Chinese Internet Addiction Scale (CIAS) | 7/9 | NA | 4/8 criteria on YIAS or 3 + criteria on CIAS |
| Su et al. (2011) | General: Adult | Online self-help | Young Diagnostic Questionnaire (YDQ) | 7/9 | Weekly hours | 5 + on YDQ; > 14hr/week |

*Note.* IGD = Internet gaming disorder; CBT = cognitive-behavioral therapy; IG = Internet gaming; NA = not assessed; ND = no diagnosis; NR = not reported.
[1]The number of items that match the IGD criteria.

Table 2
*Posttreatment Outcomes Assessed Within IGD Treatment Studies*

| Study | IGD symptoms | Craving | Diagnostic status | IGD cognition | Gaming activity | Anxiety | Depression | Attention difficulties | Time management | Social relationships | School/employment | Diet/Physical activity | Substance use | Sleep activity | Other leisure activity | Self-esteem | Quality of life |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Du et al. (2010) | • | ○ | ○ | ○ | ○ | • | • | • | • | • | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Han et al. (2010) | • | • | ○ | ○ | • | ○ | • | ○ | ○ | ○ | • | ○ | ○ | ○ | ○ | ○ | ○ |
| Han et al. (2009) | • | ○ | ○ | ○ | • | ○ | ○ | • | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Kim (2008) | • | ○ | ○ | • | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | • | • |
| Kim et al. (2012) | • | ○ | ○ | ○ | • | • | • | ○ | ○ | ○ | • | ○ | ○ | ○ | ○ | ○ | • |
| Li & Wang (2013) | • | ○ | ○ | • | ○ | • | • | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Shek et al. (2009) | • | ○ | ○ | • | • | • | • | ○ | ○ | • | ○ | ○ | ○ | ○ | ○ | • | • |
| Su et al. (2011) | • | ○ | ○ | ○ | • | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

*Note.* IGD = Internet gaming disorder.
• assessed; ○ not assessed.

Table 3
*Definitions of Treatment Outcome at Follow-Up in IGD Treatment Studies: Remission and Relapse*

| Study | Follow-up period | Recovery | | | Relapse | | |
|---|---|---|---|---|---|---|---|
| | | Diagnosis | IGD symptom severity | Gaming activity | Diagnosis | IGD symptom severity | Gaming activity |
| Du et al. (2010) | 6 months | NA | IOSRC (descriptive only) | NA | NA | NA | NA |
| Kim et al. (2012) | 1 month | NA | YIAS (descriptive only) | Hours per week | NA | NA | NA |
| Su et al. (2011) | 1 month | NA | YDQ (descriptive only) | Hours per week | NA | NA | NA |

*Note.* IGD = Internet gaming disorder; NA = not assessed; IOSRS = Internet Overuse Self-Rating Scale; YIAS = Young Internet Addiction Scale; YDQ = Young Diagnostic Questionnaire.
Five of the 8 studies (Han et al., 2010; 2009; Kim, 2008; Li & Wang, 2013; Shek et al., 2009) did not include a follow-up.

Several psychometric measures of therapy outcome have been employed and are often used in tandem with a behavioral measure of Internet gaming activity (Han et al., 2010, 2009; Kim et al., 2012; Shek et al., 2009; Su et al., 2011). Internet gaming behavior was generally measured in terms of frequency of use (e.g., hours of use spent per day), but the type of game (e.g., Massively Multiplayer Online Game) and social context of Internet gaming (e.g., physically/virtually alone or with friends) were not considered. All eight studies did not examine whether Internet gaming activity was engaged in continuously or sporadically, nor were specific gaming actions or motivations considered (e.g., competitive or achievement-oriented gaming associated with excessive Internet gaming: "grinding" [see King, Delfabbro, & Griffiths, 2010] or "templating" [see Yee, 2006]).

A behavioral measure (i.e., Internet gaming activity) was considered only when determining an IGD diagnosis in four of the eight studies (Han et al., 2010; Kim et al., 2012; Li & Wang, 2013; Su et al., 2011). Only two of the eight studies (Kim et al., 2012; Li & Wang, 2013) employed the same method of determining IGD (or equivalent) diagnosis, which raises concern about the suitability of studies for systematic comparison of treatment outcome. Two studies (Han et al., 2010; Kim, 2008) referred to participants as "Internet addicts" but did not describe the method of diagnosis. Given the limited number of published studies, it was not possible to determine whether diagnostic approaches varied according to the age of participants. However, the measures developed by Young (i.e., the YIAS and YDQ) have been employed in both adolescent and adult populations, with no evident differences in wording of test items, scoring, or interpretation.

## Posttreatment Assessment Outcomes

Table 2 summarizes all reported measures of posttreatment outcome, in addition to general health and well-being outcomes. Time limitations and other practical constraints would likely prevent any individual study from assessing all indicators within the presented framework. Therefore, the focus of this analysis was not on the *number,* but on the *consistency* of outcome measures among published studies. In this regard, no two studies were alike in terms of their profile of posttreatment outcome assessment. However, all eight reviewed studies examined posttreatment IGD symptomatology, albeit with some variation in choice of assessment tool. The second most common indicators of therapeutic change were Internet gaming activity (Han et al., 2010, 2009; Kim et al., 2012; Shek et al., 2009; Su et al., 2011) and depression (Du et al. 2010; Han et al., 2010; Kim et al., 2012; Li & Wang, 2013; Shek et al., 2009), followed by anxiety (Du et al. 2010; Kim et al., 2012; Li & Wang, 2013; Shek et al., 2009).

Less common indicators of posttreatment outcome were also examined. IGD-related cognition (e.g., cognitive preoccupation with Internet games) was assessed in three studies (Kim, 2008; Li & Wang, 2013; Shek et al., 2009). Interestingly, this indicator was not assessed in two studies that employed a CBT-based intervention (Du et al. 2010; Kim, Han, Lee, & Renshaw, 2012). However, this limitation may reflect the current lack of knowledge of problem cognitions associated with IGD (see Delfabbro & King, 2014). Although all eight studies have conceptualized IGD as a type of "addiction" (i.e., maladaptive gaming behavior characterized by physiological withdrawal and tolerance, and resulting in significant conflict or harm), only one study had assessed physical symptoms of craving (Han et al., 2010).

None of the reviewed studies assessed qualitative changes in diagnostic status (i.e., movement from one category of diagnosis to another) after treatment. Similarly, neurovegetative symptoms (i.e., diet, sleep) and engagement in nongaming leisure activities (i.e., criterion E of IGD) were not assessed in any of the eight studies. Although Han et al., (2010) assessed concurrent substance use at intake, they did not assess this indicator after an intervention. This suggests a gap in current knowledge as to how individuals treated for IGD manage a significant increase in available time that was previously devoted to Internet gaming. For example, Kim et al., (2012) reported that, at posttreatment, participants' mean Internet gaming per week had decreased from about 60 hours to 18 hours. In practical terms, this amount of time may be considered equivalent to the time commitment of a full-time job. It is not known whether participants had subsequently reengaged in former work or schooling activities at a higher level, or had substituted Internet gaming with a functionally equivalent maladaptive behavior.

## Recovery and Relapse

Table 3 presents a summary of the follow-up treatment outcomes reported in reviewed studies. As noted in the Introduction, a common limitation of past research (see Winkler et al., 2013) is the lack of a follow-up assessment. Only three of the eight studies (Du et al., 2010; Kim et al., 2012; Su et al., 2011) included a follow-up stage. Follow-up periods were 1 month (Kim et al., 2012; Su et al., 2011) and 6 months (Du et al., 2010). Notably, these three studies all employed psychological interventions, with one study (Kim et al., 2012) that examined the additive effect of psychotherapy for a drug-based intervention. Hence, there have been no controlled studies to assess the long-term efficacy of pharmacological interventions for IGD.

Psychometric indicators of recovery and relapse were assessed. IGD recovery was defined in the following ways: (a) a qualitative change in diagnostic status at follow-up indicative of improved mental health (i.e., change from "addicted" status to a "normal" or similar low-risk category); (b) a reduction in severity of IGD symptoms at follow-up, irrespective of actual diagnostic status; and (c) a reduction in frequency of IG behavior at follow-up. A caveat of this analysis was the short duration of the follow-up stage within studies. Follow-up assessment involved measurement of severity of IGD symptoms, which occurred in all three studies.

Two studies (Kim et al., 2012; Su et al., 2011) also examined IG behavior. Mean differences in IGD symptoms and behavior measures from baseline to follow-up were assessed using paired samples *t* tests in all three studies (Du et al., 2010; Kim et al., 2012; Su et al., 2011). However, effect sizes were reported only in Du et al., (2010). None of the three studies reported qualitative (i.e., clinically meaningful) changes in diagnostic status. Therefore, there was no clear indication of how many participants exited therapy no longer meeting the criteria for IGD. However, based on the reported methodology in these studies (Du et al., 2010; Kim et al., 2012; Su et al., 2011), it would have been possible for authors to measure and report any change in diagnostic status at follow-up. Thus, this information was an omission in reporting, not a limitations of study design.

Relapse was defined as the recurrence of previously absent symptoms, or the deterioration of symptoms to a former worse state. Given the above-noted limitations in studies' assessment of recovery (i.e., lack of measurement of diagnostic change), it was difficult to determine whether any participants had experienced relapse. The DSM-5 IGD classification specifies that IGD symptoms must be present for a period of 12 months to qualify for a diagnosis. Accordingly, the length of follow-up in all three studies (Du et al., 2010; Kim et al., 2012; Su et al., 2011) was inadequate for the purpose of tracking the progression and potential re-emergence of IGD. It may nevertheless be possible to use available data to assess the recurrence of IGD symptoms, within the caveat of a short timeframe. Overall, the IGD treatment literature is limited by the lack of data and reporting on relapse rates among treatment-seeking individuals with IGD. It is not clear which *specific* symptoms of IGD may change, and to what degree of magnitude, after intervention.

## Discussion

IGD is a tentative disorder currently positioned in the appendix of the DSM-5. Accordingly, IGD research evidence is only in its infancy and may require several years, and perhaps decades, to develop robust findings in regard to treatment. This systematic review was intended to provide an authoritative statement on the IGD literature in relation to its current definitions of diagnosis and treatment outcome. The main findings of this review were as follows: (a) only two treatment studies have employed an equivalent method of diagnosis for IGD, (b) studies have not assessed formative change in diagnostic status at posttreatment or follow-up, (c) the majority of studies do not include a follow-up assessment, (d) duration of follow-up has been inadequate to assess IGD recovery and relapse, and (e) the range of posttreatment assessment indicators has been predominantly limited to IGD symptomatology and behavioral measures of gaming behavior.

The strengths of the extant literature include its good coverage of IGD criteria during intake assessment, a strong focus on adolescent populations, and a wide variety of interventions. In summary, available evidence is insufficient to warrant suggestion that trialled IGD interventions of any kind confer a long-term therapeutic benefit.

## Conceptualization and Assessment

An examination of methods of diagnosis in the reviewed studies suggests that there is a reasonable degree of consistency between current IGD measures and the DSM-5 category. Although publication dates of the treatment literature have preceded the DSM-5, available studies have a high "goodness of fit" with the formalized IGD classification. However, clinical conceptualization of IGD remains an issue of debate. The IGD classification in the DSM-5 may only be a temporary definition of the disorder. It is possible that this classification will be revised in future editions, and the relevance of past studies should be reconsidered in this event.

Of particular note, some authors have questioned the validity of the addiction model in relation to Internet gaming behavior, and typically cite a lack of empirical support or theoretical justification for its application. For example, researchers have challenged the validity of *preoccupation* (Charlton & Danforth, 2007) as well as *tolerance* (Starcevic, 2013; Wood, 2008; Shaffer, Hall, & Vander Bilt, 2000). "Computer addiction": A critical consideration. American Journal of Orthopsychiatry, 70, 162-1682000) as defining features of IGD. Alternative formulations developed by Davis (2001) and Caplan (2010) have eschewed traditional addiction models (e.g., the *components* model; Griffiths, 2005) in favor of cognitive-behavioral models, and they have proposed that pathological Internet use results from maladaptive cognitions such as a preference for online social interaction. Similarly, Delfabbro and King (2014) have proposed that excessive Internet gaming may result from maladaptive core beliefs about the nature of video-gaming rewards, activities, and identities. In this developing field, clinicians should reasonably expect some future changes to diagnosis, with associated consequences for appraising the extant treatment literature on the disorder.

## Treatment Efficacy

The quality of IGD treatment studies has been critically examined previously (King et al., 2011). In considering overall treatment efficacy, there remains a need to assess the merits of individual studies prior to aggregation of findings. This review offers a critical perspective on findings presented in Winkler et al.'s (2013) meta-analysis of Internet addiction treatment. As noted previously, Winkler et al., reported that treatment effect size estimates suggested Internet addiction interventions were "highly effective" at reducing primary symptoms, Internet gaming frequency, and comorbid depression and anxiety. Although Winker et al.'s review included a relatively larger number of studies ($N = 16$) due to its focus on general Internet use, our results would appear to challenge the assertion that treatment effect sizes were "high, robust, unrelated to study quality or design, and maintained at follow-up" (p. 317), at least in regard to Internet gaming-related disorder. Given that IGD studies have not assessed formative changes in diagnostic status, and that very few studies have employed a follow-up assessment, it may be premature to suggest that any particular intervention has strong empirical support.

Another issue is that current outcome measures tend to target IGD symptomatology and gaming behavior. An expanded focus on other areas of treatment outcome in future studies may identify other areas of benefit and provide a better understanding of factors associated with recovery in successful trials.

## Pharmacological Treatment

This review's findings suggest critical consideration of prescription of medication for IGD. Three reviewed studies (Han et al., 2010, 2009; Kim et al., 2012) employed either bupropion or methylphenidate for treatment of IGD among adolescents. Winkler et al. (2013) conducted a comparative analysis of psychological and pharmacological treatments and reported that there

were no significant differences in terms of their efficacy in improving Internet addiction symptoms and decreasing time spent online. This finding could be interpreted as an endorsement of pharmacological treatments. Practitioners may therefore perceive medication as the preferential treatment option given the relatively lower associated time and expense as compared to psychotherapy. However, this review indicates that no controlled studies have assessed the long-term efficacy (i.e., therapeutic benefit beyond the postintervention stage) of pharmacological interventions for IGD. It also remains unclear what range and severity of IGD symptoms may require and benefit greatly from medication, which may be the subject of inquiry in future pharmacological treatment studies.

Given that few studies have assessed posttreatment outcomes with inclusion of a range of psychosocial indicators, it is not known whether medication confers any benefits in these areas of life. Such studies do not appear to consider the potential adverse effects of medication for treatment of Internet addiction (King et al., 2011), particularly for methylphenidate. Han et al. (2009) reported that 32 of their 62 adolescent patients ceased methylphenidate treatment during the study due to psychiatric or medical problems (e.g., nausea, insomnia, poor appetite). In studies by Han et al. (2010) and Kim et al. (2012), a total of 3 out of 54 participants on bupropion withdrew from the study due to adverse effects. Further IGD studies employing medication, particularly studies employing adult samples, are needed to develop guidelines in this area.

## Treatment Goals

The stated goal of treatment in all reviewed studies was the achievement of controlled use of Internet gaming. This may reflect an assumption that Internet gaming is not harmful at all levels of use and may be part of a normal healthy lifestyle if used in moderation. In the reviewed studies, the most common posttreatment outcome measure was IGD symptomatology. The absence of IGD symptoms, particularly criterion D (loss of control) and criterion F (continued use despite harm), would arguably provide a useful indication of whether an individual has gained control over their Internet gaming. However, it would be difficult to assess treatment outcome in this way among participants who do not endorse these specific criteria. First, this raises a conceptualization dilemma: Is it possible for individuals who do not report loss of control to be accurately classified with IGD? One answer is purely nomenclatural: The current DSM-5 classification does not require loss of control for diagnosis.

However, from an addictions perspective (West, 2006), volitional harmful behavior would not necessarily fit within the paradigm of addictive behavior and may be better understood as a maladaptive coping strategy. Therefore, it may be proposed that individuals classified with IGD without loss of control might differ significantly from those who do endorse this criterion. On this reasoning, goals of treatment could perhaps be tailored specifically for each group. Although beyond the scope of this review to examine in detail, such issues are important in considering treatment outcomes. With uncertainty regarding the conceptual fit of IGD criteria to clinical presentations, it may in some cases be more helpful for clinicians to employ frequency of Internet gaming as a simpler and more objective target of change. Examples of behavior-based outcomes in treatment of other excessive behaviors include weight gain in anorexia nervosa, or number of cigarettes for nicotine addiction. Measuring Internet gaming may be particularly useful in therapy with individuals who lack insight, or deny the severity of IGD symptomatology.

## Improving Methodology

The results of this review suggest several methodological improvements to future treatment studies of IGD. As noted by King et al. (2011), there remains a need for clinical research studies to employ control groups, as well as more precise estimates of treatment effects by including estimates of effect size and confidence intervals. This review suggests that current data on IGD treatment may be too preliminary to support widespread dissemination of treatment techniques employed in clinical studies. It is suggested that future studies would be improved by: (a) the inclusion of a detailed follow-up assessment of 3 to 6 months and optimally 12 months; (b) an

assessment of rates of recovery and relapse; (c) examination of formative change in diagnosis from baseline to follow-up; (d) broader assessment of treatment outcomes, including quality of life measures as well as measures of cognitive change in studies employing CBT; (e) an investigation of participants' longer term psychosocial adjustment to sudden decreases in Internet gaming; and (f) increased adherence to the CONSORT statement.

There is also a need for more clinical studies employing adult samples, given that the average age of Internet gamers exceeds 30 years in industrialized Western countries (Brand, 2012; Ipsos MediaCT, 2013). Adults may be more likely to seek and engage in treatment and report greater motivation to change than adolescents (Melnick, Leon, Hawke, Jainchill, & Kressel, 1997).

### Limitations of the Review

This review should be considered in light of its limitations. First, the limited extant literature on IGD treatment predates the DSM-5 classification, and therefore some discrepancies in diagnostic parameters should be expected. Second, the number of reviewed studies was fairly representative but relatively small, which makes it difficult to draw out any specific or definitive trends in reporting of interventions. As more data become available, there is a possibility that identified weaknesses of studies evaluated here may be addressed. Third, this review was intended to be as inclusive as possible, but clinical case report studies (e.g., Allison, von Wahlde, Shockley, & Gabbard, 2006) and studies of problematic Internet use without direct reference to Internet gaming (e.g., Caplan, 2010) were not included, which may have excluded some important information regarding definitions of diagnosis and treatment outcome.

Another limitation of this review is that it was primarily concerned with IGD definitions and their consistency across studies, and therefore did not critically assess weight of evidence (e.g., effect sizes; see Winkler et al., 2013 for a review). Finally, it should be noted that the databases used to identify reviewed studies may not have identified studies published in non-English journals, such as South Korea and China, although this is a common limitation of reviews (King, Haagmsa, et al., 2013).

## Conclusion

IGD is a condition in need of further clinical trials to develop a larger treatment evidence base. Previous reviews (Lortie & Guitton, 2013; King et al., 2011; King, Haagmsa, et al., 2013) have highlighted that the extant literature is characterized by inconsistences in assessment, as well as a lack of CONSORT adherence. The inclusion of IGD in the appendix of the DSM-5 is a positive step toward ensuring consistency in future quantitative and clinical studies. Such investigations afford new opportunities to evaluate alternative perspectives and conceptual models of the disorder, as well as improve methods of assessing treatment outcome. Although the disorder remains positioned as most similar in nature to an addictive disorder such as pathological gambling, it is possible that future changes to the diagnosis may occur.

This review highlights a particular need for clinical studies that employ a range of outcome measures at follow-up to identify IGD interventions that may confer a long-term therapeutic benefit. Such refinements to study design will aid in developing guidelines for best practice for IGD and, perhaps ultimately, greater recognition of IGD as a legitimate disorder.

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