Epidemiological evidence and potential interventions for problematic gaming:

A behavioral addiction perspective

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DECLARATIONS

I hereby certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

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ABSTRACT

This dissertation examines the phenomenon of problematic video gaming and gaming disorder (GD), with a focus on evidence related to epidemiology and interventions. Six research undertakings, including systematic reviews and empirical studies, are presented in this work. Summaries, key outcomes, and findings for each paper are detailed below.

Paper 1 presents a systematic review and meta-analysis of 53 studies of GD prevalence and reported a global prevalence rate of 3%. When considering only studies with non-convenience sampling, the prevalence rate was less than 2%. Males were 2.5 times more likely to have GD than females, and higher prevalence rates were found in studies employing adolescent, male-only samples, and less stringent cut-off criteria. The findings highlighted the need for more rigorous and standardized approaches to epidemiological research.

Paper 2 presents a systematic review of 10 cognitive-behavioral therapy (CBT) studies for problematic gaming. The most common components were psychoeducation, behavior therapy techniques, skill development, and relapse prevention. The least common and most underdeveloped components were cognitive therapy. No treatment program provided a 'complete' protocol. The review highlighted the need for a greater understanding of the mechanisms of GD and for more detailed treatment resources.

Paper 3 presents a systematic review and meta-analysis of 12 CBT interventions for problematic gaming. In the short-term, CBT demonstrated high efficacy in reducing GD symptoms and depression; and moderate efficacy in reducing anxiety. However, there was insufficient power to determine whether CBT was effective in reducing overall gaming time. CBT was also more effective in reducing GD and anxiety symptoms in adults, compared with adolescents, but evidence for long term effectiveness was not found. The review highlighted the lack of standardized assessment and treatment practices for GD, and the need for prevention approaches, particularly for adolescents.

Paper 4 presents an international survey of 992 gamers that assessed attitudes towards prevention for problematic gaming, as well as the role of self-efficacy and help-seeking in support for GD prevention. Gamers generally expressed more support for primary and some secondary measures, and less support for tertiary measures. Primary and secondary approaches to prevention were more likely to be favored by younger, female, and less frequent gamers. However, contrary to expectations, self-efficacy was not found to predict prevention support. These findings suggest that a significant proportion of problematic gamers may not engage with treatment options but might benefit from alternative preventative approaches.

Paper 5 presents a qualitative investigation of problem gaming and GD prevention and its potential barriers. Three key categories were identified: problem gaming recognition, prevention in practice, and social responsibility. Each category included three separate subcategories. Gamers favored self-directed, rather than imposed or mandatory approaches; and were supportive of the inclusion of responsibility features and the removal of predatory features. Some gamers were skeptical of the concept of problem gaming and expressed concerns about the motives from the gaming industry and government. Overall, this study highlighted the value of recruiting regular and problem gamers as stakeholders to provide insights into prevention for problem gaming.

Paper 6 presents an evaluation of a brief, school-based educational program which aimed to educate adolescents about problematic gaming. The program consisted of three 45-minute sessions delivered to a group of 12 students at a local secondary school. After completion, participants reported fewer GD symptoms, less gaming time, decreased psychological distress and gaming-related motivations. Participants reported that they were able to identify symptoms and indicators of problematic gaming and expressed understanding of primary and secondary prevention approaches. The program demonstrated that regular gamers appeared to benefit from critical discussion and self-reflection on problematic gaming and related issues (e.g., the influence of predatory game mechanics).

In summary, the work presented in this dissertation provides a critical examination of several problematic gaming topics germane to public health and clinical psychology. This work includes new insights into the evidence on the distribution of GD globally; the nature and efficacy of psychotherapy treatment; and the support for interventions. This research also demonstrated the feasibility of a brief intervention for adolescent problematic gamers. This work provides a foundation for further research projects in this rapidly developing field.

PUBLICATIONS

1. Stevens, M. W. R., King, D. L., Dorstyn, D., & Delfabbro, P. H. (2019). Cognitive–behavioral therapy for Internet gaming disorder: A systematic review and meta-analysis. *Clinical psychology & psychotherapy*, *26*(2), 191-203
2. Stevens, M. W. R., Delfabbro, P. H., Dorstyn, D., & King, D. L. (2020). Global prevalence of gaming disorder: A systematic review and meta-analysis. *Australian and New Zealand Journal of Psychiatry*, 0004867420962851
3. Stevens, M. W. R., Delfabbro, P. H., & King, D. L. (2021a). Prevention strategies to address problematic gaming: An evaluation of strategy support among habitual and problem gamers. *Journal of Primary Prevention.*
4. Stevens, M. W. R., Delfabbro, P. H., & King, D. L. (2021b). Prevention approaches to address problematic gaming: A large-scale qualitative investigation. *Computers in Human Behavior, 115,* 106611.

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SECTION I

THEORY AND CONCEPTS

CHAPTER 1

LITERATURE REVIEW

LITERATURE REVIEW

Background

Video gaming is among the most popular and widely used digital activities today. According to Newzoo (2020), 2.69 billion individuals globally play video games; a figure that is projected to increase to 3.1 billion by 2023 (Statista, 2020). In Australia alone, it is estimated that 67% of the population play interactive games (Brand et al., 2017), of which 46% are female. Newzoo (2020) report that the global gaming industry's revenue is more than $150bn ($USD) and projected to exceed $200bn by 2023.

A major driver of the growing popularity of gaming has been the diversity of interactive games. In the 1980s and 1990s, games were often designed by male developers with the aim of appealing to male, and usually adolescent, consumers; for example, by including hyper-sexualized depictions of women, and fantastic and violent themes (Kuss & Griffiths, 2012; Lopéz-Fernandez, Williams, & Kuss, 2019; Lynch et al., 2016). The profile of game developers and games has changed dramatically since this time. For example, as of 2019 in the UK, 30% of employees in the gaming sector identify as non-male; 10% are non-white, and 21% identify as LGBTQ+ (Taylor, 2020). Among other innovations in games that broaden their appeal, some game developers are promoting greater diversity in representation of gender (e.g., leading female and LGBTQ+ and ethnic minority characters) in their games.

Another important reason for the popularity of gaming relates to the positive benefits of play (Granic et al., 2014; Kovess-Masfety et al., 2016), including relief of boredom and stress. Playing video games is associated with changes in cognitive and emotional capacities, particularly in older adults, including improved reaction time (Clark et al., 1987) and cognitive flexibility (Stern et al., 2011); and enhancements in visuospatial working memory, visuospatial learning, and focused attention (Peretz et al., 2011). Video games have been shown to improve emotional responses to situations (Ryan et al., 2006; Russoniello et al., 2009; McGonigal, 2011); and improve self-regulation (Gabbiadini & Greitemeyer, 2017). In fact, clinicians and other health practitioners are incorporating video games into health and

wellness programs. These include psychotherapy (e.g., virtual reality-based exposure therapy), disease self-management, health education, distraction from discomfort, increased physical activity and skills training for clinicians (Primack et al., 2012). In their review of 38 eligible studies, Primack et al. (2012) reported that 69% of psychotherapy outcomes, 59% of physical therapy outcomes, 50% of physical activity outcomes were enhanced by video gaming. Thus, video games can provide enrichment to the lives of many, including within clinical settings for individuals managing various health conditions.

Despite the positive benefits of gaming, there is a small but significant proportion of the population who experience negative consequences of excessive gaming. The following section will summarize some of the literature on the phenomenon of problematic gaming and its status as a new mental health disorder.

Clinical Epidemiological Perspectives

A Brief History of Definitions of Problematic Gaming

The addictive potential of digital technologies has been a topical area of research interest for decades. In fact, for as long as video games have existed, concerns among researchers and health professionals have been raised about the harmful effects of excessive gaming (see Anderson & Ford, 1986; Fisher, 1994; Soper & Miller, 1983). One of the earliest published proposals of internet use (including gaming) as a clinical disorder occurred in 1998, when Dr. Kimberly Young published a brief paper entitled “Internet addiction: Emergence of a new clinical disorder” (Young, 1998b). Similar reports by Young (1996, 1998b) and Griffiths (1996), and several other researchers, had recognized the possibility of harmful effects of excessive technology and computer use (see Dalal & Basu, 2016). Internet addiction was described as excessive or uncontrolled preoccupations, urges or behaviors regarding the use of the internet, leading to significant impairment or distress.

For many years, Internet addiction (IA) was an umbrella or parent term that included gaming as a subtype, and therefore problematic gaming and IA were often used

interchangeably in the literature. This conflation or overlap of IA and gaming-related problems was an issue which has been a limiting feature for research (Király, Griffiths, Urbán, et al., 2014; Kuss et al., 2017; Griffiths, 2018; Griffiths & Pontes, 2014). A review of epidemiological studies of IA by Kuss et al. (2014) found that IA was associated with several risk factors, including demographic characteristics (e.g., male gender, younger ages, and higher family income); internet use behaviors (e.g., time online, social media and gaming usage); psychological characteristics (e.g., impulsivity, emotion regulation, loneliness, neuroticism); and comorbid factors (e.g., depression and anxiety).

The concept of addiction to the Internet has been controversial. Particularly in the last decade, there has been strong debate about the appropriateness of the 'addictive' label. For example, one of the major criticisms of the concept of IA was that the disorder lacked specificity; the internet is simply a medium through which one might engage in problematic behaviors (Sim et al., 2012; Starcevic & Aboujaoude, 2017). As a result, researchers have argued that it may be more appropriate to focus on the individual applications and digital activities which individuals could engage in online (King, Delfabbro, Zwaans, et al., 2013).

In 2013, Internet gaming disorder (IGD) was included in the DSM-5 under section III as an 'Emerging measure or model'. In other words, IGD was listed as a condition that warranted further investigation (APA, 2013). Prior to the publication of the DSM-5 in 2013, there was debate as to whether IA should be included (Petry & O'Brien, 2013). Ultimately, the Substance Use Disorder Work Group recommended the inclusion of IGD instead of Internet use disorder, primarily given that gaming had been the focus of the majority of both clinical research interest, and treatment-seeking behavior until that point (Petry & O'Brien, 2013). IGD and gambling disorder shared very similar clinical descriptions and criteria; and these similarities attracted criticism (Kardefelt-Winther, 2014). Many of the arguments against the classification related to the applicability of the typical features of SUDs and gambling to gaming given the lack of evidence in support of the 'dose-effect' relationship or notion that time invested in gaming was similarly harmful to users as, for example, alcohol consumption or financial

investment in gambling. Thus, symptoms of IGD have been criticized, including withdrawal (Kaptsis et al., 2016); and tolerance (King, Herd, & Delfabbro, 2017, 2018; Király et al., 2015); and these symptoms have been considered normal in some gaming contexts (Aarseth et al., 2017; Dullur & Starcevic, 2018; Starcevic, 2017). Such debates led to a renewed focus of research to refine the criteria of problematic gaming.

In 2014, the World Health Organization (WHO) established an advisory group dedicated to understanding and identifying priorities for research into problematic gaming. Five years later, gaming disorder (GD) was included in the latest iteration of the ICD-11 (WHO, 2019). For the first time, GD became a recognized mental health condition. The WHO defines GD as loss of control over gaming, increasing priority given to gaming, and the continued use despite the knowledge of harm, associated with functional impairment for at least a 12-month period (WHO, 2019). Despite some disagreement among scholars as to the appropriateness and empirical base of gaming disorder (e.g., Aarseth et al., 2017; Dullur & Starcevic, 2017; Kardefelt-Winther, 2015; Ferguson & Colwell, 2018; Przybylski & Weinstein, 2017; van Rooij et al., 2018) there appears to be consensus among clinical researchers that problematic gaming can be clinically significant (Bányai et al., 2019; Billieux et al., 2019; Higuchi et al., 2017; King, Delfabbro, Potenza, et al., 2018, 2019; King, Herd, & Delfabbro, 2018; King & Gaming Industry Response Consortium, 2018; Potenza, 2018; Rumpf et al., 2018; Saunders et al., 2017).

Problematic gaming is recognized as a spectrum of harmful behaviors, including gaming that does not include all the characteristics of gaming disorder. In the ICD-11, this spectrum of gaming-related harm is recognized in part by the classification of Hazardous gaming (HG) which refers to gaming behavior that increases the risk of negative consequences (WHO, 2019). Hazardous gaming is broad but less severe, and may not involve impaired control. The umbrella term problematic gaming is sometimes used in the literature to cover both categories (see Baggio et al., 2018; Király, Griffiths, Urbán, et al., 2014; Tiego et al., 2019). Problematic gaming represents any habitual gaming behavior that places an individual, or others, at risk of

(present or future) harm. The present thesis will adopt the term problematic gaming to refer inclusively to hazardous and disordered types of gaming.

Etiology

Understanding the causes of problematic gaming, and its psychosocial and behavioral correlates, is important to accurately predict and respond to these problems. Problematic gaming represents one extreme of the spectrum of risky gaming behavior, and is associated with a number of negative outcomes, including: cessation of hobbies or other leisure activities, social isolation, poor sleep hygiene, poor academic or work performance, unpleasant mood (irritability, aggression), family conflicts, low self-esteem, and low daily life satisfaction (Achab et al., 2011; Higuchi et al., 2017; King & Delfabbro, 2014; Mihara et al., 2016; Rehbein et al., 2010; Torres-Rodríguez et al., 2018). Although all individuals with problematic gaming tendencies are likely to experience social, emotional, and/or health related harms associated with their gaming, it appears that adolescents are at an increased risk of developing problematic gaming than adults (King, Delfabbro, Zwaans, et al., 2013; Kuss & Griffiths, 2012a; Mak et al., 2014; Müller et al., 2015). Cognitive processing models suggest that adolescents have not yet fully reached developmental brain maturation and therefore have several underdeveloped cognitive capacities, including logical reasoning, risk/reward processing, and emotion regulation (Glicksohn et al., 2018; Gross, 2001; Pine et al., 1997; Silveri et al., 2004; Steinberg, 2004; Zimmerman & Iwanski, 2014). Adolescents also typically have poorer impulse control and self-regulatory behaviors compared to adults, particularly in response to positive emotional cues (Casey & Caudle, 2013). Since adolescence is often a time of emotional turmoil, and associated with increased morbidity, riskier sexual activity, and drug and alcohol use (Jacobsen et al., 2002); it is unsurprising that some adolescents may turn to gaming as a means for coping with stress (Plante, 2019). For these reasons, researchers sometimes focus on adolescent populations when investigating various treatment and prevention programs (Sugaya et al., 2019).

Male gender is also an important risk factor for the development of problematic gaming (Fam, 2018; Mihara & Higuchi, 2017; Saunders et al., 2017; Sugaya et al., 2019). Evidence suggests that males may engage in longer gaming sessions (Desai et al., 2010); have higher craving-related responses to gaming cues (Dong et al., 2018); and may be more sensitive to reward and less sensitive to loss (Zhang, 2020) than compared to females. However, recent epidemiological research has demonstrated that problematic gaming is also common among females, and should not go unconsidered (Fam, 2018; King, Delfabbro, Perales, et al., 2019), leading to calls from researchers to better attempt to understand female problematic gaming (King & Potenza, 2020; Lopéz-Fernandez, Williams, Griffiths et al., 2019).

Aside from demographic characteristics associated with problematic gaming, individuals with comorbid psychiatric disorders are also at an increased risk of problems (King, Delfabbro, Zwaans, et al., 2013). A review of 24 studies by González-Bueso et al. (2018) found that gaming disorder was significantly associated with anxiety (92% of studies) and depression (89%); as well as ADHD (85%), social phobia (75%) and OCD (75%). Some researchers have suggested that underlying comorbid anxiety or depression might explain problematic gaming, and therefore GD should not constitute a clinical disorder (Kardefelt-Winther, 2017; van Rooij et al., 2018). In any case, individuals develop problematic relationships with gaming; either as a result from – or resulting in – the use of video gaming as a primary coping strategy.

Prevalence

A primary component of clinical epidemiological research is identifying the distribution (i.e., prevalence), or the proportion of individuals who experience a given condition at a given time period. Globally, the prevalence of problematic gaming has been difficult to determine. In 2017, Feng et al. conducted a systematic review of 27 studies and reported that the prevalence of gaming disorder was between 0.7% and 15.6% among school-aged children. The authors argued that, between 1998 and 2016, the average prevalence did not appear to have increased. A major limitation of Feng et al.'s (2017) review was that the authors did not

conduct subgroup analyses to identify potential sources of bias. Fam (2018) conducted a meta-analysis of 16 studies and found the prevalence was 4.6%, a rate that appears relatively high, although reached with greater precision than Feng et al. (2017). Fam (2018) did, however, conduct subgroup analyses, and found the rate of GD among males to be 6.8%, and that estimates were higher among older (pre-2000) studies with smaller (N<1000) samples conducted in Asia and for studies which employed measurement adapted from DSM pathological gambling criteria. Another review by Mihara and Higuchi (2017) of 50 studies reported rates between 0.7% and 27.5%. Similar to Feng et al.'s (2017) review, the estimated range determined by Mihara and Higuchi (2017) was very wide and attracts scrutiny of its accuracy.

The reason that prevalence estimates reported in recent years have been so varied is two-fold. Firstly, there has been a paucity of rigorous, well designed studies (Mihara & Higuchi, 2017). For instance, a large number of studies have employed convenience sampling rather than approaches that yield a representative sample (King et al., 2020). Secondly, there has been a lack of stringent approach to assessment, with many studies deploying checklists with low cut-off scores and inadequate symptom coverage (King, Billieux, Carragher, et al., 2020; Mihara & Higuchi, 2017). Studies have tended to include more vulnerable population samples (e.g., adolescent males), combined with low cut-off scores, potentially mis-categorizing engaged gamers as problem gamers, which has had the effect of inflating prevalence estimates.

Given reported prevalence estimates may be imprecise, it is therefore important to determine whether previous estimates are accurate and whether rates may be affected by potential sources of bias. It may be useful, too, to compare prevalence rates with rates for comparable disorders. While there are a number of clinical differences between gambling and video gaming, gaming disorder is considered a behavioral addiction, and therefore the first comparisons of prevalence may be to gambling (i.e., another widely accessible recreational activity and the other recognized behavioral addiction). Recently, the worldwide prevalence of gambling was estimated to be between 0.1% and 5.8% (Calado & Griffiths, 2016).

However, more conservative estimates have suggested rates of less than 1% (Dowling et al., 2015).

Aside from gambling, the prevalence rate of problematic gaming can also be compared to the prevalence of other addictive and substance use disorders (SUDs) including alcohol, smoking, and opiates. In a review of 28 nationally representative studies, Degenhardt et al. (2017) found the prevalence of SUDs was 2.6%. As an aside, comparing video games to SUD (and gambling for that matter) can be controversial, and can sometimes lead to discussions of moral panics and pathologizing everyday behaviors (see Markey & Ferguson, 2017a). Overall, prevalence rates of 2-3% have been found in recent, large-scale prevalence studies of GD (Przybylski et al., 2017), providing further evidence that GD prevalence is often inflated.

Another disorder that may resemble the behavioral characteristics of GD is obsessive-compulsive disorder (OCD). In OCD, individuals experience strong urges to engage in a behavior (the compulsion) in order to address an anxiety or fear about another issue (the obsession). Individuals with OCD might fear getting sick from germs (obsession) and are driven to wash their hands repeatedly (compulsion). In the context of gaming disorder, individuals with GD play to relieve aversive states (that are subsequently reinforced due to the increased level of gaming). The prevalence of OCD is estimated to fall between 0.6% and 3.5% (Crino et al., 2005; Kessler et al., 2005; Ruscio et al., 2010), and therefore presents a useful comparison for GD.

Given the similarities between gaming and other addictive and impulse control disorders, it may be expected that the prevalence of GD should fall within a similar range (e.g., between 1-3%). Clearly however, there are a number of challenges in establishing a reliable prevalence estimate for GD (Fam, 2018; Feng et al., 2017; Mihara & Higuchi, 2017). Determining a reliable estimate of prevalence is therefore a necessary step in guiding decision-making on public health interventions. Furthermore, understanding the prevalence of GD may provide useful insight into etiology and risk factors (Mihara & Higuchi, 2017) and may help to identify individuals with GD compared to less-severe forms (e.g., Hazardous gaming). Thus, the first

objective for this thesis will be to address these limitations to determine a reliable estimate of the global prevalence of gaming disorder.

Public Health Perspectives

Adopting a Public Health Approach

Public health approaches to problem gaming are becoming increasingly common. In public health models, screening and assessment presents the first line of interaction between clinicians and problematic gamers. One of the challenges with current approaches to screening, however, is that some measures may contain items that refer to behaviors normal in the context of gaming, and therefore may not necessarily distinguish between cases of GD and high engagement (King, Billieux, Carragher, et al., 2020). Better assessment can support a 'tailored care' approach (e.g., matching problem severity to intervention intensity). For example, individuals with recognized GD are likely to require specialized treatment, whereas individuals with hazardous gaming may be better suited to preventative approaches.

In public health, the SBIRT model (Screening, Brief Intervention, Referral to Treatment) (Babor et al., 2007) has been a useful paradigm. Under the SBIRT model, individuals are screened for problems using a standardized assessment, and administered a brief intervention where necessary (e.g., scoring above threshold levels) (Knight et al., 2002, 2003; Reinert & Allen, 2007). If scores on the screening assessment exceed an established threshold (i.e., indicative of disorder) individuals are referred to specialized treatment after the intervention. Systematic reviews of SBIRT in primary healthcare settings have demonstrated their efficacy in reducing the severity of problematic substance usage (McCambridge & Strang, 2004), including for alcohol, tobacco, and illicit substances (Carey et al., 2007; Kaner et al., 2018). Additionally, recent evidence suggests that SBIRT may be efficacious in reducing problem gambling behaviors (Quilty et al., 2019).

Despite evidence in support of SBIRT for both behavioral and substance-based addictions, the research into the effectiveness of SBIRT (or equivalent models) is still in its

infancy (Park et al., 2020). The primary issue is that currently, there is a lack of standardization across all components of the model. For example, while there are several diagnostic and symptom screens now available to clinicians, the variability in recommended cut-off for each given measure means that clinicians may vary in their determination of risk profile for each individual (King, Billieux, Carragher, et al., 2020). Similarly, as yet, there are no standardized brief interventions for individuals with hazardous gaming symptoms, and equally there are no standardized prevention or treatment practices for problematic gaming (King, Chamberlain, Carragher, et al., 2020). As a result, first-line health practitioners may struggle to diagnose, intervene, and find specialist clinicians to refer clients with more problematic cases. Ultimately, clinicians would benefit from standardized approaches to screening, preventing, and treating problematic gaming (King, Chamberlain, Carragher, et al., 2020). Thus, the second objective of this thesis will be to address the need for standardized treatment protocols, by synthesizing the available information on interventions to provide clinicians with a more accurate picture of what treatments currently exist.

Approaches to Treatment

For more severe cases of problem gaming, treatment is often required – as with gambling and substance-based addictions and other related disorders (e.g., OCD). Internationally, there has been growing demand for treatment for problematic gaming and other internet-based disorders (Nakayama & Higuchi, 2015). However, at present, relatively few individuals seek out treatment for gaming disorder (Feng et al., 2017; Rumpf et al., 2018), in part due to the scarcity of treatment options. The substantial demand for treatment problematic gaming (Nakayama & Higuchi, 2015); combined with the limited standardized treatment guidelines available, and the inconsistencies with classification and measurement of GD (King, Haagsma, Delfabbro, et al., 2013; Rodda et al., 2018); has led to uncertainty and inconsistency in treatment. For example, a survey by Dullur and Hay (2017) of 289 psychiatrists found that 43% lacked confidence in their ability to manage GD in their practice. Psychotherapy was the

most common approach, and most (75%) reportedly did not prescribe medication for problematic gaming. GD has been treated by a range of clinical and health-related practitioners using the same techniques (King et al., 2017), and therefore clinician training and expertise may be potential sources of heterogeneity in the treatment literature.

Despite the growing need for standardized approaches, there are still relatively few evidence-based treatment manuals (King, Wölfling, & Potenza, 2020; Zajac et al., 2017). In a systematic review of 26 treatment studies for internet addiction (including 13 IGD treatment studies), researchers found a lack of rigorous outcome studies, demonstrating limited overall effectiveness for any treatment modality (Zajac et al., 2017). King, Wölfling and Potenza (2020) provided recommendations for improving the quality of GD treatment studies, including: follow-up assessments of at least 6-months; clinical evaluations by trained professionals (e.g., psychiatrists or other clinicians); and improved assessment of treatment outcomes and underlying mechanisms. Although these recommendations might be considered a rudimentary part of high-quality research, it demonstrates that there is a paucity of basic, rigorous, and well-designed treatment research in the area.

Although there is a current lack of available high-quality treatment studies, there does appear to be some treatment approaches to problem gaming which have shown promise, including psychotherapy, pharmacology, and combined treatments (Kuss & Lopez-Fernandez, 2016; Wang, Ren, Long, et al., 2019). Common forms of psychotherapy for problematic gaming include cognitive-behavioral therapy (CBT); family therapy (FT) and motivational interviewing (MI). The goal of psychotherapy for problematic gaming is to help the individual to recognize problematic cycles of gaming, and to help devise strategies to either prevent their onset (e.g., through identifying antecedents, cues/triggers); or to cope better in aversive situations (e.g., emotion regulation, breathing training, problem solving skills). Often the goal is to help an individual to develop skills to manage the problem on their own, and to prevent or limit the severity of relapse.

Systematic reviews of treatment effectiveness (and meta-analyses in particular) play a vital role in informing best practice (Cook et al., 1997; NHMRC, 2009). The most recent meta-analysis of treatment for gaming disorder by Winkler et al. (2013) compared the effectiveness of 16 interventions (i.e., both pharmacological [n=3] and psychological [n=13]) for 'Internet addiction' (including gaming disorder). Comparisons from baseline to post-treatment indicated that both intervention types showed 'high effectiveness'; but CBT was considered the most effective treatment for reducing symptoms of depression and overall gaming time. One of the main limitations from Winkler et al. (2013) however, was that only 4 studies included a follow-up assessment. With this in mind, it is timely to re-evaluate the literature and the conclusions of Winkler et al. (2013). Thus, the third objective of this thesis will be to evaluate the effectiveness of psychological treatments for gaming disorder.

The Need for Prevention

In less serious cases of problematic gaming, or cases in which an individual has not met the threshold required for a diagnosis of GD (e.g., HG), prevention is often the primary goal. Therefore, prevention is quite often appropriately the focus of much research and policy making. Prevention represents an important avenue for the reduction of harm and burden of disease (i.e., morbidity) associated with addictive disorders, including substance (e.g., alcohol and tobacco) and behavioral disorders (e.g., gambling). While there has been an increase in research into various forms of treatment for gaming disorder, less research has focused on prevention and harm minimization approaches for less severe cases of problem gaming.

Prevention approaches generally aim to: (1) prevent or delay the onset of the problem behavior; (2) reduce the severity of the problem; and (3) improve psychological and emotional well-being in individuals to help them cope more effectively (Romano & Hage, 2000). Prevention approaches are comprised of three levels: primary, secondary, and tertiary. Primary prevention is built upon on the idea that all individuals of the general population, including healthy users, can benefit from certain interventions. For gaming, this includes education

campaigns, which promote awareness of the harms associated with problem gaming or adherence to moderate levels of use, and/or encourage healthy lifestyle behaviors related to diet and physical exercise (Vondráčková & Gabrhelik, 2016). In some cases, primary approaches can include recommendations about accessibility (e.g., removing devices from bedrooms; Xu et al., 2012). In Hong Kong, for example, the Wise-IT Use program has been employed widely to increase awareness of the potential harms of excessive gaming and to promote moderate use and engage in physical exercise (Chau et al., 2019).

Secondary prevention is targeted at more vulnerable individuals at-risk of problem gaming, including gamers showing GD symptoms, or those with comorbid mood disorders, low self-esteem lower social competence or who lack non-gaming interests (Yeun & Han, 2016). Examples of common secondary strategies include screening tools targeting younger gamers; legislature (e.g., shutdown laws) preventing younger gamers from playing at specific times; built-in lockout features (e.g., parental controls or limit-setting features in-game); and educational programs aimed at teaching protective skills, including stress and time management, self-regulation, and social skills. School-based educational programs have been developed and implemented widely in Asian regions. For example, Mun and Lee (2015) developed an 8-session educational program for vulnerable South Korean school children, based on empowerment and cognitive-behavioral principles, which reportedly reduced GD symptoms and improved self-regulation. Similarly, Walther et al. (2014) evaluated an educational program for 1843 students in Germany, which focused on self-regulation, self-monitoring, and positive gaming emotions, which was reported to successfully reduce problem gaming behaviors. Finally, the third level of approaches (tertiary strategies) are those intended for high-risk users, including those already engaged in problematic gaming. Tertiary strategies include support groups and therapy options (Fang et al., 2015; King, Wölfling, & Potenza, 2020; Liu et al., 2017). Common tertiary strategies include support groups, outpatient treatment centers, inpatient centers, and rehabilitation clinics. A number of reviews have

highlighted the effectiveness of various short-term treatment options for problematic gaming (King, Delfabbro, Wu, et al., 2017; Winkler et al., 2013; Zajac et al., 2017, 2020).

Preventative approaches represent the most viable option for reducing the harms associated with problematic gaming. Prevention programs are often preferred due to increased accessibility, reduced costs, and the promotion of self-efficacy. When aiming to evaluate whether preventative approaches may be effective, public health models, such as the Health Belief Model (HBM) are sometimes useful. The HBM suggest that behavior change for disease prevention relies on individuals' judgements or perceptions of barriers, benefits, self-efficacy, and threat (Becker, 1974; Champion & Skinner, 2008; Rosenstock, 1966, 1974; Rosenstock et al., 1988). In other words, effectively, individuals will undertake a cost-benefit analysis, by weighing the barriers of, and benefits to change; and judge one's own ability to affect change with the likelihood of experiencing future problems without change. The HBM has been shown to predict positive prevention behavior in several contexts, including gambling (Messerlain & Derevensky, 2005; Tong et al., 2019); drug and alcohol use (Bardsley & Beckman, 1988; Ilika et al., 2015; Portnoy, 1980); smoking cessation (Khazee-Pool et al., 2017; Rakhshani et al., 2010; Shafari-rad et al., 2007; Mantler, 2011; Upadhyay et al., 2019); and approaches to the prevention of other diseases including Hepatitis B (Khodaveisi et al., 2018), Hypertension (Yue et al., 2015), and even SARS-CoV-2 (Bakarat & Kasemy, 2020; Shahnazi et al., 2020).

One of the core features of the HBM is self-efficacy. Self-efficacy is the term used to describe the belief in one's utility in organizing and deploying certain actions necessary to achieve health-promoting behaviors. Under the HBM, improvements in an individual's feelings of self-efficacy may lead to increased engagement in behavior change (Bandura, 1977). Higher levels of self-efficacy have been shown to increase likelihood of smoking abstinence (Gwaltney et al., 2009) and reducing harmful substance use (Choi et al., 2013). Therefore, it may be expected that individuals with greater self-efficacy may be more inclined to support prevention strategies that promote more adaptive engagement with gaming

activities or reduce the risk of gaming-related harm. A related theory, Protection motivation theory (PMT; Rogers, 1983), argues that individuals are motivated to protect themselves from harmful situations or environments, by weighing up perceptions of four domains: problem severity, problem susceptibility, response efficacy and self-efficacy. In the context of gaming, individuals with problematic gaming may be more motivated to support prevention strategies that offer some protection from harm. Results from meta-analytic reviews have demonstrated the efficacy of PMT in predicting behavior change in a number of substance related contexts, including smoking cessation and alcohol consumption (Floyd et al., 2000; Milne et al., 2000).

A core feature of PMT is perceptions of problem severity. However, one issue that affects behavioral addictions research is that problems can sometimes be viewed as less severe in comparison to SUDs (Brand et al., 2020). Many activities regarded as recreational (e.g., social networking, shopping, eating, exercising) that are thought to have addictive potential are often viewed as trivial problems, given that the vast majority of individuals are able to engage in such behaviors in a healthy manner. This is particularly true for gaming (Colder Carras, Porter, van Rooij, et al., 2018; Thege et al., 2015). In their study, Colder Carras, Porter, van Rooij, et al. (2018) reported that regular gamers shared mixed views on the addictive potential of gaming. For example, respondents were more likely to agree that problematic gaming could involve continued use despite harm, unsuccessful attempts to quit, and loss of interest in other activities. However, typical addition markers, such as tolerance, withdrawal, and secrecy received much less support; an issue which has been raised previously (Kaptsis et al., 2016; King, Herd, & Delfabbro, 2017, 2018; Király et al., 2015). Additionally, Thege et al. (2015) surveyed 4000 participants about the perceived addiction liability and trajectory of various substances (alcohol, tobacco, marijuana, and cocaine) and behaviors (gambling, eating, shopping, sex, gaming, and work), and found that respondents tended to view behaviors as less addictive than substances and were also associated with character flaws (e.g., moral deficiencies). Although the results were somewhat mixed, problematic gaming was reportedly comparable in addictiveness to gambling, eating, alcohol and marijuana, but less addictive

than tobacco and cocaine. Ultimately, inconsistent ideas about the addictive potential of gaming and problem severity may affect the social acceptability and willingness for help-seeking.

The Role of Gamers in Prevention Research

Given the demographic diversity of the gaming population, it is clear that many individuals are likely to have unique insights into the effectiveness and utility of prevention approaches. However, investigations into preventative approaches to problematic gaming have typically sought to include the gaming population as participants, rather than key informants. Very few studies have included gamers as stakeholders in the development of useful prevention approaches (e.g., Colder Carras, et al., 2020; Colder Carras, Porter, van Rooij, et al., 2018). Park et al. (2020) surveyed 20 individuals seeking treatment for GD and reported a number of unique insights for improved GD healthcare by respondents, including valid and reliable screening, specialist practitioners with knowledge of GD, and evidence-based treatment approaches. Participants also supported the need for interventions that match problem severity with treatment severity; a key feature of the SBIRT framework. Currently, more work needs to be done to incorporate the insights of key insiders and stakeholders into findings. As such, there exists a need for research to extend beyond the focus on treatment for problematic gaming, into broader public health focused approaches.

The extent to which various prevention approaches may be deployed and implemented effectively across any population depends on a number of factors, including feasibility, access, and associated costs. One issue that has not received much research attention has been the potential role of the gaming industry in encouraging healthy or non-problematic gaming (van Rooij et al., 2010). Several researchers have argued that the gaming industry have a social responsibility to employ harm reduction strategies to reduce the likelihood and severity of problematic gaming (King & Gaming Industry Response Consortium, 2018; Kuss, 2018; Griffiths & Pontes, 2019; Derevensky & Richard, 2019; Shi et al., 2020). A current gap in

prevention research is the nature of the gaming community's attitudes and beliefs about, and support for, prevention approaches to problematic gaming, and their attitudes towards the role that the gaming industry should be taking in order to minimize harm. Thus, the fourth objective of this thesis will be to assess the level of support, using gamers as stakeholders, for preventative approaches to problematic gaming, and crucially, whether there are any demographic or psychological predictors, such as self-efficacy, which may affect level of prevention support. In addition, the fifth objective of this thesis will also be to assess whether there is anything to be learnt from current approaches to prevention and treatment, and whether any findings can be successfully and feasibly harnessed in newer programs.

Research Questions

The harmful consequences of problematic gaming represent a vital area of understanding for researchers, clinicians, and policymakers. It has become clear that improvements in public health research areas for problematic gaming are needed, to improve the health and clinical outcomes for individuals at risk. However, while there have been a number of high-quality studies and reviews in the area, there are still several important challenges in areas including screening, assessment, prevention, and treatment. This literature review highlights several key areas and research limitations. The aim of the present thesis is to attempt to address some of these limitations to inform public health policy for problematic gaming. Specifically, the following research questions are presented:

- How common and widespread is problematic video gaming and how do prevalence rates differ throughout the world? What other factors play a role in influencing the variability of prevalence rates?
- What is the nature of current psychological treatments for problematic gaming? Are there common features or similarities with treatment for other 'addictive' disorders?
- How effective are psychological treatments for problematic gaming? Is there any evidence for long-term success?

- Are there any preventative approaches to problematic gaming that might be supported by gamers? Do demographic or psychological predictors, such as self-efficacy or previous help-seeking, affect level of prevention support?
- What can be learnt from current prevention and treatment approaches to GD? What can be improved on?

Summary of Research Aims

The present research aims to generate knowledge that will lead to improved public health outcomes for individuals with problematic gaming. The focus of this work is in areas of prevalence, prevention, and treatment for problematic gaming. The first aim of this thesis will be to determine the global prevalence of gaming disorder worldwide, while addressing some of the key limitations of previous reviews, such as accounting for convenience sampling. Secondly, this thesis aims to present a summary and synthesis of current available treatment protocols for problematic gaming, in order to better understand what is often being done in practice. Third, this thesis aims to determine the effectiveness of CBT treatment for reducing the severity problem gaming outcomes specifically, as opposed to outcomes that might fall under the umbrella of PIU. Fourth, this thesis will examine prevention, and seek to determine whether there is support among gamers for various preventative options and investigate whether there are any demographic or psychosocial characteristics that might play a role in determining support. Fifth, the thesis will explore the attitudes and beliefs that gamers have toward prevention and the role of the gaming industry in relation to problem gaming. The final aim of the project will be to develop and pilot-test a brief prevention program for problematic gaming for adolescents. This work will aim to provide ‘proof of concept’ and, if successful, form the foundation for scalable research in the future.

CHAPTER 2

EXEGESIS

EXEGESIS

Preamble

Theoretical debates around the existence of, and the extent to which problematic gaming represents an addiction have been present for a number of years. In the context of those debates, clinical researchers have begun to focus on epidemiological factors and the optimization of prevention and treatment practices for problematic gaming. Much of the theoretical motivation for this research can be distilled down to the need to address the lack of standardization across several areas of problematic gaming research. Under the SBIRT paradigm (a widely implemented public health approach to problematic substance use), individuals are screened for risky behaviors, and depending on the level of risk are either given a brief intervention and/or subsequently referred to treatment. The issue with the problematic gaming research base, as previously noted, the lack of standardized approaches to screening, prevention, and treatment.

Questions about the true prevalence of problematic gaming have persisted, due to assessments and screening tools with inadequate symptom coverage and low cut-off scores. Additionally, questions have also been raised about how best to prevent problematic gaming, and whether the available treatment protocols are optimal and effective. Thus, the overall goal if this thesis can be found in addressing this need. Specifically, paper 1 provided an attempt to address a key consequence of inconsistent screening (i.e., unreliable prevalence estimates) and the lack of standardized approaches to prevention (papers 4 and 5) and treatment (papers 2 and 3) were subsequently addressed. In the sections that follow, a key recurring theme is the lack of available standardized protocols for screening, prevention, and treatment. In essence, much of the research conducted presents an attempt to draw attention to this shortcoming, and where possible, highlight solutions to address them.

On a related note, initially, the overall research project was grounded in the perspective of clinical psychology, and the focus was primarily on treatment. However, as the project developed, there became increased awareness, both from our findings, and those of other

researchers, that preventative approaches were needed. Thus, the project broadened to adopt perspectives from wider public health epistemic communities, rather than remaining within the narrower community of clinical psychology. In essence, the project allowed me to broaden my research skills, and to begin to ground this research into the realities of modern health approaches. The following section sketches the motivational arc for each individual research paper.

Individual Rationale

Paper 1

Paper 1 was conceptualized and undertaken to address the stark need for a reliable prevalence estimate for GD. Until our review was completed, prevalence estimates reported by Mihara and Higuchi (2017), Feng et al. (2017), Fam (2018), Sugaya et al. (2019) – and several others – had all produced estimates with impractically large confidence estimates. One of the primary reasons was that the underlying studies were largely inconsistent, in terms of screening and assessment. Therefore, we decided to address this shortcoming by 1) undertaking the largest and most inclusive review to date, and 2) including important methodological characteristics as key variables, including assessment screen, cut-off, and sampling methodology, in addition to several important demographic characteristics. Once completed, this work was able to provide a reliable answer to the pertinent question of GD prevalence.

Paper 1 was not without its challenges. Prevalence rates are more likely to cluster at lower values than higher, and, when considering the zero bound on rates (i.e., impossibility of negative values), the outcome is that rates tend to cluster towards zero. In statistical terms, this means that the left tail of the distribution (the lower 50%) is shorter than the right (upper 50%); a phenomenon known as *positive skew* and it suggests that the data is not normally distributed. Therefore, using statistics that rely on normal distributions is imprecise. Thus, a necessary step in conducting this review was to find a way to transform the data so that prevalence rates were

normally distributed. This was achieved by transforming the data using logit functions. Each prevalence estimate was transformed into its logit, which essentially reorganized the data to a scale where 0 was the midpoint (meaning that any prevalence value below 50% was assigned a value between 0 and -4. In layman's terms, the transformation expands the tails of the distribution, effectively stretching them out. The effect is that the data becomes normally distributed (provided there are sufficient cases) and parametric statistical analyses become possible.

Paper 2

The goal of paper 2 was to synthesize the treatment protocols of published CBT manuals for problematic gaming, in order to provide an account of the most commonly employed and well-developed components. Paper 2 was the first research project undertaken as part of this thesis and was devised initially to compile and subsequently review the psychotherapeutic treatment literature for problematic gaming. This work was primarily undertaken as a learning project. This had several aims. Firstly, my goal to become more familiar with the problematic gaming and psychological treatment literatures. Secondly, to develop the skills needed to conduct a systematic literature review, both in the identification and selection process. Finally, to develop the skills necessary to write a systematic review with both quantitative and qualitative features. In essence, the paper served as a critical developmental exercise through which I was able to hone my research skills.

Paper 2 demonstrated an attempt to address the lack of standardized treatment protocols for problematic gaming. In recent years there have been a number of different approaches to treatment, including individual and group CBT programs, and in-patient centers for more severe cases. However, the treatment manuals for most programs were not widely available, and rarely published online (King, Wölfling, & Potenza, 2020; Zajac et al., 2017). Therefore, the sense was that therapists were essentially treating patients without a working knowledge of problematic gaming, and most of the therapeutic practices were based on CBT treatment

protocols for other related conditions (e.g., for gambling). Given almost half of psychiatrists surveyed by Dullur and Hay (2017) did not feel confident in their ability to manage cases of GD in therapy, it became clear that clinicians and researchers would benefit from a standardized approach.

There were several challenges that arose during paper 2. Firstly, the lack of standardized protocols meant that sourcing materials was difficult. This meant that any conclusions we did draw were tempered. Secondly, of the manuals and protocols that were published, word count limits prevented them from providing deeper explanations of the components. This meant more questions were raised than answered. Therefore, after conducting the review and writing up the manuscript, we eventually decided against publishing at this time. As the problematic gaming research field moves quickly, it may be redundant to focus solely on CBT and IGD, given respectively the broader range of therapy options available, combined with the shift in paradigm that the ICD conceptualization has generated. As the research base continues to become refined, there may be scope for a larger review in the future.

Paper 3

Following completion of paper 2, the next step was to address the question of effectiveness. Paper 3 presented a systematic review and meta-analysis of 12 CBT treatment studies for problematic gaming. In fact, there had already been a published meta-analysis from 2013 by Winkler et al., in which the authors investigated the effectiveness of CBT treatment, but for Internet Addiction more broadly. One of the primary motivations for undertaking work was to update those findings, given that the Winkler et al. (2013) paper was at least 5 years old (at the time). In addition, there was also a clear need to narrow the scope of the findings from Winkler et al. (2013), to focus on problematic gaming specifically. Paper 3 was the first to focus solely on CBT for gaming problems, and thus we were able to standardize, through meta-analytic techniques, the overall efficacy of CBT for problematic gaming.

Meta-analyses form the highest level of evidence for clinical research due to their inherent ability to account for systematic errors across individual studies. However, one of the main limitations of meta-analyses is that can only be as informative as the studies they include. Paper 3 was able to provide an important update on the findings of Winkler et al. (2013), but there were still a number of questions which remained unanswered. Specifically, the long-term efficacy of therapy, and why adolescents appeared to respond less positively to treatment than adults. Nevertheless, a key takeaway from paper 3 was therefore that adolescents (and indeed other individuals) might benefit from a preventative approach. Thus, the remainder of the project turned focus toward prevention.

Paper 4

Findings from paper 3 suggested that a significant proportion of problematic gamers were not meaningfully engaged with treatment, and therefore, the focus of the research shifted to the viability of preventative options. While research into prevention for other addictive disorders is relatively well-developed, research into prevention for problematic gaming is still relatively new. Therefore, a primary motivation for paper 4 was to attempt to explore the relationship between prevention support and a number of demographic and psychological characteristics that have been associated with prevention for other addictive disorders.

One of the primary motivating factors for this research was the need to answer the question of user appeal. Though several preventative options exist, including education programs, apps, and built-in game mechanics (e.g., reminder notifications, limit setting features, etc.), even shutdown features that exist in South Korea; there are questions about whether such programs are effective, and whether they are ultimately appealing enough to the individuals that might engage them. Ultimately, problematic gamers are the end users of any prevention strategy, and therefore, any such option must be appealing to them. Given this research surveyed a sample of gamers (e.g., potential end users), it was necessary to focus on appeal (through the proxy of support), and importantly whether certain factors might predict

engagement, and to avoid the question of effectiveness – which would later be addressed in paper 6.

Paper 4 presented an opportunity for this thesis to broaden the scope and branch out into wider public health discourses. The public health literature for other addictive disorders suggests that self-efficacy and previous help-seeking behavior were strong predictors of prevention engagement, and therefore paper 4 also presents an attempt to examine problematic gaming prevention through the lens of other epistemic communities in the addictive disorder prevention sectors.

Paper 5

During the conceptualization phase of paper 4, it was decided that there might be some utility in simultaneously undertaking a deeper, qualitative investigation into some of the reasoning behind individual support decisions, given the fact that there was very little research in the area. Thus, the survey was amended to include several open-ended questions related to problematic gaming, prevention, and the role of the gaming industry in minimizing harm to vulnerable consumers. One of the primary findings from paper 4 was that predicting prevention support was complex and nuanced, but gamers tended to prefer approaches that promoted autonomous decision-making (e.g., educational campaigns), rather than strategies that were inherently invasive (e.g., shutdown features).

Previous research had also indicated that some gamers do not necessarily believe that problematic gaming was real or as harmful as suggested. In fact, some researchers argue that problematic gaming as a concept is stigmatic and indicative of a moral panic. Therefore, a secondary motivation for paper 5 was to investigate some of these beliefs, particularly among individuals who might be categorized as problematic gamers. A final motivation for paper 5 was to investigate the beliefs that gamers hold on the issue of social responsibility within the gaming industry. There have been concerns raised about whether the gaming industry is complicit in enabling problematic gaming harms to be exacerbated through the inclusion of

addictive mechanisms within games, in particular the use of microtransactions and 'loot-boxes'. Thus, paper 5 presented an opportunity to ground this thesis in the context of wider academic and policy debates.

Paper 6

Questions of prevention strategy viability might be conceptualized across several domains, including, effectiveness, and appeal. Where papers 4 and 5 assessed prevention appeal (vis-à-vis support), paper 6 attempted to address the question of efficacy through the design and pilot evaluation of a brief intervention for problematic gaming. The motivation for this research was primarily given by the lack of brief intervention approaches available to at-risk consumers.

Crucially, brief interventions must be cost- and time-effective, for both clinician and client. Thus, when attempting to design a brief intervention, content must be refined to the most prescient information to make it deliverable and user friendly. One of the challenges with paper 6 was distilling the findings from each of the previous papers down into the most important parts for inclusion in the present intervention. For example, one of the findings from paper 2 was that psychoeducation components of CBT protocols were underdeveloped, particularly in the sense that there was often very little discussion about the ways in which developers use predatory game design (e.g., monetization features, intermittent reinforcement) to keep players engaged and playing in ways that might be problematic. Therefore, it was important to develop an educational program that provided a balanced discussion about the positive and negative aspects of gaming, and game design that was developed to appeal to younger participants.

A Point on Terminology

For clarity, it should be acknowledged that, in the subsequent papers, references are made interchangeably to both gaming disorder (GD) and Internet gaming disorder (IGD). In the

literature, GD and IGD tend to refer to the same basic condition, despite differences in their guidelines and criteria. At the start of my PhD, IGD was the main reference term, but then GD became more commonly used after the ICD-11 inclusion of gaming disorder. This meant that some papers in this thesis referred to IGD (Papers 2 and 3) and others to IGD (Papers 1, 4-6). 1, 4, 5 and 6 refer to GD or problematic gaming more broadly. These different terms are preserved in this thesis for consistency with the published versions, and papers were published at times that chronologically differ from their order in the thesis due to the peer review process.

SECTION II

RESEARCH BODY

CHAPTER 3

Global prevalence of gaming disorder:

A systematic review and meta-analysis

Matthew W. R. Stevens

Diana Dorstyn

Paul H. Delfabbro

Daniel L. King

Statement of Authorship

Paper 1: Global prevalence of gaming disorder: A systematic review and meta-analysis.

Published: Australian & New Zealand Journal of Psychiatry, 2020

Matthew Stevens (Candidate)

I was responsible for the analysis and primary authorship of this paper. All studies included for review in this paper were identified as part of a separate review by Dr. Daniel King (Primary supervisor). Dr. King and I decided upon the variables of interest for the analysis, and I subsequently carried out the data extraction, coding and conducted the primary and auxiliary analyses. I was responsible for the interpretation of the findings, with insights and critical feedback from Dr. King. I then prepared multiple drafts of the manuscript in collaboration with my primary and co-supervisors. The response to reviewers was undertaken by Dr. King and I together, and I was responsible for conducting revisions of this paper. My contributions total 75% of this paper.

I hereby certify that this paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.

Matthew Stevens

January, 2021

Daniel King (Co-author)

I was primarily responsible for overseeing the candidate's contribution to this paper. All studies included for review in this paper were identified as part of a larger previous review by myself and other colleagues. The candidate and I decided upon the variables of interest for the analysis, and after the analysis, I helped with the interpretation of the findings. I was responsible for providing feedback and corrections during the drafting process. During the peer-review process, responses to reviewers were undertaken by the candidate and I together. My contributions total 15% of this paper.

Paul Delfabbro (Co-author)

I was primarily responsible for providing critical commentary and feedback during revisions of the final manuscript. My contributions total 5% of this paper.

Diana Dorstyn (Co-author)

I was primarily responsible for providing guidance to the candidate for the analytic framework. I was also responsible for providing critical commentary and feedback during revisions of the final manuscript. My contributions total 5% of this paper.

By signing this statement of authorship, each of the following authors certifies that: (1) the candidate's stated contribution to the publication is accurate (as detailed above); (2) permission is granted for the candidate to include the publication in the thesis; and (3) the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Daniel King, PhD

January, 2021

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January, 2021

Abstract

Background: Gaming disorder (GD) was included in the latest revision of the International Classification of Diseases (ICD-11). Worldwide, prevalence estimates of GD are considerably heterogeneous and often appear to be exceedingly high. However, few studies have examined the methodological, cultural and/or demographic factors that might explain this phenomenon. This review employed meta-analytic techniques to compute the worldwide-pooled prevalence of GD and evaluate the potential contributing factors for varied prevalence estimates. ***Method:*** Prevalence estimates were extracted from 53 studies conducted between 2009 and 2019, which included 226,247 participants across 17 different countries. Study findings were meta-analyzed using a random effects model. Subgroup and moderator analyses examined potential sources of heterogeneity, including assessment tool and cut-off, participant age and gender, sample size and type, study region, and year of data collection. ***Results:*** The worldwide prevalence of GD was 3.05% [CI: 2.38, 3.91]; this figure was adjusted to 1.96% [0.19, 17.12] when excluding studies based on more stringent sampling criteria (e.g., stratified random sampling). However, these estimates were associated with significant variability. The choice of screening tool accounted for 77% of the variance, with the Lemmens IGD-9, GAIT, and PVP scales associated with the highest estimates. Adolescent samples, lower cut-off scores, and smaller sample size were significant predictors of higher prevalence. GD rates were approximately 2.5:1 in favor of males compared to females. ***Conclusions:*** The worldwide prevalence of GD appears to be comparable to OCD and some substance-based addictions, but lower than compulsive buying and higher than problem gambling. GD prevalence rates appear to be inflated by methodological characteristics, particularly measurement and sampling issues.

Global prevalence of gaming disorder: A systematic review and meta-analysis

Following a provisional status for 'internet gaming disorder' (IGD) in the *DSM-5*, gaming disorder (GD) was officially adopted at the World Health Assembly in May 2019 as a diagnosis in the eleventh edition of the International Classification of Diseases (ICD-11; https://icd.who.int/en). GD is characterized by persistent gaming behavior, impaired control over gaming, and functional impairment due to gaming usually for a period of at least 12 months. Individuals with GD play games to the exclusion of other activities, resulting in missed life opportunities and interference with normal routine and basic self-care (i.e., sleep, eating, personal hygiene); real-world social interaction (i.e., meeting friends, visiting family); and important responsibilities (i.e., school, work, care of children) (Brand et al., 2019; Humphreys, 2019; Wölfling et al., 2019). Individuals with GD often feel unable to regulate or cease their gaming behavior, and experience intense negative mood states (e.g., irritability, sadness, and boredom) when unable to play (Kaptsis et al., 2016; King, Adair, Saunders, et al., 2018; Rumpf et al., 2018; Saunders et al., 2017). Personal distress may relate to a fear of missing out on the online game world, where the user feels a strong sense of personal identity and self-efficacy (King & Delfabbro, 2014; Leménager et al., 2013; Marino & Spada, 2017; Stevens et al., 2019; Wegmann et al., 2017). With the inclusion of GD as a diagnostic category in the ICD-11, it was considered timely to evaluate the worldwide prevalence of GD to assist in estimating the potential burden of harm related to excessive gaming behaviors.

The conceptualization of gaming disorder shares features and symptoms (e.g., loss of control and continuation despite awareness of harm) with other addictive behaviors (e.g., gambling disorder), substance use disorders (SUDs), impulse control disorders (e.g., compulsive buying disorder [CBD]) and obsessive-compulsive disorder (OCD). However, the extent to which the prevalence of GD may be comparable to these disorders is unclear. For context, Calado and Griffiths (2016) reported that the worldwide prevalence of problem gambling was between 0.12 – 5.80%, with most studies reporting figures less than 1%. Degenhardt et al.'s (2017) review of 28 nationally representative studies reported the

prevalence of various SUDs was 2.6%. Epidemiological studies of OCD have estimated that its prevalence falls between 0.6% and 3.5% (Crino et al., 2005; Kessler et al., 2005; Ruscio et al., 2010). Higher prevalence rates have generally been reported for compulsive buying, with a meta-analysis of 40 studies by Maraz et al. (2016) reporting the prevalence of CBD was between 3.4% and 6.9%.

Understanding the epidemiological aspects of GD provides valuable insight into its etiology and risk factors (Mihara & Higuchi, 2017). Prevalence data is also important for guiding decisions on public health policy interventions and the allocation of research funding and health resources. In the past few decades, a number of research teams, particularly those in Europe and Asia, have made substantial efforts to define the prevalence of GD and/or problematic gaming. Some studies have reported figures between 1 and 2% (Haagsma et al., 2012; Müller et al., 2015; Rehbein et al., 2015), whereas other estimates have been as high as 14% (Wang et al., 2015; Wartberg et al., 2019) and even in excess of 20% (Vadlin et al., 2018). Given that such figures greatly exceed those of related disorders, it is necessary to evaluate whether there may be sources of bias that affect the validity of these prevalence estimates (King, Billieux, Carragher, et al., 2020).

Variability across GD prevalence rates is proposed to be attributable to the influence of demographic and cultural factors, as well as the methodological characteristics of studies. Research has consistently reported, for example, that adolescents have higher rates of gaming-related problems than older age groups (Mak et al., 2014; Mentzoni et al., 2011; Müller et al., 2015; van Rooij et al., 2011). Studies also report that males engage in longer gaming sessions (Desai et al., 2010) and experience more gaming-related problems than females (Rehbein et al., 2010; Turner et al., 2012; Vadlin et al., 2015; Wang et al., 2014). Age and gender differences have been reported in studies of impulse control disorders, but not necessarily in the same direction, e.g., compulsive buying appears to be more prevalent among females (Maraz et al., 2016).

In their systematic review of GD prevalence, Feng et al. (2017) examined 27 studies and reported prevalence estimates ranging from 0.7% to 15.6% among school-aged children. The authors concluded that the average prevalence from 1998 to 2016 '*[did] not appear to have increased in prevalence to the extent that internet usage has increased*' (p.22). However, the authors did not conduct subgroup analyses to identify potential sources of bias. Another review by Fam (2018), which involved a meta-analysis of 16 studies of adolescents, reported that the pooled prevalence estimate was 4.6%, including 6.8% among males. Fam's (2018) subgroup analyses indicated that prevalence estimates tended to be higher among older (pre-2000) studies with smaller (N<1000) samples conducted in Asia and for studies which employed measurement adapted from *DSM* pathological gambling criteria. Another systematic review by Mihara and Higuchi (2017) of 50 GD prevalence studies – the largest to date – found prevalence rates ranged between 0.7% and 27.5%. The authors noted that methodological differences, particularly the choice of instrument and cut-off score, made it difficult to compare prevalence estimates across studies. These studies highlight the complexities that arise when attempting to reach an accurate pooled prevalence rate of GD but have not yet determined clearly the most significant factors contributing to variability in rates.

Another important reason for undertaking this meta-analysis of GD prevalence was to account for differences that may arise due to cultural factors (King, Chamberlain, Carragher, et al., 2020; Long et al., 2018). A review of 36 studies published in Chinese by Long et al. (2018) reported that the prevalence of GD ranged from 3.5% to 17%. Gaming is a popular activity in some East Asian countries, including Japan and China and particularly in South Korea, where gaming is highly accessible and available '24/7' (e.g., 'PC bang' or internet café culture) and supported by high-speed internet services and related infrastructure propelled by booming esports industries. These countries have also been active in promoting public health and regulatory initiatives to reduce excessive use of gaming and other screen-based activities (Humphreys, 2019). One explanation for higher GD rates in these regions has been the greater familial and societal pressures on young people to succeed in education, which may be

pronounced in single-child families (Lim, 2012). However, higher prevalence rates in East Asian regions (Fam, 2018) should be considered cautiously given that these studies have often employed instruments (e.g., the Internet Addiction Test) that were developed outside of Asia and without adequate attempts to ensure that these measures are valid and culturally appropriate (King, Chamberlain, Carragher, et al., 2020; Wang et al., 2014).

Methodological characteristics of studies, including the instrument and its scoring, are an important influence on GD prevalence (Lortie & Guitton, 2013; Petry et al., 2015), however these issues have received less attention than demographic and regional differences. The tools used to screen for GD have changed greatly over time, and many tools have been based on criteria transposed from other disorders, such as gambling and substance use disorders. This may affect the validity and applicability of certain items (e.g., tolerance and withdrawal, deception, and chasing losses). Variability in GD measurement, including different profiles of strengths and weaknesses across instruments, has been highlighted by King, Chamberlain, Carragher, et al. (2020) in a systematic review that identified 32 tools used across 320 studies of GD in Europe and Asia. Tools have varied in their scope of coverage of *DSM-5* and ICD-11 criteria for GD, which may potentially affect their sensitivity and specificity. For example, the criterion referring to continued use despite harm (i.e., an important feature of addictive disorders, including in the ICD-11 conceptualization of GD) has appeared in only 9 out of 32 tools. Currently, the extent to which specific tools may contribute to variability in prevalence estimates is unclear.

The Present Review

Previous work has suggested that demographic and/or regional differences as well as methodological characteristics are likely to contribute to variability in GD prevalence estimates. However, these factors have not yet been examined systematically using meta-analytic techniques. The purpose of this review was to review the literature on the prevalence of GD to: (1) calculate the global pooled prevalence of GD, and (2) determine which factors

may be implicated in the variability of estimates by conducting subgroup analyses based on the demographic, regional, and methodological characteristics of studies. Given limited previous reviews to guide hypotheses, this review was designed to be exploratory but expected to identify significant differences in prevalence rates according to all these characteristics.

Method

Data Sources

The present review sought to collect the findings of all published studies reporting prevalence rates of GD. Although numerous studies refer to 'Internet gaming disorder' or IGD (i.e., the *DSM-5* terminology), this review uses the abbreviation GD to encompass both the *DSM-5* and ICD-11 classifications, including when referring to studies that predate the *DSM-5*. This review employed the same methodology used in King, Chamberlain, Carragher, et al.'s (2020) review, which involved the identification of all empirical literature (*N*=320 studies) that employed a named instrument to assess GD. King, Chamberlain, Carragher, et al.'s (2020) review involved a database search employed the following keywords and protocol: ([measure or tool or test or validation or psychometric or screening or diagnostic or item or instrument] AND gaming). Databases included *PsycINFO*, *PsycArticles*, *PubMed*, *ScienceDirect*, *Scopus*, *Web of Science*, and *Google Scholar*. There were 5,828 results (including duplicate results). The titles and abstracts of all results generated by each database were screened for relevance, which led to the initial identification of 75 studies. Three duplicate studies (i.e., same data re-analyzed) were removed. Sixteen studies did not provide a prevalence estimate nor sufficient data for manual calculation. Note that the reference lists of included studies were not checked for potential additional studies; however, this would likely not have identified further studies due to the requirement of studies to have used a named GD tool (which would likely be cited and therefore identified by the protocol). Thus, there were 53 studies for inclusion in the present review, which encompassed a total of 226,247 participants across 17 different countries.

In the present review, studies from the list of 320 studies met the following inclusion criteria: (1) peer-reviewed and published in English; and (2) assessed problematic gaming or gaming disorder using a named IGD/GD tool; and (3) reported a prevalence rate of IGD/GD. In relation to criterion (3), a further check of each study was performed to assess each prevalence rate against the sample characteristics of the study (i.e., identifying level of rigor and variability in study procedures and reporting). This subsequent check led to studies being categorized into 1 of 4 categories based on aspects of their sampling (*Data Analysis* section, or Table 3.1 legend for a complete description of each 'sample type'). Regarding criterion (2), studies that employed Internet addiction tools were included when they were used to screen for gaming-related problems, e.g., the Young Internet Addiction Test (YIAT) and Compulsive Internet Use Scale (CIUS).

Data Extraction

Data of interest were extracted from each study independently and checked for agreement by two authors (MS. & DK.). The variables of interest were: participants (i.e., total number of participants, and total number with GD status); age (i.e., mean age, SD, and age range); gender (i.e., total number of male and female participants); prevalence (i.e., proportion of individuals with GD among the total sample; and separate prevalence rates for males and females); methodology (i.e., location and year of data collection); and assessment (i.e., screening tool and cut-off score).

Data Analysis

The first aim of the review was to determine a pooled estimate for prevalence of GD based on all 53 included studies. Reported prevalence estimates were extracted from each study and checked for accuracy by dividing the number of GD cases (*n*) by the number of total participants (*N*). Where possible, calculated rates were chosen in favor of reported rates to yield more precise estimates and to reduce error caused by rounding of figures.

When prevalence estimates are small (i.e., <.10), heterogeneity tends to be artificially inflated (Higgins et al., 2003). To counteract the influence of heterogeneity and outliers, all prevalence estimates were transformed into logits (or log odds). By transforming prevalence estimates onto a logit scale, the data become normally distributed, centered around a mean of zero, making statistical analysis more straightforward. The formula for the logit transformation as well as calculating the standard error, were as follows:

$$ES_k = \ln\left(\frac{p_k}{1 - p_k}\right)$$

and,

$$SE_k = \sqrt{\frac{1}{n_k p_k} + \frac{1}{n(1 - p_k)}}$$

In the above case, *ES* is the log odds of study *k*, where *ln* is the natural log, and *p* is the raw GD prevalence estimate; and *SE* is the standard error for study *k*, where *n* is the total number of participants. Pooled prevalence estimates (point estimates) and 95% confidence intervals were calculated using a random effects model. All analyses were conducted using the logits and then converted back to the original proportion metric. A random-effects model was selected due to handling data from diverse populations (Borenstein et al., 2011). The formula for converting back to the original proportion metric was:

$$p = \left(\frac{e^{ES_k}}{1 + e^{ES_k}}\right)$$

The degree of between-study heterogeneity, or the variance in prevalence estimate, was examined using the following two indices: Cochrane's *Q*, which determines the ratio of observed variation to within-study error (Borenstein et al., 2017) and the I^2 statistic, which estimates the true effect variance over sampling error observed. I^2 reflects the level of inconsistency of findings across studies and is expressed as a percentage, with values of 25%, 50% and 75% indicating low, medium, and high heterogeneity respectively (Borenstein et al., 2017). All analyses were conducted using *Meta-Essentials v.1.4*.

Subgroup and moderator analyses were conducted to identify possible sources of heterogeneity among prevalence estimates. Studies were sorted into the following categories: *sample type* (Type 1: Representative [age, gender, education, socio-economic status, urbanicity] sampling, stratified random or randomized cluster sampling; population or cohort registry; Type 2: Convenience or purposive sampling; online (social media) marketing or advertising; non-representative sample via crowd-sourcing platform; Type 3: Selective sampling based on male gender; Type 4: Selective sampling based on gaming participation); *assessment* (i.e., assessment tool used to identify potential cases of GD); *region* (i.e., geographical region of data collection); and *year* (i.e., year of data collection). In three cases where data collection dates were not provided, the year prior to publication was substituted. Point estimates and 95% CIs were then compared for each group using a random effects model.

Three other potential sources of variance were identified. These were *age* (i.e., mean age of participants); *cut-off* (i.e., cut-off value used to determine cases of potential GD as a percentage of total score, or as percentage of endorsed criteria); and *sample size* (i.e., size of the total sample). Total sample size was reported in all included studies. In studies where GD cut-off scores were not reported, the cut-off recommended by the tool's authors was used. The number of endorsed criteria (rather than a continuous score) was used in some cases. Cut-off scores were converted to a percentage. Similarly, gender rates were manually calculated if not reported and sufficient data were available. All three variables (i.e., *age*, *cut-off*, and *sample-*

size) were first analyzed individually using univariate regression to determine the ability of each variable to predict variance in GD prevalence scores. Significant univariates were then included in a multivariate regression analysis.

Potential publication bias was also checked in this analysis. Fail-safe *N*'s were calculated using Rosenthal's (1979) method. A conservative Fail-safe *N* was adopted for the present review. Specifically, publication bias was deemed to not be an issue if the Fail-safe *N* value was greater than the number of studies (*k*) that contributed to each analysis.

Results

Study Characteristics

Table 3.1 presents a summary of the study characteristics. Of studies that provided demographic information, the majority included adolescent-only samples (*n*=25, 47.2%) with an overall mean age of 17.55 years (*SD*=6.1). Of the 53 studies, 58.5% of studies (*k* =31) belonged to the Type 1 ('representative') sample type. There were 12 studies (22.6%) in Type 2 ('convenience/purposive'), and 8 studies (15.1%) in the Type 3 ('male only') and 2 studies (3.8%) in the Type 4 ('gamer only') category. The majority of studies were conducted in Europe (*k*=37, 69.9%), with the Gaming Addiction Scale (7-item; GAS-7) being the most used assessment tool (*k*=11, 20.8%). In terms of *cut-off*, the mean adjusted score was 59.8% (*SD*=17.0%), which equated to endorsement of 5.3 out of 9 *DSM-5* GD criteria. The lowest cut-off value was 33% (i.e., 3/9 IGD criteria) (Wang et al., 2014); with the strictest tool requiring all criteria are met or a total score of 100% (Müller et al., 2015) Most studies (81.1%) measured GD specifically (*k*=43) whereas other studies measured GD either by using a tool designed for problematic internet use (*k*=4, 7.5%) or a tool for both GD and PIU (*k*=6, 11.3%). In terms of ICD-11 qualifiers for GD (i.e., online/offline distinction), the most common type of GD was online-only (*k*=18, 33.4%) and both online and offline forms (*k*=9, 17.0%); with the other studies (49.0%) not providing sufficient information about predominantly online/offline distinctions (*k*=26).

Table 3.1. Characteristics of included studies (*N*=53) in order of year of data collection.

Study	Data collected[a]	N	Location	Mean age	Age range	Female (%)	Prevalence (%)			Sample type*	Tool	Cut-off
							Total	M	F			
Turner et al. (2012)	2007	2826	CA	15.00	12 – 19	52.70	8.53	15.1	3.1	1	PVP	5 / 8
Rehbein et al. (2010)	2008	15168	DE	15.30	15 – 16	51.30	1.7	3.0	0.3	1	CSAS-II	42 / 56
van Rooij et al. (2010)	2009	8299	NL	14.35	13 – 16	48.50	1.04	NR	NR	4	CIUS	40 / 56
Mentzoni et al. (2011)	2009	816	NO	NR	15 – 40	NR	0.61	7.2	1.3	1	GAS-7	3 / 7
Brunborg et al. (2013)	2009	1320	NO	13.60	12 – 14	52.12	4.24	6.5	2.2	4	GAS-7	28 / 35
Jeong & Kim (2011)	2010	600	SK	NR	12 – 18	53.20	2.17	NR	NR	2	YIAT-20	80 / 100
Shiue (2015)	2010	5003	JP	NR	20 – 89	42.26	5.50	NR	NR	1	JGSS	NR
Seok and Da Costa (2012)	2011	1332	SK	NR	18 – 29	14.00	2.70	NR	NR	2	A-EQ	6 / 11
Festl et al. (2012)	2011	4382	DE	37.80	14 – 90	NR	0.16	4.1	3.2	4	GAS-7	7 / 7
Király et al. (2014)	2011	4875	HU	16.40	15 – 18	68.40	4.33	NR	NR	4	POGQ-SF	32 / 60
Papáy et al. (2013)	2011	5045	HU	16.40	15 – 18	51.00	4.56	3.8	0.6	4	POGQ-SF	32 / 60
Kim et al. (2017)	2011	1401	SK	33.13	18 – 74	69.90	7.71	5.2	2.5	4	PVP	4 / 9
Faulkner et al. (2015)	2011	3338	CA	15.90	11 – 20	51.10	1.89	1.6	0.3	1	PVP	5 / 9
van Rooij et al. (2014)	2011	8478	NL	14.20	12 – 16	49.00	2.41	4.8	1.3	1	VAT	4 / 5
Khazaal et al. (2016)	2011	5983	M.N	20.00	19 – 22	100.00	2.3	NR	NR	3	GAS-7	21 / 35
Müller et al. (2015)	2012	12938	M.N	15.80	14 – 17	47.10	1.62	3.6	0.3	1	AICA-S	14 / 14
Colder Carras and Kardefelt-Winther (2018)	2012	13460	M.N	15.80	NR	62.90	2.20	NR	NR	1	AICA-S	13 / 14
Vadlin et al. (2015)	2012	1783	SE	NR	13 – 15	45.20	1.29	1.3	0.0	1	GAIT	5 / 9

Colder Carras et al. (2017)	2012	9733	NL	NR	NR	48.83	1.30	NR	NR	1	VAT	4 / 5
Ustinavičienė et al. (2016)	2012	1730	LT	15.84	13 – 18	50.20	9.13	10.6	7.7	1	YDQ	5 / 8
Kuss et al. (2013)	2012	3105	NL	14.20	11 – 19	48.30	3.64	1.7	2.0	1	CIUS	28 / 56
Wartberg et al. (2013)	2012	1744	DE	15.50	14 – 17	50.00	3.21	1.9	1.4	1	CIUS	28 / 56
Rehbein et al. (2015)	2013	11003	DE	14.88	13 – 18	51.09	1.16	.25	0.07	1	CSAS	5 / 9
Wang et al. (2014)	2013	503	HK	14.58	13 – 16	49.50	14.71	22.7	8.7	2	GAS-7	3 / 9
Brunberg et al. (2015)	2013	3037	NO	35.00	16 – 74	58.00	0.72	NR	NR	1	GAS-7	21 / 35
Wang et al. (2015)	2013	920	HK	15.03	NR	36.30	13.04	10.21	2.82	2	GAS-7	21 / 35
Wittek et al. (2015)	2013	10081	NO	32.60	16 – 74	62.70	0.53	.23	0.0	1	GAS-7	28 / 35
Henchoz et al. (2016)	2013	5223	SW	21.25	NR	100.00	1.6	NR	NR	3	GAS-7	21 / 35
Müller et al. (2014)	2013	2512	DE	NR	14 – 94	48.50	2.11	5.2	2.5	1	AICA-S	7 / 14
Strittmatter et al. (2015)	2014	8807	M.N	15.00	NR	44.50	3.62	2.64	0.97	1	YDQ	5 / 8
Maanikko et al. (2017)	2014	271	FI	18.70	13 – 24	52.70	8.86	NR	NR	4	GAS-7	4 / 7
Vink et al. (2015)	2014	5278	NL	15.60	13 – 18	39.80	4.00	NR	NR	1	CIUS	28 / 56
Strittmatter et al. (2016)	2014	515	DE	14.50	13 – 17	37.90	3.11	NR	NR	1	YDQ	5 / 8
Gmel et al. (2018)	2015	2921	SW	NR	15 – 35+	50.30	3.36	2.5	3.8	1	CIUS	13 / 32
Vadlin et al. (2018)	2015	1576	SE	NR	13 – 18	42.01	21.76	16.03	3.66	1	GAIT	44 / 52
Pontes et al. (2016)	2015	1071	SI	13.44	12 – 16	50.20	2.43	NR	NR	1	IGDS9-SF	25 / 45
Durkee et al. (2016)	2015	11931	M.N	14.89	NR	43.40	4.43	5.2	3.9	1	YDQ	5 / 8
Li et al. (2016)	2015	654	CN	20.29	18 – 22	45.60	4.74	3.7	1.1	2	OGCAS	32 / 80

Przybylski et al. (2017a)	2015	1247	US	NR	18 – 24	42.26	2.80	NR	NR	2	IGD	5 / 9
Przybylski et al. (2017b)	2015	1899	UK	NR	18 – 24	49.55	2.70	NR	NR	2	IGD	5 / 9
Przybylski et al. (2017c)	2015	10009	M.N	NR	18 – 65	49.9	2.60	NR	NR	2	IGD	5 / 9
Przybylski et al. (2017d)	2015	5777	US	45.49	NR	57.6	1.20	NR	NR	2	IGD	5 / 9
Yu & Cho (2016)	2015	2024	SK	14.5	14 – 15	50.6	5.88	10.4	1.2	1	IGD-9	5 / 9
Müller et al. (2018)	2016	1489	DE	13.10	10 – 17	45.90	2.48	1.9	3.0	1	AICA-S	13 / 14
Wartberg et al. (2017)	2016	1531	DE	18.86	12 – 25	51.40	5.75	8.4	2.9	2	IGD-9	5 / 9
Kim et al. (2018)	2016	402	SK	13.00	12 – 14	55.50	8.96	NR	NR	2	IGUESS	10 / 27
Dreier et al. (2017)	2016	3967	DE	15.55	12 – 18	54.50	1.94	5.7	4.6	1	AICA-S	13 / 14
Vadlin et al. (2016)	2016	2110	SE	14.07	12 – 16	43.44	9.48	17.3	3.7	1	GAIT	19 / 52
Wartberg et al. (2019)	2017	985	DE	13.40	12 – 14	50.80	14.42	NR	NR	1	IGD-9	5 / 9
van Den Eijnden et al. (2018)	2017	538	NL	12.90	12 – 15	48.90	9.76	10.23	9.32	2	IGD-9	5 / 9
Chiu et al. (2018)	2017	8110	TW	15.66	15 – 16	53.50	3.14	2.6	0.4	4	IGDT-10	15 / 27
Myrseth and Notelaers (2018)	2017	2055	NO	17.50	NR	47.10	1.22	NR	NR	1	GASA	28 / 35
Lin et al. (2019)	2018	4442	IR	15.30	13 – 18	50.30	2.39	NR	NR	1	IGDS9-SF	NR

*Sample type: Type 1: Representative [age, gender, education, socio-economic status, urbanicity] sampling, stratified random or randomized cluster sampling; population or cohort registry; Type 2: Convenience or purposive sampling; online (social media) marketing or advertising; non-representative sample via crowd-sourcing platform; Type 3: Selective sample based on male gender; Type 4: Selective sample based on gaming participation.

Note. A-EQ: Addiction Engagement Questionnaire; AICA-S: Scale for Assessment of Internet and Computer Gaming; CIUS: Compulsive Internet Use Scale; CSAS-II: Videogame Dependency Scale; GAIT: Gaming Addiction Identification Test; GAS-7: Gaming Addiction Scale (7-item); GASA: Gaming Addiction Scale – Adolescent; IGD-9: Lemmens IGD Scale (9-item); IGDT-10: Internet Gaming Disorder Test (10-item); IGUESS: Internet Game Use-Elicited Symptom Screen; JGSS: Japanese Gaming Social Survey; OGCAS: Online Gaming Attitudes and Cognitions Scale; POGQ-SF: Problematic Online Gaming Questionnaire – Short Form; PVP: Problematic Videogame Playing Scale; VAT: Videogame Addiction Test; YDQ: Young Diagnostic Questionnaire.
Country Abbreviations: CA: Canada; CN: China; DE: Germany; FI: Finland; HK: Hong Kong; HU: Hungary; IR: Iran; JP: Japan; LT: Lithuania; M.N: Multi-National; NL: Netherlands; NO: Norway; SE: Sweden; SI: Slovenia; SK: South Korea; SW: Switzerland; TW: Taiwan; UK: United Kingdom; US: United States. [a]Year of data collection.

Data Synthesis

Overall, the pooled prevalence of GD across the 53 studies was 3.05% (*k*=53, [2.38, 3.91]). However, significant heterogeneity between estimates was detected. Subgroup and moderator analyses were conducted to explore possible sources of heterogeneity. Figure 3.1 presents a forest plot of subgroups containing at least 5 studies. Figure 2 provides a visual summary of the GD prevalence rate across all 53 studies, in chronological order of data collection. Tables 3.2 and 3.3 present the results of subgroup and moderator analyses, respectively.

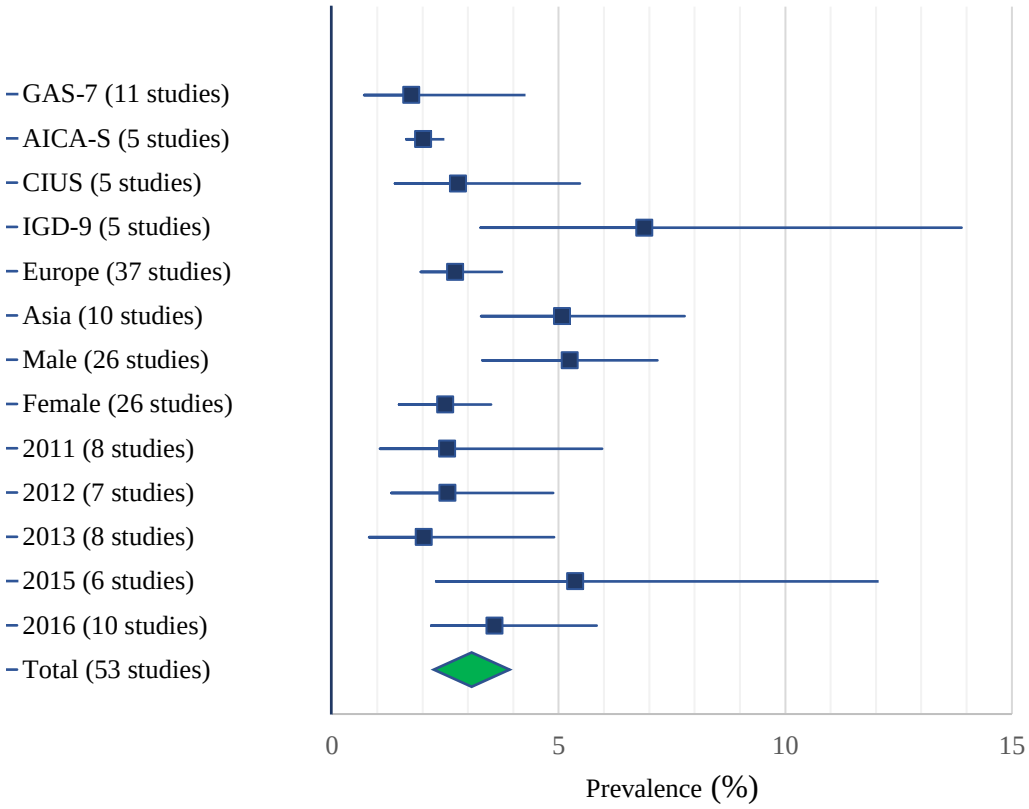

Figure 3.1. Forest plot of pooled prevalence estimates across all groups containing >5 studies

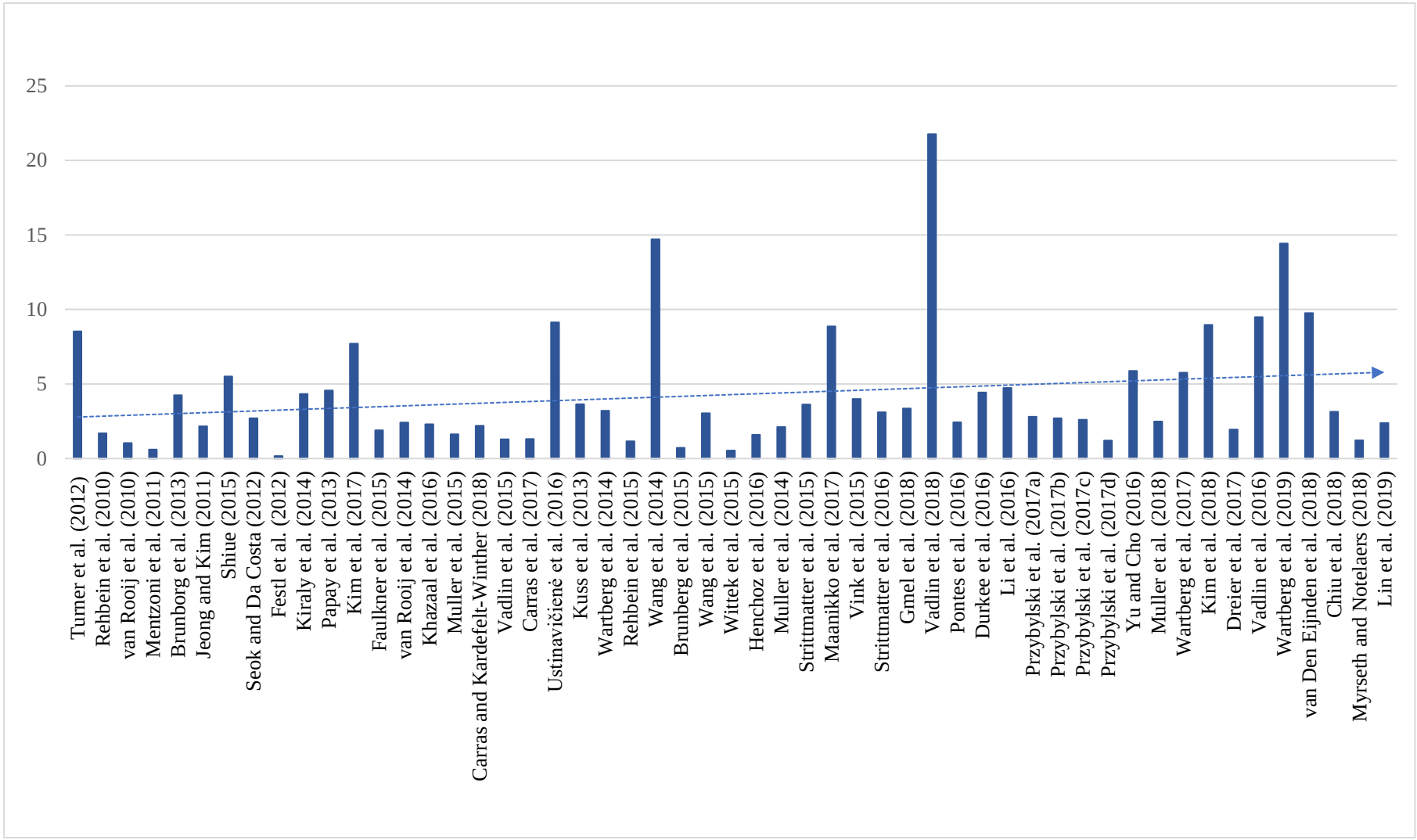

Figure 3.2. Prevalence rates in order of data collection date (publication date in parentheses)

Table 3.2. Subgroup analyses of prevalence according to assessment, region, and year of data collection (*N*=53 studies).

		Combined estimates				Heterogeneity				Tau				Model
	Subgroup	*k*	Prevalence (%)	95% CI	*p*	*Q*	df	*p*	I^2	Tau^2	Tau	SE	*p*	Pseudo R^2 (%)
By sample type	-	-	-	-	-	-	-	-	-	-	-	-	.061	9.93
	Type 1	31	1.96	[0.19, 17.12]	< .01	2.10	30	.147	52.34	.04	.19	.18		
	Type 2	12	2.91	[2.10, 4.01]	< .01	2124.85	11	< .01	98.59	.70	.84	.16		
	Type 3	2	4.56	[2.71, 7.56]	< .01	1551.57	1	< .01	99.29	.91	.95	.24		
	Type 4	8	2.97	[1.05, 8.07]	< .01	473.23	7	< .01	98.52	.44	.67	.45		
By assessment	-	-	-	-	-	-	-	-	-	-	-	-	< .01	77.97
	CSAS[#]	2	1.41	[0.12, 14.17]	< .01	12.50	1	< .01	92.00	.06	.26	.19		
	GAS-7[^]	11	1.75	[0.71, 4.24]	< .01	545.36	9	< .01	98.17	1.27	1.12	.41		
	VAT	2	1.77	[0.03, 49.23]	< .01	30.17	1	< .01	96.69	.19	.43	.31		
	AICA-S	5	2.01	[1.64, 2.45]	< .01	14.38	4	< .01	72.18	.02	.15	.07		
	IGD Survey	4	2.20	[1.15, 4.17]	< .01	36.73	3	< .01	91.83	.14	.38	.21		
	IGDS-9-SF	2	2.39	[2.20, 2.61]	< .01	0.01	2	.937	0	.00	.00	.01		
	CIUS	5	2.78	[1.39, 5.47]	< .01	123.67	4	< .01	96.77	.28	.53	.25		
	POGQ-SF	2	4.45	[3.19, 6.17]	< .01	0.31	1	.577	0	.00	.00	.03		
	YDQ	4	4.76	[2.19, 10.02]	< .01	99.95	3	< .01	97.00	.16	.40	.25		
	PVP	3	5.07	[0.60, 32.16]	< .01	124.34	2	< .01	98.39	.55	.74	.51		
	IGD-9	5	6.89	[3.28, 13.89]	< .01	239.24	2	< .01	98.33	.52	.72	.28		
	GAIT	3	6.90	-	.242	256.64	2	< .01	99.22	1.02	1.01	.90		
By region	-	-	-	-	-	-	-	-	-	-	-	-	<.05	12.33
	Europe	37	2.72	[1.96, 3.75]	< .01	3219.21	36	< .01	98.88	.74	.86	.16		

	USA	4	2.74	[0.70, 10.21]	< .01	285.82	10	< .01	98.95	1.21	1.10	.44		
	Asia	10	5.08	[3.29, 7.78]	< .01	217.41	9	< .01	95.86	.28	.53	.20		
By year	-	-	-	-	-	-	-	-	-	-	-	-	<.05	16.53
	2009	3	1.46	[0.12, 15.16]	< .01	74.12	2	< .01	97.30	.99	.99	.59		
	2010	2	3.60	[0.01, 94.43]	< .01	11.32	1	<.01	91.17	.65	.43	.48		
	2011	8	2.54	[1.06, 5.96]	< .01	245.76	7	< .01	97.15	.55	.30	.38		
	2012	7	2.55	[1.31, 4.88]	< .01	398.78	6	< .01	98.50	.72	.52	.28		
	2013	8	2.03	[0.82, 4.90]	< .01	536.18	7	< .01	98.69	.97	.95	.39		
	2014	3	4.81	[1.23, 17.06]	< .01	15.88	2	< .01	87.40	.46	.21	.33		
	2015	6	5.37	[2.30, 12.03]	< .01	683.00	5	< .01	99.27	.81	.90	.34		
	2016	10	3.59	[2.19, 5.84]	< .01	427.97	9	< .01	99.40	.53	.73	.23		
	2017	4	4.97	[0.79, 25.55]	< .01	297.88	3	< .01	98.99	1.06	1.12	.59		

Note: [#]indicates both CSAS and CSAS-II combined. [^]indicates GAS-7 and GASA scales.

Subgroup Analyses

Sampling

Statistical heterogeneity is inevitable in meta-analysis due to the diverse range of participants and study designs (Higgins et al., 2003). A subgroup that contains significant heterogeneity indicates that the underlying populations are too diverse to be considered homogenous. Thus, non-significant results are not necessarily more ideal than significant results; the difference lies in the interpretation. For GD prevalence according to the sample type (i.e., Types 1, 2, 3 and 4; see *Data Analysis* section for descriptions), the point estimate for Type 1 (k=31) was significant, with I^2 estimates of heterogeneity indicating moderate heterogeneity. Types 2, 3 and 4 also had significant point estimates, with each group displaying large I^2 estimates of heterogeneity. Overall, sample type explained 9.93% of the variance in prevalence rates but was only considered significant at the .05 level (p=.023). Of the 3 subgroups including 5 or more studies, Type 1 samples (k=31) provided the lowest estimates (1.96, [0.19, 17.2]), and Type 3 (k=8, male only) samples reported the highest pooled prevalence (4.56, [2.71, 7.56]).

Assessment

Considering GD prevalence according to assessment tool, the point estimates for all assessment tools were significant except for the Gaming Addiction Identification Test (GAIT; k=3, p=.242). I^2 estimates indicate heterogeneity was not detected for the Problematic Online Gaming Questionnaire-Short Form (POGQ-SF) and Internet Gaming Disorder Scale-9-Short Form (IGDS-9-SF); moderate for the Scale for Assessment of Internet and Computer Gaming (AICA-S) and high for the remaining tools. Overall, the choice of assessment tool was a significant predictor (p<.01) that accounted for 77.97% of the variance across prevalence estimates. Of the 4 subgroups including 5 or more studies, the GAS-7 reported the lowest prevalence estimates (1.75, [0.71, 4.24]) and the Lemmens IGD-9 reported the highest prevalence estimates (6.89, [3.28,13.89]).

Region

For GD prevalence according to geographical region, the point estimates for Europe (*k*=37), Asia (*k*=10) and USA (*k*=4) were significant, with each group displaying large I^2 estimates of heterogeneity. Overall, study region accounted for 12.33% of the variance in prevalence rates but was only considered significant at the .05 level (*p*=.039). Only two subgroups contained 5 or more studies, of which Asia reported higher prevalence estimates (5.08 [3.29, 7.78]) in comparison to Europe (2.72 [1.96, 3.75]).

Year

For GD prevalence according to the year of data collection, the point estimates for all values were significant. In all cases, I^2 estimates of heterogeneity were large. Overall, year of data collection explained 16.53% of the variance in prevalence rates but was only considered significant at the .05 level (*p*=.012). Of the 5 subgroups including 5 or more studies, 2013 (*k*=8) provided the lowest estimates (2.03, [0.82, 4.89]), and 2015 was the highest (5.37, [2.30, 12.03]).

Moderator Analyses

Moderator analyses were conducted to examine possible effects of underlying univariates of *participant age* (*k*=41), *cut-off* (*k*=51), and *sample size* (*k*=53). Univariate regression analysis determined that *age* ($F(1,40)=14.39$, $p=.001$, $R^2=26.9\%$); *cut-off* ($F(1,50)=9.82$, $p=.003$, $R^2=16.7\%$); and *sample size* ($F(1,52)=8.28$, $p=.006$, $R^2=14.0\%$) were all significant predictors of GD prevalence rate. A stepwise multivariate model was then generated using *age*, *cut-off*, and *sample size*. The model was significant ($F(3,35)=14.25$, $p<.001$, $R^2=55.0\%$), with standardized coefficients: *age* (B=-.05, [-.08, -.02], *p*=.001, *B*=-.41); *cut-off* (B=-.02, [-.04, -0.01], *p*=.003, *B*=-.41); and *sample size* (B=-.00, [-.00, -.00], *p*=.022, *B*=-.31), indicating that younger participants, smaller sample sizes and lower cut-off values predicted higher prevalence rates. Table 3.3 provides a summary of the meta-regression analyses.

Table 3.3. Univariate and multivariate regression analyses of prevalence according to age, tool, cut-off, and sample size.

	Model fit					Model Parameters		
	n	*F*	df	*p*	R^2	*B*	95% CI	*p*
Univariate	-	-	-	-	-	-	-	-
Age	41	14.4	1, 40	<.01	26.9	-.52	[-.10, -.03]	<.01
GD tool cut-off	51	9.8	1, 50	<.01	16.7	-.41	[-.04, -.01]	<.01
Sample size	53	8.3	1, 52	<.01	14.0	-.37	[-.00, -.00]	<.01
Multivariate	-	-	-	-	-	-	-	-
Age x sample size x cut-off	38	14.3	3, 35	<.01	55.0	-	-	-

Gender Differences in GD Prevalence

There were 31 studies that stratified prevalence by gender or provided sufficient information to calculate distinct prevalence rates according to gender. Gender-specific prevalence rates were included in a separate analysis. GD rates were approximately 2.5:1 in favor of males compared to females. Only 3 out of 31 studies (9.6%) reported a higher GD prevalence rate among females. Results from a one-way ANOVA were statistically significant ($F(1,60)=13.04$, $p=.001$), indicating that the average GD rate was higher for male (6.31%, [4.30-8.31]) than female samples (2.54, [1.65-3.43]).

Publication Bias

No evidence of publication bias was found (Failsafe $N=12,350$); indicating 12,350 studies with null findings would need to be included in the analysis to render the true prevalence 0 (i.e., no effect).

Discussion

Main Findings

The purpose of this review was to determine the global prevalence of GD. To our knowledge, this work represents the largest systematic review and meta-analysis of GD prevalence rates, including a total of 226,247 participants across 17 different countries. The main findings were: (1) the global pooled prevalence of GD was 3.05% (95% CI=[2.38-3.91]), and this figure was adjusted to 1.96% (95% CI=[0.19-17.12]) when considering only those studies which met more stringent sampling criteria (e.g., stratified random sampling); (2) prevalence estimates varied largely as a function of the GD screening tool; (3) studies with smaller sample sizes, adolescent samples, and/or studies employing lower cut-off scores reported significantly higher prevalence rates; and (4) GD rates were approximately 2.5:1 in favor of males compared to females. There was also some evidence that higher prevalence rates were reported in more recent (post-2013) studies and in studies conducted in Asia as compared to Europe.

The results suggest that the global prevalence of GD (3.05%) may be comparable to some SUDs (2.6%) (Degenhardt et al., 2017) and OCD (0.6-3.5%) (Crino et al., 2005), but appears to be lower than compulsive buying (3-6%) (Maraz et al., 2016) and higher than problem gambling (close to 1%) (Calado & Griffiths, 2016). This GD prevalence rate is lower than the rate reported in Fam's (2018) review, which appears attributable to its focus on adolescents. However, interpretation of these findings should take several factors into consideration. First, the results from subgroup analyses indicated GD prevalence estimates varied significantly according to the GD screening tool. Additionally, as expected, moderator analyses identified lower cut-off scores as a significant predictor of higher prevalence rates. In some cases, cut-off scores for identifying potential cases of GD were as low as 33% of the total score. Studies employing cut-off scores lower than 50% should be treated cautiously, because these studies may inflate prevalence estimates above thresholds recommended by the *DSM-5* (i.e., at least 5/9 criteria) and may be more likely to count cases without functional impairment.

Prevalence rates varied according to several study characteristics. Regression analysis identified that adolescent samples tended to report higher prevalence estimates. Higher GD prevalence among adolescents is a common finding in the literature (Müller et al., 2015; Mak et al., 2014; King, Delfabbro, Zwaans, et al., 2013). Given that the overall mean age of the total sample was 17.5 years (*SD*=6.1), the total pooled prevalence figure may represent the peak of the distribution of GD scores. Gender was another demographic factor that affected prevalence rates in the expected direction (i.e., male bias). Consistent with previous reviews (Mihara & Higuchi, 2017; Feng et al., 2017), GD prevalence rates were found to be 2.5 times higher for males than for females. Although female prevalence rates were lower, the results suggested that female prevalence rates increased over the last decade. The average female GD prevalence rate was 1.75% in 2009 compared to 4.47% in 2017, which may be due partly to the increasing popularity of games among females, particularly for games that intersect with social media and related online activities (King & Potenza, 2020).

This review contributes to critical discussion of GD screening approaches by highlighting that GD prevalence is strongly influenced by the choice of instrument. The field has an abundance of screening tools (i.e., more than 30); many appear to be quite similar on face value but demonstrate varying psychometric properties (King, Chamberlain, Carragher, et al., 2020). The relative performance of different tools according to sampling approaches warrants closer attention. This review highlights, for example, that the CSAS assessment tool has been administered exclusively in non-convenience samples and yielded the lowest prevalence estimate (1.41%). However, the GAIT was also administered in non-convenience samples, and the Lemmens IGD-9 was primarily administered (65%) in non-convenience samples, and these two tools yielded some of the highest prevalence estimates (6.90% and 6.89%, respectively). Thus, when considering prevalence rates according to tools, the effect of sampling, while relevant, does not necessarily tell the whole story.

As often the case in psychological research, it is the interaction between several factors that becomes important in understanding the bigger picture. Overall GD prevalence was

affected by the combination of small sized and adolescent only samples. For example, 3 of the 5 smallest studies in the present review had quite low mean ages and reported some of the highest prevalence rates (i.e., Kim et al. (2018) [8.96%, *N*=402, age=13.0y]; Wang et al. (2014) [14.71%, *N*=503, age=14.58y]; and van den Eijnden et al. (2018) [9.76%, *N*=538, age=12.9y]). Such studies can contribute to the perception of GD prevalence as being unreasonably high which can then draw strong criticism of the validity of the condition. Although some studies have been described as 'prevalence' studies, a closer inspection of some studies reveals that their methods were not likely to yield genuinely representative data. The present review differentiated 31 studies, which we termed 'Type 1' studies, based on clearly identifiable representative sampling (e.g., according to age, gender, education, socio-economic status, urbanicity), stratified random or randomized cluster sampling, and population or cohort registry sampling. The pooled prevalence rate for Type 1 studies was 1.96%. However, it bears noting that, like the total sample of 53 studies, this figure had a large confidence interval, partly due to lower cut-off scores applied in some of these studies which increased heterogeneity.

Prevalence rates were found to be higher for Asian countries than for other regions. These results support previous findings in which East Asian prevalence rates were among the highest worldwide (Fam, 2018; Long et al., 2018). The reasons for these regional differences remain unclear, but it is well-documented that gaming is very popular and considered a national pastime in regions including South Korea. The greater popularity of gaming in Asian regions is often understood with reference to the rise in popularity of esports, more abundant gaming infrastructure (i.e., 24/7 gaming cafes), and more accepting cultural attitudes towards gaming in general despite strong regulatory measures. However, methodological factors including a higher proportion of high-school survey studies conducted in those regions should be considered. There is a need for cross-cultural research on GD (i.e., comparing Eastern and Westerns countries) employing comparable methodological approaches, including recruitment, sampling, and measurement (Rumpf et al., 2019).

Results suggest that GD prevalence has increased slightly over the last decade. In 2009, the average prevalence estimate was 1.97%, whereas estimates in 2017 averaged 4.70%. One reason for this apparent increase may be related to the adoption of the *DSM-5* criteria into screening measures. The *DSM-5* refers to 9 criteria that include symptoms of preoccupation, tolerance, and withdrawal, which have been shown to converge with highly engaged but non-problematic gaming (Charlton & Danforth, 2007). Although these criteria are listed in other addictive disorders (including gambling disorder), their inclusion in GD screening tools may lead to tests being overly sensitive. Some authors have argued that applying *DSM-5* criteria to activities, including gaming and other everyday activities, may result in over-pathologization (Billieux et al., 2015). The *DSM-5* approach (i.e., any 5 criteria, with harm not required) employed in some tools (e.g., the Lemmens IGD-9) may lead to artificially high prevalence rates that do not reflect genuine gaming-related problems. In support of this, the present review showed that the pre-2013 (i.e., pre-*DSM-5*) pooled prevalence estimate of GD was 2.35% compared to 4.45% post-*DSM-5*. As an alternative to the *DSM-5*, the ICD-11 guidelines refer to three GD criteria (over-prioritization of gaming, loss of control, and continued use despite harm) and requires functional impairment. Therefore, future studies adopting the ICD-11 approach may be expected to report lower prevalence figures which may not necessarily reflect an actual decrease in prevalence rate. This potential decrease (due to the ICD-11 approach) should be anticipated by policymakers and public health authorities in evaluating the GD-related burden in populations over time, or in evaluating effects of potential GD preventive countermeasures (King & Delfabbro, 2017). On the other hand, there may be a general increase in gaming and associated problem gaming in the context of the COVID-19 pandemic (i.e., due to stay-at-home mandates and lockdowns) which may counteract this potential decrease (King, Delfabbro, Billieux, et al., 2020; Király et al., 2020)

Limitations

The main strength of the present review was its scope. This meta-analysis was the largest to date, including 53 studies and 226,247 participants across 17 different countries. However, some limitations warrant acknowledgement. First, some of the subgroup analyses may have been underpowered. The Cochrane Handbook recommend the inclusion of at least 10 studies for each continuous variable in subgroup analyses (Higgins et al., 2003). However, Fu et al. (2011) contend that between 6 and 10 studies is sufficient. Differences in sampling approaches were another potential limitation to the present review. Some studies did not provide detailed information about their sampling methods, which affected the designation of some studies to the four types of sampling. Another limitation is that only English language studies were included, which affected the representativeness of cross-cultural comparisons. This review only included peer-reviewed studies; grey literature was not included, which may have excluded some important studies, such as those published in government reports. The relative number of adolescent samples also affects the overall representativeness of the data. About half of the studies did not report whether gaming occurred predominantly online versus offline or both (i.e., ICD-11 category distinctions).

As the GD evidence base continues to grow, it would be helpful for future reviews that consider prevalence rates to consider some additional variables. Specifically, this work could examine the potential effects of sampling methodologies in more detail (e.g., school-based samples, online convenience sampling, and crowd-sourced data, such as Amazon MTurk). Another issue for consideration is the influence of comorbidity, e.g., axis I disorders, other addictive disorders. A stronger focus on gaming-related harm (see Delfabbro et al., 2020; King & Delfabbro, 2018b) to gain insights into genuine harm and functional impairment would strengthen future studies and meta-analyses.

Conclusions

This review found that the worldwide prevalence of GD was 3.05% [CI: 2.38, 3.91] and this rate reduced to 1.96% [0.19, 17.12] when selecting studies based on more stringent sampling criteria (e.g., stratified random sampling). However, given the larger proportion of adolescent samples in this evidence base, these prevalence rates may be substantially lower among other demographic groups. The results indicated that the choice of assessment tool accounted for a large proportion of the variance in GD prevalence. Further, higher GD rates were found among adolescents and males, as well as in studies employing smaller sample sizes or lower cut-offs. This review affirms previous observations of the varied methodological approaches employed in GD research (King, Chamberlain, Carragher, et al., 2020; Zajac et al., 2017), and was consistent with Mihara and Higuchi's (2017) observation that variability in GD screening greatly affects comparability of studies of prevalence. Future epidemiological research should apply standardized approaches to GD screening and report more detailed information on sampling. Given that much of the variability in prevalence is related to screening, a potentially helpful next step for the global GD research agenda would be to conduct studies employing cognitive interviews to gain insights into how people are interpreting screening questions or whether classifications based on screening instruments stand up to independent clinical review of the same cases. Future research should also consider the potential effect of other factors including the role of comorbidity and different types of games (Green et al., 2020; King, Delfabbro, Perales, et al., 2019; King, Koster, & Billieux, 2019).

CHAPTER 4

Systematic review of the components of CBT for Internet gaming disorder

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Statement of Authorship

Paper 2: Systematic review of the components of CBT for Internet Gaming Disorder.

Unpublished and Unsubmitted work written in manuscript style.

Matthew Stevens (Candidate)

I was responsible for the analysis and primary authorship of this paper. All treatment manuals included for review in this paper were identified by Dr. King and myself. I subsequently carried out the data extraction, coding and conducted the analyses. I was responsible for the interpretation of the findings, with insights and critical feedback from Dr. King. I then prepared multiple drafts of the manuscript in collaboration with my primary and co-supervisors. My contributions total 75% of this paper.

I hereby certify that this paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.

Matthew Stevens

January, 2021

Daniel King (Co-author)

I was primarily responsible for overseeing the candidate's contribution to this paper. All studies included for review in this paper were identified as part of a larger previous review by myself and other colleagues. The candidate and I decided upon the variables of interest for the analysis, and after the analysis, I helped with the interpretation of the findings. I was responsible for providing feedback and corrections during the interpretation and drafting processes. During the peer-review process, responses to reviewers were undertaken by the candidate and I together. My contributions total 15% of this paper.

Paul Delfabbro (Co-author)

I was primarily responsible for providing critical commentary and feedback during revisions of the final manuscript. My contributions total 10% of this paper.

By signing this statement of authorship, each of the following authors certifies that: (1) the candidate's stated contribution to the publication is accurate (as detailed above); (2) permission is granted for the candidate to include the publication in the thesis; and (3) the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

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January, 2021

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January, 2021

Abstract

Background: Few standardized treatment protocols for Internet gaming disorder (IGD) are currently available. This review aimed to describe and analyze the components of published CBT interventions for IGD; to assess consistency between the theoretical understanding of IGD and its treatment, and to assess consistency between treatments for IGD and other behavioral addictions. ***Method:*** A systematic search of six databases identified 10 treatment studies. Treatment modules were summarized, and then compared with a leading theoretical model of IGD (Brand et al., 2016) and a standard CBT program for gambling disorder (Petry, 2005). ***Results:*** CBT modules for IGD vary greatly, and no study has employed all standard modules. Treatment approaches were moderately consistent with IGD theory-driven recommendations and were consistent with CBT for gambling disorder. ***Conclusions:*** IGD treatment protocols require improved descriptions, particularly for cognitive therapy components. Future trials should aim to identify the most effective components of CBT for gaming-related problems.

Systematic review of the components of CBT for Internet gaming disorder

In 2013, the American Psychiatric Association (APA) included *Internet gaming disorder* (IGD) in the Diagnostic and Statistical Manual (*DSM-5*; APA, 2013) under section III as a condition warranting further study, and therefore not yet a legitimate diagnosis. IGD is defined as the persistent use of online games that can result in clinically significant impairment or distress, as evidenced by at least five criteria during the previous 12-month period. These symptoms include preoccupation with playing; withdrawal-like symptoms when unable to play; the need to spend increasing amounts of time playing (tolerance); or unsuccessful attempts to control playing time. Other symptoms include a loss of interest in other hobbies and entertainment; continued use despite awareness of negative consequences; hiding or lying about gaming; using gaming to escape or alleviate negative states or moods; and, jeopardizing significant relationship, occupation, academic or career opportunities. According to this classification, IGD is conceptualized as a behavioral addiction with similar characteristics to gambling disorder.

Although IGD is listed as a provisional classification, there appears to be a consensus among scholars that IGD entails addictive elements, including withdrawal-like symptoms. A common approach to the study of problematic gaming has been the use of the 'components' model of addiction (see Griffiths, 2005), which includes: salience, mood modification, tolerance, withdrawal, conflict, and relapse. Research from neuroimaging studies suggest that there is a significant overlap between IGD and other addictive disorders, to the extent that excessive gaming is associated with functional brain changes in prefrontal and other cortical areas (Brand et al., 2014; Kuss & Griffiths, 2012). A review by Kuss and Griffiths (2012) concluded that, at the neurobiological, neurocognitive, and behavioral levels, IGD shows similar characteristics to other addictive disorders. For example, IGD is associated with decreased dopamine activity in areas associated with reward (Han et al., 2014; Hou et al., 2012; Kim et al., 2011; Tian et al., 2014), and may be associated with structural changes in white matter density and grey matter volume in areas of the brain associated with attention,

control, impulse control, motor function and emotion regulation (Ding et al., 2014; Dong, DeVito, Huang, et al., 2012). Finally, IGD is associated with impairments in cue-reactivity, reward processing, learning, memory, response inhibition, executive function etc.

Theoretical Models of IGD

Several theoretical models have been developed to conceptualize the underlying processes within IGD. Two such models (i.e., Brand et al., 2016; Dong & Potenza, 2014) have proven particularly useful in delineating the interaction between cognitive and behavioral processes that underlie IGD. Dong and Potenza's (2014) model suggests that IGD is characterized by motivational drives for reward-seeking and stress-alleviation that interact with diminished cognitive control of response inhibition, resulting in impaired decision-making capabilities. Individuals with IGD have been shown to display increased sensitivity to rewards and decreased sensitivity to losses (Clark, 2014; Dong et al., 2013; Dong, Huang, & Du, 2011; Dong et al., 2015), indicating they may be more motivated to play games, and be less affected by the negative consequences than normal players. Furthermore, compared with healthy gamers, individuals with IGD have poorer impulse control (Dong, Lu, Zhou, et al., 2011) and demonstrate abnormal neural activation in frontal brain regions when performing tasks related to response inhibition (Dong, DeVito, Du, et al., 2012; Dong, Lu, Zhou, et al., 2010; Ko et al., 2014). These findings provide empirical support for the interaction between motivation, cognitive control and decision-making, as suggested by Dong and Potenza (2014).

A second, more recent, updated model proposed by Brand, Wegmann, Stark, et al. (2019) termed the Interaction of Person-Affect-Cognition-Execution (I-PACE) model, has conceptualized the interaction of various factors underlying the development and maintenance of internet-use disorders, including IGD. The I-PACE model suggests that IGD can be characterized as the consequence of the interaction of predisposing factors (e.g., neurochemical imbalance and comorbid psychopathology) with moderator (e.g., maladaptive coping styles and internet-related cognitive biases) and mediator variables (e.g., cognitive, and

affective response to triggers and reduced executive function). The I-PACE model states that individuals with IGD are predisposed to developing addictive behaviors, due to preexisting psychopathologies that lead the individual to play games for gratification and compensatory effects. Persistent use leads to changes in emotional and cognitive responses to gaming, and thus develop into a chronic and habitual use of gaming. Operant conditioning processes maintain a maladaptive cycle of gaming behavior.

Current Approaches to Treatment

Both of the models described have important implications for how IGD might be treated and, in particular suggest that cognitive-behavioral interventions are likely to target a number of the etiological factors identified. Consistent with this view, Dong and Potenza (2014) argued that motivation-related therapies might be used to target decision-making processes and increase focus on future-oriented goals, and this should be combined with behavioral elements, including contingency management to promote abstinence through reinforcement, while using cognitive-behavioral strategies to reduce the motivational drive to play online games. Similarly, the I-PACE model describes specific biopsychosocial factors, including cognitive-behavioral components, that may be addressed using CBT strategies. These two models suggest, for example, that clinicians should target general and gaming-specific cognitive biases through cognitive therapy and reduce and redirect gaming behaviors through behavioral therapy techniques.

The relative value of CBT approaches has generally been born out in reviews of treatment studies. For example, King, Delfabbro, Wu, et al. (2017) reviewed 30 treatment studies and reported that, despite some methodological limitations of studies, CBT was the most promising treatment for longer term gains. Similarly, a meta-analysis by Winkler et al. (2013) reported that, based on the effect size estimates (g=1.61), pharmacological and psychological interventions were both ‘highly effective’ in improving outcomes for Internet addiction (including IGD) from pre- to post-treatment, but that CBT was more beneficial in reducing

time spent online and reducing depressive symptomatology than other psychological treatments. Overall, the treatment evidence base is still developing but indicates that CBT may be the recommended approach for IGD.

Despite this general support for CBT, there can still be considerable variability in how interventions are provided due to the lack of well validated treatment protocols or manuals. This creates some additional challenges in comparing psychological treatments across studies, as well as replicating these approaches. For example, based on some recent reviews, it appears that CBT for IGD may often include 'generic' CBT for addiction modules, sometimes in combination with other treatments including reality training, motivational interviewing, and counselling. Thus, to further our understanding of what makes CBT effective for IGD, it is necessary to understand what specific CBT techniques are being administered in trials. Furthermore, with IGD intended as an 'addictive disorder' alongside gambling disorder, it may be useful to consider the extent to which there may be some important overlap (and differences) between the treatment approaches for IGD and other addictive disorders.

The Present Review

In summary, while problems associated with online digital technologies have been examined by clinicians since the 1990s (Young, 1996, 1998a, 1998b), the literature tends to lack clear statements on the conventional or 'best practice' approach for these disorders, including IGD. Accordingly, the principal aim of this review was threefold. The first aim was to describe and analyze what would appear to be the main components of current cognitive-behavioral interventions for IGD. This work served to assess the level of consistency in current approaches across studies and regions. A second component of the research then compared treatment modules with those recommended by the I-PACE model (Brand, Wegmann, Stark et al., 2019), to determine whether IGD treatment appears to capture the elements thought to underlie the disorder. A third and final aim of the review was to determine how similar IGD treatments are to more established inventions used for related disorders such as for gambling

disorder. It was hoped that these three analytical approaches would help to consolidate some convergence between theoretical understanding of the disorder, and the practical application of principles and current best practice for established behavioral addictions.

Method

Identification and Selection of Studies

A search of six databases (i.e., *Academic Search Complete, PubMed, PsychINFO, Science Direct, Scopus* and *Web of Science*) was conducted using the following search terms and logic: (Internet OR video OR computer) AND (addic* OR gam* disorder) AND (treat* OR intervention). The searches were restricted to the titles, abstracts or keywords of full-text papers, published in peer-reviewed journals from 2007 onward. The searches generated a total of 1,545 hits, comprised of the following for each database: *Academic Search Complete* (255 results), *PsychINFO* (152 results), *PubMed* (436 results), *Scopus* (366 results), *ScienceDirect* (226 results), and *Web of Science* (110 results). Additionally, a search of *Google Scholar* generated 25,400 results, and the reference lists of other systematic reviews were checked (i.e., King & Delfabbro, 2014; King et al., 2012; King, Delfabbro, Wu, et al., 2017; Kuss & Lopez-Fernandez, 2016; Przepiorka et al., 2014; Winkler et al., 2013), as well as the reference lists of the included studies. However, these searches did not yield any previously unidentified results.

Following initial identification of studies (N=30), reports without outcome data were excluded, as well as interventions not addressing specific gaming-related issues or those applying a non-cognitive-behavioral intervention (N=10). Studies not published in English (N=10) were excluded. A total of ten studies remained for inclusion for review. Figure 4.1 presents a flow chart summary of the selection process in accordance with PRISMA guidelines.

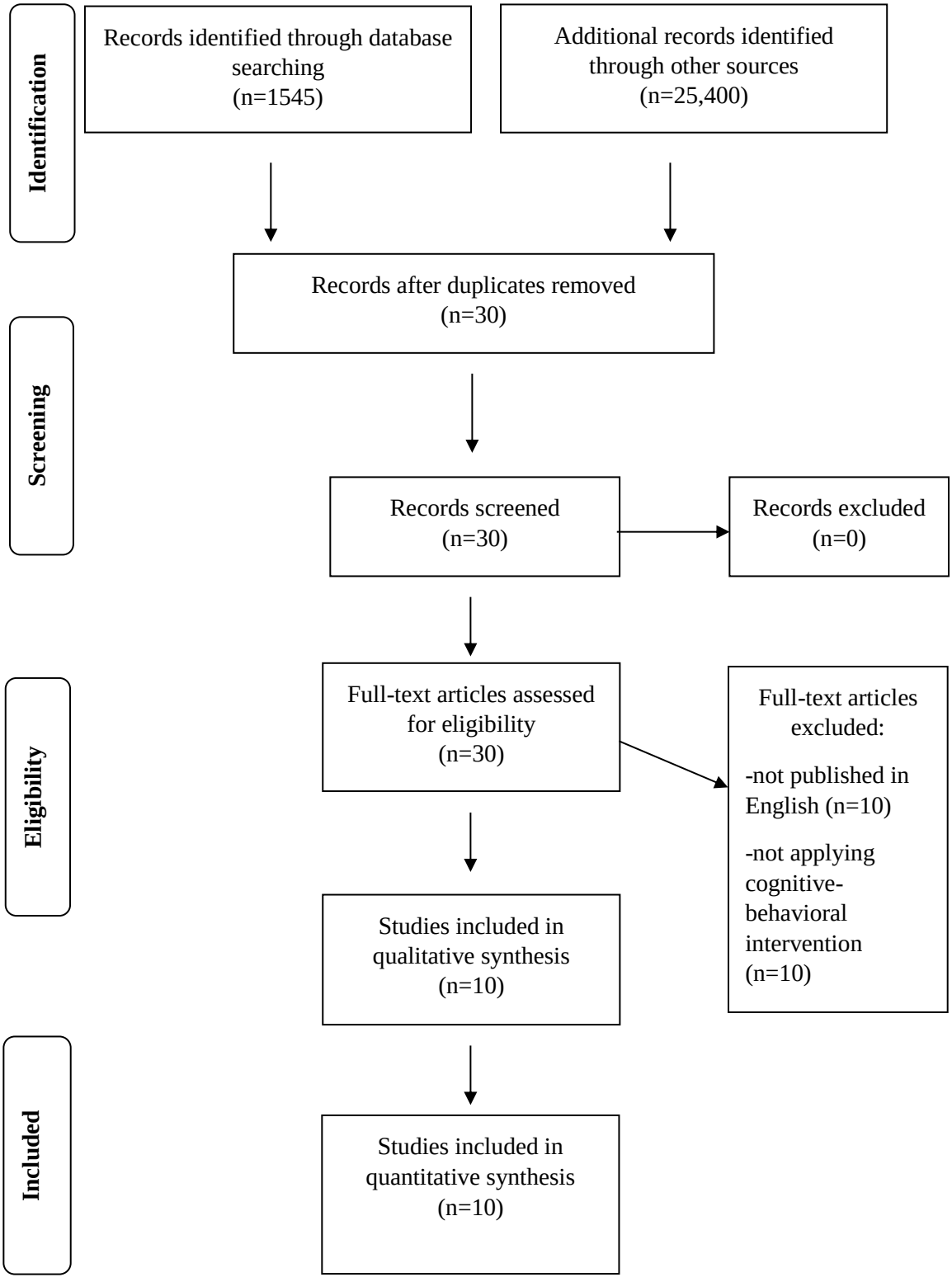

Figure 4.1. Study identification and selection process according to PRISMA guidelines.

Intervention Component Assessment

To assess the intervention of each study, an analytic framework was developed by the authors by consulting well-regarded CBT protocols for treating addictive disorders (Greenberg & Padesky, 1995; Mitcheson et al., 2010). A total of five components (i.e., *psychoeducation*, *behavior therapy*, *cognitive therapy*, *skill development*, *relapse prevention*) were employed. Each component (except *psychoeducation* and *relapse prevention*) was then divided into relevant sub-sections. The *behavior therapy* component was divided into five sub-sections, including: antecedents, behaviors, consequences, modification strategies and associated maintenance factors. The *cognitive therapy* component was divided into two sub-sections, including: *cognitive distortions* and *measures* used to identify them. The *skill development* component was divided into three sub-sections, including: *communication training* (i.e., verbal skills training), *problem solving training* (i.e., decision making or assertiveness training), and *mood management training* (i.e., relaxation training).

The interventions of all 10 studies included in the present review were assessed systematically using the analytic framework, based on whether features were reported or not. In some cases, authors did not report intervention details, and therefore attempts were made to elicit those details from either the authors themselves, or other parts of the manuscript. A detailed Excel spreadsheet containing the framework and results is available by request.

Results

Table 4.1 provides a summary of the features of the intervention components for all 10 studies. The most common CBT components included psychoeducation, particularly involving reviews of adverse effects of gaming, the IGD mechanism and gaming motivations; behavior therapy (including behavior rehearsal and modification, and exposure therapy techniques); skill development (including verbal and problem-solving skills, and mood-management); and relapse prevention (particularly self-management). The most underdeveloped aspects included the cognitive distortions addressed through cognitive

restructuring which were mostly generic (i.e., negative core beliefs about the self) and/or biases unrelated to gaming (i.e., over-generalizing and all-or-nothing thinking, catastrophic thinking).

Table 4.1. Summary of the components of cognitive-behavioral interventions for GD.

Component	*Subcomponent*	Techniques / Content area			
Psychoeducation	-	Therapy rules and guidelines and treatment expectations[5,7]	Adverse outcomes of gaming, IGD and gaming motivations[4,5,7-10]	Psychological and physical harm[4,9]	Five steps of change[8]
Cognitive therapy	*Cognitive Restructuring*	Over-generalizing and all-or-nothing thinking[1,3,5,6]	Negative core beliefs and catastrophic thinking[1,4,6]	Rationalization, rumination and short-term thinking[4,5]	Irrational conditional statements[9]
Behavior therapy	*Antecedents*	Situations[3,7]	Cognitions[4,6-9]	Beliefs[7]	Stress[7]
	Consequences & Maintenance Factors	Academic / workplace problems[1,4,6-9]	Financial problems[1,4,6,8,9]	Relationship / family problems[1,4-9]	Psychological / emotional problems[1,4,6,7,9]
	Modification Strategies	Behavioral rehearsal[1,6]	Behavioral modification[7,9]	Exposure training[1,6,7,9,10]	Outdoor activities[10]
Skills training	*Communication*	Social skills[1-7,9]	Empathic thinking[9]	-	-
	Problem-solving	Practical problem-solving[1,4-6,8]	Assertiveness[1,6,9]	Decision-making[4,8]	Pros and Cons analysis[7]
	Mood Management	Stress management[5,8,9]	Relaxation[1,6]	Breathing training[9]	-
Relapse prevention	-	Self-management and self-monitoring[1-3,5,6]	Craving management and impulse control[2,4,8]	Harm reduction and emergency stopping[1,6,7]	Alternative interests and behavioral reinforcement[4,7,9]

Note: 1: Young (2007); 2: Du, Jiang, & Vance (2010); 3: Ge et al. (2011); 4: Kim et al. (2012); 5: Li & Wang (2013); 6: Young (2013); 7: Wölfling et al. (2014); 8: Park et al. (2016); 9: Santos et al. (2016); 10: Sakuma et al. (2017).

Table 4.2 provides an evaluation of intervention components for each study, including the level of reported detail. It was clear that there was general consistency in terms of the types of components delivered across studies. However, no single study provided a 'complete' intervention (i.e., the presence of all identified CBT components in a single program). The most consistently delivered and well-reported components were psychoeducation, skills training, and relapse prevention. Techniques from cognitive therapy and behavior therapy were the most underrepresented across studies and were the least detailed components.

Table 4.2. Evaluation of the components of Cognitive-behavioral interventions for GD.

Study	Psychoeducation	*BT Antecedents*	*BT Behaviors*	*BT Consequences*	*BT Maintenance Factors*	*BT Modification Strategies*	*CT Cognitive Distortions*	*CT Identification Measures*	*ST Communication*	*ST Problem Solving*	*ST Mood Management*	Relapse Prevention
Young (2007)	–	–	○	–	●	●	●	–	●	●	○	●
Du et al. (2010)	○	–	○	–	–	●	–	–	●	○	–	●
Ge et al. (2011)	–	○	○	–	–	–	–	–	●	–	–	●
Kim et al. (2012)	●	○	○	●	●	●	●	–	●	●	–	●
Li & Wang (2013)	●	–	–	–	●	–	●	●	●	●	○	●
Young (2013)	–	○	○	–	●	●	●	–	●	●	○	●
Wölfling et al. (2014)	●	●	○	●	●	●	–	–	●	●	–	●
Park et al. (2016)	●	○	–	●	●	–	–	–	●	●	○	●
Santos et al. (2016)	●	○	–	●	●	●	●	–	●	●	○	●
Sakuma et al. (2017)	●	–	○	–	–	●	–	–	–	–	–	–

Note: BT: Behavior therapy component, CT: Cognitive therapy component, ST: Skills training component; ●: present; ○: present with limitations; –: not reported.

Narrative Synthesis

Psychoeducation

Psychoeducation was reportedly delivered at the beginning of treatment to introduce individuals to important information about the causes and consequences of problematic internet use, and the options for treatment. Seven of the ten studies (i.e., refs: 2, 4, 5, 7-10) reportedly included a psychoeducation component as part of their intervention. According to Wölfling et al. (2014), the purpose of psychoeducation was to develop a personalized case formulation for each participant, which included their gaming maintenance factors and social environment. Their rationale was that an individual's awareness of the 'vicious cycle' of processes involved in problematic gaming may provide an important first step in building treatment readiness.

Psychoeducation reportedly involved a discussion of the problems and outcomes associated with excessive gaming, and the typical motivations to play games despite negative consequences. For example, Kim et al. (2012) presented clients with a "*review of adverse results of online game addiction, in terms of academic, job and economic performance*" (p. 1956); and facilitating a "*discussion of the damage caused…in terms of body and mind*" (p. 1956). Similarly, Wölfling et al.'s (2014) psychoeducation component provided information "*focusing on its triggers and reactions…on cognitive, emotional, psychophysiological and behavioral levels*" (p. 6). Psychoeducation was not limited to individuals undergoing therapy. Du et al. (2010) included a separate psychoeducation session for the parents and teachers of the client. This focused on recognition of the problem and assisting the client regain control over states of emotion. For example, parents were taught "*principles and techniques for recognizing the child's feeling states*" (p. 131). Teachers were taught the same principles but were provided with additional workshops which included didactic teaching and role-playing exercises that involved the client.

Behavior Therapy

All ten studies reported to address problem behaviors related to gaming and Internet use in some way. Three studies reported addressing gaming-specific behaviors (Kim et al., 2012; Li & Wang, 2013; Park et al., 2016). According to Young (2013), problem gamers often engage in high levels of gaming and therefore find themselves unable to manage other important aspects of their lives, such as meeting deadlines at school or work and participating in normal routines and social relationships. Wölfling et al. (2012) stated that an early focus of therapy should be on reducing gaming behaviors and limiting exposure to situations that trigger gaming.

Six studies (i.e., refs: 3, 4, 6-9) reported addressing internal and external antecedents for problem gaming. Wölfling et al. (2014) reported assisting participants to understand which "*situations, cognitions, beliefs, emotions and psychophysiological reactions*" (p. 2) led to problematic gaming. Similarly, Kim et al. (2012) and Park et al. (2016) both reported addressing stress-related triggers arising from academic, occupational, relationship and financial problems, as well as the influence of peer pressure to game.

Six studies reported focusing on relationship problems or conflicts (i.e., refs: 1, 4-8). For example, Kim et al. (2012) stated that strained or conflictual relationships between parents and adolescents often contributed to the cycle of problematic gaming. Their treatment involved social skills (e.g., conflict resolution) to improve the client's important social relationships. For example, the authors reported *"promotion of communication and improving family relationships*" (p. 1955) were among the most pertinent factors addressed during treatment. Similarly, Santos et al. (2016) reported that relationship breakdown and divorce were common consequences of excessive gaming and therefore social relations required attention. They reported attempts to break behavioral routines, teaching clients new ways of dealing with family and friends, and teaching skills to manage mood and improve social skills.

Occupational and academic problems were often addressed as part of treatment. Santos et al. (2016) identified "*job loss, social isolation, academic failure, abandonment and expulsion*

from school" (p. 2) as negative consequences of excessive gaming. According to Du et al. (2010), negative consequences of problem gaming were exacerbated by decreased strategizing, organizational and time management skills, especially among adolescents. They promoted techniques and strategies to counteract these issues (e.g., teaching time management).

Seven studies (i.e., refs: 1, 2, 4, 6, 7, 9, 10) employed behavioral modification strategies to address problem behaviors. Santos et al. (2016) reported including time management training and undertaking new social and physical activities. Sakuma et al. (2017) employed interactive outdoor camp activities (e.g., hiking, cooking) as a means for developing healthy and socially cooperative behaviors. Across several studies, clients were taught a form of 'behavioral rehearsal', which involving scheduled practice of other activities to reduce and displace persistent Internet or gaming behaviors. For example, Young (2007) reported using behavioral rehearsal and coaching techniques to "*help clients develop positive lifestyle changes without the internet*" (p. 673). Aside from scheduled abstinence (i.e., non-gaming time), impulse control training (Du et al., 2010; Kim et al., 2012) and exposure training or desensitization (i.e., refs: 6, 7, 9) were used as behavior modification strategies.

Cognitive Therapy

CBT involves identifying and challenging maladaptive patterns of thought to develop new and helpful ways of thinking. Therapists will often engage in discussion with a client using Socratic questioning methods. In addition, they may employ a screening tool to identify common cognitive biases or distortions. A range of strategies to modify cognitions and cognitive styles were reported in the reviewed studies. Kim et al. (2012) explained that the relationship between activating events (or triggers) and problematic gaming behaviors was mediated by cognitive distortions. According to Kim et al. (2012), the cognitive distortions associated with IGD include overgeneralizing, rationalizing, catastrophizing, and maintaining negative core beliefs. Young (2013) reported that client and therapists must work

collaboratively to recognize maladaptive patterns of thought (e.g., overgeneralizing, negative core beliefs, and rumination), and then attempt to modify them using cognitive restructuring techniques. Similarly, Li and Wang (2013) referred to self-doubt and all-or-nothing thinking as targets for cognitive therapy. Santos et al. (2016) reported that therapy should address irrational conditional statements, such as "*Just a few more minutes on the internet won't do me any harm*" (p. 3).

Six studies (i.e., refs: 1, 4-7, 9) reportedly addressed cognitive distortions, however it was unclear how these distortions were identified, and which specific cognitions were present for participants. Only Li and Wang (2013) reported using the Cognitive Distortions Scale (CDS) to identify cognitive distortions.

Six studies (i.e., refs: 1, 4-7, 9) referred to challenging unhelpful thoughts. For example, Young (2007, 2013) referred to cognitive restructuring to challenge underlying negative core beliefs. Similarly, Kim et al. (2012) reported examining evidence for cognitive distortions, and a collaborative therapist-client effort to identify alternative beliefs. Cognitive therapy components were not clear or reported by the remaining four studies that employed CT modules (i.e., refs: 2, 3, 8, 10).

Skill Development

CBT will often involve the development of some new skills to increase and maintain treatment effectiveness. Anxious or avoidant individuals may be taught assertiveness skills or strategies to manage difficult social situations. As Li and Wang (2013) note, interpersonal problems are common in IGD and therefore users tend to form and rely on online relationships. As a result, real-world interpersonal skills may be used less, and the user may feel less confident to interact with others. For this reason, most reviewed studies included a module on communication skills.

Eight studies (i.e., refs: 1-7, 9) reported including a component involving the development of social skills. Kim et al. (2012) presented a component that involved "*managing problems*

in a social relationship" (p.1956). Du et al. (2010) reported a component aimed at promoting parent-child communication. In some studies, managing adolescents' peers was the focus of social skills training. Kim et al. (2012) referred to "*managing peer pressure*" (p. 1956), where adolescents were taught the skills needed to communicate their thoughts and feelings to peers, particularly in relation to declining opportunities to play games or play moderately. Santos et al. (2016) focused on training clients to think more empathically toward others, and to view situations from others' perspectives, as a foundation for healthier relationships.

Individuals with IGD often avoid commitments and play games to escape from reality. Li and Wang (2013) encouraged individuals with IGD to engage in problem-solving and identify short-term solutions to reduce stress or conflict, rather than choosing to "*indulge in pleasure brought by game playing*" (p. 1470). Eight studies (i.e., refs: 1, 2, 4-9) included a component involving problem solving. Three studies (Santos et al., 2016; Young, 2007; 2013) reported providing participants with assertiveness training. Five studies (i.e., refs: 1, 4-6, 8) reported teaching participants to develop practical solutions to gaming-related problems (e.g., failure to complete homework). Li and Wang (2013) and Park et al. (2016) reported using decision-making skills training, and Wölfling et al. (2014) reported conducting a 'pros and cons' analysis to help guide decision-making.

Relapse Prevention

Another important skill taught in CBT involves personal management of mood and stress. Two studies (Li & Wang, 2013; Park et al., 2016) reported the inclusion of 'stress management' training. Young (2007; 2013) reported relaxation training as a component of their intervention. Santos et al. (2016) reported relaxation training and breathing exercises as part of their stress management component, as well as helping participants to manage their anxiety symptoms.

Nine studies (i.e., refs: 1-9) reported the inclusion of relapse prevention techniques as part of their intervention. All nine studies reported some form of craving management training,

which often involved teaching the client to monitor and manage their own symptoms. Five studies (refs: 1-3, 5, 6) reported teaching clients 'self-management' techniques to prevent initial relapse. Other studies included harm reduction strategies (Young, 2007, 2013) and emergency stopping plans (Wölfling et al., 2014) to prevent escalating gaming behaviors.

Four studies (refs: 4, 5, 7, 9) reported other various relapse prevention strategies. Kim et al. (2012) and Wölfling et al. (2014) reported helping participants to learn to develop new interests and activities. Li and Wang (2013) reported helping participants monitor their unique cognitive distortions (i.e., internal triggers for use), and Santos et al. (2016) reported that the client should practice and reinforce new beliefs. Of the 10 studies, three (refs: 3, 4, 8) reported future planning and setting goals as a component of relapse prevention. Ge et al. (2011) reported helping participants plan university careers, as an alternative to gaming-related goals.

Consistency with Theoretical Understanding of IGD

Brand et al. (2016, 2019) outlined several areas that clinicians should target during CBT, including: coping styles, gaming-related expectancies, attentional biases, cue-reactivity, cravings, executive function, and inhibitory control. The authors argued that psychoeducation was useful for retraining implicit and explicit cognitions, and understanding gaming motivation, social cognitions, and the potential influence of psychopathological processes; and how individuals deal with stressors and gaming-related cues, or how they manage urges and cravings. Overall, there was moderate consistency between this model and the body of CBT evidence, with seven out of 10 studies (i.e., refs: 2, 4, 5, 7-10) reporting the inclusion a psychoeducation component consisting of references to some of these areas.

Brand et al. (2016, 2019) have argued that cognitive therapy strategies (e.g., cognitive restructuring) for IGD should target the maladaptive ways in which individuals perceive and cope with stressful situations, including their expectancies about gaming and the reinforcing effect that gaming has on these beliefs. They explain that cognitive strategies are needed to reduce the arousal elicited by gaming related stimuli to enable more adaptive decision-making

processes. Overall, there was moderate consistency between these recommendations and the body of CBT evidence, with six out of 10 studies (i.e., refs: 1, 4-7, 9) reporting the inclusion of cognitive restructuring techniques.

According to Brand et al. (2016, 2019), behavior modification strategies target an individual's learned response to stressful situations through habituation training and behavioral rehearsal. Behavioral rehearsal, for example, involves individuals actively practicing responses to stressful situations in order to develop a more adaptive behavioral repertoire. Habituation training aims to address the individual's affective and cognitive response to stressful situations. Both strategies are aimed at reducing maladaptive coping behaviors common in IGD. The research was largely in line with these suggestions, with seven out of 10 studies (i.e., refs: 1, 2, 4, 6, 7, 9, 10) reporting the inclusion of behavior modification techniques.

Individuals with IGD have a diminished capacity to control craving for games and demonstrate a tendency toward gaming-related decisions that favor instant gratification. According to Brand et al. (2016, 2019), diminished control may be improved by promoting problem-solving and social communication skills. In this respect, there was high consistency between theory and practice with eight out of the 10 studies (refs: 1-7, 9) including a verbal social skills training component, and eight studies (refs: 1, 2, 4-9) including a problem-solving skills component. Brand et al. (2016) add that various retraining programs, such as attentional retraining, cue-exposure therapy and approach/avoidance retraining programs may be useful in shifting automatic and learned responses to more adaptive ones. However, the reviewed studies only referred to cue exposure techniques.

Consistency with Gambling Disorder Treatment

Gambling disorder has a much more developed body of literature, including multiple studies of the effectiveness of CBT for gambling disorder. For reference, Petry (2005) has outlined an 8-session CBT treatment program for gambling disorder. Given the strong

conceptual overlap between gambling and gaming disorders, and the general support for CBT for IGD, it is worth considering the extent to which CBT for gaming may resemble CBT for its gambling counterpart. This program includes modules for: (1) identifying triggers, (2) functional analysis, (3) finding other sources of enjoyment, (4) self-management, (5) coping with gambling urges, (6) assertiveness and gambling refusal skills, (7) thought challenging, and (8) coping with relapse.

All eight modules included in Petry (2005) were evident in the body of reviewed IGD studies; however, none of the studies presented a program with all 8 modules of Petry's (2005) program. Modules 1 and 2 of Petry's (2005) program are akin to psychoeducation. Petry (2005) note that common triggers associated with gambling disorder include situational factors (e.g., having cash and time available); psychological factors (e.g., bored, depressed, or anxious affect); and conflicts (e.g., with family members and coworkers). On the whole, there appears to be moderate consistency between IGD and gambling treatment practices, with six studies (i.e., refs: 3, 4, 6-9) reportedly addressing situational and psychological factors, and six other studies (i.e., refs: 1, 4-8) reportedly addressing conflicts with others as triggers for problem gaming behaviors.

Developing interests and other hobbies or activities, and learning to self-manage the behavioral response to triggers is key to overcoming problem gambling (Petry, 2005), which are presented during modules 3 and 4. On the whole, there appears to be moderate-to-high consistency between IGD and gambling treatment practices, with seven studies (i.e., refs: 1, 2, 4, 6, 7, 9, 10) including techniques geared towards finding enjoyment in other activities such as hiking, cooking and other non-gaming pursuits.

Various forms of stress become associated with the urge to gamble, through operant conditioning principles, and that conflicts are one of the main sources of stress (Petry, 2005). Thus, dealing with stress through problem-solving and learning to communicate effectively are targets of CBT for gambling. Modules 5 and 6 of Petry's (2005) CBT program are akin to skills training components. On the whole, there appears to be high consistency between IGD

and gambling treatment practices, with eight studies (i.e., refs: 1-7, 9) reportedly including a verbal communication skills component, and a separate eight studies (i.e., refs: 1, 2, 4-9) reportedly including a problem-solving skills component.

According to Petry (2005) cognitions associated with gambling include selective remembering of wins and misremembering losses (availability heuristic), overestimating odds, superstitious behaviors, and the gambler's fallacy. Module 7 of Petry's (2005) program aligns with cognitive therapy. However, the cognitive distortions associated with problematic gaming are not well established. Thus, a difference between approaches to treatment can be found. On the whole, there appears to be moderate consistency between IGD and gambling treatment practices, with six studies (i.e., refs: 1, 4-7, 9) reportedly including a component dedicated to identifying and challenging maladaptive thought processes.

Petry (2005) notes many individuals learn to manage and overcome their addiction. However, as is quite often the case, life stressors and unforeseen future events (both positive and negative) may trigger a relapse. Module 8 of Petry's (2005) program is dedicated to equipping the individual with the tools needed to limit and prevent any potential relapse. On the whole, there appears to be a high degree of consistency between IGD and gambling treatment practices, with nine out of the 10 studies (i.e., refs: 1-9) including a relapse prevention component.

Discussion

Main Findings

The purpose of this systematic review was to describe and evaluate the components of cognitive-behavioral approaches to the treatment of IGD. It was found that CBT interventions commonly involved: (a) psychoeducation and functional analysis, (b) a range of behavior and cognitive therapy techniques, including cognitive restructuring, behavioral rehearsal, and exposure therapy, (c) training component to modify verbal communication, problem-solving and mood management skills, and (d) relapse prevention, including self-management and

harm reduction strategies. A second aim of this review was to determine the extent to which treatment was consistent with the I-PACE model, a recent multidimensional model of IGD. Overall, the identified components were moderately consistent with the model, with studies including coverage of areas including the need to alter dysfunctional coping styles and gaming-related expectancies; reduce cue-reactivity; manage cravings and urges; improve executive function and response inhibition; and teach verbal communication, mood management and problem-solving skills. However, CBT studies lacked reference to 'retraining' exercises, including the retraining of attentional biases and approach/avoidance tendencies.

The review also found that CBT interventions were mostly consistent with Petry's (2005) standard CBT treatment protocol for gambling disorder. There was a clear focus in the reviewed studies on identifying and managing the triggers for problem gaming behavior; identifying and changing distorted patterns of thinking around gaming behaviors; attempting to find new areas of life to gain enjoyment; developing more adaptive behaviors to manage stress and mood, and the development of skills in problem-solving and communication. However, there were some differences in protocols regarding the nature of cognitive distortions associated with either disorder. While CBT for gambling disorder refers to common gambling-related biases (e.g., gambler's fallacy, illusion of control), the reviewed studies did not refer to specific gaming-related biases. Their cognitive therapy components referred to cognitive distortions that contribute to generally poor decision-making, including over-generalizing, rationalization, rumination, and all-or-nothing thinking. The similarities and differences between IGD and other addictive disorders, and other mental disorders, were not entirely clear in these studies (see Delfabbro & King, 2015; King & Delfabbro, 2016). The specific cognitive dimensions of IGD suitable for modification in cognitive therapy require further attention.

The review found that only one study (Li & Wang, 2013) employed a tool to measure cognitive distortions, whereas other studies seemingly obtained this information through

interviewing. It is unclear whether changes in cognitive distortions over the course of CBT were assessed. Future trials may wish to include validated measure of gaming cognitions (e.g., *Online Game Cognitive Addiction Scale*; Li & Wang, 2013; *Gaming-Contingent Self-Worth Scale*; Beard & Wickham, 2016) to help target gaming-related cognitive distortions. On the whole, cognitive therapy components of CBT for IGD appear to be similar to or transposed from gambling disorder, rather than tailored to the known characteristics of IGD. Further refinements in these areas may help to improve the efficacy of CBT for problematic gaming.

It is acknowledged that providing adequate details of a treatment protocol is challenging within the constraints of a research report. Although the reviewed studies provided brief protocol summaries, it was often difficult to locate complete information about each CBT module. Given the limited space for these details in a research report, it would be beneficial for researchers to provide a supplementary file that provides more detail on interventions. For example, the CONSORT statement refers to "precise details" as a requirement of clear reporting on interventions (Schulz, Altman, & Moher, 2010). Access to this information would be highly informative to researchers and clinicians, particularly in serving the need for replication studies and given the lack of available treatment manuals.

Given the identified inconsistencies across CBT programs, it may be difficult to fairly compare interventions across all studies. For example, it is unclear whether the psychoeducation components of each study were delivering similar information about IGD as a condition. Similarly, exposure therapy may have proceeded quite differently, with differing targets and procedures, across studies. Compounding the differences is the broadly underdeveloped nature of cognitive therapy for IGD, making it difficult to describe a 'prototypical' treatment protocol. More positively, however, it is clear that CBT for IGD and gambling disorder share many features, which may indicate that some of the lessons learnt from studying treatment of gambling may be applicable to IGD.

Limitations

This review had several limitations. First, the review excluded studies not published in English and therefore a body of research, particularly from Asian countries including Japan and South Korea, were not included. It is not known whether there are any regional differences in CBT for problematic gaming. Second, there was a considerable lack of reported detail of treatment protocols making it difficult to determine what was administered. In one sense, one should not expect an unabridged treatment protocol, but it is possible that crucial details were not reported. Another issue is that this review did not compare all reviewed IGD studies to all theoretical models of IGD or to all CBT protocols for gambling disorder. A more comprehensive review may seek to undertake these comparisons. Finally, the majority of studies were published before the *DSM-5*, and although the DSM does not refer to treatment, the reviewed studies should still be viewed in this light.

Conclusions

The status of CBT for IGD appears to be somewhat inconsistent across treatment studies. In comparison to standard CBT protocols, none of the studies provided a 'complete' CBT program. However, the reviewed studies were largely consistent with the recommendations of a recent multidimensional model of IGD. Similarly, there was consistency between the overall approach of the reviewed studies and that which is routinely applied to gambling disorder. To improve IGD research and practice, researchers should seek to identify more specific areas of cognition associated with IGD and use that knowledge to refine aspects of cognitive therapy. The IGD treatment field would also benefit generally by improving reporting standards with respect to providing more detail on interventions.

CHAPTER 5

Cognitive-behavioral therapy for Internet gaming disorder: A systematic review and meta-analysis

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Statement of Authorship

Paper 3: Cognitive-behavioral therapy for Internet Gaming Disorder: A systematic review and meta-analysis.

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Matthew Stevens (Candidate)

I was responsible for the analysis and primary authorship of this paper. I was responsible for identifying and selecting the studies for inclusion. Dr. King and I decided upon the variables of interest for the analysis, and I subsequently carried out the data extraction, coding and conducted the primary and auxiliary analyses. I was responsible for the interpretation of the findings, with insights and critical feedback from Dr. King. I then prepared multiple drafts of the manuscript in collaboration with my primary and co-supervisors. The response to reviewers was undertaken by Dr. King and I together, and I was responsible for conducting revisions of this paper. My contributions total 75% of this paper.

I hereby certify that this paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.

Matthew Stevens

January, 2021

Daniel King (Co-author)

I was primarily responsible for overseeing the candidate's contribution to this paper. The candidate and I decided upon the variables of interest for the analysis, and after the analysis, I helped with the interpretation of the findings. I was responsible for providing feedback and corrections during the interpretation and drafting processes. During the peer-review process, responses to reviewers were undertaken by the candidate and I together. My contributions total 15% of this paper.

Paul Delfabbro (Co-author)

I was primarily responsible for providing critical commentary and feedback during revisions of the final manuscript. My contributions total 5% of this paper.

Diana Dorstyn (Co-author)

I was primarily responsible for providing guidance to the candidate for the analytic framework. I was also responsible for providing critical commentary and feedback during revisions of the final manuscript. My contributions total 5% of this paper.

By signing this statement of Authorship, each of the following authors certifies that: (1) the candidate's stated contribution to the publication is accurate (as detailed above); (2) permission is granted for the candidate to include the publication in the thesis; and (3) the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Daniel King, PhD

January, 2021

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January, 2021

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January, 2021

Abstract

Background: While there is sufficient research and clinical evidence to support the inclusion of gaming disorder in the latest revision of the International Classification of Diseases (ICD-11), relatively little is known about the effectiveness of first-line psychological treatment for gaming disorder or Internet gaming disorder (IGD) as it is listed in the *DSM-5*. This systematic review employed meta-analytic techniques to determine the effectiveness of cognitive-behavioral therapy (CBT) for IGD on four key outcomes: IGD symptoms, anxiety, depression, and time spent gaming. ***Method***: A database search identified 12 independent CBT studies. Effect size estimates (Hedges' *g*) with associated confidence intervals, prediction intervals and *p* values, for each pre-post treatment outcome, were calculated. Study reporting quality was evaluated in accordance with the Consolidated Standards of Reporting Trials (CONSORT) guidelines. Subgroup and moderator analyses were undertaken to investigate potential sources of heterogeneity. ***Results***: CBT demonstrated high efficacy in reducing IGD symptoms (*g*=.92, [0.50,1.34]) and depression (*g*=.80, [0.21,1.38]) and showed moderate efficacy in reducing anxiety (*g*=.55, [0.17,0.93]) at post-test. There was insufficient power to determine whether CBT was capable of reducing time spent gaming. Treatment gains at follow-up were non-significant across the four treatment outcomes. ***Conclusions***: The pooled findings suggest that CBT for IGD is an effective short-term intervention for reducing IGD and depressive symptoms. However, the effectiveness of CBT for reducing actual time spent gaming was unclear. Given the limitations of this evidence base, there is a need for more rigorous studies to determine the potential long-term benefits of CBT for IGD.

Cognitive-behavioral therapy for Internet gaming disorder: A systematic review and meta-analysis

The notion that video-gaming should be recognized as an acquired addictive disorder has received strong support from within clinical psychology, psychiatry, and public health. Internet gaming disorder (IGD) was included in Section III of the latest Diagnostic and Statistical Manual (*DSM-5*) as a condition warranting further study in 2013 (American Psychiatric Association, 2013). More recently, gaming disorder was included in the latest revision of the International Classification of Diseases (ICD-11) (World Health Organization, 2018). While the ICD and DSM systems differ in their clinical description of gaming disorder, both systems state that the disorder has similar characteristics to gambling disorder (e.g., prioritization of gaming over other activities, loss of control, and functional impairment). Numerous epidemiological studies (e.g., Rehbein et al., 2015; Müller et al., 2015; Haagsma et al., 2012; Przybylski et al., 2017) have reported that the prevalence of gaming disorder exceeds 1% of the general population, with much higher estimates among adolescents (Mentzoni et al., 2011; Müller et al., 2015; Mak et al., 2014; van Rooij et al., 2011; King, Delfabbro, Zwaans, et al., 2013). Currently, little is known on the effectiveness of psychological treatments for IGD to inform clinical guidelines.

At an international level, there is increasing demand for clinical and public health interventions for gaming-related problems. Available research suggests that cognitive-behavioral therapy (CBT) may be a promising first-line approach (King, Delfabbro, Wu, et al., 2017; Winkler et al., 2013; Zajac et al., 2017). Recommendations of CBT for gaming-related problems appear to be consistent with recent models of gaming disorder (i.e., Brand, et al., 2016; Dong & Potenza, 2014; King & Delfabbro, 2016, 2019). The I-PACE model proposed by Brand et al. (2016), for example, posits that IGD is maintained by diminished cognitive control, which inhibits decision-making processes resulting in the decision to play video games. Young and Brand (2017) argue that CBT techniques may be particularly useful to target the maladaptive processes that contribute to IGD as described in the I-PACE model

and other related models of gaming disorder. An apparent advantage of CBT over other therapies, including pharmacological treatment, is its ability to target and modify maladaptive cognitions that underlie gaming behaviors that generate harm and/or distress. Another benefit of CBT is that it may be more equipped to address comorbid conditions in the context of IGD. IGD is significantly associated with depression (Wang et al., 2018), general anxiety (Bargeron & Hormes, 2017), social anxiety (Wei et al., 2012), attention deficits (Yen et al., 2017), other addictive behaviors (van Rooij et al., 2014), elevated stress and maladaptive coping (Batthyány et al., 2009), sleep problems (Dworak et al., 2007), loneliness (Lemmens et al., 2011), and suicidal ideation (Rehbein et al., 2010). The known effectiveness of CBT for many of these comorbidities and other issues suggests that CBT may be a strong first-line therapy candidate for IGD. There may also be some cost-benefit considerations if existing CBT programs can be adapted to accommodate IGD-specific content.

The substantial demand for treatment of IGD and problematic gaming (Nakayama & Higuchi, 2015) in combination with a lack of standard treatment guidelines and inconsistent classification approaches and measurement tools (King, Haagsma, Delfabbro, et al., 2013; Rodda et al., 2018) had led to widespread uncertainty and inconsistent approaches to treatment. A recent survey of 289 psychiatrists reported that 43% were not confident in their ability to manage IGD in their practice (Dullur & Hay, 2017). Psychological treatment was considered the first-line therapy approach and most (75%) reportedly did not prescribe medication for IGD. IGD has been treated by a range of clinical and health-related practitioners using the same techniques (King, Delfabbro, Wu, et al., 2017), and therefore clinician training and expertise may be potential sources of heterogeneity in the treatment literature.

The most recent meta-analysis of treatment for gaming disorder by Winkler et al. (2013) compared the effectiveness of pharmacological (n=3) and psychological (n=13) interventions for ‘Internet addiction’ (including gaming disorder). Both intervention types were reportedly ‘highly effective’ (g=1.61) from pre- to post-treatment. Although Winkler et al. referred to

positive long-term treatment benefits, very few studies (n=4) included a follow-up assessment. CBT was considered the most beneficial treatment for reducing depressive symptoms and time spent gaming compared to other psychological interventions. It is timely to re-evaluate the literature and these conclusions given that information is most useful when it is current and includes evidence that may inform a new consensus on this topic (Moher et al., 2008).

The Present Review

Current recommendations of CBT for IGD have not taken into consideration the important issue of sample heterogeneity, such as differences in participant age and gender, among other methodological differences. It is necessary to clarify which IGD treatments are most effective for whom and under which conditions. The present meta-analytic review will evaluate the effectiveness of cognitive-behavioral treatment for gaming disorder. This review will refer to gaming disorder as 'IGD' given that this terminology predominates the research literature and most measurement tools for gaming disorder are based on the *DSM-5* conceptualization. CBT has the strongest preliminary support for IGD treatment despite the evidence of inconsistent findings and some methodological concerns (King, Delfabbro, Wu, et al., 2017; Winkler et al., 2013). Since Winkler et al.'s (2013) meta-analytic review, additional studies have been published, thereby allowing for an updated empirical evaluation which also includes examination of potential sources of study heterogeneity. The presented meta-analysis will evaluate the short- and long-term effectiveness of CBT in relation to four key outcomes: IGD symptomatology, anxiety symptoms, depression symptoms, and time spent gaming. These therapy outcomes were chosen to be consistent with Winkler et al.'s (2013) meta-analysis.

Method

Identification and Selection of Studies

Figure 5.1 provides an outline of the study selection process according to PRISMA guidelines (Moher et al., 2009). Studies were identified for inclusion if they included a CBT

intervention for IGD. Studies were excluded if they did not include pre-post outcome data which was necessary for the analysis. Studies published from 2007 to 2018 were included, for greater comparability of gaming products and activities implicated within gaming disorder and for consistency with the *DSM-5* conceptualization (i.e., studies in the 1990s and 2000s primarily adapted DSM-IV-TR pathological gambling and/or referred to 'Internet addiction' not gaming disorder).

A search of six academic databases (i.e., *Academic Search Complete, PubMed, PsychINFO, Science Direct, Scopus* and *Web of Science*) was conducted using the following search terms and logic: (Internet OR video OR computer OR online) AND (addic* OR gam* disorder) AND (treat* OR intervention OR therapy OR CBT). Titles, abstracts or keywords of full-text papers published in peer-reviewed journals were examined. The search also included grey literature (e.g., dissertations and google scholar) and the reference lists of recent systematic reviews on IGD cognition and treatment (i.e., King & Delfabbro, 2014; King, Delfabbro, Wu, et al., 2017; Kuss & Lopez-Fernandez, 2016; Przepiorka et al., 2014; Winkler et al., 2013; Zajac et al., 2017). These searches did not yield any additional results. The methodology sections and tabular content in three studies (i.e., refs 1,3,5) published in Korean and Chinese were translated using *Google Translate* to identify relevant variables. Thirty studies were identified.

Following initial identification, study eligibility was assessed independently by two raters (MS & DLK). There were no disagreements on study variable ratings. The outcome data from each study were extracted by two independent assessors and checked by a third arbitrator. There were no discrepancies. A total of 13 independent studies were included. All studies were summarized according to the following characteristics: *participant age, gender proportion, CBT type* (group vs. individual), *setting* (e.g., mental health center vs. university), *practitioner* (e.g., clinical psychologist vs. psychiatrist), *referral source* (i.e., self vs. other), *treatment intensity* (including frequency of contact and total sessions), and *reporting quality rating* (i.e., adherence to the CONSORT statement guidelines). The outcome variables were: *IGD*

symptoms (i.e., score on a measure of IGD symptomatology); *anxiety* (i.e., score on anxiety inventories or clinical diagnosis), *depression* (i.e., score on depression inventories or clinical diagnosis) and *time spent gaming* (i.e., total hours spent gaming).

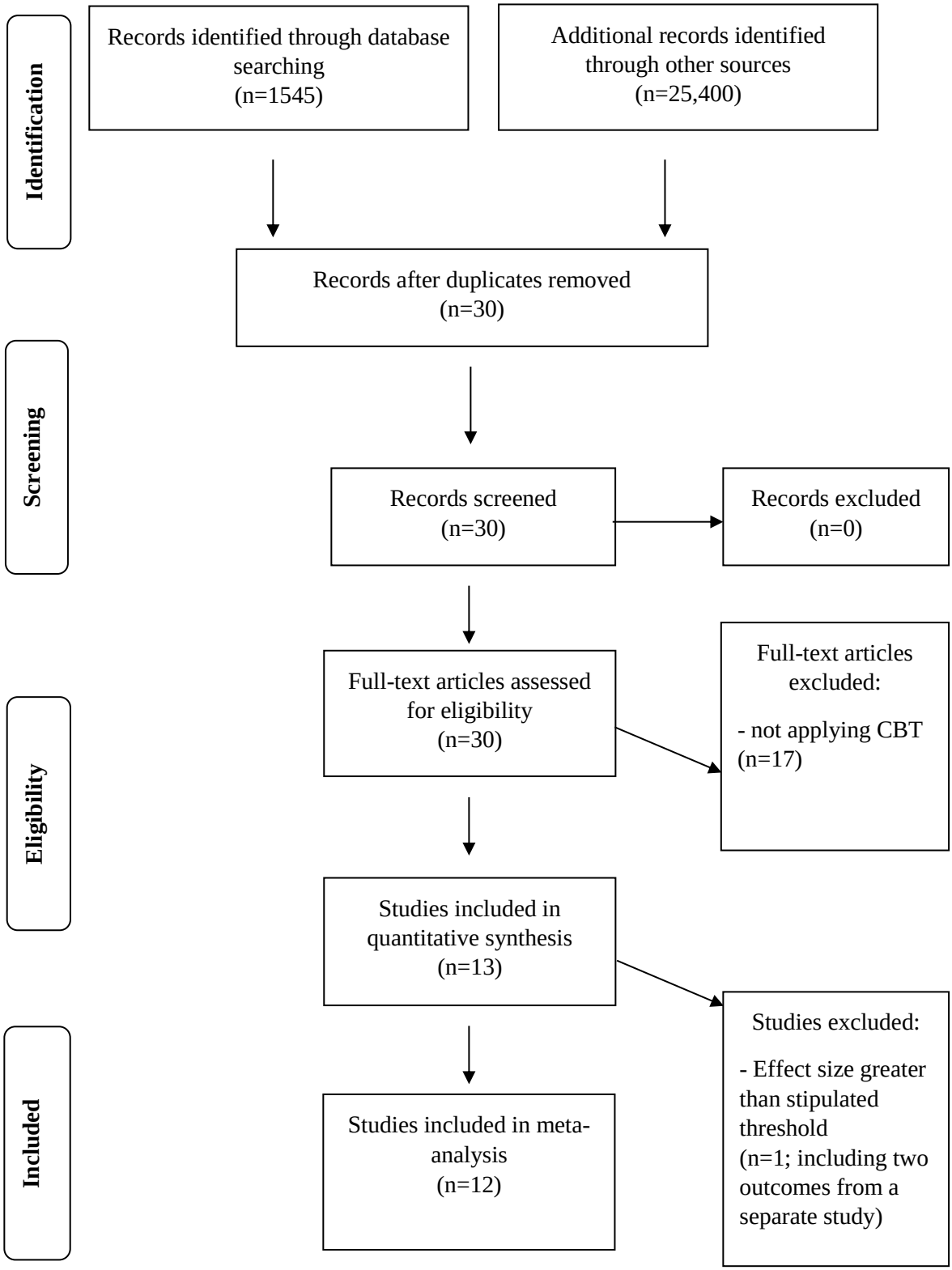

Figure 5.1. Study identification and selection process according to PRISMA guidelines.

Study Reporting Quality

Study reporting quality was assessed using the 25-item CONSORT (Consolidating Standards of Reporting Trials) guidelines for nonpharmacological treatments, including psychotherapy (Boutron et al., 2017). The checklist was used to evaluate studies based upon the level of reported detail with respect to a number of domains including objectives and participant details, methodological details (e.g., randomization, blinding, implementation and recruitment), outcomes and baseline data, discussion details (e.g., limitations, implications), and other details (e.g., sources of funding).

Statistical Methods

Hedges' *g* effect size estimates, 95% confidence intervals, prediction intervals (which provide an indication of the dispersion of effect sizes; Borenstein et al., 2011) and corresponding tests of significance were calculated for each study using Microsoft Excel software package *Meta-Analysis Essentials 1.2*. (Hak et al., 2016). Hedges' *g* was chosen over Cohen's *d*, because it weights the effect size using sample size and therefore accounts for upward bias in studies with small samples (Hedges & Olkin, 1985). Hedges' *g* of .2, .5 and .8 indicate low, moderate, and high effect sizes according to Cohen's (1998) recommendations. Effect size estimates and 95% confidence intervals were calculated for within-group (treatment group only) and between group (for RCT study) designs at pre- to post-test and, where possible at follow-up. Hedges' *g* values above 3.00 were considered to be outliers and excluded from further analysis. The correlation between pre- and post-treatment measures is also essential for the calculation of effect sizes, however the study manuscripts lacked sufficient detail to identify them. Therefore, a conservative estimate of r=.70 was selected, as recommended by Rosenthal (1993).

Effect sizes were calculated using standardized mean differences (SMD), which were calculated based on formulas provided by Borenstein et al. (2011), depending on the study

design (i.e., between or within groups). The SMD for within-groups designs was calculated using the following formula:

$$d = \left(\frac{Y_1 - Y_2}{S_{within}} \right)$$

where Y_1 is the sample mean pre-treatment, Y_2 is the sample mean post treatment, and:

$$S_{within} = \frac{\sqrt{SD_1^2 + SD_2^2 - 2r \times SD_1 \times SD_1}}{\sqrt{2(1-r)}},$$

where SD_1 is the standard deviation of the sample mean pre-treatment, SD_2 is the standard deviation of the sample mean post-treatment, and r is the Pearson's r correlation between pre- and post-treatment scores. Hedges' g was then calculated by multiplying d by the correction factor:

$$J = 1 - \frac{3}{4df - 1}$$

where df is the degrees of freedom. The variance of g for within-groups designs was calculated using the formula:

$$V_g = J^2 \times \left(\frac{1}{n} + \frac{d^2}{2n} \right) 2(1-r),$$

with standard error of g given by:

$$SE_g = \sqrt{V_g}.$$

The SMD for between-groups designs was calculated using the following formula:

$$d = \left(\frac{X_1 - X_2}{\sqrt{\frac{(n_1 - 1)SD_1^2 + (n_2 - 1)SD_2^2}{n_1 + n_2 - 2}}} \right)$$

where X_1 and X_2 are the sample means of each condition (intervention and control), SD_1 and SD_2 are the respective standard deviations, and n_1 and n_2 are the sample sizes of each condition. Hedges' g was calculated by multiplying d by the correction factor:

$$J = 1 - \frac{3}{4df - 1}$$

where df is the degrees of freedom. The variance of g for within-groups designs was calculated then using the formula:

$$V_g = J^2 \times \left(\frac{n_1 + n_2}{n_1 n_2} + \frac{d^2}{2\left(n_1 + n_2\right)} \right),$$

with standard error of d given by:

$$SE_g = \sqrt{V_g}\,.$$

Effect sizes were calculated for each outcome variable. To ensure data independence, only one effect size was calculated per variable from each study. For studies with multiple measures of the same outcome (e.g., time spent gaming), effect sizes were calculated individually and then a mean value determined (e.g., Santos et al., 2016). For studies with multiple subscales

measuring the same outcome, scores on each subscale were weighted by the inverse variance prior to pooling (e.g., Young 2007). A random effects model was used to determine pooled effect size estimates (point estimates). A random effects model was chosen due to the diverse populations of the included studies (Borenstein et al., 20119).

The degree of between-study heterogeneity, or effect size variance, was examined using two indices: Cochrane's *Q*, which analyses the ratio of observed variation to within-study error (Borenstein et al., 2017) and the I^2 statistic, which estimates the true effect variance over sampling error observed. I^2 reflects the level of inconsistency of findings across studies and is expressed as a percentage, with values of 25%, 50% and 75% indicating low, medium, and high heterogeneity respectively (Borenstein et al., 2017).

Publication bias is the reported tendency for significant results to be published at a higher proportion than non-significant results. To account for publication bias, Fail-safe Ns were calculated. The Fail-safe N adopted for this analysis was adapted from Orwin's (1983) formula. A conservative Fail-safe N value was adopted, i.e., publication bias was deemed not an issue if the Fail-safe N was greater than the number of studies that contributed to each subgroup analysis.

A combination of these statistics was used to determine whether a combined effect size was significant. This included: the combined effect size had to be larger than 0.2 (Cohen, 1988), the associated confidence interval must not include zero, the associated *p*-value must be significant (i.e., $< .05$), and Orwin's Fail-safe N must be larger than the number of studies contributing to a particular analysis. If all four criteria were met, then the result was considered robust and free from potential sources of bias.

This review also examined whether grouping effect sizes based upon study design (between vs. within groups) was more appropriate than combining effect sizes. Between-groups analyses consistently report much lower effect size estimates, and lower levels of statistical heterogeneity, than within-groups analyses for each outcome (Baguley, 2009). Thus,

combining studies with different designs may result in high levels of statistical heterogeneity and therefore should be considered.

Subgroup and Moderator Analyses

Subgroup analyses for three outcome variables, i.e., IGD symptoms, anxiety, and depression, were conducted to investigate whether subgroups could explain the heterogeneity in combined effect size estimates. Studies were subsequently categorized based upon population (i.e., whether the mean age or age range included adolescents [<18] or adults [>18]); therapy delivery (i.e., whether therapy was delivered by group or individual CBT); region (i.e., whether the study took place in an Asian or non-Asian region); and practitioner (i.e., intervention delivery by a clinical psychologist or psychiatrist). Combined effect size estimates using a random effects model were compared for each subgroup using Z-tests (Borenstein et al., 2011).

Potential moderating variables were also identified as part of this process. Specifically, study reporting quality (i.e., CONSORT score); gender balance (i.e., percentage of male participants); and number of sessions (i.e., the total number of sessions). These variables were chosen based on their availability across studies. A linear regression of these variables was conducted using the program *Meta-Analysis Essentials v1.2.*

Results

Study Selection

Thirteen studies were initially evaluated. Effect sizes were calculated for each outcome variable assessed in each study. Two studies (i.e., Santos et al., 2016; Young, 2013) reported effect sizes considered to be exceedingly high (Hedges' $g > 3$). These outcomes were considered outliers. For this reason, two out of three outcome variables in Santos et al. (2016) were excluded and Young's (2013) study was excluded altogether. Therefore, 12 studies were included in the meta-analysis, which included a total of 580 participants.

Study Characteristics

Table 5.1 presents a summary of the 12 study characteristics. Of the studies that reported age details, six studies involved adolescents and five involved young and middle-aged adults. Five studies included male-only samples, with another five including predominantly male samples (i.e., N > 50%). Nine studies involved group CBT and the remaining four involved individualized therapy. Treatments were predominantly conducted in Asian regions including China (n=4), South Korea (n=3) and Japan (n=1). The remaining studies were conducted in Western regions, including Germany (n=2), USA (n=1) and Brazil (n=1). Clinical psychologists were the most common practitioners, as reported in 7 of the 12 studies. Two studies involved a multi-disciplinary team. Three studies involved a psychiatrist who delivered the intervention, and one study did not report the practitioner. Program length was varied, with six studies providing an 8-session CBT program, and four providing a 12-session program. One study (Sakuma et al., 2017) provided daily therapeutic contact for the duration of a 9-day retreat. Only six studies reported the inclusion of a follow-up, with follow ups occurring at 8 weeks (n=2), 12 weeks (n=1), three months (n=1) and six months (n=2).

Table 5.1. An overview of treatment study characteristics (*n*=13).

Author (year)	N ($_tN_{0,}$ $_tN_1$) ($_cN_{0,}$ $_cN_1$)	N males (%)	Age range (*M*)	Group details	Setting, Region	Practitioner	Referral source	Total sessions	Follow up	Outcome variables	Quality score†
Cao et al. (2007)	64 (29,26) (35,31)	53 (93%)	12 - 18 years (14.8)	1. CBT (group) 2. NTC	Hospital, China	Psychiatrist	Self, parent, or teacher	8	-	1. IGD symptoms (YDQ, CIAS) 2. Anxiety (SCARED)	14
Young (2007)	114 (114,114) (0,0)	66 (58%)	(M_f = 46, M_m = 38)	1. CBT (individual)	MHC, USA	Clinical psychologist	Self	12	6m	1. IGD symptoms (MTQ, ACU, RF, ATA) 2. Time (AEO)	9
Lee & Son (2008)	27 (13,13) (14,14)	NR	NR (NR)	1. CBT (Group) 2. Physical exercise	NR	Clinical psychologist	NR	12	8w	1. IGD symptoms (YIAS) 2. Depression (BDI)	11
Du et al. (2010)	56 (32,32) (24,24)	45 (80%)	12 - 17 years (NR)	1. CBT (group) 2. NTC	MHC, China	Psychiatrist	Self or parent	8	6m	1. IGD symptoms (IOSRS) 2. Anxiety (SCARED)	20
Jing et al. (2010)	81 (36,32) (45,45)	NR	NR	1. CBT (group) 2. NTC	MHC, China	NR	Self	8	-	1. IGD symptoms (YDQ, CIAS)	12
Kim et al. (2012)	65 (32,32) (33,33)	65 (100%)	13 -18 years (NR)	1. CBT (group) + med 2. med only	Clinic, South Korea	Multi-disciplinary team	Self or parent	8	12w	1. IGD symptoms (YIAS) 2. Anxiety (BAI) 3. Depression (BDI) 4. Time (time online)	17
Li & Wang (2013)	28 (14,14) (14,14)	28 (100%)	12 - 19 years (NR)	1. CBT (group) 2. NTC	Hospital, China	Clinical psychologist	Self or parent	12	-	1. IGD symptoms (IAS) 2. Anxiety (SAS) 3. Depression (SDS)	15
Young (2013)	128 (128,128) (0,0)	83 (65%)	22 - 56 years (NR)	1. CBT (individual)	MHC, USA	Clinical psychologist	Self	12	6m	1. IGD symptoms (IADQ)	9
Wartberg et al. (2014)	24 (24,18) (0,0)	21 (89%)	12 – 17 years (15.33)	1. CBT (group)	MHC, Germany	Clinical psychologist	Self or parent	8	-	1. IGD symptoms (YIAS) 2. Anxiety (PLC-J) 3. Depression (PLC-J) 4. Time (time online)	14

Wölfling et al. (2014)	37 (37,26) (0,0)	37 (100%)	18 - 47 years (26.1)	1. CBT (individual)	Outpatient clinic, Germany	Psycho-therapist	Self	23	-	1. IGD symptoms (AICA-S) 2. Anxiety (SCL) 3. Depression (SCL) 4. Time (time online)	15
Park et al. (2016)	36 (12,12) (12,12) (12,12)	36 (100%)	NR (24.2)	1. CBT (group) 2. VRT (individual) 3. Control	Outpatient clinic, South Korea	Multi-disciplinary team	Self	8	-	1. IGD symptoms (YIAS)	15
Santos et al. (2016)	39 (39,39) (0,0)	12 (33%)	19 - 42 years (28.6)	1. CBT (individual)	Outpatient clinic, Brazil	Psychiatrist	Self	10	-	1. IGD symptoms (IAT) 2. Anxiety (HAM-A) 3. Depression (HDRS)	13
Sakuma et al. (2017)	10 (10,10) (0,0)	10 (100%)	NR (16.2)	1. SDiC – including CBT (group)	Hospital, Japan	Clinical psychologist	Self or parent	9 days	3m	1. Time (time online)	15

Note. †Indicated by CONSORT evaluation score (/25). ${}_{t}N_{0}$: pre-test treatment *N*; ${}_{t}N_{1}$: post-test treatment *N*; ${}_{c}N_{0}$: pre-test control *N*; ${}_{c}N_{1}$: post-test control *N*.
ACU: Ability to Control Use; AEO: Ability to Engage in Offline Activities; AICA-S: Scale for the Assessment of Internet and Computer Game Addiction; ATA: Ability to Abstain from Internet Use; BAI: Beck Anxiety Inventory; BDI: Beck Depression Inventory; CBT: Cognitive Behavior Therapy; CIAS: Chinese Internet Addiction Scale; HAM-A: Hamilton Anxiety Rating Scale; HDR-S: Hamilton Depression Rating Scales; IAS: Internet Addiction Scale; IAT: Internet Addiction Test; IOSRS: Internet Overuse Self-Rating Scale; MHC: Mental Health Centre; MTQ: Motivation to Quit; NTC: No treatment Control; NR: PLC-J: German Adaptation of Reynolds Adolescent Adjustment Inventory; Not reported; RF: Relationship Function; SCARED: Screen for Child Anxiety Related Emotional Disorders; SDiC: Self-Discovery Camp; USA: United States; VRT: Virtual Reality Therapy; YDQ: Young's Diagnostic Questionnaire; YIAS: Young Internet Addiction Scale.

Study Reporting Quality

Table 5.1 includes a list of reporting quality scores for each study. Mean quality score was 14.15 (*SD*=3.18), with scores ranging from 9 to 20. The most thoroughly reported areas included participant characteristics, intervention details, baseline data, and outcome details. The most underreported areas were the randomization (e.g., allocation and implementation), blinding, and recruitment and intervention scheduling.

Quantitative Data Synthesis

Table 5.2 presents the pooled effect size estimates for each outcome variable at post-test and follow-up, based on study design (i.e., within groups, between groups and combined). Table 5.3 presents the effect size estimates and associated confidence intervals for baseline to post-test and baseline to follow-up comparison on each outcome variable for each study.

Table 5.2. Pooled effect size estimates for each outcome variable based on study design.

		Pooled/combined effect size							Heterogeneity			Publication bias
Outcome	Comparison	n	*g*	95% CI	Prediction interval	SE	*Z*	*p*	*Q*	*p*	I^2	Fail-safe *N*
GD symptoms	within group change (post-test)	4	1.25	[0.17,2.32]	[-0.79,3.28]	.34	3.69	<.001**	28.74	<.001**	89.56	21
	between group difference (post-test)	6	.67	[0.23,1.11]	[-0.20,1.55]	.17	3.94	<.001**	10.10	.072	50.49	14
	combined effect size (post-test)	10	.92	[0.50,1.34]	[-0.23,2.07]	.19	4.94	<.001**	49.78	<.001**	81.92	36
	within group change (follow up)	1	.90	[0.72,1.08]	-	.09	9.80	<.001**	-	-	-	4
	between group difference (follow up)	3	.14	[-0.03,0.32]	-	.04	3.48	.001**	0.13	.939	.00	-1[a]
	combined effect size (follow up)	4	.37	[-0.28,1.03]	[-1.24,1.99]	.21	1.80	.071	16.42	.001**	81.73	3[a]
Anxiety	within group change (post-test)	3	.27	[-0.38,0.93]	[-1.17,1.72]	.20	-6.50	<.001**	20.50	<.001**	85.36	1[a]
	between group difference (post-test)	3	.72	[-0.23,1.67]	[-0.77,2.22]	.22	3.27	<.001**	3.66	.160	45.50	8
	combined effect size (post-test)	6	.55	[0.17,0.93]	[-0.29,1.40]	.15	3.76	<.001**	14.86	.011*	66.35	11
	within group change (follow up)	0	-	-		-	-	-	-	-	-	-
	between group difference (follow up)	2	.55	[-0.53,1.63]	-	.08	6.51	<.001**	0.21	.644	.00	4
Depression	within group change (post-test)	3	.89	[-1.15,2.93]	[-3.11,4.89]	.47	1.88	.060	41.59	<.001**	95.19	10
	between group difference (post-test)	3	.66	[0.36,0.97]	-	.07	9.39	<.001**	0.29	.863	.00	7
	combined effect size (post-test)	6	.80	[0.21,1.38]	[-0.91,2.51]	.23	3.49	<.001**	42.52	<.001**	88.24	18
	within group change (follow up)	0	-	-		-	-	-	-	-	-	-
	between group difference (follow up)	2	.22	[-0.55,.99]	-	.06	3.64	<.001**	0.08	.771	.00	0[a]

Time	within group change (post-test)	3	1.39	[-0.99,3.77]	[-3.60,6.38]	.55	2.51	.012*	72.50	<.001**	97.24	18
	between group difference (post-test)	1	.84	[0.32,1.36]	-	.26	3.30	.002**	-	-	-	3
	combined effect size (post-test)	4	1.26	[-0.07,2.58]	[-2.03,4.55]	.42	3.02	.003**	79.58	<.001**	96.23	21
	within group change (follow up)	2	1.74	[-9.95,13.43]	[-18.32,21.81]	.92	1.89	.058	37.58	<.001**	97.34	15
	between group difference (follow up)	1	.39	[-0.11,0.89]	-	.25	1.59	.112	-	-	-	1
	combined effect size (follow up)	3	1.29	[-1.70,4.29]	[-5.20,7.78]	.70	1.86	.063	78.41	<.001**	97.45	16

Note: [a]Fail-safe *N* not calculated. * p<.05, ** p<.01, *** p<.001. n = number of studies contributing to pooled estimate.

Table 5.3. Hedges' *g* estimates, 95% CIs and *p*-values for each outcome variable per study at post-test and follow-up.

Author (year)	Outcome variables	pre-post			pre-follow-up		
		g	95% CI	*p*-Value	*g*	95% CI	*p*-Value
Cao et al. (2007)	IGD status	1.24[a]	[0.66,1.82]	<.001**	NA	-	-
	Anxiety	.78	[0.43,1.13]	<.001**	NA	-	-
Young (2007)	IGD status	1.19	[1.01,1.37]	<.001**	.90	[0.72,1.08]	<.001**
	Time	2.38	[2.10,2.66]	<.001**	2.65	[2.35,2.95]	<.001**
Lee & Son (2008)	IGD status	.89[a]	[0.09,1.69]	.023*	.08[a]	[-0.68,0.84]	.846
	Depression	.85[a]	[0.05,1.65]	.029*	.13[a]	[-0.63,0.89]	.734
Du et al. (2010)	IGD status	.14[a]	[-0.40,0.68]	.619	.10[a]	[-0.44,0.64]	.721
	Anxiety	.44[a]	[-0.10,0.98]	.104	.46[a]	[-0.08,1.00]	.090
Jing et al. (2010)	IGD status	.83[a]	[0.35,1.31]	.001**	NA	-	-
Kim et al. (2012)	IGD status	.70[a]	[0.20,1.20]	.005**	.21[a]	[-0.29,0.71]	.397
	Anxiety	1.12[a]	[0.60,1.64]	<.001**	.63[a]	[0.13,1.13]	.012*
	Depression	.61[a]	[0.11,1.11]	.015*	.26[a]	[-0.24,0.76]	.294
	Time	.84[a]	[0.32,1.36]	.002**	.39[a]	[-0.11,0.89]	.112
Li & Wang (2013)	IGD status	.20[a]	[-0.56,0.96]	.599	NA	-	-
	Anxiety	.54[a]	[-0.22,1.30]	.149	NA	-	-
	Depression	.61	[-0.17,1.39]	.104	NA	-	-
Young (2013)	IGD status	4.20[b]	[3.79,4.62]	<.001**	3.36[b]	[3.00,3.72]	<.001**
Wartberg et al. (2014)	IGD status	.43	[0.05,0.81]	.018*	NA	-	-
	Anxiety	.07[c]	[-0.29,0.43]	.700	NA	-	-
	Depression	.07[c]	[-0.29,0.43]	.700	NA	-	-
	Time	.47	[0.09,0.85]	.011*	NA	-	-
Wölfling et al. (2014)	IGD status	2.08	[1.53,2.64]	<.001**	NA	-	-
	Anxiety	.47	[0.14,0.80]	.003**	NA	-	-
	Depression	.90	[0.53,1.27]	<.001**	NA	-	-
	Time	1.31	[0.90,1.72]	<.001**	NA	-	-

Park et al. (2016)	IGD status	1.40	[0.74,2.06]	<.001**	NA	-	-
Santos et al. (2016)	IGD status	3.38[b]	[2.74,4.03]	<.001**	NA	-	-
	Anxiety	3.32[b]	[2.67,3.97]	<.001**	NA	-	-
	Depression	1.71	[1.33,2.09]	<.001**	NA	-	-
Sakuma et al. (2017)	Time	NA	NA	NA	.81	[0.22,1.40]	.002**

NA: Not available due to missing data. [a]Between-groups comparison. [b]Outlier excluded from further analysis. [c]Combined anxiety/depression measure. [x]Bonferroni corrected criterion level. *p <.05, **p < .01.

Within Groups Effect Sizes at Post-treatment

The within groups effect sizes at post-treatment included GD symptoms (k=4 studies, n=170 participants), anxiety (k=4, n=125), depression (k=3, n=100) and time spent gaming (k=3, n=158). The effect sizes associated with GD symptoms were large, suggesting overall reductions in GD symptoms at post-test. This finding can be considered robust given the associated 95% confidence interval did not include the value of zero. Small to large reductions in anxiety, depression and time spent gaming were also noted, however associated confidence intervals all contained zero. Tests of heterogeneity indicated high levels of inconsistency across effect estimates for all outcomes, suggesting the need for further subgroup analyses to examine potential sources of heterogeneity.

Between Groups Effect Sizes at Post-treatment

Between groups effect sizes at post-treatment were calculated for GD symptoms (k=6 studies, n=321 participants), anxiety (k=3, n=149), depression (k=3, n=120) and gaming time (k=1, n=65; Table 5.2). The between-groups effect size for time spent gaming was based on a single study (i.e., Kim et al., 2012) and therefore needs to be interpreted with caution. Post-treatment reductions in GD symptoms and depression were large and significant. Reductions in anxiety were not significant because confidence intervals indicate the true effect size may not differ from zero. Moderate levels of heterogeneity were also noted for GD symptoms and anxiety.

Combined Effect Sizes at Post-treatment

Combined between and within groups effect sizes at post-treatment were calculated for GD symptoms (k=10 studies, n=491 participants), anxiety (k=7, n=274), depression (k=6, n=220) and time spent gaming (k=4, n=223; Table 5.2). Significant large effect sizes were noted for post-treatment GD symptoms, anxiety, and depression. The combined effect size for

time spent gaming was non-significant. Moderate to high levels of heterogeneity were evident across all outcome variables.

Within Groups Effect Sizes at follow-up

The within groups effect sizes at follow-up were calculated for reductions time spent gaming (k=2, n=124; Table 5.2). Combined effect size was not significant and again, characterized by a high level of heterogeneity.

Between Groups Effect Sizes at follow-up

Between groups effect sizes at follow-up were calculated for GD symptoms (k=3 studies, n=148 participants), anxiety (k=2, n=121), depression (k=2, n=92) and time spent gaming (k=1, n=65; Table 5.2). Effect sizes suggested small to moderate, but non-significant, reductions in GD symptoms, anxiety, and depression. The associated I^2 values suggest that effect estimates across these studies were, however, relatively consistent (i.e., I^2=0.00).

Combined Effect Sizes at Follow-up

Combined within- and between-group effect sizes at follow-up were calculated for GD symptoms (k=4 studies, n=262 participants) and time spent gaming (k=3, n=189; Table 5.2). Moderate to large reductions were noted for these variables, although associated confidence intervals for both effect sizes indicate the true effect size may not differ from zero. These findings were associated with high levels of heterogeneity.

Subgroup Analyses

Table 5.4 presents the Subgroup analyses for GD symptoms, anxiety, and depression.

Table 5.4. Subgroup Analyses for GD symptoms, anxiety, and depression

			Combined effect size							Heterogeneity			Z-test	
Variable	Subgroup	Outcome	n	*g*	95% CI	Prediction interval	SE	*Z*	*p*	*Q*	*p*	I^2	*Zdiff*	*p*
IGD symptoms	Population	*Adolescents (<18)*	5	.55	[0.01,1.08]	[-0.46,1.55]	.19	2.89	.004	9.65	.047	58.53	1.43	.153
		Adults (>18)	3	1.52	[0.37,2.68]	[-0.65,3.69]	.27	5.63	<.001	9.93	.007	79.86		
	CBT type	*group*	8	.72	[0.34,1.09]	[-0.15,1.59]	.16	4.50	<.001	17.79	.013	60.65	1.14	.256
		Individual	2	1.60	[-4.04,7.23]	[-7.84,11.04]	.44	3.64	<.001	9.78	.002	89.77		
	Region	*Asia*	7	.78	[0.34,1.21]	[-0.20,1.76]	.18	4.33	<.001	15.09	.020	60.23	.54	.591
		Western	3	1.21	[-0.80,3.22]	[-2.09,4.50]	.47	2.57	.010	27.94	<.001	92.84		
	Practitioner	*Clinical Psychologist*	7	1.00	[0.42,1.58]	[-0.35,2.34]	.24	4.17	<.001	37.55	<.001	84.02	-.36	.719
		Psychiatrist	2	.68	[-6.30,7.67]	[-10.88,12.25]	.55	1.24	.218	7.71	.006	87.02		
Anxiety	Population	*Adolescents (<18)*	5	.59	[0.10,1.08]	[-2.44,3.62]	.18	3.28	.001	14.74	<.001	72.87	.66	.512
		Adults (>18)	2	1.42	[-16.25,19.95]	[-20.84,24.54]	1.42	1.00	.322	63.46	<.001	98.42		
	CBT type	*group*	5	.59	[0.10,1.08]	[-2.44,3.62]	.18	3.28	.001	14.74	<.001	72.87	.66	.512
		Individual	2	1.42	[-16.25,19.95]	[-20.84,24.54]	1.42	1.00	.322	63.46	<.001	98.42		
	Region	*Asia*	4	.72	[0.24,1.20]	-	.15	4.80	<.001	3.69	.297	18.68	.45	.654
		Western	3	1.25	[-3.11,5.61]	[-5.19,7.68]	1.01	1.24	.218	82.51	<.001	97.58		
	Practitioner	*Clinical Psychologist*	4	.53	[-0.16,1.23]	[-1.38,2.45]	.22	2.41	.016	11.68	.009	74.31	.71	.480
		Psychiatrist	3	1.44	[-2.36,5.24]	[-3.06,5.94]	.88	1.64	.102	57.61	<.001	96.53		
Depression	Population	*Adolescents (<18)*	3	.29	[-0.52,1.09]	-	.19	1.53	.127	4.02	.134	50.26	.82	.414
		Adults (>18)	2	1.28	[-3.86,6.42]	-	.40	3.20	.001	9.58	.002	89.56		
	CBT type	*group*	4	.34	[-0.21,0.90]	-	.18	1.89	.059	5.90	.116	49.18	.78	.437
		Individual	2	1.28	[-3.86,6.42]	-	.40	3.20	.001	9.58	.002	89.56		
	Region	*Asia*	3	.68	[0.35,1.02]	-	.08	8.50	<.001	0.29	.863	.00	.21	.831
		Western	3	.89	[-1.15,2.92]	[-2.30,4.08]	.47	1.89	.058	41.59	<.001	95.19		
	Practitioner	*Clinical Psychologist*	5	.52	[0.02,1.03]	-	.18	2.89	.004	12.36	.015	67.65	n/a	n/a

Population Type

For IGD symptoms, the combined effect sizes for adolescent populations (n=5) and adult populations (n=3) were both significant. However, in both cases heterogeneity was moderate to large and respectively. For anxiety, the combined effect size for adolescent populations (n=5) was significant with moderate to large heterogeneity. No significant differences were found between adolescent and adult populations for IGD symptoms, anxiety or depression based on individual Z-tests (see Table 5.4).

Therapy Delivery

For IGD symptoms, the combined effect size for group (n=8) was significant with moderate heterogeneity. The combined effect size for individual CBT (n=2) was not significant. For anxiety, the combined effect size for group CBT (n=5) was significant with moderate to large heterogeneity. The combined effect size for individual CBT (n=2) was not significant. For depression, the combined effect size for group CBT (n=4) was not significant. The combined effect size for individual CBT (n=2) was significant with high levels of heterogeneity. No significant differences were found between individual and group CBT delivery for IGD symptoms, anxiety or depression based on individual Z-tests (see Table 5.4).

Region

For IGD symptoms, the combined effect size for Asian studies (n=7) was significant with moderate heterogeneity. The combined effect size for Western studies (n=3) was not significant. For anxiety, the combined effect size for Asian studies (n=4) was significant with low heterogeneity. The combined effect size for Western studies (n=3) was not significant. For depression, the combined effect size for Asian studies (n=3) was significant with no statistical heterogeneity. The combined effect size for Western studies (n=3) was not significant. No significant differences were found between studies conducted in Asian and

Western regions for IGD symptoms, anxiety or depression based on individual Z-tests (see Table 5.4).

Practitioner

For IGD symptoms, the combined effect size for clinical psychologist (n=7) was significant with large heterogeneity. The combined effect size for psychiatrists (n=2) was not significant. For anxiety, the combined effect size for both clinical psychologist (n=4) and psychiatrist (n=3) were not significant. For depression, the combined effect size for clinical psychologist (n=5) was significant with moderate heterogeneity. No significant differences were found between therapy delivered by a clinical psychologist or a psychiatrist for IGD symptoms, anxiety or depression based on individual Z-tests (see Table 5.4).

Moderator Analyses

Moderator analyses were conducted to examine the possible effects of underlying variables of study quality, gender ratio and overall session number on treatment outcome. The analysis determined that study quality was not a significant predictor for any of the four outcome variables: IGD symptoms ($F(1,8)=1.13$, $p=.329$, $R^2=15.81\%$); anxiety ($F(1,5)=.79$, $p=.416$, $R^2=13.58\%$); depression ($F(1,4)=.62$, $p=.487$, $R^2=17.21\%$); or time ($F(1,2)=3.84$, $p=.189$, $R^2=65.75\%$).

Among studies that reported gender statistics, gender ratio was explored as a possible moderator for treatment outcome. Results indicate gender ratio was a significant predictor of anxiety outcomes ($F(1,5)=13.36$, $p=.015$, $R^2=72.76\%$). The model (B=-0.04, [-0.06, -0.01], $p<.001$) indicated that studies with a higher proportion of males were less effective than gender balanced studies. Gender ratio for the other three outcome variables IGD symptoms ($F(1,6)=.06$, $p=.818$, $R^2=.95\%$); depression ($F(1,3)=4.53$, $p=.123$, $R^2=60.15\%$); and time spent gaming ($F(1,2)=2.72$, $p=.241$, $R^2=57.59\%$) were not significant.

Total number of CBT sessions was assessed as a moderator variable for treatment outcomes. Results indicated that total number of sessions was not a significant predictor for any of the four outcomes: IGD symptoms ($F(1,6)=4.94$, $p=.068$, $R^2=45.14\%$); anxiety ($F(1,5)=.07$, $p=.795$, $R^2=1.47\%$); depression ($F(1,4)=.13$, $p=.735$, $R^2=3.18\%$); or time ($F(1,2)=.20$, $p=.695$, $R^2=9.28\%$).

Discussion

Main Findings

The purpose of this systematic review and meta-analysis was to determine the effectiveness of CBT for IGD. The results indicated that CBT was highly effective at reducing IGD symptoms and depression at post-test, and moderately effective at reducing anxiety outcomes at post-test. The reported benefits of CBT diminished greatly at follow-up (i.e., typically 3 to 6 months), but this finding was based on a limited number of studies. There was insufficient evidence (i.e., inadequate power) to determine whether CBT was capable of reducing time spent gaming. Overall, these findings suggest that CBT is a promising approach, but more rigorous studies are needed to develop treatment guidelines for IGD. These results were largely consistent with those reported in Winkler et al.'s (2013) review. Although fewer than half of the studies (n=5) assessed the effectiveness of CBT for reducing time spent gaming, the associated effect sizes for this outcome, at post-test and follow-up, were large. There was insufficient evidence to determine whether CBT was effective at reducing all four treatment outcomes at follow-up. Although CBT approaches have been the most studied treatment for IGD (King, Delfabbro, Griffiths, et al., 2011; King, Delfabbro, Wu, et al., 2017; Zajac et al., 2017), these results suggest that the evidence base may still be too underdeveloped to reach firm conclusions.

These findings should be considered with respect to recent models (e.g., the I-PACE model; Brand et al., 2016, 2019) that describe maladaptive processes that contribute to harmful gaming behavior (e.g., impaired decision-making) as well as the fact that gaming is not

considered inherently problematic (Király et al., 2017). One such consideration is that treatments for IGD may intend to reduce IGD symptoms to their lowest potential point (i.e., absolute zero), however such treatments may not aim to reduce actual gaming behavior in the same way for all users (i.e., achieve a total abstinence goal). Rather, therapy for IGD may be intended to assist the client to regain control over their gaming behavior (i.e., 'controlled use'). For this reason, the evaluation of therapies for IGD should consider whether a broad measure of gaming involvement (e.g., total hours per week) is the optimal way to capture the individual's ability to regulate gaming time. To supplement a broad measure of gaming time, a more nuanced measurement approach to gaming behavior (i.e., sensitive to 'controlled use') may include information such as whether the client engaged in short periods of gaming (e.g., not gaming for longer than two hours), setting and adhering to limits on gaming time, taking breaks during gaming, and/or days of abstinence from gaming.

The subgroup analyses found that CBT was more effective in reducing IGD symptoms and anxiety for adults as compared with adolescents. These findings may be explained by individual-level factors, such as the lower willingness of adolescent participants to engage in treatment. Research has consistently shown that adolescents are more inclined to resist therapy, particularly if the individual believes that he or she does not have a problem or is capable of managing the problem without help (Andrade et al., 2014). This may apply in cases where the adolescent is required by a parent to attend therapy and is unwilling to form a therapeutic alliance (Raviv et al., 2009). Relatedly, adolescents are known to prefer help from non-professional sources, such as friends in their social network (Sawyer et al., 2007) and may be less comfortable sharing information with adults (Helms, 2003). They may also be less likely to seek treatment due to shame and stigmatization (Clement et al., 2015), particularly in Asian regions (Ting & Hwang, 2009). Future studies should report more information on the referral status (e.g., voluntary admission, adult support, client insight) to assist in the interpretation of subgroup analyses based on client age.

The findings provide some preliminary support for the notion that individual CBT might be more effective at reducing IGD symptoms than group CBT. The reasons for this are not clear from this analysis and warrant further consideration. There was insufficient evidence in relation to therapy delivery (i.e., group vs. individual CBT) in relation to anxiety or depressive outcomes. Notably, the adolescent samples included in this review tended to receive group-based CBT; future studies should evaluate the effect of individualized approaches and/or the inclusion of family members (i.e., parents) in treatment (e.g., Liu et al., 2015). The results also demonstrated that studies conducted in two Asian regions (i.e., South Korea and China, specifically) tended to have smaller treatment effects than non-Asian studies. It should be noted that Asian studies tend to employ stronger research designs and therefore provide a more accurate effect size estimate than in non-Asian studies.

The moderator analyses suggested that gender ratio influenced the effect of CBT on anxiety. Specifically, having a greater proportion of females in the study co-occurred with larger effect sizes. This is consistent with research that has reported that females tend to have more favorable attitudes towards psychological treatment than males (Komiya et al., 2000; Sheu & Sedlacek, 2004). The observation that females reported greater improvements in anxiety than males is also consistent with the generally poorer outcomes observed in male-biased adolescent treatment studies.

Limitations

A meta-analysis is largely dependent on the quality of included studies. The inclusion of quasi-experimental studies in this review may therefore have compromised some of the analyses. The inclusion of such studies was, however, considered necessary given that few studies exist and many IGD studies employ psychometrically weak measures. For example, a review using the CONSORT guidelines of 30 IGD treatment studies reported inconsistencies in the definition of problematic gaming and diagnosis, lack of control groups, lack of randomization and blinding, and lack of key details including sample information (King,

Delfabbro, Wu, et al., 2017). Similarly, Zajac et al. (2017) reported there was a lack of methodological rigor in 26 studies, which affects estimates of treatment efficacy. Another limitation of this review was the lack of follow up assessments, limiting insights into longer term treatment effects. Similarly, it was not possible to assess whether CBT may have differential effects on specific symptoms of IGD; for example, whether CBT may reduce preoccupation with gaming or develop more self-control specifically. The lack of standardized measures and definitions also creates difficulties in comparing treatment outcomes across studies. Earlier (i.e., pre-*DSM-5*) studies tended to focus broadly on internet-related activities, and not only problematic gaming.

In regard to the subgroup and moderator analyses for continuous variables, the Cochrane Handbook recommended that at least 10 studies are needed for each continuous variable (Higgins et al., 2011) and at least four studies for each categorical variable (Fu et al., 2011). Due to the small number of studies included in both the subgroup and moderator analyses, the outcomes were all underpowered as no analysis contained a group with more than seven studies. For this reason, no subgroup comparisons yielded statistically significant results as every analysis contained a group with less than four studies, and only one moderator variable, gender ratio yielded a statistically significant result.

Conclusions

This review found that cognitive-behavioral therapy for IGD, which is often considered the first-line therapy for this disorder, may improve IGD symptoms and comorbid depression. However, treatment gains tend to be short-term and its effectiveness at reducing time spent gaming is not clear. In addition, CBT appears to have greater benefits for adults than adolescents, and females tend to experience greater treatment effects for comorbid anxiety than males. Therapeutic programs that target problematic gaming may be improved by the provision of additional support beyond the standard program or structure of therapy sessions. The relative cost-benefit of intensive programs that include CBT within a residential retreat or

‘detox’ setting should be evaluated given these findings. More funding and resources are needed to support the development of a more rigorous evidence base on IGD and its treatment.

CHAPTER 6

Prevention strategies to address problematic gaming:

An evaluation of strategy support among habitual and problem gamers

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Statement of Authorship

Paper 4: Prevention strategies to address problematic gaming: An evaluation of strategy support among habitual and problem gamers.

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Matthew Stevens (Candidate)

I was responsible for the analysis and primary authorship of this paper. I was responsible for the designing, developing, and administering the survey, and later collecting and coding responses. I subsequently conducted all statistical analyses. I was responsible for the interpretation of the findings, with insights and critical feedback from Dr. King. I then prepared multiple drafts of the manuscript in collaboration with my primary and co-supervisors. The response to reviewers was undertaken by Dr. King and I together, and I was responsible for conducting revisions of this paper. My contributions total 75% of this paper.

I hereby certify that this paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.

Matthew Stevens

January, 2021

Daniel King (Co-author)

I was primarily responsible for overseeing the candidate's contribution to this paper. The candidate undertook the analysis, and I helped with the interpretation of the findings. I was responsible for providing feedback and corrections during the interpretation and drafting processes. During the peer-review process, responses to reviewers were undertaken by the candidate and I together. My contributions total 15% of this paper.

Paul Delfabbro (Co-author)

I was primarily responsible for providing critical commentary and feedback during revisions of the final manuscript. My contributions total 10% of this paper.

By signing this statement of Authorship, each of the following authors certifies that: (1) the candidate's stated contribution to the publication is accurate (as detailed above); (2) permission is granted for the candidate to include the publication in the thesis; and (3) the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

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January, 2021

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Abstract

Background: Psychosocial problems arising from excessive gaming are a public health issue across the developed world. In its most serious form, problematic gaming is recognized as gaming disorder (GD) in the ICD-11. Research has tended to focus on the value of outpatient treatment for GD, but less attention has been paid to broader prevention strategies to address less serious but nevertheless life-interfering gaming behaviors. Another gap in this literature has been the lack of involvement of the gaming community as stakeholders to identify feasible prevention approaches. This study investigated: (1) regular and problematic gamers' level of support for different prevention strategies within primary, secondary, and tertiary approaches; and (2) whether self-efficacy is associated with greater support for prevention strategies, as predicted by the Health Belief Model. ***Method:*** A total of 992 participants completed an online survey that evaluated support for problem gaming prevention strategies and included measures of self-efficacy, gaming involvement, and GD symptoms, psychological distress, and mental health help-seeking behaviors. Participants reported stronger support for primary prevention strategies, including education, screening, and warning labels, than for other prevention approaches. ***Results:*** Overall, 61% of participants expressed support for primary prevention as compared to secondary (39%) and tertiary (36%) approaches. There was stronger support for outpatient care (48%) than inpatient services (25%). In-game shutdown features received the lowest support (65% disapproval). Contrary to the Health Belief Model, self-efficacy was not associated with prevention support. Younger, female, and less frequent gamers were more likely to support primary and secondary prevention strategies. ***Conclusions:*** These findings suggest that gamers may be more favorable toward prevention measures aligned with informed decision-making, autonomy, and self-directed actions. Gamers may be strongly opposed to modifications to the structure of gaming activities (e.g., shutdown features). Future research should evaluate the efficacy and cost-effectiveness of problem gaming prevention measures in different populations and regions.

Prevention strategies to address problematic gaming: An evaluation of strategy support among habitual and problem gamers

Globally, it is estimated that 2.7 billion people play video games (Newzoo, 2020). The vast majority play recreationally and report benefits in cognitive, motivational, emotional, and social domains (Granic et al., 2014). However, some individuals engage in excessive gaming which can lead to negative consequences, including poor psychological health, low self-esteem, relationship difficulties, and poor work or study outcomes (King & Delfabbro, 2018b, 2019a; Milani et al., 2018; von der Heiden et al., 2019). Problematic gaming, in its most serious form, has been recognized as gaming disorder (GD) in the ICD-11 (World Health Organization, 2019). This condition is characterized by persistent involvement in gaming activities, impaired control over gaming, and continued use despite harm to multiple areas of functioning. While the clinical validity of problem gaming as a disorder has been the subject of debate (Dullur & Starcevic, 2018; King, Delfabbro, Potenza, et al., 2018) and research has focused on clinical interventions (King, Delfabbro, Wu, et al., 2017; Wölfling et al., 2019), there has been less of a focus on broader prevention approaches to address less serious forms of problematic gaming.

Gaming involvement can be considered along a spectrum, from recreational involvement to more excessive or risky use and, in rare cases, problematic and harmful engagement. Prevalence estimates of problematic gaming vary greatly due to the methodological characteristics of studies, but robust studies applying more stringent cut-offs tend to report that about 1-3% of individuals meet the symptoms for gaming disorder (Przybylski et al., 2017; Stevens et al., 2020). A larger proportion of individuals may be considered low or moderate risk players who report some of the symptoms of GD and may be at greater risk of developing more serious gaming-related problems. Government health bodies in many countries have recognized the negative health consequences of excessive gaming and other online activities and have recommended that these activities should be used in moderation (Király et al., 2018). In some regions, however, there is relatively little information and guidelines, or support

services, to address excessive and problematic gaming. In Australia, for example, government bodies (e.g., the eSafety Commission) have tended to consider the main risks of online activities as those related to online harassment (predators) and cybersecurity vulnerabilities. The impact of excessive digital media use on mental health, including gaming disorder, has received less attention. It is currently unclear, therefore, what strategies might effectively address problematic gaming, and which approaches may be considered particularly feasible and useful to the gaming population at large. Although some research has consulted gamers' views on the nature of problematic gaming experiences (e.g., Colder Carras, Porter, van Rooij, et al., 2018; Shi et al., 2019), there has been limited research investigating gamers' level of support for prevention strategies for problematic gaming.

Prevention approaches incorporate a broad range of strategies aimed at: (a) preventing the onset of problem behavior; (b) delaying the onset of the problem; (c) reducing the severity of the problem; and (d) promoting psychological and emotional well-being in individuals through other means (Romano & Hage, 2000). Public health models suggest that there are three main types of prevention: primary, secondary, and tertiary. Primary prevention strategies target the general population and aim to maintain gaming at healthy levels. This approach assumes that all individuals who use games can benefit from information and skills to prevent the occurrence of associated problems. Primary approaches typically include educational and public awareness campaigns, including recommendations about accessibility (e.g., removing devices from bedrooms; Xu et al., 2012). In Hong Kong, for example, the Wise-IT Use program has been employed widely to increase awareness of the potential harms of excessive gaming and to promote moderate use and engage in physical exercise (Chau et al., 2019).

Secondary prevention strategies are targeted towards individuals who are more at-risk or more likely to develop problems with gaming, such as individuals who play games habitually, those with comorbid disorders or lower social competence, or who lack non-gaming interests (King, Delfabbro, Deleuze, et al., 2019). Common secondary strategies include screening tools for adolescent gamers; legislature (e.g., shutdown laws) preventing younger people from

gaming at specific times; in-game lockout features (e.g., parental controls and limit-setting features); and school programs aimed at teaching protective skills such as stress and time management, self-regulation, and social skills. School-based educational programs have been developed and implemented widely in Asia. For example, Mun and Lee (2015) developed an 8-session school-based program for vulnerable youth in South Korea based on empowerment and cognitive-behavioral principles, which they reported reduced GD symptoms and improved self-regulation. Similarly, Walther et al.'s (2014) trial evaluated a program for 1843 students in Germany who participated in an educational program, covering topics of self-regulation, self-monitoring, and positive gaming motivations, which they reported reduced excessive gaming.

Tertiary prevention strategies are targeted at individuals who are either at high risk of, or have already developed, problematic gaming tendencies. Common tertiary strategies include: support groups and communities, outpatient treatment options, and inpatient clinics or rehabilitation centers. Several reviews have highlighted the short-term effectiveness of psychotherapeutic and psychopharmacological treatment for problem gaming, although there are limitations of this evidence base (e.g., lack of standard measures and control groups). For example, a meta-analysis by Stevens et al. (2019) reported that CBT was an effective short-term treatment. Similarly, some drug therapies, such as methylphenidate and bupropion, have also been shown to reduce GD symptoms (see Zajac et al., 2017).

While there is a growing literature on the efficacy of prevention and treatment for problem gaming, there has, to date, been no evaluation of gamers' support for these strategies. Thus, it is not clear to what extent regular gamers, including problem gamers, may be personally inclined to actually seek out and engage with prevention initiatives, and whether any personal or psychological characteristics of gamers might predict greater support and engagement. One of the more widely known models, the Health Belief Model (HBM) argues that individuals' beliefs about their susceptibility to a given problem, the perceived severity of the problem, benefits, and barriers to change, and their self-efficacy beliefs, may explain their level of

engagement with behavior change (Becker, 1974; Champion & Skinner, 2008; Rosenstock, 1966, 1974; Rosenstock et al., 1988). Self-efficacy refers to the belief in one's ability to organize and execute certain actions that are necessary to achieve health-promoting behaviors. The HBM suggests that improving an individual's feelings of self-efficacy may make them more inclined to engage in behavior change, as suggested by Social Learning Theory (Bandura, 1977).

Based on this model, problematic gamers with higher levels of self-efficacy may be more inclined to engage with prevention strategies. This would be consistent with GD treatment studies that have reported that greater self-efficacy is associated with reduced gaming time and GD symptoms (Sakuma et al., 2017). This model has been evaluated in studies of the effectiveness of both prevention strategies for gamblers (Messerlain & Derevensky, 2005; Tong et al., 2019) and smoking cessation (Khazee-Pool et al., 2017; Mantler, 2011; Rakhshani et al., 2010; Shafari-rad et al., 2007). Individuals with greater self-efficacy have a higher likelihood of achieving abstinence from smoking (Gwaltney et al., 2009) and reducing harmful substance use (Choi et al., 2013). On this basis, greater self-efficacy may be associated with stronger support for prevention strategies that facilitate more adaptive engagement with gaming activities or reduce risk of gaming-related harm.

The Present Study

The psychosocial problems arising from excessive gaming have been recognized as an issue of public health interest across the developed world (Fineberg et al., 2018; Rumpf et al., 2018; Saunders et al., 2017). Research has tended to focus on outpatient treatment and overlooked broader prevention strategies to address the often more hidden difficulties that arise from excessive gaming (King & Delfabbro, 2017). For example, there is little research that has involved the gaming community as stakeholders to examine support for various prevention and harm minimization approaches to problem gaming. This population is important to include in studies of prevention strategies because they are the target or active

users of these measures, and their feedback may help to refine how prevention is implemented. This study aimed to investigate: (1) regular and problematic gamers' level of support for different prevention strategies; (2) whether greater self-efficacy predicted stronger support for problem gaming prevention strategies, in line with the HBM; and (3) whether individuals with higher psychological distress and GD levels would be more likely to support prevention strategies than their less distressed, non-problematic gaming counterparts.

Method

Sample and Study Design

Participants for this study were recruited online via advertisements on several gaming related forums (Reddit, Overclockers Australia, Whirlpool, and Gamers Australia). Participants were informed about the study aims, survey length (15 minutes), and data privacy. A total of 992 participants (82.4% male) with a mean age of 29.1 years (*SD*=7.9) years, completed the survey. (Most participants were Australian or New Zealander (33.1%) or European (32.7%). About half were employed full-time (53.9%) and had a university degree (45.5%). Participants were eligible if they: (a) played games on a weekly basis, and (b) were over 18 years of age. Survey completers entered a prize draw for a $50 gift card. Ethics approval was granted by the University of Adelaide Human Research Ethics Subcommittee in the School of Psychology (ID: 20/07). Data were collected between March and April 2020.

Measures

Each participant provided socio-demographic information, including gender, age, ethnicity, country of residence, relationship status, employment status (casual [i.e., varying hours, no benefits], part-time, full time, unemployed, retired, studying), and highest level of educational attainment (high-school, higher education [i.e., university or college]). Participants also reported the typical number of hours spent gaming each day (i.e., individual ratings for Monday through Sunday) in the last 3 months (scores were summed to provide an

estimate of weekly gaming time), the number of games currently being played, and history of gaming experience (i.e., number of years). For the purpose of chi-square analyses, weekly gaming hours were grouped into three categories (0-20, 21-39, and 40+). These categories were selected to allow for groups large enough for comparison and did not have any underlying theoretical meaning.

Prevention Strategy Support

Participants rated their level of support for nine different prevention strategies, which we drew from King, Delfabbro, Doh, et al.'s (2018) international review of prevention strategies for problematic gaming. The questions encompassed four primary prevention strategies (e.g., "School-based education"); three secondary strategies (e.g., "Self-monitoring tools"); and two tertiary strategies (e.g., "Outpatient treatment"). Each item included an accompanying description of the prevention strategy to explain its implementation. Five response options ranged from 1 ("*Strongly do not support*") to 5 ("*Strongly support*") Higher scores indicate greater support for strategies. While the survey included diverse views across different prevention topics (i.e., all responses reflected subjective opinions), these questions together demonstrated high internal consistency (α=.86).

Self-Efficacy

The General Self-Efficacy Scale (GSE; Chen et al., 2001) is a standard, widely used 8-item questionnaire to assess respondents' capacity to handle life challenges. Participants are asked to rate their agreement with statements such as "In general, I think I can obtain outcomes that are important to me." Responses were scored across a 5-point Likert scale, ranging from 1 ("*Strongly disagree*") to 5 ("*Strongly agree*"). Higher scores indicate greater self-efficacy. For the purpose of chi-square analyses, participants scores were used to categorize them as either low or high using a median split. Cronbach's alpha indicated high internal consistency (α=.89).

Problematic Gaming and Help-Seeking

Petry et al.'s (2014) checklist is a 9-item self-report measure to assess the DSM-5 gaming disorder (APA, 2013). Response options are dichotomous (Yes/No). A score of 5+ indicated problematic status. The checklist has been used in clinical and neurobiological studies of GD and shown strong psychometric qualities (King, Billieux, Carragher, et al., 2020; King, Chamberlain, Carragher, et al., 2020). The internal consistency of the scale in this study was .69, which is relatively low for a unidimensional measure but may reflect that some symptoms in the measure (e.g., preoccupation, withdrawal, tolerance) have been criticized for being too sensitive (e.g., capturing highly engaged players; Billieux et al., 2019). For the purpose of chi-square analyses, participants' scores were used to categorize them as either non-problem (<5) or problem gamers (5+). Additional questions concerned overall impression of the gaming-related problems, onset of problems, and treatment-seeking intentions and history (e.g., social support, online support, counselling, and psychotherapy options). For the purpose of chi-square analyses, participants' responses were used to categorize them as either help-seeking (currently seeking or previously sought help for gaming problems) or non-help-seeking (never sought help).

Psychological Distress

The Kessler Psychological Distress Scale (K10; Kessler et al., 2003) is a 10-item checklist that yields a global measure of distress in the previous four-week period. Questions relate to anxiety (e.g., "*About how often did you feel nervous?*") and depressive symptoms (e.g., "*About how often did you feel worthless?*") and are scored from 1 ("*None of the time*") to 5 ("*All of the time*"). Scores on the K10 range from 10-50, with scores from 10-19 indicating minimal distress, 20-29 indicating mild distress, 30-39 indicating moderate distress, and 40-50 indicating severe distress. The K10 is suitable for use in normal and clinical populations. The internal consistency of the K10 was high (α=.90).

Results

Sample Characteristics

Table 6.1 provides a summary of participant characteristics. Participants reported an average age of 29.1 years (*SD*=7.9, range [18-67]), an average total weekly playing time of 26.4 hours (*SD*=14.3, range [0-70]) and an average of 20.0 years (*SD*=7.9, range [4-48]) of gaming experience. Their most commonly played games included role-playing games (65.5%), massively multiplayer online games (53.8%), and first-person shooter (45.2%) games. Based on GD checklist scores, there were 221 (22.2%) problem gamers, including 77 (or 34.8% of problem gamers) who reported that their problems had been present for more than 12 months. Sixty-nine respondents (7.0%) reported currently receiving help for any mental health issues (not including gaming-related problems), and 149 (15.0%) had previously sought help. Eight respondents reported current or past help-seeking for gaming-related problems.

Table 6.1. Summary of participant demographic characteristics

Variable	*N* (992)	(%)
Age	*M*=29.07	*SD*=7.93
Gender		
Male	817	82.4
Female	153	14.4
Non-binary	22	2.2
Education		
High School	205	20.7
Further (i.e., Vocational)	160	16.1
Higher (i.e., Undergraduate)	451	45.5
Postgraduate	176	17.7
Employment		
Casual	59	5.9
Part-time	117	11.8
Full-time	535	53.9
Unemployed	145	14.6
Retired	9	.9
Student	219	22.1
Nationality		
Australian / NZ	328	33.1
European	324	32.7
American	224	22.6
Asian	48	4.8
Other	68	6.9

Support for Prevention Approaches

Figure 6.1 displays the level of support (in % categories) for each prevention approach (primary, secondary, and tertiary) and its constituent strategies (e.g., education, screening, age restrictions). Overall, 61% of participants expressed support for primary strategies, as compared to secondary (39%) and tertiary (36%) strategies. Only 17% did not indicate support for any primary strategies, compared to secondary (41%) and tertiary (21%) strategies. The highest disapproval rating was for in-game shutdown features, with 65% not supporting this strategy.

All four primary strategies received a majority of favorable responses. A total of 64% of respondents indicated support for educational guidelines; 59% of respondents supported consumer warning labels; 68% of respondents supported self-monitoring tools and apps; and 51% of respondents supported free online screening tools. Between 22 and 26% of participants were neutral or ambivalent toward these strategies, and between 14 and 21% indicated that they did not support these strategies.

Secondary prevention strategies were mostly supported. Half of respondents (50%) indicated support for school-based interventions, and 47% indicated support for age restriction labels on games. However, only 24% supported in-game shutdown features, which was rated the lowest of all strategies and contributed to a lower overall rating of secondary prevention. Between 14 and 26% of participants were neutral or ambivalent toward these strategies, and between 24 and 33% indicated they did not support them.

The tertiary prevention strategies also received mixed support. There was greater support for outpatient services (48% support) than for inpatient services (25%). For these two strategies, participants indicated similar levels of neutral responses (32 and 34%), but 44% indicated that they did not support inpatient care for gaming-related problems. Inpatient care received the second highest overall disapproval rating among participants.

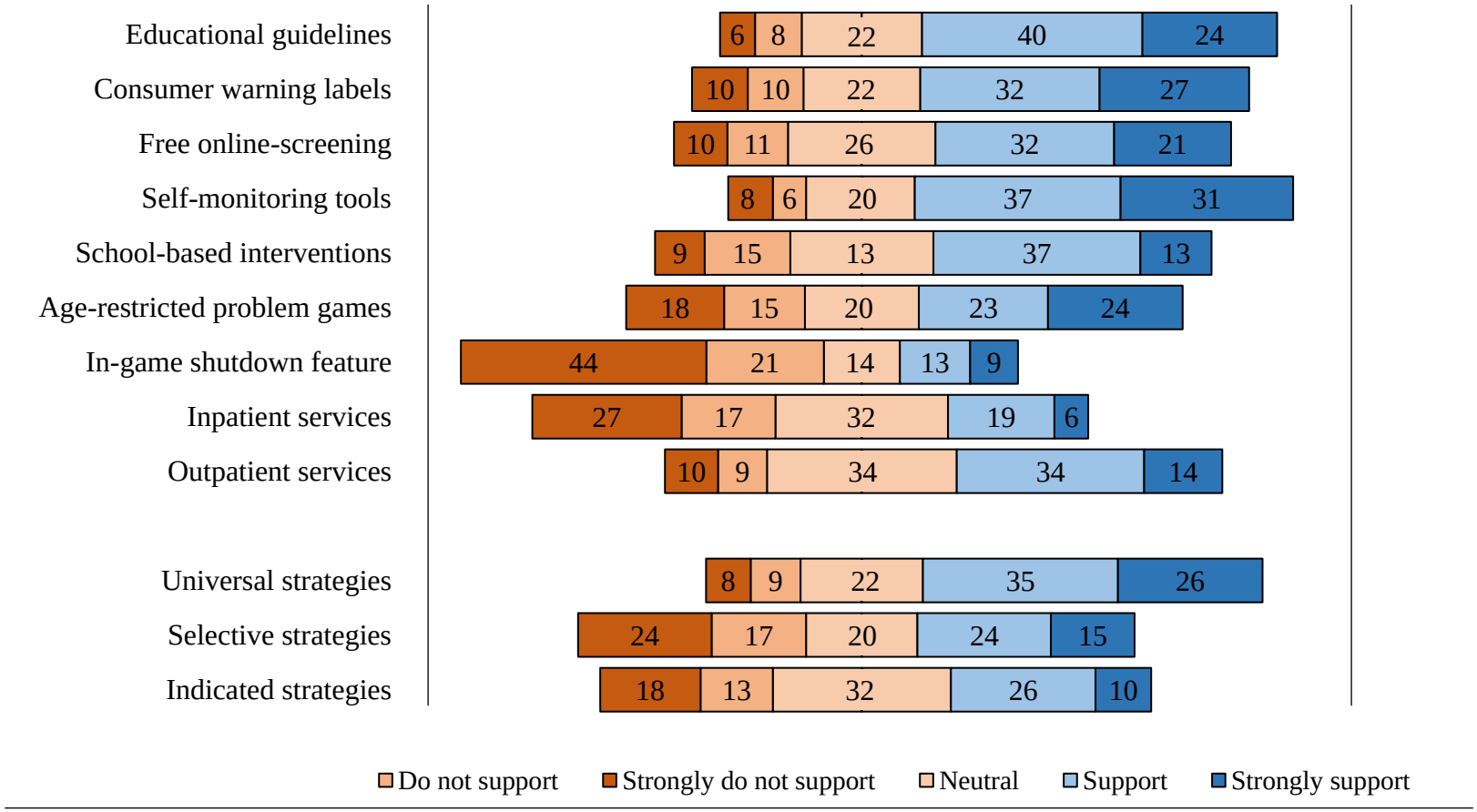

Figure 6.1. Support levels for individual and grouped prevention strategies.

Individual Differences in Prevention Support

Table 6.2 presents the results of Chi-square tests which examined the association between each prevention approach (i.e., primary, secondary, tertiary) and other variables. These included: age (i.e., 18-29, 30-39, 40+); gender (i.e., male, female, non-binary); GD status (i.e., problem, non-problem); self-efficacy (i.e., low, high); weekly gaming hours (i.e., 0-20, 21-39, 40+); and help-seeking behaviors (i.e., no help-seeking, help-seeking). For the purpose of the analysis, scores for each prevention strategy were averaged and used to determine mean support. For example, the mean ratings of the four primary strategies were calculated for each participant, as well as the mean for the three secondary and the two tertiary strategies. Each participant's mean ratings were rounded to the nearest integer in the analysis.

Support for primary and secondary prevention was more common among younger, female, and less frequent gamers. No significant association was found between support for tertiary strategies and any of the other variables we examined. Support for prevention strategies did not differ according to self-efficacy or GD scores.

Table 6.2. Chi-square tests of association between demographic and gaming characteristics, and prevention support.

	Primary strategies			Secondary strategies			Tertiary strategies		
Variable	χ^2	*p*	*V*	χ^2	*p*	*V*	χ^2	*P*	*V*
Age	18.42*	.02	.10	19.72*	.01	.10	15.23	.06	.09
Gender	20.82*	.01	.10	15.98*	.04	.09	12.93	.11	.08
Nationality	16.98	.39	.07	25.42	.06	.08	21.78	.15	.07
Problem gaming status	4.27	.37	.07	3.49	.48	.06	3.77	.44	.06
Self-efficacy	7.26	.12	.09	2.92	.57	.05	6.62	.16	.08
Gaming time	23.87*	.01	.13	26.76*	.01	.13	11.63	.17	.09
Help-seeking	1.94	.87	.03	.95	.94	.03	1.46	.92	.03

Note: *p<.05; Age: (18-29yrs, 30-39yrs, 40+yrs); Gender (male, female, non-binary); Problem gaming status (problem, non-problem); Self-efficacy (low, high); Gaming time (0-20hrs, 21-39hrs, 40+hrs); Help-seeking (no help-seeking, help-seeking).

Correlations

Table 6.3 summarizes the Spearman's rank-order correlations among the study's main variables. Self-efficacy was associated with age, gender, and help-seeking behaviors, but did not correlate significantly with support for any strategy. GD symptoms were not significantly correlated with any prevention support variables but were significantly negatively correlated with self-efficacy and positively correlated with current help-seeking. Psychological distress was positively correlated with all three prevention types.

There were significant but very small positive correlations between support for all three types of prevention approaches and psychological distress, history of GD, history for help-seeking for gaming-related problems, and current help-seeking for problem gaming. There were also significant but small negative correlations between support for prevention approaches strategies and age, gender, weekly gaming time, and gaming experience. Similar patterns of correlations (i.e., $r<.20$ for all associations) were observed for all individual

Table 6.3. Spearman's rank-order correlations between demographics, help-seeking, and prevention strategy support.

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Age												
2. Gender	.02											
3. Weekly gaming time	-.17*	.01										
4. Gaming experience	.80*	.07*	-.08*									
5. Psychological distress	-.14*	-.17*	.03	-.12*								
6. Problem gaming symptoms	-.16*	.02	.20*	-.16*	.36*							
7. Self-efficacy	.12*	.19*	-.15*	.11*	-.35*	-.20*						
8. History of GD	-.10*	.04	.02	-.09*	.26*	.26*	-.07*					
9. History of help-seeking	-.05	-.07	.07	-.06	.32*	.10*	-.15*	.21*				
10. Current help-seeking	-.10*	-.08*	.13*	-.08*	.32*	.20*	-.17*	.16*	.45*			
11. Primary strategies	-.09*	-.13*	-.14*	-.10*	.19*	.06	-.04	.12*	.12*	.11*		
12. Secondary strategies	-.04	-.11*	-.15*	-.10*	.09*	.01	-.02	.08*	.12*	.08*	.58*	
13. Tertiary strategies	.01	-.10*	-.13*	-.05	.10*	.00	.03	.12*	.09*	.05	.51*	.49*

Note: *p<.05

Self-Efficacy and Problem Gaming Status

In order to examine relationships between prevention support and predictors of self-efficacy and problem gaming status, we conducted three separate hierarchical regression analyses, with step 1 (age, gender, weekly gaming time), and step 2 (self-efficacy, GD status) predicting prevention support (primary, secondary, tertiary). All three models explained between 3 and 5% of the variance in prevention support, and only 1% of the variance when age, gender and gaming hours were held constant. Therefore, these models demonstrate low predictive value of these variables. Table 6.4 presents a summary of each model.

Table 6.4. Hierarchical stepwise regression models of prevention strategy support, based on demographic and psychological predictors.

Prevention model	Included predictors	*F*	df	*p*	*Adjusted* R^2	R^2 *change*
1. Primary	Step 1	10.34	3, 765	<.001	.04	-
	Step 2	7.71	5, 763	<.001	.05	.01
2. Secondary	Step 1	7.90	3, 765	<.001	.03	-
	Step 2	6.22	5, 763	<.001	.03	.01
3. Tertiary	Step 1	3.23	3, 765	.022	.01	-
	Step 2	4.61	5, 763	<.001	.02	.01

Note: Step 1 (age, gender, weekly gaming hours); Step 2 (GD status, self-efficacy).

Discussion

Main Findings

Our study investigated gamers' general support for different prevention approaches and the role of individual differences. Overall, the results showed that gamers supported primary prevention strategies, including education, screening, and warning labels, but reported only mixed support for secondary and tertiary strategies. There was stronger support for outpatient care (48%) than inpatient services (25%). In-game shutdown features received the lowest support (65% disapproval) of all strategies. Younger, female, and less frequent gamers were marginally more likely to support primary and secondary prevention strategies. These findings

suggest that gamers may be more favorable toward prevention measures that support informed decision-making, autonomy, and self-directed actions than mandatory restrictive measures. In particular, this gaming population was strongly opposed to modifications to the structure of gaming activities (e.g., shutdown features).

Contrary to the Health Belief Model (Rosenstock et al., 1988), individual differences in self-efficacy were not associated with respondents' level of support for prevention measures. In addition, the hypothesis guided by the Health Belief Model (i.e., that greater problem awareness and belief in one's ability to achieve positive change would correspond to stronger support for strategies to facilitate change) was not supported. These findings were inconsistent with previous studies involving other behaviors such as gambling (Ladouceur et al., 2013; Messerlain & Derevensky, 2006; Shead et al., 2011) and smoking cessation (Parlove, 2002). The results also indicated no association (or associations with only very small effect sizes) between self-reported problem gaming symptoms or help-seeking behaviors and support for any of the prevention strategies specified. These findings may be due to the fact that gaming may be perceived as being less likely to cause serious harms than are more established addictive behaviors. Written feedback indicated that, instead of approving of stronger regulatory measures, gamers endorsed the importance of more proximal supports such as the role of parents in regulating the behavior of young people (Smith et al., 2015). Further analysis of our extensive written material is presented elsewhere (see Stevens et al., 2021b). contrast, other participants stated that the industry should be more closely scrutinized and highlighted their current lack of regulation. It is also possible that many gamers may be cautious in supporting strategies to reduce problem gaming because this could be construed as support for the view that gaming is inherently harmful ('addictive'). For example, the influence of previous debates gaming, and violent behavior may have stymied attempts to draw attention to the risks associated with excessive gaming. These earlier debates have sometimes been likened to a form of 'moral panic' (Aarseth et al., 2017; Markey & Ferguson, 2017a), with dubious connections, for example, being drawn between gaming and emasculation in males

(Zimbardo & Duncan, 2012) or violent games and gun violence (Anderson, 2004; Anderson & Dill, 2000). As a result, it may not be surprising to find that some gamers will be skeptical of 'strategies' that imply the need for sweeping changes by the authorities who may be seen as overstating gaming's potential harms or relying upon questionable evidence to do so.

Given the low predictive value of self-efficacy and problem gaming status reported in our analyses, the results we have presented suggest that other variables not measured in this study may have been related to endorsement of prevention strategies. Accordingly, with reference to Health Belief Model (HBM) concepts, it may be helpful for further studies to determine the extent to which gamers perceive any personal or other benefits of prevention strategies and, further, whether they perceive problem gaming to be sufficiently severe to warrant these measures. For example, recent studies have shown that some highly engaged gamers are opposed to the concept of gaming disorder (Colder Carras, Porter, van Rooij, et al., 2018; Stevens et al., 2021b), which is likely to adversely affect their attitudes towards prevention efforts. Our sample included individuals who had sought help for mental health issues, but very few who had sought help specifically for gaming-related problems. Therefore, ratings of support for strategies may have been based on judgements that were unrelated to personal reasons or circumstances, despite the relatively high number of problem gamers in this sample. The substantial proportion of 'neutral' responses (23%, on average) to prevention items may reflect the perception that these strategies were not overly relevant or necessary, regardless of personal views on problem gaming.

The results did, however, provide a clear indication of what strategies may not be supported or received well. Shutdown features in games received the strongest disapproval. These systems have been implemented in some games in China (Davies & Blake, 2016), but their effectiveness is unclear. Although there are some major differences between gaming and gambling (e.g., financial requirements), the closest comparison to gaming shutdown features may be mandatory pre-commitment features in electronic gambling machines (i.e., setting limits on financial expenditure to prevent continuous gambling) such as are implemented in

Norway, where gamblers cannot spend beyond a certain monthly limit. Reviews of pre-commitment features (e.g., Delfabbro & King, 2020; Ladouceur et al., 2012) have concluded that mandatory pre-commitment may have a modest effect on financial expenditure, but gamblers are generally not favorable toward pre-commitment and may instead seek out other unregulated gambling machines or activities. Participants' lack of support for shutdown features in video games may reflect similar concerns about feasibility (e.g., needing to log in and set limits), reduced enjoyment (e.g., receiving notifications that interrupt immersion), and the potential likelihood of diverting players away to other gaming activities that do not include these features.

Limitations

We acknowledge that this study has limitations. First, our study employed purposive sampling to recruit experienced gamers. For this reason, these findings are unlikely to generalize to the wider gaming population. Further, this sample contains a greater proportion of individuals with higher education qualifications than found in the general population of gamers. To enhance the validity of these findings, we therefore suggest that future research might seek to identify a broader range of gamers, including clinical samples, using different methods of recruitment. Second, our study also targeted Western gamers whose gaming experiences are likely to differ from those in Asia, which generally have more restrictive regulations and countermeasures to limit gaming, including lockdowns at night for underage gamers. Third, our study was conducted during the COVID-19 pandemic. Thus, although most of the variables we examined are likely to be relatively stable, participants may have responded differently due to pandemic-related stress and uncertainties. In particular, the pandemic may have influenced individuals' views of gaming activities, such as the value of gaming for stress-relief during self-isolation (King, Delfabbro, Billieux, et al., 2020). Fourth, the time-based categories (e.g., weekly gaming hours) were selected to enable comparisons between groups of sufficient size. The category bounds we employed were somewhat arbitrary in that respect,

and further studies may identify more meaningful categories. Finally, our study did not investigate industry responsibility or regulatory issues related in-game spending, e.g., loot-boxes and other microtransactions (see Drummond et al., 2019; King & Delfabbro, 2019b; King, Delfabbro, Gainsbury, et al., 2019). With the increasing digital cross-over of gaming and gambling, it would be useful to investigate views related to applying gambling prevention and regulation approaches to gaming activities.

Conclusions

We investigated regular and problematic gamers' level of support for prevention strategies related to problematic gaming. Overall, there was stronger support for primary prevention strategies, including education, screening, and warning labels, than for other prevention approaches. These results underscore the value of surveying individuals who are highly engaged in gaming activities to gather a range of views and to understand the perspectives of those who are likely to be the target of prevention strategies aimed at gaming in general. However, it was not entirely clear from our data why these gamers were more favorable toward prevention measures that support informed decision-making, autonomy, and self-directed actions. It seems likely that measures of this kind tend to align with the cultural values of Western individualized societies and would be consistent with previous studies undertaken with gamblers (Harris & Griffiths, 2017). Although gaming disorder and hazardous gaming are recognized in the ICD-11, there is some uncertainty as to whether the gaming community generally embraces these concepts and makes connections between gaming-related harms and preventive countermeasures. Future research should involve regular gamers and clinical samples in more detailed, consultative interviews to determine their personal needs and understanding of excessive gaming, and what practical solutions they may be more inclined to support (e.g., asking "what measures would have been helpful before your gaming became a problem?"). Although our data suggest that gamers may tend to oppose measures that alter the gaming activity itself (e.g., limits, shutdown features), it is possible that some

implementations that draw from primary prevention principles may be more readily embraced. Ideally, such interventions should be designed to target the harmful features of games and prevent the development of harm without detracting from the fundamental enjoyment of gaming experiences.

CHAPTER 7

Prevention approaches to address problematic gaming:

A large-scale qualitative investigation

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Statement of Authorship

Paper 5: Prevention approaches to address problem gaming: A large-scale qualitative investigation.

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Matthew Stevens (Candidate)

I was responsible for the analysis and primary authorship of this paper. I was responsible for the designing and administering the survey and collecting and coding responses. I subsequently conducted the primary qualitative thematic analyses. I was responsible for the interpretation of the findings, with insights and critical feedback from Dr. King. I then prepared multiple drafts of the manuscript in collaboration with my primary and co-supervisors. The response to reviewers was undertaken by Dr. King and I together, and I was responsible for conducting revisions of this paper. My contributions total 75% of this paper.

I hereby certify that this paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.

Matthew Stevens

January, 2021

Daniel King (Co-author)

I was primarily responsible for overseeing the candidate's contribution to this paper. The candidate undertook the thematic analysis, and I was responsible for helping with the interpretation of the findings. I was responsible for providing feedback and corrections during the drafting process. During the peer-review process, responses to reviewers were undertaken by the candidate and I together. My contributions total 15% of this paper.

Paul Delfabbro (Co-author)

I was primarily responsible for providing critical commentary and feedback during revisions of the final manuscript. My contributions total 10% of this paper.

By signing this statement of Authorship, each of the following authors certifies that: (1) the candidate's stated contribution to the publication is accurate (as detailed above); (2) permission is granted for the candidate to include the publication in the thesis; and (3) the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Daniel King, PhD

January, 2021

Paul Delfabbro, PhD

January, 2021

Abstract

Background: Prevention and harm minimization approaches to problem gaming have become a matter of growing public health interest, following the recognition of gaming disorder and hazardous gaming in the ICD-11. The present study was the first to gather firsthand accounts of the potential options and challenges for prevention approaches among regular and problematic gamers. ***Method***: An online survey of 992 adult gamers (N=221 problem gamers) yielded 1,987 text responses to open-ended questions. ***Results:*** Qualitative analysis of 53,458 words extracted 9 subcategories. Participants believed that some gaming activities were inherently riskier than others, particularly those with 'predatory' in-game spending features (microtransactions) that resemble or facilitate electronic gambling. Some participants supported the introduction of in-game features that might facilitate greater self-monitoring and awareness (e.g., education, playing time notifications, limit-setting). Some participants believed that the gaming industry should proactively support and/or fund prevention schemes and share its player data for the purpose of independent health-focused research. ***Conclusions:*** These results highlight some of the complexities in developing population-level approaches to problem gaming and anticipate some of the practical barriers to gaining support from stakeholders, including the industry and the gaming community. Future research should examine the effectiveness and feasibility of voluntary primary prevention measures in real-world settings.

Prevention approaches to address problematic gaming: A large-scale qualitative investigation

About one-third of the world population plays video games (Newzoo, 2020). While most gamers play recreationally and experience various associated benefits, some individuals play excessively which can sometimes result in negative consequences. Research has documented negative outcomes including poor physical and mental health, low self-esteem, relationship conflict, and problems at school or work (von der Heiden et al., 2019; King & Delfabbro, 2019a; Milani et al., 2018). In the context of continuing debate concerning the validity of gaming as an addictive disorder, including its defining criteria being similar to gambling and substance use disorders (see Aarseth et al., 2017; Billieux et al., 2019; Dullur & Starcevic, 2018; Kardefelt-Winther, 2015, 2017; Higuchi et al., 2017; King & Delfabbro, 2013; King, Delfabbro, Potenza, et al., 2018; Rumpf et al., 2018; van Rooij et al., 2018), Gaming disorder (GD) and hazardous gaming classifications were included in the eleventh revision of the International Classification of Diseases (ICD-11; World Health Organization, 2019). GD in the ICD-11 is characterized by persistent and recurrent gaming, impaired control over gaming, and continued gaming despite harm to multiple areas of functioning (e.g., psychological, relationship, occupational, etc.). This classification followed the recognition of 'Internet gaming disorder' as a condition for further study in the DSM-5, which differs from the ICD-11 criteria with its reference to debated concepts of tolerance and withdrawal (Kaptsis et al., 2016; King, Herd, & Delfabbro, 2017, 2018; Király et al., 2015; Starcevic, 2016).

The term 'problematic gaming' is employed in the literature to capture both GD as well as non-pathological gaming behaviors as a distinct condition (see Baggio et al., 2018; Király, Griffiths, Urbán, et al., 2014; Tiego et al., 2019) that result in harms to self or others. To date, research on GD interventions has had a strong focus on therapies for individuals who fall on the extreme end of the spectrum, e.g., vulnerable users with major life problems due to gaming (e.g., unemployment, disengagement from study, social isolation) (King, Delfabbro, Wu, et al., 2017; Wölfling et al., 2019). Treatments for GD have tended to be provided in countries

across Europe, North America, and Asia, where much of this research has been conducted (King, Delfabbro, Doh, et al., 2018; Liu et al., 2017), and usually with a focus on cognitive-behavioral therapies and other psychotherapies (King, Delfabbro, Wu, et al., 2017; Stevens et al., 2019). Other treatment and support modalities include peer supports, such as through Computer Gamers Anonymous (https://cgaa.info/) and GameQuitters (https://gamequitters.com/), and group therapies at hospitals and universities. Examples of these are the residential in-hospital treatment program for video gaming dependency at Hotel-Dieu Grace in Windsor, problem gaming group therapies for gamers and family members at the Centre for Addiction Mental Health in Toronto, and the digital detox summer camp at the UCSB campus in Santa Barbara. Some drug therapies, including methylphenidate and bupropion, have also been used with some limited success (Zajac et al., 2017). However, despite these developments, relatively little research has focused on prevention and harm minimization options for less serious cases, e.g., to prevent gaming-related problems from becoming more serious in nature. Currently, the literature is lacking in studies that provide insight into the potential value, feasibility, and level of support for prevention options among diverse groups of regular and problem gamers.

Prevention approaches generally aim to: (1) prevent or delay the onset of the problem behavior; (2) reduce the severity of the problem; and (3) improve psychological and emotional well-being in individuals to help them cope more effectively (Romano & Hage, 2000). Prevention encompasses three main levels: primary, secondary, and tertiary. Primary prevention is based on the notion that all members, including healthy users, of the general population can benefit from certain interventions. For gaming, this includes education campaigns, which promote awareness of the harms associated with problem gaming or adherence to moderate levels of use, and/or encourage healthy lifestyle behaviors related to diet and physical exercise (Chau et al., 2019; Vondráčková & Gabrhelik, 2016). Secondary strategies are targeted at more vulnerable individuals at risk of developing problems, including gamers who show signs of problem gaming, or those with comorbid mood disorders, low self-

esteem, and social competence (Yeun & Han, 2016). This includes programs in schools for vulnerable students who routinely engage in gaming (e.g., Walther et al., 2014; Mun & Lee, 2015; Throuvala et al., 2019); in-game countermeasures such as parental controls and limit-setting features (Davies & Blake, 2016); and 'shutdown laws' (e.g., South Korea) to prevent adolescents from gaming after midnight. Finally, tertiary strategies are intended for high-risk users, including those who are already engaged in problematic gaming, and includes support groups and therapy options (Fang et al., 2015; King, Wölfling, & Potenza, 2020; Liu et al., 2017).

The extent to which these different approaches may be implemented effectively in any given population is likely to depend on multiple factors, including issues of cost, access, and feasibility. Another important but overlooked issue in the behavioral addictions field is the general perception of the severity of behavioral conditions, which extends to problematic gaming (Brand et al., 2020). Many activities (e.g., social media, shopping, eating) proposed to be 'addictive' may often be seen as small, even trivial, problems because most people tend to engage in these activities at safe, recreational levels. This issue is also relevant to problematic gaming which, due to its widespread popularity and acceptance in popular culture (notwithstanding the sensationalistic media narrative that contributes to 'moral panic' about new technologies, including games; see Markey & Ferguson, 2017a, 2017b; Orben, 2020), may be perceived as generally harmless (including the notion that gaming has multiple benefits) and its potential addictiveness for some users may be downplayed.

Social judgements of the relative 'addictiveness' of certain behaviors and substances were examined in Thege et al.'s (2015) study. The authors asked a representative sample of 4000 participants about the perceived addiction liability and etiology of four substances (alcohol, tobacco, marijuana, and cocaine) and six behaviors (problematic gambling, eating, shopping, sexual behavior, video gaming, and work). Respondents tended to consider substances as having greater addiction liability than behaviors, whereas character flaws (e.g., moral failures) were viewed as more associated with behavioral addictions. However, the perceptions of each

individual activity indicated a more complex picture. Gaming was rated by participants as being of comparable addictiveness to gambling and eating, as well as alcohol and marijuana, but lower than tobacco and cocaine. Another study by Colder Carras, Porter, van Rooij, et al. (2018) reported that regular gamers were mixed on the concept of gaming 'addiction'. They tended to view that problematic gaming could involve continued use despite harm, unsuccessful attempts to quit, and loss of interest in other activities. However, addiction concepts like tolerance, withdrawal, and secrecy received much less support. Mixed views of gaming as an addiction or societal problem may affect people's willingness to seek help or engage with interventions.

Another issue that has not received much academic attention has been the potential role of the gaming industry (van Rooij et al., 2010). Some authors have argued that the gaming industry (i.e., game developers and publishers) have a social responsibility to address issues related to problematic gaming, including offering player protections (King & Gaming Industry Response Consortium, 2018; Shi et al., 2020). Recently, the scope of this discussion has included a focus on the industry's use of monetized game features that resemble gambling ('loot boxes') and have been considered 'predatory' (Drummond et al., 2020; King, Delfabbro, Gainsbury, et al., 2019; King, Koster, & Billieux, 2019). Recent papers have drawn comparisons between paid random rewards in games and electronic gambling machines, as well as virtual currencies ('skins') that facilitate financial gambling (Greer et al., 2019), and the lack of regulation or protective countermeasures (Brooks & Clark, 2019; King & Delfabbro, 2018a; Drummond et al., 2019). Some countries (e.g., Belgium, the Netherlands) have taken steps to legally classify and regulate these activities as gambling, and other regions (e.g., China and Japan) have mandated the industry to disclose the odds associated with random item purchases (Drummond et al., 2019; Király et al., 2018). Despite this, the industry has generally not directly acknowledged the existence of 'problem gaming' and has expressed opposition to ICD-11 gaming disorder (European Games Developer Foundation, 2018; King & Gaming Industry Response Consortium, 2018). A current gap in prevention research is the

nature of the gaming community's attitudes and beliefs about prevention approaches to problem gaming, and the extent to which they may support specific measures. Therefore, it was considered timely in light of recent developments in the GD field to investigate problem gaming prevention from the perspective of regular and problematic gamers. The broad purpose of this work was to contribute needed data to the continuing discussion of public health responses to problem gaming and other behavioral addictions.

The Present Study

Problem gaming has been recognized as a matter of public health interest across a number of regions (King & Delfabbro, 2017), following the recognition of gaming-related harms within the 6C51 ('Gaming disorder') and QE22 ('Hazardous gaming') ICD-11 classifications. Identifying effective preventive countermeasures for problem gaming has become more important with the worldwide growth in popularity of gaming related to Esports and streaming, as well as unregulated monetized gaming that resembles and facilitates gambling. Little research on prevention has involved gamers themselves, including those who identify as having problems, despite their status as knowledgeable stakeholders who may have a significant personal stake or interest in this area (Colder Carras, Kalbarczyk, Wells, et al., 2018; Shi et al., 2019). The specific aims of this study were two-fold: (1) to examine the attitudes and beliefs among gamers about the nature of problem gaming and how this may relate to the purpose and necessity of prevention; and (2) to evaluate their views on the potential options and challenges in addressing gaming-related problems, including the role of the gaming industry and others (e.g., parents, teachers, families, health professionals) who may attempt to respond to the needs of problem users.

Method

Participants

A total of 992 participants (82.4% male) with a mean age of 29.1 years (*SD*=7.9) years, were recruited online from gaming-related forums and were directed to an online survey hosted on SurveyMonkey. There were 112 additional respondents who do not complete the survey. Table 7.1 provides a summary of the participants' demographic information. Most participants were Australian or New Zealander (33.1%) or European (32.7%). About half were employed full-time (53.9%) and had a university degree (45.5%). Participants reported an average of 20.0 years (*SD*=7.9) of gaming experience, and the most commonly played games included role-playing games (65.5%); massively multiplayer online games (53.8%) and first-person shooter (45.2%) games. Based on GD checklist scores, there were 221 (22.2%) problem gamers, including 77 (or 34.8% of problem gamers) who reported that their problems had been present for more than 12 months.

Table 7.1. Summary of participant demographic characteristics

Variable	*N* (992)	(%)
Age	*M*=29.07	*SD*=7.93
Gender		
Male	817	82.4
Female	153	14.4
Non-binary	22	2.2
Education		
High School	205	20.7
Further (i.e., Vocational)	160	16.1
Higher (i.e., Undergraduate)	451	45.5
Postgraduate	176	17.7
Employment		
Casual	59	5.9
Part-time	117	11.8
Full-time	535	53.9
Unemployed	145	14.6
Retired	9	.9
Student	219	22.1
Nationality		
Australian / NZ	328	33.1
European	324	32.7
American	224	22.6
Asian	48	4.8
Other	68	6.9

Design & Procedure

Participants were recruited online by advertising on online gaming-related forums, including Reddit, Overclockers Australia, Whirlpool forums and Gamers Australia. The aim of recruitment strategy was to use purposive sampling to gather a sample of regular and experienced gamers. Participants were eligible if they: (a) played games weekly, and (b) were over 18 years of age. Survey completers entered a prize draw for a $50 gift card. Mean survey completion time was 15 min. Ethics approval was granted by the University of Adelaide Human Research Ethics Subcommittee in the School of Psychology (ID: 20/07). All data were collected between March and April 2020. All participants responded to at least one open-ended question; however, some responses were quite short (e.g., "yes" and "no"). The study was freely available to all users and was promoted as a study of 'healthy gaming and the prevention of gaming-related harms.' All written responses (1,987 responses; N=53,458 words) and frequencies of responses are available by request.

Measures

Demographics

Participants were asked a series of demographic and gaming-related questions as part of a larger survey about problem gaming prevention. Questions requested: age, gender, ethnicity, country of residence, relationship status, income, employment status and educational attainment. Participants reported the average time spent gaming, the number of games currently played and the types of games they typically played (e.g., MMO, MOBA, FPS).

Problem Gaming Status

Problem gaming status was assessed using Petry et al.'s (2014) 9-item, self-report symptom checklist. Items measure the 9 IGD symptoms including: preoccupation, tolerance, withdrawal, unsuccessful attempts to reduce gaming, deception or hiding gaming activity, loss of interest in other activities, continued use despite knowledge of harm, use for escape or relief

of negative mood, and conflict/harm. Response options are dichotomous (Yes/No), where a score of 5-or-more indicates problematic gaming status. The checklist has been used in clinical and neurobiological studies of GD, and demonstrates reliable psychometric properties (King, Billieux, Carragher, et al., 2020; King, Chamberlain, Carragher, et al., 2020). Internal consistency (Cronbach's alpha) of the scale in this study was .69, which was consistent with research (e.g., alpha of .69: King, Adair, Saunders, et al., 2018; alpha of .70: Jeromin et al., 2016) but lower than reported in other studies (e.g., alpha of .86: Mills et al., 2018; alpha of .82: Sarda et al., 2016) and studies simply using the DSM-5 criteria (e.g., alpha of .87: Li et al., 2019). As noted in the Introduction, some of the DSM-5 criteria for gaming disorder have been critiqued for adapting substance use disorder criteria. For example, studies have shown that some of the DSM-5 criteria (e.g., preoccupation) fail to distinguish between highly engaged and problematic players (Deleuze et al., 2017) and some criteria (e.g., mood regulation and deception) demonstrate relatively lower specificity in clinical studies of treatment-seeking individuals with IGD (Müller et al., 2019).

Open-Ended Questions

Five open-ended questions explored participants' insights into problem gaming and prevention. These questions were initially sent to a small sample (N=10) of regular gamers within our social networks to check the questions for readability and comprehension, and no issues were identified that warranted modification. Questions were: (1) *How would you recognize a problem gamer in need of help?*, (2) *Do you feel there is a need for prevention strategies for problem gaming?*, (3) *Which prevention strategies do you feel might actually be useful?*, (4) *Do you feel the gaming industry should be involved in identifying/helping problem gamers? how?*, and (5) *Do you have any other questions or comments about gaming and prevention to add?*. All questions were developed by a registered clinical psychologist (corresponding author) and were designed to elicit open discussion. There was no associated word limit for responses.

Qualitative Analysis

Data were handled in Microsoft Excel spreadsheets and followed the methods described in previous qualitative gaming studies (King, Herd, & Delfabbro, 2017; King, Kaptsis, Delfabbro et al., 2017). The purpose of the qualitative analysis was to generate data-driven, descriptive categories based on the responses to each question, with a focus on describing the characteristics of responses rather than identifying themes that were present throughout the data (see Morse, 2008). As per the COREQ reporting guidelines (Tong et al., 2007), we declare that we are male researchers, including two with PhDs with 10+ years of research experience and the third who is a PhD candidate. Further, no relationship was formed with participants prior to this study, and no personal information about the researchers except for their institution details was provided. Participants provided all responses in written text format and were not provided with further opportunities after the study to revise their responses. Qualitative data were transposed to a single document. The most salient information and categories were identified by the first author, who initially coded the datafile and shared the coding with the senior author who checked and either modified or confirmed the coding. The senior author suggested minor revisions to the names of some of the categories and subcategories and to combine two of the subcategories due to their close similarity. There was strong agreement (i.e., at least 95% agreement) between the two raters on the assignment of content to categories. The first author then reread the coding document and made additional changes to the coding document and exchanged this with the second rater on two further occasions between May and July 2020 which led to total agreement on the categories. All written content was analyzed at the same time and given equal attention in the coding process to ensure an inclusive and comprehensive process. Another document was created to store a list of all identified categories, as well as record a series of relevant extracts illustrating each category and is available by request.

This process yielded 3 main categories including 9 subcategories in total (Category 1: *Recognizing problem gaming*, including subcategories of *Addiction components*, *Mood and*

behavior, and *Criticism of addiction*; Category 2: *Prevention in practice*, including subcategories of *Self-directed strategies, Addition of in-game responsibility features* and *Removal of problematic in-game features*; Category 3: *Social Responsibility*, including subcategories of *Corporate social responsibility, Personal responsibility, Family and community responsibility*).

Results

This section presents a summary of the qualitative analysis. A selection of quotes is provided to elucidate each category and subcategory, accompanied by qualifiers to identify gender (M: Male; F: Female; Other: gender reported as 'other'), age (years), and group status (GD: Meets 5 or more of the GD criteria; Norm: Does not meet the GD criteria). For example, the following qualifiers [M, 26, GD] refer to a 26-year-old male who met the GD criteria. The results presented in sections 3.1 to 3.3 largely correspond to the order of questions administered to participants; however, some material gathered from earlier questions may have been included in subsequent categories. The following results align with the main study aims of identifying the attitudes and beliefs about the nature of problem gaming, and the potential options to address problem gaming.

Recognizing Problem Gaming

Addiction Components

Participants were asked to describe how they would recognize an individual experiencing problem gaming. Participants reported a range of behavioral indicators, including those listed in standard descriptions of addictive disorders (DSM-5/ICD-11). Participants referred to aspects of loss of control, including difficulties in terminating gaming session (e.g., *Wanting to quit but being unable to* [M, 22, Norm]), financial overcommitment (e.g., *They cannot control how much money they are spending* [F, 30, Norm]); and an inability to stop despite an awareness of harm and displacement of other activities (e.g., *Missing opportunities but are*

unable to stop gaming after realizing so [M, 18, GD]; *Plays games to the point it is hurting them* [F, 24, Norm]). Participants referred to the time and money invested in gaming (e.g., *By the time they spend gaming* [F, 30, Norm]; *When gaming has an overall negative effect, either in time spent, or money spent, or neglect of personal responsibility* [M, 23, Norm]), and behaviors resembling compulsive spending and hoarding (e.g., *Players are gamblers and spend their entire life savings on games they barely play, or to pay for items and loot-boxes they can't help but need* [M, 26, Norm]).

Mood and Behavior

Respondents referred to mood changes in the context of problem gaming. These changes were described as generalized (e.g., *Witnessing a change in their demeanor* [M, 30, Norm]); persistent (e.g., *Persistent negative impact on mood due to gaming* [Other, 25, Norm]); and involving aggression when unable to play (e.g., *Mood swings or anger when forced to stop gaming* [M, 32, Norm]; *Angry when unable to game* [M, 49, Norm]). Participants noted that mood in problem gaming may resemble depression (e.g., *Depression, lack of motivation to do anything that isn't gaming* [M, 24, Norm]); and may compound other pre-existing mood issues (e.g., *People use gaming to cover their problems, such as depression, anxiety, social isolation, so it's a vicious circle, one feeds the other* [M, 32, Norm]; *Playing games to escape from their problems* [M, 26, Norm]; *Some people use games as a coping mechanism that impedes them from living a normal, well-adjusted life* [M, 26, Norm]). Self-conscious emotions and attempts to conceal the extent of the problem were also recognized (e.g., *In my experience, the most telling factor is the secrecy/denial/defensiveness aspect* [M, 32, Norm]).

Criticism of Addiction

Some participants were critical of the concept of problem gaming. They referred to problem gaming as a 'symptom'; as symptomatic of another disorder; or as a stress response to negative life events (e.g., *I feel like gaming is more of a symptom than the problem itself, in*

that gaming is a very easy form of escapism [F, 28, Norm]; *Gaming becomes part of the problem when the individual is having difficulties in other areas of their life* [M, 24, Norm]; *I think that there are underlying issues with the person and the game is just the tool* [F, 37, Norm]). Other participants stated that gaming was not inherently problematic and conveyed that, for some, problems could arise across a range of activities (e.g., *No, because games are not the problem. The problem exists in humans, a person who is addicted to games could instead be addicted to slot machines* [F, 25, Norm]). Some participants challenged the severity of problem gaming in general (e.g., *I feel this problem is being blown out of proportion* [M, 46, Norm]) and the concept of behavioral addiction (e.g., *There is no such thing* [M, 32, GD]; *Distinguishing problem gaming is an overstep - what about problem woodworking, problem reading, problem movie-watching?* [M, 32, Norm]).

Prevention in Practice

Self-Directed Strategies

Two questions asked participants whether they believed that prevention strategies were necessary and could be beneficial to address problem gaming. Participants were generally inclined to express support for primary and secondary measures that promote autonomy and self-directed actions. Respondents referred to raising awareness, particularly through education for gamers (e.g., *More education and awareness* [Other, 28, GD]; *People need to know how to game smartly and recognize when it is a problem* [M, 22, Norm]; *Education helps people to see things differently* [F, 25, GD]) and helping parents of younger players (e.g., *Educated and involved parenting* [M, 30, Norm]; *Information should be made more available to parents* [M, 23, Norm]). There was a preference for strategies that were voluntary (e.g., *If someone does or does not want to participate, it should be up to them* [M, 18, Norm]; *There should be help for those in need but not involuntary* [M, 21, Norm]). Endorsed strategies of this type included warning labels on games, such as for spending features (e.g., *Putting notices on games* [F, 20, GD]; *put proper warning labels as well as an option for users to features on*

or off (e.g., block in-game stores) [M, 34, Norm]) and age restrictions (e.g., *Age restrictions for certain games like Battlefield, COD* [M, 32, Norm]).

Addition of In-Game Responsibility Features

Participants referred to the inclusion of in-game features to promote healthier gaming, particularly those which might regulate gaming time. They highlighted pop up-style user feedback (e.g., *Notifications like "you have been playing for # hours" that will make them snap back into reality* [M, 18, Norm]) and reminders to take breaks (e.g., *Pop ups reminding you to take a break* [M, 20, GD]). However, it was acknowledged that players may deactivate these features if given the option (e.g., *Pop ups are a great idea, time gets away from you. But I think most gamers would turn it off* [M, 37, Norm]). Other suggestions included preset time limits (e.g., *Selecting maximum play times* [M, 29, Norm]) and shut-down features under certain conditions (e.g., *A timer for a set amount of time, then shutting off and allowed back on in 24 hours* [M, 29, Norm]; *Forced locked windows. Console goes live at said time and retires within a certain time* [M, 28, GD]; *A game mode that restricts time playing by locking things behind time-based milestones. They are locked out until the timeclock is over* [F, 23, Norm]).

Removal of Problematic In-Game Features

Participants referred to the removal of in-game features that may be more likely to elicit problematic gaming behaviors. There was an emphasis on 'predatory' features such as loot-boxes and microtransactions as a deliberate strategy to exploit some users (e.g., *There are predatory design patterns in games which exploit compulsive behavior* [M, 29, Norm]; *I believe the gaming industry has a number of bad actors who are utilizing gambling and addictive systems built into the game to specifically target people and get them addicted* [M, 27, Norm]). Participants made direct comparisons to gambling (e.g., *Loot-boxes are a "gambling fix", they are a blemish on gaming even if it isn't gambling, legally speaking* [M,

27, Norm]) and the need for greater regulation and controls on spending (e.g., *Gambling, loot-box and freemium models of gameplay should be tightly controlled and regulated* [F, 34, Norm]; *Legal classification as gambling with respective requirements* [M, 26, Norm]; *I think more needs to be done with limiting how much money people can spend on microtransactions* [M, 28, GD]; *Gaming companies should limit how much people can spend on their games* [M, 25, GD]), particularly for children and adolescents (e.g., *Possible legal restrictions for underage microtransactions* [M, 38, Norm]).

Social Responsibility

Corporate Social Responsibility

Participants provided their views on the role of the gaming industry in relation to prevention and harm minimization. Responses were particularly diverse in this area of the survey. Participants expressed that the gaming industry should be more accountable and proactive in identifying and responding to potentially problem gamers (e.g., *Yes, but game companies should be responsible for it* [M, 30, Norm]; *Depending on circumstance, if they've got gambling mechanics then they can be held accountable* [M, 20, Norm]; *It would be nice if some companies to acknowledge and set up assistance* [M, 38, Norm]); however, others contended that the industry may be unlikely to take steps that would affect their core business and/or profit, and believed they should not be involved due to competing interests (*The gaming industry is the problem, they are attempting to make gaming as addictive as possible* [M, 41, Norm]; *The game industry is not just unaware of problem gamers, it's actively encouraging them and profiting from them* [M, 32, Norm]; *Developers aren't psychologists* [F, 25, Norm]; *No, it is not the responsibility of the product creator to make sure its worldwide audience understands the risks* [M, 29, GD]). Practical solutions included industry-funded prevention programs (e.g., *Yes, provide funding for programs* [M, 30, Norm]) and sharing player data with researchers and health professionals (e.g., *Use the statistics of game time/game behavior and work with professionals to determine unhealthy patterns* [M, 20, Norm]).

Personal Responsibility

Some participants believed that it was ultimately the responsibility of gamers to use gaming products responsibly (e.g., *People should be held accountable for their own actions* [M, 40, Norm]). Personal responsibility included taking steps to be educated about risks of gaming and being taught 'moderation', although it was not clear who should provide this information (e.g., *People need to make themselves aware of any risks or problems associated with their hobbies* [M, 29, Norm]); *I think the value of moderation would benefit everyone* [F, 41, Norm]; *Teach them moderation* [M, 23, Norm]). Others referred to the concepts of self-control and discipline (e.g., *Training in discipline, self-control, and self-awareness* [M, 22, Norm]) and adaptive coping (e.g., *Enabling people to deal with real-life problems* [M, 47, Norm]). Other practical skills included time management and financial planning (e.g., *Fiscal mindfulness and effective time management skills* [M, 32, Norm]) and the ability to detect predatory industry tactics (e.g., *Spot predatory practices by gaming companies* [M, 39, Norm]).

Family and Community Responsibility

The wider social context of social responsibility was another subcategory, particularly with reference to managing underage gamers. Participants referred to the role of responsible parenting in fostering healthy social and emotional development, and promoting involvement in non-gaming activities (e.g., *Get your kid motivated and into other activities. Convince them to actively be curious, keep learning, teach them discipline, and hear them out, believe in them, make them confident* [M, 26, GD]; *There is a need for actual good parenting* [M, 26, GD]); *Get them involved in a project. My dad got me involved in model planes and fishing when he noticed I was becoming aggressive after playing games for too long* [M, 31, Norm]). Other family members and close friends were seen as important too (e.g., *Prevention strategies should be subjectively targeted and executed on a family level* [M, 31, Norm]; *Having a friend or someone else you value to keep you accountable* [M, 25, Norm]; *A supportive community,*

rather than empty reminders [M, 21, Norm]; *Prevention and intervention roles would sometimes have to fall to the friends and family* [Other, 37, Norm]).

Discussion

Main Findings

Preventing problematic use of immersive digital technologies, including online gaming, is likely to be a public health challenge for developed nations for the foreseeable future. To the best of our knowledge, this study was the first to recruit regular and problem gamers as stakeholders to provide insights into the value and feasibility of prevention for problem gaming. Although players' views were diverse, several main categories were identified in this analysis. First, our sample appeared to be largely in favor of self-directed prevention and harm minimization strategies (e.g., self-education to understand problem gaming, users setting time limits on gameplay, etc.). This finding was consistent with studies in which gamblers have tended to express a preference for voluntary approaches (Delfabbro & King, 2020; Ladouceur et al., 2012). It bears noting that the literature on responsible gambling tools suggests that voluntary measures demonstrate limited efficacy in reducing problem gambling (Delfabbro & King, 2020; Harris & Griffiths, 2017; Marionneau & Järvinen-Tassopoulos, 2017; Wohl et al., 2013). Interestingly, participants acknowledged that some gaming activities were inherently riskier than others, with reference in particular to 'predatory' in-game spending features (microtransactions) that were thought to resemble electronic gaming activities. However, there were mixed views on whether problem gaming was actually a distinct problem, with many participants stating that excessive gaming could be symptomatic of other underlying issues, including a stress response (see Snodgrass et al., 2017). Overall, these results highlight the complexities in developing standard population-level approaches to reduce problem gaming, and these data anticipate some of the likely practical barriers to gaining support from the gaming community in introducing preventive countermeasures.

The structural design of video games was a common focal point of discussion. Participants highlighted the potential introduction of in-game features to facilitate self-monitoring and awareness (e.g., playing time indicators/notifications). Some participants were supportive of self-monitoring tools and feedback on player behavior (see King & Delfabbro, 2019b; Thompson et al., 2010), highlighting some practical examples of in-game notifications about playing time which may have the consequence of: (1) interrupting long playing sessions and encouraging breaks in play, and/or (2) providing factual information about behavior (personalized feedback) to prompt self-reflection. Some participants viewed pop-up style notifications and similar measures as a potentially useful feature that could be added into some games; however, participants acknowledged that these features would likely be deactivated by players if given the choice to do so. It should be noted that some games currently do include these kinds of features (i.e., reminders, feedback) but none of the participants in this study referred to any personal experiences of such features leading to major behavioral changes.

A related discussion of in-game measures referred to the removal or stronger regulation of 'predatory' features (e.g., loot boxes). Some participants expressed frustration and dislike for these features due to their emphasis on spending money, thereby shifting the focus of the game away from conventional requirements of player skill or strategy or time investment (see Alha et al., 2018). This view may have been motivated in some cases by personal preferences for particular gaming experiences rather than a genuine desire to improve prevention. Nevertheless, many argued that these features were designed to reinforce compulsive behaviors and drew explicit comparisons between microtransactions and gambling. While some participants supported a total ban or removal of these features, others supported a stronger implementation of regulatory approaches than consumer warnings, with a specific focus on preventing underage users from accessing microtransactions. Similar views have been expressed in recent academic papers, including studies that identify similarities between in-game spending and problem gambling (Brooks & Clark, 2019; King & Delfabbro, 2018a; Zendle, 2018). Participants also supported the introduction of spending limits on

microtransactions, as discussed in some recent commentaries (Drummond et al., 2019; King & Delfabbro, 2019c).

There were contrasting views on the nature and severity of problem gaming, including its current position as a recognized mental disorder. Such views are likely to influence the likelihood of gamers seeking or supporting prevention approaches and may constitute a barrier to implementing many preventive countermeasures if they are presented as a strategy to combat a problem that some do not believe actually exists. Although participants did not all agree that excessive gaming was an addictive disorder, many highlighted core symptoms of gaming disorder when asked to identify the signs of a gaming-related problem. Participants referred to the hallmarks of addiction, including loss of control or an inability to stop gaming, and functional impairment due to gaming. It is worth noting that these features are represented in both the DSM-5 and ICD-11 classifications; however, the DSM-5 includes additional criteria (e.g., tolerance) which were not specified by participants. This suggests that the more 'streamlined' ICD-11 classification may be more consistent with the gaming community's perceptions of the condition. These results were consistent with Colder Carras, Porter, van Rooij, et al.'s (2018) group interview study, which reported some similar skepticism among gamers as well as a consistent pattern of support for the above listed features.

While there are mixed views on the conceptualization of problem gaming (i.e., disorder versus coping strategy; see Colder Carras, Kalbarczyk, Wells, et al., 2018) including strong opposition to the DSM/ICD classification, the gamer sample nevertheless identified mood and behavioral indicators that might indicate that an individual needed some kind of assistance or support from others. These signs included a persistent change in demeanor, increased irritability or anger, defensiveness, and depressive mood states. Participants suggested that psychoeducation about gaming in healthy ways and finding productive ways to cope with stress would be helpful responses to these problem signs. Further, participants expressed support for education for younger users about game design (e.g., "how games affect behavior")

to promote critical thinking about specific mechanisms in games that might contribute to overcommitment (time/money) irrespective of whether behaviors were 'addictive'.

Participants discussed social responsibility from several perspectives, including a strong focus on the potential role of the gaming industry. This included views of the negative impact of certain game designs, although some believed that the industry should not have to alter its products or take steps in any way. Many participants argued strongly that the industry should not be allowed to employ 'predatory' designs, particularly in reference to financial payment systems which were seen to exploit certain types of users. They referred to measures taken across some jurisdictions to regulate these features or make them more transparent. This was a complex issue that appeared difficult to identify standard approaches for, but there were some general suggestions that included companies funding prevention schemes and sharing data on potentially problematic players with independent researchers and health professionals. To our knowledge, these basic measures have not yet been undertaken by the major gaming companies or publishers (King & Gaming Industry Response Consortium, 2018).

Limitations

The strengths of this study included: (a) open-ended questions to explore different perspectives on problem gaming and potential public health responses; (b) a large and diverse sample of regular gamers (*N*=992), including a large proportion of self-identified problem gamers (*N*=221, 22.2%); and (c) detailed responses with evidence of critical reflection. However, this study had limitations. First, the study employed purposive sampling and therefore these results may not generalize to the wider population of gamers, particularly a more 'casual' population of gamers. For example, the strong opposition toward microtransactions may not be a salient issue to less frequent recreational gamers who may perceive that these features enhance the gaming experience. Second, the sample was composed of adults, and therefore this study may not have captured some of the potential prevention measures or approaches that adolescents may be more inclined to support. The sample was

also predominantly male (82.4%) and thus biased toward male preferences and views. There is a need for more studies on prevention involving adolescents given that they are often referred to health professionals due to parental concerns about excessive gaming. This study was conducted during the COVID-19 pandemic, which may have affected some participants' views of the relative value of gaming (King, Delfabbro, Billieux, et al., 2020). Another limitation was the lack of follow-up questions to probe for further detail or clarification. This study prioritized a large sample size to gather diverse views; a follow up interview study with a selective sampling approach may enable more in-depth exploration of relevant issues.

Conclusions

Qualitative research to identify practical solutions to address problem gaming has been lacking in the literature. The present study provides firsthand accounts of the attitudes and beliefs of regular and problematic gamers regarding the concept of gaming disorder and the value and feasibility of prevention and harm minimization approaches. Overall, there was support for self-directed and autonomous forms of prevention that promote increased player awareness and sound decision-making. Although some gamers disagree with the fundamental concept of problem gaming as defined in the ICD-11, these data suggest that gamers do recognize some gaming activities can pose risks to players under certain conditions. In particular, games with continuous in-game purchasing systems (e.g., loot boxes) have been controversial. Current proposals to regulate these features, including improved classification of certain implementations of microtransactions that resemble gambling, appear likely to be supported by the gaming community. At the same time, there appears to be some interest in introducing more player feedback and other self-regulating features in games to assist players in monitoring (and potentially self-correcting) their time and money investment in games. Future research could expand on this work by consulting the views of individuals with a confirmed diagnosis of gaming disorder to identify any other potentially useful preventive measures. The next step for this research agenda would be to conduct systematic evaluations

of such features in ecologically valid gaming situations to identify their real-world benefits for players. Overall, this study indicates that the gaming community do acknowledge that problematic gaming can sometimes occur for some players, and that there is some support for preventive countermeasures to address harmful behaviors without necessarily having to compromise the fundamentally positive aspects of gaming activities.

CHAPTER 8

The development, implementation, and pilot evaluation of a brief school-based education program for problematic gaming prevention

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Statement of Authorship

Paper 6: The development, implementation, and pilot evaluation of a brief school-based education program for problematic gaming prevention

Unpublished and Unsubmitted work written in manuscript style

Matthew Stevens (Candidate)

I was responsible for the primary authorship of this paper. I was responsible for conceptualizing the workshops together with constructive inputs from Dr. King. I was responsible for the design and production of all surveys and contents, as well as administration. I was responsible for contacting schools to obtain permission to deliver the workshop, and subsequent delivery of each session. Dr. King and I decided upon the variables of interest, and I carried out the data extraction from written responses. I coded the transcripts and conducted the primary and auxiliary analyses. I was responsible for the interpretation of findings, with insights and critical feedback from Dr. King. I then prepared multiple drafts of the manuscript in collaboration with my primary and co-supervisor. My contributions total 75% of this paper.

I hereby certify that this paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.

Matthew Stevens

January, 2021

Daniel King (Co-author)

I was primarily responsible for overseeing the candidate's contribution to this paper. I was responsible for providing critical feedback during the development of workshops and surveys. The candidate undertook all qualitative and quantitative analyses, and I helped interpretations of the findings. I was responsible for providing feedback and corrections during the drafting and interpretation processes. My contributions total 15% of this paper.

Paul Delfabbro (Co-author)

I was primarily responsible for providing critical commentary and feedback during revisions of the final manuscript. My contributions total 10% of this paper.

By signing this statement of authorship, each of the following authors certifies that: (1) the candidate's stated contribution to the publication is accurate (as detailed above); (2) permission is granted for the candidate to include the publication in the thesis; and (3) the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

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Abstract

Background: Problematic gaming has been recognized as a public health issue throughout the developed world. In particular, gaming disorder (GD) and hazardous gaming have been officially recognized as conditions in the ICD-11. While some intervention options for GD have been investigated, there have been relatively few evaluations of prevention approaches designed to address hazardous gaming. Adolescents tend to be the most at-risk group of developing gaming-related problems, and therefore appear to be a priority target for preventative measures. The purpose of the present study was to develop and evaluate a brief school-based psychoeducation program. ***Method:*** This pilot program consisted of three weekly 45-minute interactive workshops, delivered face-to-face. A total of 12 participants signed up for the program, with 9 completing the program. At each stage of the program, participants were asked to complete surveys, including a series of open-ended questions, in which their level of understanding of problem gaming and prevention concepts was assessed. Gaming behaviors, problem gaming, gaming-contingent self-worth, and motivations, were also examined using standard surveys. ***Results***: Participants reported fewer GD symptoms, less gaming time, decreased psychological distress and gaming-related motivations. Participants reported that they were able to recognize some symptoms of problem gaming and improved their knowledge of universal and selective preventative approaches. ***Conclusions****:* While based on a limited sample, these pilot data demonstrated some promise, including the feasibility of the program content. This work provides the foundation for future implementations of the program, which may benefit from more session content and methodological improvements including a larger sample and follow-up measures. This study demonstrates that psychoeducation on gaming that balances discussion of the positive and unwanted or harmful aspects of gaming may be well-received by young participants and presents a useful opportunity for stakeholders in the future.

The development, implementation, and pilot evaluation of a brief school-based education program for problematic gaming prevention

Video games are a popular and regular pastime for many people around the world (Newzoo, 2020). The increased accessibility and affordability of games and gaming platforms means that many people begin gaming at an early age. Many games are popular because they are designed to reduce stress by providing an immersive experience, which allows players to temporarily switch-off from the real world (Yee, 2006; Dauriat et al., 2011). While most individuals play games in a healthy and controlled manner, some individuals play excessively and experience problems as a result of their usage, including poor psychological health, low self-esteem, relationship difficulties, and poor work or study outcomes (von der Heiden et al., 2019; King & Delfabbro, 2018b; Milani et al., 2018). As gaming is widespread globally, problematic video gaming has become recognized as a public health issue.

The harmful use of video games is not a new phenomenon; however, it has not received strong recognition in clinical psychology and psychiatry until recently. In 2013, Internet Gaming Disorder (IGD) was included into section III of the *DSM-5* as a condition for further study (American Psychological Association, 2013). However, there were researchers who challenged the appropriateness of IGD as a behavioral addiction (Kardefelt-Winther, 2014). More recently, Gaming disorder (GD), along with Hazardous gaming, were included in the ICD-11 (World Health Organization, 2019). Gaming disorder is characterized by persistent and recurrent gaming, impaired control over gaming, and continued use despite harm to other areas of functioning. Hazardous gaming is defined as any pattern of gaming that increases the risk of harm to physical or mental health in the future. While there are now a number of interventions available to individuals with GD (King, Delfabbro, Wu, et al., 2017; Wölfling et al., 2019), the evidence for prevention strategies for problem gaming is less developed (King, Delfabbro, Doh, et al., 2018).

Prevalence rates for GD have tended to vary greatly, due to methodological (e.g., convenience sampling) and diagnostic limitations (e.g., inconsistent cut-off scores) (King &

Delfabbro, 2019a). However, robust studies with large populations and stringent cut-off scores report rates between 1-3% (Przybylski et al., 2017). A meta-analysis of 53 studies estimated that the global prevalence rate was 3%; and less than 2% when including only studies with non-convenience samples (Stevens et al., 2020). Although individuals with GD constitute a minority of gamers, prevalence studies tend to report only those who screen for GD, not those individuals with less severe forms, and thus the proportion of individuals who may be at-risk of developing GD may be higher and undetected.

Studies consistently demonstrate that adolescent males are the most at-risk group for developing problematic gaming habits (Fam, 2018; Feng et al., 2017; Stevens et al., 2020). This may be explained by that fact that, until previously, gaming had predominantly been an activity enjoyed by male adolescents (Mclean & Griffiths, 2013). However, the rate of female gamers is increasing (Lopez-Fernandez, Williams, & Kuss, 2019; King & Potenza, 2020). Nevertheless, males have been shown to exhibit rates of 2.5:1 compared with females (Stevens et al., 2020). Discrepancies in the level of problems experienced by males and females may be attributable to the structure of certain games, as well as individual differences in motivations to play games (Lopez-Fernandez, Williams, Griffiths, et al., 2019). These gender differences notwithstanding, it appears that adolescents in general may be the most at-risk of GD, and therefore should be the focus of primary prevention measures.

Understanding what motivates individuals to continue to play games despite the awareness of problems is an important consideration. The I-PACE model (Brand et al., 2019) proposes the mechanisms through which GD (and other problematic internet-based behaviors) are initiated and maintained. In the early stages of problematic use, an individual's core characteristics (e.g., comorbid psychopathology) may predispose them to an internet-use disorder when their perceptions of external cues (e.g., entering the gaming environment) and internal triggers (e.g., low mood) are met with cognitive and affective responses (e.g., urges) which result in a decision to engage in the behavior. Individuals receive gratification which reinforces reward and expectancy pathways. In the later stages of problematic use, the

gratification experienced from engaging the behavior increasingly gives way to compensation, where the individual has learned through operant conditioning that engaging in the behavior is a way to avoid aversive states. The gradual shift towards compensation may reflect a shift towards prioritization of gaming over other activities.

There are several other factors which can influence problematic gaming. For example, specific needs and motivations, such as self-esteem, can sometimes be driven exclusively, or become contingent upon gaming. Contingent self-worth is the idea that an individual's self-esteem (or self-worth) is based on the approval of others or extrinsic factors through social comparison (Hodgins & Knee, 2002). When an individual is unable to meet basic needs intrinsically (i.e., for self-worth), they may become reliant on external sources to maintain self-esteem (Deci & Ryan, 1995; Hodgins & Knee, 2002). In the case of gaming, individuals who derive self-esteem from gaming can be a factor in the maintenance of problematic gaming (King & Delfabbro, 2014). Importantly, aside from predicting gaming disorder symptoms, gaming contingent self-worth has also been shown to predict weekly gaming time, and overall self-esteem (Beard & Wickham, 2016). Therefore, understanding motivations and contingent self-worth in the context of gaming presents a useful avenue for investigation.

Preventative Approaches to Problematic Gaming

For individuals who present clinically with problematic gaming symptoms, there are some emerging psychotherapeutic and pharmacological treatment options. Cognitive-behavioral therapy (CBT) is the most common and well-studied psychotherapeutic treatment available. A meta-analysis of 12 CBT-treatment studies found that CBT was highly effective in reducing IGD and depressive symptoms in the short-term, and moderately effective in reducing anxiety symptoms in the short term. Individuals with gaming disorder often have cognitive deficits in impulse control, cue reactivity and reward processing (Fauth-Bühler & Mann, 2017; Li et al., 2020; Şalvarlı & Griffiths, 2019), as well as low self-esteem (von der Heiden, 2019); low self-efficacy (Jeong & Kim, 2011) and comorbid mood disorders (Wang et al., 2018). Thus, to

many, gaming presents an effective and available coping or escape mechanism (Brand et al., 2019; Plante et al., 2019). Part of the reason why CBT appears to be effective in reducing GD symptoms and comorbid anxiety is that therapists are able to help individuals restructure gaming-related cognitive and behavioral processes, while simultaneously dealing with the comorbid issues that reduce capacity for coping with stress and contribute to the reliance on gaming (Stevens et al., 2019).

While there are interventions and treatment options available to individuals with gaming disorder, fewer preventative options available to people with less-severe forms of problem gaming (King, Delfabbro, Doh, et al., 2018). Preventative approaches encompass a wide variety of strategies that can be targeted towards different types of people. In the public health literature, prevention approaches can be conceptualized as a pyramid, with the more-broad and population-based approaches at the base, to the more acute and individualistic approaches at the tip. The broad strategies are sometimes termed primary or universal approaches, which, as the name suggests, are designed for the wider population (including non-gamers). The acute strategies are sometimes termed indicated or tertiary strategies and are designed for individuals considered the most at-risk of developing gaming disorder. There are also a third group of strategies existing in the middle, sometimes termed secondary or selective strategies, which are designed for gamers who may be at some risk of developing problems.

Primary and tertiary strategies are most useful for targeting regular and disordered gamers respectively, however selective approaches may be the most useful for individuals with hazardous gaming (King, Delfabbro, Doh, et al., 2018). Selective approaches are often implemented in areas where individuals may be particularly vulnerable to problems, which in the case of hazardous gaming, includes adolescents. School-based educational awareness programs for gaming aim to promote healthy use of technology, increase social functioning through real-world interaction, and foster the development of outside hobbies and interests to improve self-esteem and create a sense of empowerment (Shek & Yu, 2012). A systematic review of prevention approaches by King, Delfabbro, Doh, et al. (2018) found that

psychoeducation was a common feature of preventative approaches, and while similar results were found in a separate systematic review of CBT treatment studies for GD (i.e., Chapter 4), all psycho-educational protocols were lacking discussions around the game mechanics and the addictive mechanisms specific to gaming (Stevens et al., 2017). Therefore, problematic gamers may benefit from the development of gaming-specific psychoeducational material that can be administered in both in treatment and preventative settings.

At present, the evidence base for prevention strategies shows promise, but it is still in its infancy (King, Delfabbro, Doh, et al., 2018). According to King, Delfabbro, Doh, et al. (2018) there are currently 9 school-based educational programs for problematic internet use which have been trialed outside of the Asian context. However, the review only identified three studies which addressed problematic gaming specifically (i.e., Davies & Blake, 2016; Walther et al., 2014; Yang & Oh, 2007). Of those studies, two trialed selective prevention approaches (i.e., Walther et al., 2014; Yang & Oh, 2007); while Davies and Blake (2016) implemented an indicated approach (e.g., shutdown features and limits). Yang and Oh (2007) trialed a 6-week program in South Korea, comprised of 269 elementary school students, and reported significant increases in self-control related to gaming scores, but no change in time spent gaming when compared with the control group. Walther et al. (2014) trialed a 4-session RCT among a cluster of 1843 secondary students in Germany and reported lower levels of gaming time and excessive gaming in the intervention group. Both studies showed early success in their implementation of brief school-based programs. There is a need for further prevention-based programs with updated psychoeducation components, given the constant evolution of gaming activities and recent changes to clinical classifications (i.e., ICD-11) that affect our understanding of gaming as a mental health condition.

The Present Study

Adolescents are an at-risk group for developing problematic gaming habits. Currently, there is a growing evidence base on treatment options for gaming disorder, but there is limited

evidence for primary preventative approaches for adolescents, particularly outside of the Asian context. Therefore, the primary aim of this study was to develop and pilot trial a brief school-based psychoeducation program to address this gap. The overall goal of the program was to help adolescents develop greater awareness and knowledge of problem gaming.

The program will be evaluated using a mixed-methods approach. Based on quantitative data, it was predicted that, at the end of the program, participants would report lower gaming hours on both weekends and weekdays; lower levels of GD symptoms; and lower psychological distress compared to baseline levels; and lower levels of gaming motivation and contingent self-worth compared to baseline. Qualitative data was also gathered to examine participants' perceptions of problematic gaming and potential prevention strategies.

Method

Program Development

The initial conceptualization of the program was six 30-minute modules, to be delivered over the course of six weeks, during regular school hours. Two schools in Adelaide were approached to participate. The principals at both schools were initially receptive, however, they expressed a preference for a shorter program to fit with the availability of students. After receiving this feedback, the program was streamlined by reducing the session outline to three sessions. The reduction in overall program delivery time was managed by (1) increasing the duration of each session from 30- to 45-minutes, and (2) including a homework-style take-home component to include content between sessions. Furthermore, to ensure the program did not interfere with the teaching schedule, the program was delivered before- or after-school hours. However, this was deemed not feasible, due to the regulatory requirement that each school provide an existing teacher to be present during the program delivery. Therefore, to compromise, the program was delivered at lunchtime (with lunch provided), which was agreed upon by both participating schools.

Once the program outline was established, the content for each module in the program was drafted. The first task was to develop the program aims and objectives. This was relatively straightforward: previous research indicated that awareness and education about problem gaming referred to the promotion of insight, particularly in relation to the distinction between healthy or engaged, and unhealthy or problematic gaming. Thus, the primary goal of the program was to help individuals develop more helpful and informed ideas as to what constitutes healthy and unhealthy gaming and how to recognize when gaming becomes problematic. This led to the next aim of helping individuals to recognize and develop some ways in which they might prevent the onset of problem gaming in the first place.

With the program aims established, the next task was to develop the content. Given the time constraints of the program, the program was designed to avoid long introductions to topics or concepts; all sessions had to be concise. Another important consideration was ensuring that the concept of problem gaming was not the first topic of the program but would be introduced after considering the broader types of gaming and acknowledging benefits of gaming and gaming as a subculture. The aim was to introduce the concept of problem gaming without making individuals feel as though they were participating in an intervention. Therefore, the focus of the program was to externalize problem gaming, i.e., referring to it as an issue that may arise in others and leaving open the possibility that it might be an issue for participants. The session was intended to provide contrasting discussion of healthy and unhealthy gaming to aid in promoting balanced discussion.

The next step in the development of the program was to design the method of delivery. With the main goal of the program being to foster self-discovery, the program was intended to balance delivering educational content and facilitating guided discussion. The intended split was based on a 1:1 ratio. Further, it was decided that including a fun quiz and video content to illustrate concepts might help to keep the program relatively light despite the more serious issues sometimes raised by the content. Establishing rapport with the participants and

establishing that the program was intended as the free and welcome exchange of ideas and perspectives, was important as the foundation for delivering all program content.

Program Overview

The overall aim of the program was to help individuals to develop or strengthen insights into various gaming issues; to foster knowledge of problematic gaming and ways of recognizing this in oneself and others, and to promote an understanding of how to prevent gaming becoming a problem. The program was designed to be delivered in small group format to enable all participants to contribute freely to the discussions.

The content delivery was achieved primarily through collaborative discussions related to questions and scenarios about healthy vs. unhealthy gaming; all of which were designed to promote self-discovery among participants, rather than a 'lecture-style' delivery of the program content. For example, initial discussion was prompted by asking "*What does the phrase "healthy gaming" mean to you?*" to which each participant would be asked to articulate and share their ideas and perspective. Each participant also had a worksheet to record answers and ideas, giving them an opportunity to expand on their ideas and assumptions. The format of the modules enabled participants to freely comment and discuss others' ideas, and contribute their own views (e.g., sharing experiences of games with predatory in-game spending mechanisms).

Program Structure

The program consisted of three separate 45-minute sessions, delivered to students during their lunchtime hour a private school in Adelaide, South Australia. Students were provided with lunch during the session. The first two sessions included a take-home exercise. The purpose of each take-home exercise was to consolidate the content generated in each discussion and to provide some background for the subsequent session. The final session included a program recap and a survey component which asked participants to provide answers

to four open-ended questions about problematic gaming. Short quizzes were also integrated into each session to anticipate future content and increase engagement.

The program involved three modules. Each session focused on an aspect of gaming psychology that related to problematic gaming. The first module introduced participants to the concept of problematic gaming and how to recognize healthy versus unhealthy video-gaming practices. There was a take-home exercise that focused on the distinction between healthy vs. unhealthy gaming. The second module focused specifically on gaming disorder (i.e., ICD/DSM conceptualizations), and its underlying cognitive biases and behavioral factors. The second session included a take-home exercise which focused on recognizing signs of gaming disorder, and its associated thought processes and behaviors. The final session focused on how gaming disorder is maintained; the social aspects of gaming; the role of the gaming industry in problematic gaming, and the role of in-game spending. Table 8.1 presents an overview of the three modules in the pilot program.

Table 8.1. Program outline for all sessions, including aims, concepts, discussion prompts, tasks/objectives and measures applied.

Session	Aim	Concepts	Discussion prompts	Tasks/objectives	Measures applied
1	Introduction to problem gaming concept	Healthy gaming	*What do you enjoy about gaming?* *Why do you play games?* *What does the phrase 'healthy gaming' mean to you?* *Do you believe you have a healthy relationship with gaming?*	Outline positives/benefits of gaming Discuss individual motivations to play games.	Baseline survey: -Demographics -Gaming time -GAMS -GCSW -K10 -SCI-IGD
		Unhealthy gaming	*Do you think someone can have an 'unhealthy' relationship with gaming? What might that look like?*	Rate scenarios of gaming behavior according to healthy/unhealthy continuum (e.g., staying up all night to play games; missing school to stay home and game; playing games to unwind after a long day) Define engaged vs. problematic gaming	Take-home sheet: -*Write down 5 signs you think may indicate that someone has an unhealthy relationship with gaming* -*Now consider your own gaming. Do you fit any of these criteria? If yes, please elaborate.*
		Esports	Quiz: *What was the first prize winnings for the Fortnite world cup?* *Do you think a career in Esports, or streaming is viable?*	Discuss pros and cons of Esports (e.g., getting paid to do what you enjoy; having to work long hours; decreased level of enjoyment [i.e., hobby becoming work]) Discuss problematic gaming among Esports players	

2	Maintenance of problem gaming	Gaming disorder	*Do you think you can be 'addicted' to gaming?* *Gaming and gambling are both sometimes considered 'behavioral addictions.' Do you think they are similar?* *How might you describe someone's behavior who has 'lost control' over their gaming?* *Can you identify some potential problems or 'harms' that might result from having gaming disorder?* Quiz: *What was the name of the virtual casino in GTA online, where players can convert real cash into online money to gamble with?*	Evaluation of *DSM-5* classification (e.g., how valid is each criteria) Compare ICD-11 criteria (e.g., harm, loss of control, continued use) to *DSM-5* criteria (e.g., is it more appropriate than the *DSM-5* definition) Discuss idea of behavioral addictions (e.g., similarity to gambling/social media 'addictions')	Take-home sheet: -*Write down 3 signs you think may indicate that someone has gaming disorder (by the ICD-11 definition)* -*What are some thoughts, feelings, and behaviors that a person with gaming disorder might display?*
		CBT model	*Can you describe a situation specific to gaming where how you are feeling emotionally determines how you behave? Or what you think?* *Can you describe a situation specific to gaming where what you are thinking determines how you feel emotionally? or how you behave?* *Can you describe a situation specific to gaming where how you are behaving determines how you feel? Or what you think?*	Discuss relationship between thoughts, behaviors, and emotions Introduction to concept of cognitive biases ("thinking traps"); core beliefs; and automatic thoughts	

3	Prevention of problem gaming	Gaming disorder continued	*In the above example, what does loss of control over gaming look like for Sam?* *How might Sam feel during or after losing control of their gaming?*	Read fictional case study of problem gamer and identify instances of GD criteria (e.g., loss of control, harm, continued use) Discuss changes in mood	Post-test survey: -Gaming time -GAMS -GCSW -K10 -SCI-IGD Open-ended questions: *-Now that you have completed this program, do you feel more informed about what constitutes problematic gaming?* *-Do you now feel more comfortable recognizing the*
		Prevention	*What strategies might Sam use to prevent the loss of control over gaming in the future?* *Do you think time-limits on games are a good idea? What about pop-up notifications in game to tell you how long you have been playing?* *What do you think about the Cinderella Laws? Do you think they are a good idea?*	Introduction to prevention strategies (e.g., limit-setting, mandatory shutdown features, pop-up notifications, warning labels, age restrictions, bans on problematic games) Discussion of prevention approaches in other regions (e.g., Asia)	

Role of gaming industry in GD	*Do you think the gaming industry contributes to problematic gaming?* *What are your experiences with predatory mechanisms e.g., Loot-boxes?* *What would you like to see the gaming industry do to help reduce problematic gaming?*	Critically evaluate role of gaming industry in promotion of problematic gaming Discuss strategies to prevent overspending on microtransactions	signs of problem gaming? If so, what are they? -What are some strategies you feel are useful to prevent yourself from falling into a cycle of problematic gaming? -What strategies might you suggest to help a friend who is engaged in problematic gaming?

Program Outline

Session 1: Introduction to Problem Gaming

The aim of the first session was to introduce participants to the concept of problematic gaming. To reduce the likelihood of pathologizing gaming in general, and to stimulate ideas about the psychological appeal of games, the first discussion question was "*What do you enjoy about gaming?*". This opening question was also intended to promote self-reflection. Participants were given a few minutes to record their responses. Participants were then asked, "*What does the phrase "healthy gaming" mean to you?*" Participants were given time to record responses before sharing their responses with the group. The next question asked, "*Do you think someone can have an 'unhealthy' relationship with gaming? And what might that look like?*" Participants were given time to record and share their answers with the group. These questions established that gaming could be considered to fall along a continuum from healthy to unhealthy gaming. Participants were then given a practical exercise to rate several gaming scenarios (e.g., *staying up all night to play games*) and rate where each situation might belong on the continuum. The quiz in the first session asked, "*What was the first prize winnings for the Fortnite World Cup?*". The purpose of including this question was to set up discussion of the rise in popularity of Esports, the level of engagement it takes to become an Esports player, and subsequently whether it presents a viable career opportunity. This discussion would then link to the concepts of healthy and unhealthy gaming in the first session.

At the end of the session, participants were provided a recap, and introduced to the material and topics for discussion on the following section. Participants were also provided with a take-home worksheet. The worksheet consisted of the following two tasks: (1) "*Write down five signs you think might indicate that someone has an unhealthy relationship with gaming*" and (2) "*Considering your own gaming behavior, have you or do you fit any of these criteria? If yes, please elaborate*". The purpose of the worksheet was to reinforce the concepts of problematic gaming and to promote insights into personal experiences.

Session 2: Maintenance of Problem Gaming

The aim of the second session was to introduce participants to a cognitive-behavioral model of problematic gaming. After beginning with a brief recap, the session focused on common cognitive biases, including *thinking traps,* and then more gaming-specific *automatic thoughts* associated with problematic gaming. Concepts from the model related to how thoughts, feelings and behaviors contribute to and reinforce negative gaming practices. Following the initial recap, participants were introduced to the conceptual definition of *gaming disorder* as outlined in the ICD-11. Participants were then asked to determine which of the situations previously rated on the continuum might be indicative of gaming disorder.

Participants were asked to discuss situations where their gaming behavior was influenced by specific thoughts or feelings. For example, participants were asked "*Can you describe a situation specific to gaming where how you're feeling determines how you behave?*" and "*can you describe a situation specific to gaming where the thoughts in your head determine how you feel?*" Participants were given time to record and share their answers with the group. The quiz question posed to participants in the second module was "*What is the name of the virtual casino in GTA online where players can convert real cash into online money to gamble with?*" This question was selected to highlight and promote discussion about the potential overlap between gaming and gambling technologies, and the role of the gaming industry in maintaining commitment to a game or persistent gaming behaviors.

At the end of the session, participants were provided with a recap of the session, and introduced to the material and topics for discussion on the following section. Participants were also provided with a take-home worksheet. The worksheet consisted of the following two tasks: (1) "*Write down three signs you think might indicate that someone has gaming disorder*" and (2) "*What are some thoughts, feelings and behaviors that a person with gaming disorder might display?*". The purpose of the take-home worksheet was to reinforce the concepts of problematic gaming and the interplay between cognition, emotion, and behavior; and to promote further insight into problematic gaming.

Session 3: Prevention of Problem Gaming

The aim of the final session was to explore the processes that serve to maintain gaming disorder with regard to the previously learned CBT model; as well as beginning to explore how some gaming features, including predatory monetization mechanics, can affect gaming behavior, and strategies to prevent the onset or worsening of problem gaming. After beginning with a brief recap, the session focused on *loss of control* and *harm* related to gaming. Participants were provided with a *case study* of someone with a gaming problem, and asked to identify indicators of *loss of control, changes in mood,* and *instances of harm*. For example, participants were asked *"What does loss of control over gaming look like for Sam?*", "*How might Sam feel during or after losing control of gaming?*" and "*what strategies might Sam use to prevent the loss of control over gaming in the future?*". Participants were asked similar questions related to how Sam's gaming might affect physical and mental health, relationships with others, and performance at school or work; and to provide strategies to prevent problems occurring in the first place. Participants were asked to discuss all responses among the group.

Following the initial task, participants were asked to explore the role of the gaming industry in maintaining persistent gaming. For example, participants were asked "*What are your experiences with predatory mechanisms e.g., Loot-boxes?*", "*Do you think the gaming industry contributes to problematic gaming? If so, how*" and "*What would you like to see the gaming industry do in order to reduce problem gaming?*" All the questions in this section were designed to explore how gaming features and services affect gaming behavior and the practical steps that the industry could take to reduce excessive gaming without necessarily affecting the recreational value of gaming.

The final task for participants was to discuss the effectiveness of certain proposed strategies to prevent problem gaming, including limit-setting, pop-up notifications, warning labels on potentially problematic games (e.g., MMOs), shutdown features and educational guidelines. Participants were asked to discuss whether each strategy was feasible, and whether they believed that adopting the strategy would be effective in preventing problematic gaming

in the future. Participants were provided a recap of the session and were presented with the final survey which included four open-ended questions to answer.

Measures

Each participant provided answers to several questions pertaining to socio-demographic information (e.g., gender, age, parental living-status). Participants also reported the typical number of hours spent gaming each weekday over the previous 3-month period, number of hours spent gaming each day on the weekend over the previous 3-month period, number of games and type of game currently playing, and years of gaming experience.

Problem Gaming Status

Participants were screened for problem gaming status using the Structured Clinical Interview for Internet Gaming Disorder (SCI-IGD; Koo et al., 2017). The SCI-IGD is a 12-item self-report symptom checklist, designed to address the nine IGD criteria: preoccupation, tolerance, withdrawal, unsuccessful attempts to control or reduce gaming, deception about gaming, loss of interest in other activities, continued use despite the knowledge of harm, gaming to escape, and conflict/harm. Response options to the SCI-IGD are scored on a dichotomous (yes/no) format, with each question mapping onto one of the 9 criteria, except continued use despite harm (1-initial item plus 1 follow-up item) and conflict/harm (1-initial item plus 2 follow-up items). Scores on the SCI-IGD range from 0 to 9, with a score of 5-or-more indicating problematic gaming status. The SCI-IGD has been used in clinical studies of GD and demonstrates reliable psychometric properties (King, Billieux, Carragher, et al., 2020; King, Chamberlain, Carragher, et al., 2020).

Gaming Motivations Scale (GAMS)

The Gaming Motivations Scale (GAMS; Lafrenière et al., 2012) is an 18-item measure designed to assess 6 motivations for gaming, based on Self-Determination theory (SDT; Deci

& Ryan, 1985, 2000). Each motivation (intrinsic motivation, integrated regulation, identified regulation, introjected regulation, external regulation, amotivation), is assessed by 3 separate items. Responses to each question are scored on a 7-point Likert scale, ranging from 1 (*Do not agree at all*) to 7 (*Very strongly agree*). Scores on each motivational construct are summed to provide an overall score, with higher scores indicating higher total motivation for gaming to play games. The GAMS has been widely used to investigate individual motivations for gaming. Intrinsic motivation reflects internal drives (e.g., *For the feeling of efficacy I experience when I play*). Integrated regulation reflects motivations related to gaming being integral to the individual (e.g., *Because it is an integral part of my life*). Identified regulation reflects identity drives (e.g., *Because it has personal significance to me*). Introjected regulation reflects the need to play to maintain positive self-regard (e.g., *Because I must play to feel good about myself*). External regulation reflects motivation to play based on rewards (e.g., *To acquire more powerful and rare items, or to unlock hidden elements of the game*). Finally, Amotivation reflects dissociation from gaming motivation (e.g., *I used to have good reasons, now I am not sure if I should continue*).

Gaming Contingent Self-Worth (GCSW)

The Gaming Contingent Self-Worth scale (GCSW; Beard & Wickham, 2016) is a 29-item measure that assesses self-worth derived from gaming. There are four subscales: validation seeking, reward orientation, competition focused, and detached. Responses to the GCSW are scored on a 5-point Likert scale, ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). Scores on each subscale are then summed to provide an overall score, with higher scores indicating higher levels of contingent self-worth attained from gaming. The validation-seeking subscale assesses the idea that individuals obtain self-worth from being able to play (e.g., *If I did not have gaming in my life, I would be a second-rate person*). Reward orientation assesses the extent to which self-worth is derived from feeling valued by others (e.g., *Helping newer players makes me feel like a better person overall*). The competition focused subscale assesses

the extent to which individual self-worth is derived from competition with others (e.g., *Having more achievement points than others increases my self-worth*). The detached subscale assesses the extent to which individuals are immune to self-worth impacts from gaming (e.g., *When I have repeated losses within the game, my self-respect remains unaffected*). Validation-seeking, reward orientation and competition-focused subscales are all positively correlated with GD symptoms, while detached scores are negatively correlated with GD symptoms (Beard & Wickham, 2016).

Psychological Distress

Participants overall mental health was assessed using the Kessler Psychological Distress Scale (K10; Kessler et al., 2003). The K10 yields a global measure of distress based on anxiety and depressive symptoms and is suitable for use in both normal and clinical populations. Scores on the K10 range from 10-50, with scores from 10-19 indicating little risk of distress, 20-29 indicating mild risk of distress, 30-39 indicating moderate risk of distress, and 40-50 indicating severe distress.

Open-Ended Questions

Four open-ended questions were included as part of the final survey. Two questions were designed to address problem gaming recognition, and the other two were designed to explore prevention. The questions were: (1) *Now that you have completed this program, do feel more informed about what constitutes problematic gaming?*; (2) *Do you now feel comfortable recognizing the signs of problematic gaming? If so, what are they?*; (3) *What are some strategies you feel are useful to prevent problematic gaming?*; and (4) *What strategies might help a friend who is engaged in problematic gaming?*.

Results

Participants

Initially, two schools in Adelaide agreed to participate in the pilot program. However, only one school participated due to administrative reasons. A total of 12 individuals agreed to participate. Nine participated in all three workshops. All participants were male, aged between 14 and 18 years. After the completion of the final workshop, participants were asked to complete the final survey. Of the 9 participants that completed the program, only four completed all baseline and post-test survey questions, which was necessary for comparisons. At baseline, all four comparable participants (i.e., those who completed both surveys) reported scores that would be considered ‘at-risk’ ‘of problematic gaming (i.e., 3-4 symptoms). Additionally, three of those participants reported scores that would be considered ‘mild risk’ of psychological distress. Table 8.2 presents an overview of all participant responses.

Table 8.2. Changes in outcomes from pre- to post-test across gaming behavior, gaming cognition and psychological outcomes for only complete participant data.

	Weekday gaming time (hrs/day)			Weekend gaming time (hrs/day)			GD status (symptoms)			Psychological distress			Gaming motivations			Gaming contingent self-worth		
ID	pre	post	+/-	pre	post	+/-	pre	post	+/-	pre	post	+/-	pre	post	+/-	pre	post	+/-
1	14	6	*-8*	4	3	*-1*	4	3	*-1*	20	14	*-6*	51	38	*-13*	78	70	*-8*
2	2	2	*0*	4	6	*2*	3	1	*-2*	15	16	*1*	66	73	*7*	83	87	*4*
3	1	2	*1*	1	3	*2*	3	9	*6*	24	19	*-5*	34	38	*4*	75	83	*8*
4	.5	0	*-.5*	1	1	*0*	4	0	*-4*	22	14	*-8*	46	39	*-7*	60	62	*2*
Total			***-1.9***			***.8***			***-.2***			***-4.5***			***-2.3***			***1.5***

Gaming Time

Of the four participants who provided complete responses, one participant reduced their gaming time on weekdays from 14 hours to 6 hours, and their weekend gaming hours from 4 hours to 3 hours. In all other cases, participants reported either small reductions or increases. Overall, on average, participants reported a reduction of 1.9hrs of weekly gaming, and an increase of .8hrs of weekend gaming. Figure 8.1 presents changes in mean scores on all gaming related measures from baseline to post-test (see also table 8.2).

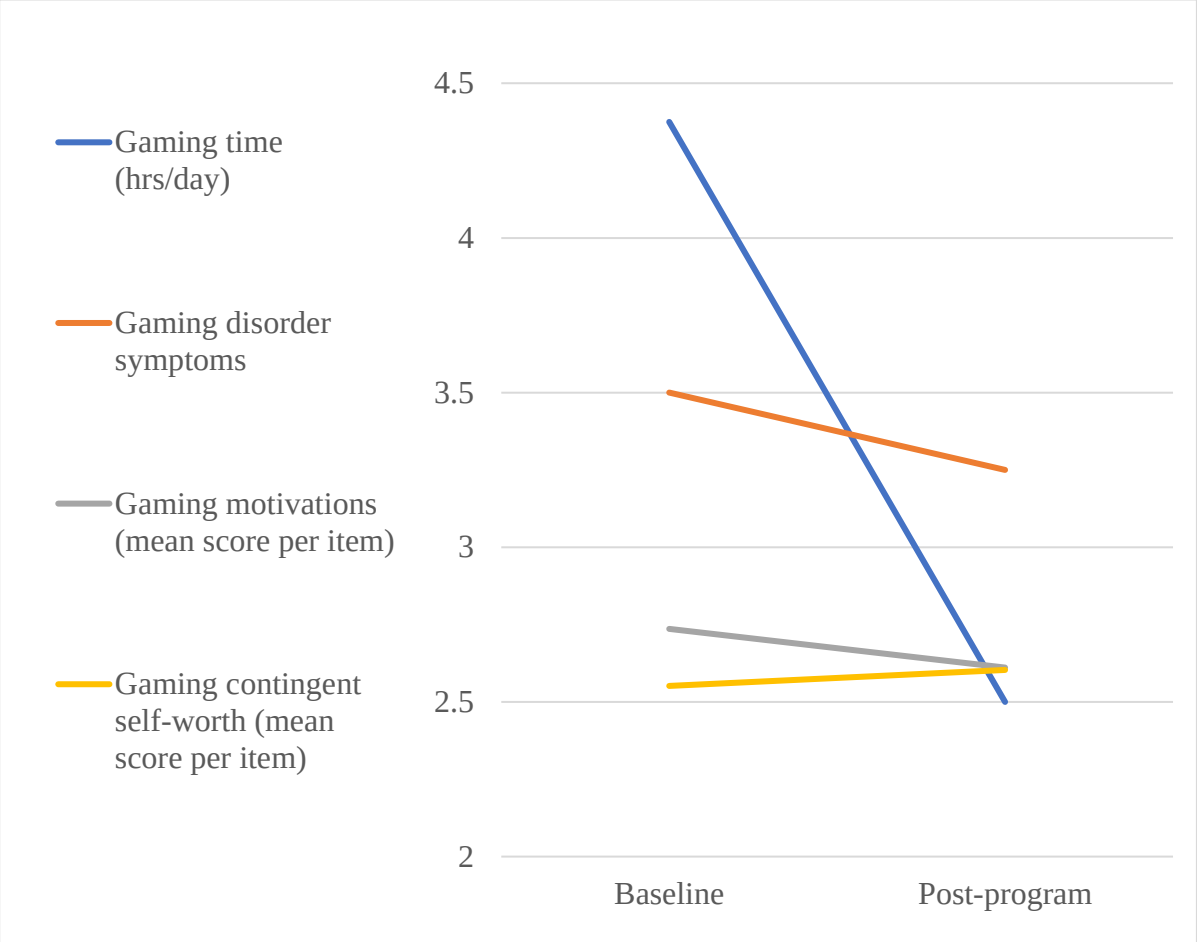

Figure 8.1. Changes from baseline to post-test on mean scores for all gaming-related measures.

Problem Gaming Status

At baseline, all four participants reported scores that would indicate ‘at-risk’ status of problem gaming. At post-test, three participants reported reduced scores, and thus only two

would still be considered at-risk at post-test. Of the four participants providing complete responses, three reported reduced GD symptoms (i.e., -1, -2, and -4 symptoms respectively), and one reported increased GD symptoms (i.e., +6 symptoms). At baseline, all participants were considered at-risk; however, at post-test, two reported reduced scores and subsequently would no longer be considered at-risk, and another participant reported reduced scores but would still be considered at-risk. The final participant increased from 3- to 6-symptoms at post-test, however upon closer inspection of other results (i.e., small increases in gaming time, large reduction in psychological distress and small increases in motivation and contingent self-worth), this finding should be considered an outlier (see Table 8.2).

Mental Health Status

Of the four participants providing complete responses, three reported reduced psychological distress levels (i.e., -5, -6, and -8 points respectively), and one reported an increase in distress (i.e., +1 point). At baseline, three participants scored over 20 on the K10, indicating mild distress; however, at post-test all participants scored below 20, indicating no distress. The participant reporting 9/9 GD symptoms reported a reduction in distress levels (-5 points). Overall, participants reported an average of 20.3 points at baseline (indicating mild psychological distress), which reduced to 15.8 points at post-test (indicating no psychological distress) (see Table 8.2)

Gaming Motivations

Of the four participants providing complete responses, one participant scored lower on all subscales, except introjected regulation (+1) and amotivation (no change), for a total reduction of 13 points. One participant scored higher on three subscales (i.e., intrinsic motivation, identified regulation, and external regulation) and lower on two subscales (i.e., integrated regulation, and amotivation) for a total overall decrease of 7 points. Another participant scored higher on three subscales (i.e., intrinsic motivation, integrated regulation, and identified

regulation) and no change on the remaining three subscales for a total overall increase of 4 points. The final participant scored higher on all subscales except identified regulation (-1) and external regulation (-1) for a total increase of 7 points. With respect to each subscale, on average, participants scored 2.3 and 1.7, and .3 points lower on amotivation, external regulation and integrated regulation subscales respectively; and .8, .8, and .5 points higher on identified regulation, integrated regulation, and intrinsic motivation, respectively. Overall, participants scored 49.3 points on average at baseline, which decreased to 47 points at post-test, indicating an average total decrease of 2.3 points. However, mean scores per-item reduced from 2.7 to 2.6, and therefore in practice remain unchanged (see Figure 1). Table 8.3 presents a breakdown of scores on each subscale of the GAMS for participants who completed both baseline and post-test measures.

Table 8.3. Changes in outcomes from pre- to post-test across gaming motivation subscales.

	Intrinsic motivation			Integrated regulation			Identified regulation			Introjected regulation			External regulation			Amotivation			Total		
ID	pre	post	+/-	pre	post	+/-	pre	post	+/-	pre	post	+/-	pre	post	+/-	pre	post	+/-	pre	post	+/-
1	15	8	*-7*	9	5	*-4*	16	14	*-2*	3	4	*1*	5	4	*-1*	3	3	*0*	51	38	*-13*
2	14	15	*1*	10	14	*4*	11	10	*-1*	7	9	*2*	11	10	*-1*	13	15	*2*	66	73	*7*
3	13	15	*2*	5	6	*1*	7	8	*1*	3	3	*0*	3	3	*0*	3	3	*0*	34	38	*4*
4	6	12	*6*	7	5	*-2*	6	11	*5*	3	3	*0*	9	4	*-5*	15	4	*-11*	46	39	*-7*
Total			***.5***			***-.3***			***.8***			***.8***			***-1.7***			***-2.3***			***-2.3***

Gaming Contingent Self-Worth

Of the four participants providing complete responses, one participant scored lower on all subscales of the GCSW, for a total reduction of 8 points; and another participant scored higher on validation (+6) and competition (+8) measures; lower one detached (-5) and reward (-1) measures, for a total overall increase of 8 points. Similarly, another participant scored higher on validation (+1) and competition (+3) measures; lower one detached (-1) and reward (-1) measures, for a total overall increase of 8 points. The final participant scored higher on validation (+4) and reward (+1) measures; lower (-1) on detached and no change on competition measures, for a total overall increase of 4 points. With respect to each subscale, on average, participants scored 2.3 points higher on validation, and competition subscales respectively; and 2.5, and .5 points lower on reward, and detached subscales, respectively. Overall, participants scored 74 points on average at baseline, which increased to 75 points at post-test, indicating an average total increase of 1.5 points. However, mean scores per-item remained unchanged (see Figure 1). Table 8.4 presents a breakdown of scores on each subscale of the GCSW for participants who completed both baseline and post-test measures.

Table 8.4. Changes in outcomes from pre- to post-test across gaming contingent self-worth subscales.

	Validation			Reward			Competition			Detached			Total		
ID	pre	post	+/-	pre	post	+/-	pre	post	+/-	pre	post	+/-	pre	post	+/-
1	19	17	***-2***	22	21	***-1***	15	13	***-2***	22	19	***-3***	78	70	***-8***
2	16	20	***4***	27	28	***1***	19	19	***0***	21	20	***-1***	83	87	***4***
3	12	18	***6***	26	25	***-1***	13	21	***8***	24	19	***-5***	75	83	***8***
4	13	14	***1***	15	14	***-1***	7	10	***3***	25	24	***-1***	60	62	***2***
Total			***2.3***			***-.5***			***2.3***			***-2.5***			***1.5***

Qualitative Responses

Problematic Gaming Recognition

Participants were also asked a series of open-ended questions. Firstly, participants were asked whether they felt capable of recognizing problematic gaming within themselves and others. Responses tended to involve aspects related to the prioritization of gaming. Specifically, prioritization over (1) health and other activities, and (2) psychosocial well-being. These are discussed in further detail below.

Prioritization of Gaming

Health and Other Physical Activities. The first feedback related to neglecting other activities or obligations to play games. For example, in majority of cases, participants reported that prioritizing gaming ahead of sleep was an early indicator of problem gaming (e.g., *Lack of sleep; Infringing on sleep*; *Not getting enough sleep*). Additionally, participants reported that prioritizing gaming over other physical health factors, such as poor diet (e.g., *Lack of nutrition*) and sedentary behavior indicators (e.g., *Problems from sitting a lot; Not leaving the couch*; *The game gets in the way of other commitments or activities*). One participant reported that, in the past, gaming had previously taken precedence over finishing school homework (e.g., *Staying up until 3am knowing I had homework due the next day that I had not started because I was too busy playing video games*).

Psychosocial Well-being. Problem gaming was viewed as having indicators of poor psychosocial well-being. Participants noted that poor school or work performance were indicators of problem gaming (e.g., *Reduced performance at school or work*; *Missing out on school*; *Missing out on important obligations such as school or your job*). Other indicators included the impact on social relationships (e.g., *Damaged relationships*; *Choosing to play over maintaining relationships*). Participants noted that changes in mood were indicators, particularly irritability during gameplay (e.g., *Getting irritable at other team-mates*; *Letting*

results influence mood) or after gaming (e.g., *Irritable when forced to get off*); stress (e.g., *Feeling tense/stressed*); anger (e.g., *More likely to get angry; Getting angry if something does not go my way*); and other mental health issues (e.g., *Depression/Anxiety*). Finally, some participants noted that lying/deception was an important indicator of problems (e.g., *Lying about usage*).

Prevention

Participants were asked which strategies they thought might be useful in the prevention of problematic gaming. Three strategies were discussed: (1) limit-setting, (2) prioritization of other areas, and (3) self-monitoring. Each prevention theme is outlined in detail below.

Limit-Setting. One of the most common prevention strategies was limit-setting. Among participants however, there were differences in what limits should be applied to. For example, one participant indicated that limits should be set around playing at night (e.g., *Setting clear limitations stands out as something useful, e.g., not playing at nighttime*). Another participant indicated overall time-limits should be set in advance (e.g., *Stopping gaming at particular times, and if it is an online game, think ahead with regard to the time limit*) which may be more beneficial for some, given some participants played MMOs which can sometimes only be played at night (e.g., when involved in an online game with overseas players).

Prioritization of Other Areas. Participants indicated that setting goals such as prioritizing the completion of homework before gaming was important (e.g., *Completing their priorities first, such as homework,* f*inishing my homework before gaming*). Participants noted that sleep should be prioritized and kept consistent (*Setting a healthy bedtime*). One participant referred to removal of gaming consoles from areas of sleep and work (e.g., *Removing gaming from sleep or study areas*). Participants also reported that shifting priority away from gaming to effectively developing new interests to substitute (e.g., *Working on slowly cutting down*

playing-time and find other related activities that interest them instead; *Developing other interests in life*; *Pick up another hobby and find other interests*).

Self-Monitoring. Another strategy was the need for self-monitoring thoughts and behaviors. Specifically, participants indicated that monitoring gaming habits and motivations was important to gain insight. For example, one participant indicated that paying attention to the types of games being played, and monitoring overall gaming behavior was important (e.g., *Keeping an eye on what games I am playing as well as making sure to step back and analyze what is going on*). Another participant indicated that having an awareness of motivations was beneficial (e.g., *Paying attention to your reasons for playing also seems useful*).

Discussion

Main Findings

The aim of the present study was to develop, and pilot test a brief school-based psychoeducation program for problematic gaming. The program focused on developing awareness among a group of engaged adolescent gamers about: (1) the indicators and harms of problematic gaming, and (2) useful prevention strategies. Although only a limited number of participants engaged with the program and completed all surveys, the program was found to be feasible and engaging. Survey measures showed that participants reduced GD symptoms and overall psychological distress; and remained relatively unchanged with respect to gaming time, gaming motivations and gaming contingent self-worth. Based on written feedback, individuals who completed the modules reported gaining stronger insight into problematic gaming. Therefore, the program showed some promise and could be further evaluated in a larger cohort. The main study outcomes, challenges and limitations, directions for future research and overall conclusions are discussed in detail in the following sections

Program Evaluation

The aim of the program was to develop, trial and evaluate a brief educational awareness program using a mixed-methods approach. One expectation was that participants would reduce overall gaming time. On weekdays, results demonstrated one participant reported a substantial reduction in gaming time (from 14 hours to 6) on weekdays. The remaining participants reported relatively low gaming time at baseline anyway, and therefore would not be expected to reduce significantly. Similarly, on weekends, there were no substantial changes to gaming time, but given the relatively low levels of gaming reported, substantial changes might not be expected. At post-test, it was also expected that participants would reduce GD symptoms and overall psychological distress. Three participants reduced their overall GD rating from 'at-risk' at baseline to 'no-risk' at post-test. Of the three participants rated 'mild risk' of psychological distress, all three managed to reduce their K10 ratings, such that all four participants rated 'no-risk' of distress at post-test. Thus, in both cases, GD symptoms and psychological distress were considered reduced, in line with expectations. Finally, it was also predicted that gaming motivations and contingent self-worth would decrease. At post-test, only one participant had managed to significantly reduce both motivation and contingent self-worth; with the remainder reporting small increases or decreases to one-or-both metrics. In practice however, no real changes were evident, and therefore, expectations in this regard were not met.

All of the quantitative results must be interpreted with due caution, given the small number of participants. Caveats of sample size and self-reporting biases aside, participants reduced overall gaming time on weekdays, while remaining relatively unchanged on weekends. Whether participants play video games less or more overall may not necessarily be as important as the times in which they are choosing to play, or whether they are neglecting responsibilities in order to play. This is important, given overall gaming time is not necessarily an indicator of problematic gaming (i.e., higher gaming time is also an indicator of higher engagement) (Charlton & Danforth, 2007), and presumably, individuals gaming less on

weekdays means they are free to engage in more important tasks, such as homework or after-school employment.

Evidence for the reduction of gaming on weekday gaming time may highlighted through responses to open-ended questions. For example, at the completion of the trial, when participants were asked ways in which they might recognize problematic gaming in themselves or others, responses typically involved *prioritization*. Firstly, over physical health, and secondly also over factors associated with psychosocial well-being. Presumably, participants were able to recognize a shift in their own priorities during the week (i.e., school or homework instead of gaming). These findings are consistent with outcomes from previous research (Stevens et al., 2021b); and indeed, is understandable given prioritization is a clinical feature of problematic gaming according to both ICD and DSM classifications. Increased prioritization of gaming to the detriment of other areas may reflect, a shift from behavioral gratification to compensation as outlined in the I-PACE model (Brand et al., 2016; Kardefelt-Winther, 2014).

One explanation for participant responses identifying prioritization as a key indicator of problems, may be that the individuals themselves recognized limitations in their own ability to prioritize school/work over gaming at some point in time. By adolescence, individuals may not have fully developed time- and priority-management skills and thus their ability to manage their responsibilities is likely to vary depending on their mood at any given time. Furthermore, adolescents nowadays face increased challenges in balancing their school/work/life balance, given the ever-increasing role that digital technologies play in everyday life; particularly for work/study, socialization, and entertainment. Reliance on digital technology for school or work is a now necessary side-effect of the prominence of digital technologies in everyday life.

In terms of awareness, participants were asked which strategies they believed were useful and would suggest to a friend. Responses typically involved primary and secondary prevention approaches. These included limit-setting, self-monitoring, prioritization of other areas of life and development of other hobbies and interests, which was consistent with findings from

previous research (Stevens et al., 2021a, 2021b). Primary approaches in general are seen as less intrusive for players and therefore are likely to gain the most widespread support, compared with some secondary and tertiary approaches. One such approach is the inclusion of voluntary limit-setting features. Limit-setting features are similar in structure and purpose to pre-commitment features and have been implemented successfully in gaming studies (e.g., Lee, 2013) and particularly in gambling (Auer et al., 2020; Parke et al., 2007). In the context of gaming, allowing participants (or parents) to set limits on playing time before playing may be particularly useful for younger adolescent players who are: (a) less able to regulate their behavior than adults, and (b) subsequently more vulnerable to developing problematic gaming.

Relatedly, the development of other interests and hobbies was presented as a useful prevention strategy. The development of new skills and interests plays an important role in the establishment or restoration of healthy functioning for individuals with a wide variety of mood and addictive disorders, including depression (Stice et al., 2009) and substance use disorders (McKay, 2017). While the use of activity scheduling is a common feature of cognitive-behavioral interventions for GD (Stevens et al., 2017), other preventative approaches also have adopted similar strategies among problematic gamers and internet users, to some success (Deng et al., 2017; Shek & Sun, 2010; Yang & Oh 2007). Problematic gamers are particularly vulnerable to some physical complaints, including hand and wrist pain (Gentile, 2009) and sleep disturbances (Achab et al., 2011; Kim et al., 2016), given the sedentary and sometimes nocturnal nature of the activity.

Challenges and Limitations

Participants were able to identify signs and characteristics of gaming disorder, as well as strategies to prevent problematic gaming. Although the program was short in session number and duration, participants were able to gain insight into their own gaming practices, which suggests that the method of delivery, rather than the content itself played an important role. Using the collaborative, focus-group discussion and debate seemed to afford participants the

opportunity to explore and challenge their own perspectives towards problem gaming and prevention. Despite the relative success however, there were some challenges to implementation and limitations with the program that warrant some discussion.

Firstly, the pilot program comprised of a small number of participants, which makes it difficult to draw definitive conclusions. One benefit of the smaller group was it enabled more comfortable discussion, given that larger groups can sometimes be intimidating for some individuals. Regardless, future iterations of the current or similar programs could be trialed in a larger group. Another limitation was the lack of female participation. Given males are far more likely than females to develop GD, this composition reflected current demands. However, research has shown that female prevalence rates may be underrepresented and, on the rise (Stevens et al., 2020; Wang et al., 2018). It is important, therefore, that females are included in future cohorts, in order to better guide future interventions. Participants in this study were self-selected, which like affects generalizability of results. Participants may have been more likely to be amenable to the program intentions, or more receptive to the opportunity to discuss and explore topics that align with their personal interests.

Aside from issues with the sample, there were some other challenges arising from this pilot program. Firstly, participants were at an age where they are beginning to develop insight, but at times, needed continuous prompting to share insights. Although participants were avid gamers and keenly interested in the gaming-specific topics, there was less enthusiasm, including boredom, for the discussion of broader psychological constructs. The challenge with developing and implementing a program for high-school aged participants is balancing the delivering quality educational material and keeping the session fun and enjoyable.

One final challenge was the program length. The program was only allowed to run for 3 weeks, meaning that a large amount of background information had to be removed from the program in order to make it as streamlined as possible. Having one or two additional sessions may allow participants more time to process some of the more complex concepts. In addition,

increasing the program to 4- or 5- weeks would have the benefit of increasing familiarity, which may make participants more comfortable sharing experiences within the group.

Conclusions and Future Directions

Despite some challenges with the design and implementation of the program, overall, the results were promising. Overall, participants were able to reduce markers of problematic gaming (i.e., GD symptoms and psychological distress), whilst remaining unchanged across cognitive (i.e., motivations, contingent self-worth) and behavioral (e.g., gaming time) domains. In addition, participants were as also able to recognize instances of problem gaming and offer useful preventative strategies. Future studies could extend this work by increasing the sample and refining the program content to make it more generally appealing (e.g., referring to general digital technology use, for example). A challenge in delivering an education program in a school-based setting is there may be less interest among those who are not part of an active social gaming group. Therefore, a future iteration of this program would need to be targeted at those who play games but may not identify as a ‘gamer’. The program would also benefit from being more inclusive of females and other gender groups.

Based on the pilot data, an area for improvement may be a greater emphasis on activity scheduling, to enable participants to form better diet, sleep, and exercise routines. These are relatively simple but active behavioral strategies that enable coping with stress and are often incompatible with gaming activities. Poor physical health and sleep hygiene can have severe adverse effects on adolescents, including decreases in mood, attention and concentration, decision-making, often resulting in poor performance outcomes (Dietrich et al., 2016). Future prevention approaches may benefit from the inclusion of physical or non-gaming social activity scheduling component. Another area to potentially improve the program would be to have a greater number of sessions to enable more depth to each topic discussion and may become necessary if sessions included a larger group of participants.

These data, while limited by the constraints of low sample size, demonstrate the feasibility and value of an interactive education program. There is growing evidence for the need for such programs, particularly for adolescents, and including coverage of use of gaming, social media, and related devices. As games have become more sophisticated in their reward systems and social integration to encourage greater engagement and ‘time on device’, it has become increasingly important that adolescent gamers are equipped with the skills and protective strategies to recognize and avoid problems with gaming and related online activities

SECTION III

CONCLUSIONS

CHAPTER 9

GENERAL DISCUSSION

GENERAL DISCUSSION

Overview of Thesis Aims

The aim of the present thesis was to investigate prevention and treatment approaches for problematic gaming. Specifically, the present work aimed to review and critique current prevention and treatment practices, including within this analysis to develop an understanding of the scope of problematic gaming issues and who tends to be affected, and to identify areas for potential improvement. The present thesis was guided by the following research questions:

- How common and widespread is problematic video gaming and how do prevalence rates differ throughout the world? What other factors play a role in influencing the variability of prevalence rates?
- What is the nature of current psychological treatments for problematic gaming? Are there common features or similarities with treatment for other 'addictive' disorders?
- How effective are psychological treatments for problematic gaming? Is there any evidence for long-term success?
- Are there any preventative approaches to problematic gaming that might be supported by gamers? Do demographic or psychological predictors, such as self-efficacy or previous help-seeking, affect level of prevention support?
- What can be learnt from current prevention and treatment approaches to GD? What can be improved on?

In addition to addressing these research questions, another aim of the project was to develop and pilot-test a brief prevention program for problematic gaming for adolescents. This work was intended to provide 'proof of concept' and form the foundation for an expanded research undertaking in the future. The following section outlines a review of each of the included studies in terms of findings, significance, and contribution to the overall project.

Review of Papers

Paper 1

Paper 1 provided the first step toward understanding the scope and magnitude of problem gaming as a public health issue. Although the prevalence of GD has been debated, particularly in regard to its variability across countries, there had been very few systematic attempts to synthesize studies across different countries using meta-analytic techniques. This work involved undertaking a systematic review and meta-analysis of 53 studies reporting a GD prevalence rate from 17 different countries. Results showed that problematic video game prevalence rates were approximately 3% (3.05). However, when only the studies which employed stronger sampling methodologies (i.e., non-convenience), prevalence rates were lower (1.96%). The choice of GD screen was the most important factor in determining prevalence rates, accounting for 77% of the variance in estimates. Additionally, adolescent samples, lower cut-off scores and smaller sample size were all significant predictors of larger prevalence estimates; and males appear reported 2.5 times higher GD rates than females. There was also some evidence to suggest that more recent studies, and studies conducted in Asia reported higher prevalence rates than pre-2013 and non-Asian studies, respectively. Overall, paper 1 presented a seminal underpinning for the remainder of the current project. Although this paper was not the first attempt at meta-analyzing GD prevalence rates in recent years (i.e., Fam, 2018; Feng et al., 2017), it does represent the largest and most comprehensive attempt to date, both in terms of number of included studies and also of number and scope of predictor variables. Importantly, this paper was also the first to attempt to account for the effect of convenience sampling on prevalence rates.

The findings from the review highlighted several areas for improvement with the wider research base. Firstly, that there is a need for standardized procedures for identifying cases of potential GD, given the large degree of discrepancy in screening capability between tools. These findings provide useful context to some of the criticism from scholars aimed at the *DSM-5* criteria for IGD (see van Rooij et al., 2018), including concerns that some measures

might be over-sensitive. Notably, some of these criticisms, such as criticism of tolerance and withdrawal concepts in problem gaming, have been addressed in the ICD-11 classification (WHO, 2019). The second issue highlighted by this review was the need for more rigorous methodological practices. Almost half of the 53 studies included in the review which reported a "prevalence" rate employed a non-representative sample or sample of limited generalizability. The effect of removing these samples led to a reduction in prevalence of about 1% (of the total population), thereby highlighting the need to apply appropriate filters if such estimates are to be useful indicators that guide, for example, the allocation of resources for preventative measures. Thus, a more concerted effort to standardize assessment practices should be a research priority. In the context of the present thesis, this paper was the foundation for the remainder of the project by demonstrating that GD is an important clinical and public health problem, particularly among males and adolescents, and supported the need for effective prevention and treatment approaches.

Paper 2

Paper 2 provided a descriptive summary of the nature of treatments for problematic gaming. The rationale for this paper was that, although CBT is a commonly used therapy for many conditions, it was not always clear how this therapy was used in the context of problem gaming. This paper involved a systematic review of the components of 10 published CBT treatment protocols for problematic gaming. Each program was assessed using an analytic framework developed by reviewing well-regarded CBT treatment protocols for other 'addictive' disorders. There were 5 domains of interest: psychoeducation, behavior therapy, cognitive therapy, skills-training, and relapse prevention. It was found that the most commonly employed components were psychoeducation (particularly discussions around the adverse effects of problem gaming, the GD mechanism and gaming motivations); behavior therapy techniques (e.g., behavior rehearsal and modification, exposure therapy); and skill development (e.g., verbal, and problem-solving skills and mood management); and relapse

prevention (self-management). The least common and most underdeveloped components were cognitive therapy (e.g., discussions about cognitive distortions and cognitive restructuring). No treatment program provided a 'complete' protocol. Overall, the paper highlighted the need for a greater understanding by practitioners of the mechanics of GD (particularly initiation and maintenance), and the need for more detailed resources for CBT for problem gaming to inform the procedures of studies of this kind. While clinical guidelines are commonly available for other disorders with similar characteristics (e.g., Gambling disorder, SUDs, etc.), there is limited work on the best practices for treatment of GD.

Paper 3

Paper 3 was designed to extend the descriptive findings of Paper 2, by attempting to assess the effectiveness of CBT treatment for GD. This involved a systematic review and meta-analysis of 12 CBT interventions to address problematic gaming. The review found that, in the short-term, CBT demonstrated high efficacy in reducing GD symptoms and depression; and moderate efficacy in reducing anxiety. However, there was insufficient power to determine whether CBT was effective in reducing overall gaming time. Evidence for long term effectiveness is yet to be established. Subgroup analyses found that CBT was more effective in reducing GD and anxiety symptoms in adults, compared with adolescents. Overall, although Paper 3 was not the first attempt at meta-analyzing CBT treatment studies for problematic internet use behaviors, this work represented a considerably more recent assessment of the evidence (the previous review was conducted in 2012; see Winkler et al., 2013). This review was also the first attempt at meta-analysis for CBT and GD specifically, as opposed to considering all therapies as more or less the same and considering any therapy in connection to any Internet-related condition.

The findings from Paper 3 identified two main implications for future research: firstly, there was a lack of standardized assessment and treatment practices for GD, which made comparisons of effectiveness across treatment conditions difficult. Specifically, the study

found that more standardized approach to case assessment, particularly at follow-up was needed. Secondly, findings from paper 3 demonstrated that there needed to be a greater focus on prevention, rather than treatment, particularly for adolescents. Given younger participants appeared less responsive to treatment, researchers and clinicians need to find a way to increase education and awareness about the risks of problematic gaming to younger individuals.

Paper 4

Paper 4 examined demographic and psychological factors related to support for various prevention approaches for problematic gaming. This involved a large international survey of 992 habitual and problem gamers from 62 different countries. The survey found that gamers tended to favor primary approaches to prevention (e.g., education, screening, and warning labels). Lower levels of support were found for secondary and tertiary approaches. Importantly, self-efficacy was not associated with prevention support. Finally, primary, and secondary approaches to prevention were more likely to be favored by younger, female, and less frequent gamers. An important feature of paper 4 was its involvement of a large proportion of self-identified problem gamers (*N*=221) as stakeholders in understanding attitudes towards prevention for GD. Research has tended to focus on outpatient treatment for GD, but as findings from paper 3 demonstrate, there is a significant proportion of problematic gamers who do not appear to meaningfully engage with treatment or other help options, who otherwise might benefit from a preventative approach. Additionally, paper 4 was the first to investigate the possible link between self-efficacy and prevention, as might be expected based on popular models of public health. However, no association was found, indicating that attitudes towards prevention may be more complex than might appear.

A key finding presented in paper 4 (which was later explored in paper 5) was that gamers themselves appeared to favor less invasive prevention approaches. Specifically, strategies in which gamers were able to make informed decisions, preserve autonomy and to continue to play with the least disruption to regular gameplay were favored, compared to strategies which

necessitated modifications to gaming structure (e.g., shutdown features). This finding was important because, compared with other similar disorders (e.g., gambling or SUDs), gaming is not necessarily a harmful activity, and the majority of individuals are able to play and enjoy games without harmful consequence. Therefore, prevention approaches that detract from the gaming experience appear unwanted or unnecessary. Authoritative approaches such as simply banning games or placing involuntary limits on gaming time appear to lack support among gamers and may target individuals who are at very low or negligible risk of problematic play.

Paper 5

Paper 5 further examined attitudes and beliefs about prevention from a large-scale global sample of gamers. This involved a large-scale qualitative investigation into the responses of 5 open-ended questions about prevention and any potential barriers. A qualitative analysis was conducted, and three key categories were identified: problem gaming recognition (e.g., addictive components, mood and behavior, criticism of addiction); prevention in practice (e.g., self-directed strategies, addition of in-game responsibility features, removal of predatory features); and social responsibility (e.g., corporate social responsibility, personal responsibility, family, and community responsibility). The results demonstrated that gamers appeared to favor self-directed prevention strategies rather than imposed approaches; and were supportive of the inclusion of responsibility features (e.g., notifications of playing time) and the removal of predatory features (e.g., banning loot-boxes). In addition, some gamers were skeptical of both the concept of problem gaming, and of the motives from the gaming industry or government to interfere with the gaming experience but appeared to recognize many GD symptoms as markers of problematic gaming. Overall, paper 5 highlighted the value of recruiting regular and problem gamers as stakeholders to provide insights into prevention for problem gaming.

Paper 6

This final paper presented an attempt to devise a brief prevention program and evaluate its effectiveness. This involved creating a brief-school based intervention for the prevention of problematic gaming in a group of at-risk adolescent gamers. A program of three 45-minute sessions was developed and delivered to a group of 12 students at a local high school. Results showed participants reported fewer GD symptoms, less gaming time, decreased psychological distress and gaming-related motivations after completing the program. Participants also reported that they were able to identify symptoms and indicators of problematic gaming and had gained greater insights into primary and secondary prevention approaches. While there were the small number of participants, who were sourced using convenience sampling methods and thus necessary caution should be applied when interpreting the impact of the results, the results demonstrated some promise regarding the feasibility and value of the content, particularly for similar prevention approaches in the future.

The final paper presented several key findings. Firstly, prevention approaches that balance discussion of positive and negative aspects of gaming may be well-received by younger gamers and this balanced approach appears necessary to ensure rapport and engagement with program content. Secondly, given male adolescent gamers are at higher risk of developing problems, prevention approaches present a unique way to engage vulnerable groups in a meaningful way to promote psychological wellbeing. Thirdly, as the COVID-19 pandemic continues globally and individuals in many regions face quarantine and isolation, developing cost effective programs that can be made available online are likely to be of significant importance moving forward. The study conducted in paper 6 was only able to draw limited findings, based on the limited sample size. However, the program showed that individuals who play games regularly appeared to benefit from critical discussions about problematic gaming and reflecting on the influence of game mechanics, including so-called predatory game design.

Summary of Main Findings

This thesis presents several research findings related to the status of problematic gaming and its prevention and treatment. The global prevalence of problematic video gaming was estimated with reference to a large number of studies and with greater precision that in previous reviews. Current approaches to treatment were assessed and evaluated, providing some detailed descriptions of current approaches and an evidence-based statement of the effectiveness of CBT for problem gaming. The attitudes and perspectives of regular and problem gamers towards prevention were directly examined and evaluated in connection to support for specific strategies. The final contribution of this research was the development of a brief educational awareness prevention program targeted at at-risk adolescent gamers. The program was informed by the findings of the preceding five papers and demonstrated some limited success.

Overall, the following insights were gained: (1) problematic gaming is more common among adolescent males, and rates are comparable to other SUDs and addictive disorders; (2) treatment approaches for GD are developing, but more robust psychoeducation components about gaming mechanics are needed; (3) psychotherapy is effective for adults with GD, but less so for adolescents; indicating a need for preventative strategies; (4) gamers are supportive of primary and secondary prevention approaches that preserve autonomy and decision-making, but the relationship between self-efficacy and prevention is unclear; (5) prevention programs which are built around educational awareness, strategies which allow players to monitor gaming time, and removing predatory gaming features are strategies which are likely to be well-received by gamers, and (6) a brief school-based prevention program may help to promote healthy gaming practices and awareness of the risks of problem gaming.

Overall Significance

There has been continuing debate as to whether classifying problematic gaming as a disorder is valid and appropriate, and whether by creating new disorders for everyday

behaviors, that we as researchers are beginning to 'over-pathologize' normal activities. While there may be some merit to these arguments, it appears to be clear that certain individuals continue to experience negative consequences of excessive video game use and that, in some cases, such problems can be effectively conceptualized as gaming-related problems (as opposed to depression or anxiety, for example). Therefore, it is important that research is undertaken to better understand and devise measures to reduce the impact of problematic gaming, either through prevention or treatment. Based on a reading of the relevant literature and on the feedback of regular and problematic gamers in this project, it may be useful for clinicians and related practitioners dealing with problematic gaming to promote balanced and healthy gaming practices. A unique challenge that arises is how best to reduce the impact of problem gaming without limits or impositions on the everyday gaming experience for regular players. The findings from this thesis support this view and can be used to guide discussions and improvements in gaming experiences for both regular and problem gamers alike.

This thesis involved three systematic reviews, two of which incorporated meta-analyses. Systematic reviews are useful in health and medical settings, because they can synthesize findings of a range of - ideally high-quality - studies in such a way that is able to reduce biases or reliance on limited information or collection of sources. These reviews are therefore often consulted to inform relevant treatment and policy decisions. Paper 1 helps to understand the variability in prevalence rates. Until recently, the most comprehensive meta-analyses reported wildly variable rates of between 1 and 30% (Feng et al., 2017, Long et al., 2018; Mihara & Higuchi, 2017) but did not identify what factors might contribute to higher rates. This review is useful for identifying the sources of bias that lead to greater estimates of prevalence, which has implications, for example, for screening approaches in light of particular tools showing consistently higher levels of problem gaming prevalence.

A second important research contribution, based on Paper 3, was related to understanding to treatment effectiveness. The previous paper on this topic by Winkler et al. (2013) reported that that CBT was effective in reducing internet addiction symptoms from pre- to post-test, as

well as anxiety, depression and time spent online. In their paper, the researchers included gaming behaviors as a problematic use of internet, and therefore the assumption that led on from that work was that CBT was effective in reducing all internet use disorder symptoms (including GD). However, as recent understanding of problematic gaming and other behavioral addictions develops, it is becoming clear that gaming is a separate clinical issue. The present review provides an important update on this topic, by demonstrating a) the effectiveness of psychotherapeutic interventions for GD, and by b) underscoring the importance of more rigorous, longitudinal research to understand the long-term efficacy of such interventions.

Paper 3 highlighted another key issue: that a one-size-fits-all approach to treatment is not appropriate. Adolescents were found to be less responsive to CBT treatment. Therefore, it appears that greater efforts should be made towards understanding and developing useful prevention options. Further to this, Papers 4 and 5 demonstrated that there are a number of countermeasure options which gamers, clinicians, policy makers and game developers could explore, develop, and implement, which may have a significant impact on the reduction of gaming-related problems for vulnerable individuals.

Overall, this thesis has presented important steps toward further research into interventions for problematic gaming, and in particular for adolescents. As gaming companies seek to increase modes of engagement, particularly through the COVID-19 pandemic, it is important that collaborative and practical solutions are developed to address the growing number of gamers experiencing significant problems.

Methodological Limitations

In science, there are rarely ‘perfect’ research strategies; every approach to understanding a question will have some methodological limitation. The present thesis is a collection of research undertakings and each has a number of specific limitations. Each of these limitations have been described in the corresponding discussion section of each paper, and for parsimony

they will not be repeated here. This section is intended to present a general discussion of the limitations of this project as a whole, including some theoretical and methodological assumptions and limitations.

Firstly, there is an assumption that underpins this project and most psychological research, which is that individuals are willing and able to report accurately on past, present and future psychological processes. In this thesis, it assumed that individuals have the insight and capability to access and report that insight. The fact is that most, if not all, individuals are unable to report accurately on certain psychological processes. Further, psychometric tests are not able to perfectly capture all of the nuances associated with the constructs that they reportedly assess.

Another limitation, related to the reviews in this thesis, is the overall quality of the studies included. Some studies have much greater validity and more strengths than others. The inclusion of weaker studies can affect the overall validity of conclusions. This is known colloquially in computer science as the *garbage-in, garbage-out* principle. Since systematic reviews and meta-analyses are essentially syntheses of individual research studies, their strength is that they are less susceptible to the effects of the influence of limitations specific to each study. With a large sample size, each study's findings contribute less to the overall picture, and meta-analyses are able to overcome the limitations associated with outlier influence that affect smaller studies. However, when the papers included in a review are of limited quality (whether reporting or methodological or otherwise) the review's quality can suffer as a result. Papers 1, 2 and 3 were similarly constrained by this issue. This overarching limitation of the GD field may be reduced if a larger proportion of higher-quality studies are produced and selectively included in reviews.

Another limitation is that the definition of gaming disorder has evolved from 2016 when the project began. Changes in views of problem gaming due to the transition from DSM- to ICD-based conceptualizations affect some of the consistency of this thesis. For example, when assessing GD in paper 3, IGD, rather than GD symptoms were assessed because GD had not

been established by the WHO at that point. The difference between ICD and DSM-5 conceptualizations is important when considering whether treatment outcomes (i.e., reductions in symptoms) is effective, because the DSM-5 criteria appear to be much more sensitive than the ICD guidelines. Over time, there may be a greater tendency for researchers to refer to the ICD guidelines and develop tools that refer primarily to this conceptualization.

Future directions

As the worldwide appeal of videogaming continues to increase, researchers will continue to investigate the harmful consequences of problematic gaming. This thesis suggests several future research avenues. Paper 1 demonstrated that adolescents (and in particular, males) tended to report higher rates of GD than other age (and gender) groups. This group appears to be a priority population for further research studies. In particular, based on the findings from Paper 3, adolescents appeared to report fewer benefits from conventional CBT treatment, suggesting that this group may require a different approach. Further, it be that adolescents would be better served by preventative measures, and future studies should consider potential options in this area. Given that Paper 4 did not include adolescents, one avenue for future research would be to investigate the level of support and feasibility of various prevention approaches to adolescent gamers.

Another avenue for future research on problem gaming is to develop and evaluate the effectiveness of various primary and/or secondary prevention approaches. The pilot program described in Paper 6 was an attempt to evaluate a psychoeducation approach; with a larger sample and control condition, it would be possible to evaluate its potential effectiveness more effectively. Refining the program content based on participant feedback to make it more appealing and potential increasing its scope to other digital media (e.g., other internet-based problems, such as social media) might be useful. Adopting a more inclusive approach to prevention may enable more insights among participants, who can then apply the lessons or information to a wider range of digital media and habitual lifestyle activities.

Concluding Statement

There are increasing opportunities in our modern environment to engage in unlimited digital media experiences. At the same time, changes in living conditions for individuals globally due to the current pandemic have meant that many individuals may be more susceptible to developing GD due to stay-at-home lifestyles. While presently uncertain, it is possible that many employment, education, and recreational situations will change as a result of the coronavirus pandemic, and many individuals may adapt by spending more time in interactive virtual environments. This includes spending more time playing video games at home than ever before; for some players, this will be an adaptive coping response that increases well-being, whereas for others it may compound existing problems or establish unhealthy habits that are difficult to curb. With growing recognition of the double-edged sword of digital media, including the ways in which it can be potentially maladaptive for some users, it is important that researchers continue to investigate ways to reduce the impact of problematic gaming for individuals in order to promote balanced psychological wellbeing.

CHAPTER 10

REFERENCES

REFERENCES

Aarseth, E., Bean, A. M., Boonen, H., Colder Carras, M., Coulson, M., Das, D., ... Haagsma, M. C. (2017). Scholars' open debate paper on the World Health Organization ICD-11 Gaming Disorder proposal. *Journal of Behavioral Addictions, 6,* 267-270.

Achab, S., Nicolier, M., Mauny, F., Monnin, J., Trojak, B., Vandel, P., ... Haffen, E. (2011). Massively multiplayer online role-playing games: comparing characteristics of addict vs non-addict online recruited gamers in a French adult population. *BMC psychiatry*, *11*(1), 144.

Alha, K., Kinnunen, J., Koskinen, E., & Paavilainen, J. (2018). Free-to-Play Games: Paying Players' Perspective. In Proceedings of the 22nd International Academic Mindtrek Conference, pp. 49-58.

Allison, S. E., von Wahlde, L., Shockley, T., & Gabbard, G. O. (2006). The development of the self in the era of the internet and role-playing fantasy games. *American Journal of Psychiatry*, *163*, 381-385.

American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders (5th ed.) (DSM-5).* Washington, DC: Author.

Anderson, C. A. (2004). An update on the effects of playing violent video games. *Journal of Adolescence*, *27*(1), 113-122.

Anderson, C. A., & Dill, K. E. (2000). Video games and aggressive thoughts, feelings, and behavior in the laboratory and in life. *Journal of Personality and Social Psychology*, *78*(4), 772-790.

Anderson, C. A., & Ford, C. M. (1986). Affect of the game player: Short-term effects of highly and mildly aggressive video games. *Personality and social psychology bulletin*, *12*(4), 390-402.

Andrade, L, Alonso, J., Mneimneh, Z., Wells, J., Al-Hamzawi, A., Borges, G., … Kessler, R. (2014) Barriers to mental health treatment: Results from the WHO World Mental Health surveys. *Psychological Medicine, 44*(6), 1303-1317

Auer, M., Reiestad, S. H., & Griffiths, M. D. (2018). Global limit setting as a responsible gambling tool: What do players think? *International Journal of Mental Health and Addiction*, 1-13.

Babor, T. F., McRee, B. G., Kassebaum, P. A., Grimaldi, P. L., Ahmed, K., & Bray, J. (2007). Screening, Brief Intervention, and Referral to Treatment (SBIRT) toward a public health approach to the management of substance abuse. *Substance abuse, 28*(3), 7-30.

Baggio, S., Starcevic, V., Studer, J., Simon, O., Gainsbury, S. M., Gmel, G., & Billieux, J. (2018). Technology-mediated addictive behaviors constitute a spectrum of related yet distinct conditions: A network perspective. *Psychology of Addictive Behaviors*, *32*(5), 564.

Baguley, T. (2009). Standardized or simple effect size: what should be reported? *British Journal of Psychology*, *100*(3), 603-617.

Bandura, A. (1977). *Self-efficacy: The exercise of Control*. New York: Freeman.

Bányai, F., Griffiths, M. D., Király, O., & Demetrovics, Z. (2019). The psychology of esports: A systematic literature review. *Journal of gambling studies*, *35*(2), 351-365.

Barakat, A. M., & Kasemy, Z. A. (2020). Preventive health behaviours during coronavirus disease 2019 pandemic based on health belief model among Egyptians. *Middle East Current Psychiatry*, *27*(1), 1-9.

Bardsley, P. E., & Beckman, L. J. (1988). The health belief model and entry into alcoholism treatment. *International Journal of the Addictions*, *23*(1), 19-28.

Bargeron, A. H., & Hormes, J. M. (2017). Psychosocial correlates of internet gaming disorder: Psychopathology, life satisfaction, and impulsivity. *Computers in Human Behavior*, *68*, 388-394.

Batthyány, D., Müller, K. W., Benker, F., & Woelfling, K. (2009). Computer game playing: clinical characteristics of dependence and abuse among adolescents. *Wiener Klinische Wochenschrift*, *121*(15-16), 502-509.

Beard, C. L. & Wickham, R. E. (2016). Gaming-contingent self-worth, gaming motivation, and Internet Gaming Disorder. *Computers in Human Behavior, 61*, 507-515.

Becker, M. H. (1974). The health belief model and sick role behavior. *Health Education Monographs*, *2*(4), 409-419.

Billieux, J., Flayelle, M., Rumpf, H. J., & Stein, D. J. (2019). High involvement versus pathological involvement in video games: A crucial distinction for ensuring the validity and utility of gaming disorder. *Current Addiction Reports, 6*, 323-330.

Billieux, J., Schimmenti, A., Khazaal, Y., Maurage, P., & Heeren, A. (2015). Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research. *Journal of behavioral addictions*, *4*(3), 119-123.

Borenstein, M., Hedges, L. V., Higgins, J. P., & Rothstein, H. R. (2011). *Introduction to meta-analysis*. New York, NY: John Wiley & Sons.

Borenstein, M., Higgins, J., Hedges, L. V., & Rothstein, H. R. (2017). Basics of meta-analysis: I2 is not an absolute measure of heterogeneity. *Research Synthesis Methods*, *8*, 5-18.

Boutron, I., Altman, D. G., Moher, D., Schulz, K. F., & Ravaud, P. (2017). CONSORT statement for randomized trials of nonpharmacologic treatments: A 2017 update and a CONSORT extension for nonpharmacologic trial abstracts. *Annals of Internal Medicine, 167*, 40-47.

Brand, J. E., Todhunter, S. & Jervis, J. (2017). Digital Australia 2018. Eveleigh, NSW: IGEA.

Brand, M., Rumpf, H. J., Demetrovics, Z., King, D. L., Potenza, M. N., & Wegmann, E. (2019). Gaming disorder is a disorder due to addictive behaviors: Evidence from

behavioral and neuroscientific studies addressing cue reactivity and craving, executive functions, and decision-making. *Current Addiction Reports*, *6*(3), 296-302.

Brand, M., Rumpf, H. J., Demetrovics, Z., MÜller, A., Stark, R., King, D. L., ... Potenza, M. N. (2020). Which conditions should be considered as disorders in the International Classification of Diseases (ICD-11) designation of "other specified disorders due to addictive behaviors"? *Journal of Behavioral Addictions*.

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

Brand, M., Young, K. S., & Laier, C. (2014). Prefrontal control and Internet addiction: a theoretical model and review of neuropsychological and neuroimaging findings. *Frontiers in Human Neuroscience*, *8*, 375.

Brand, M., Young, K. S., Laier, C., Wölfling, K., & Potenza, M. N. (2016). Integrating psychological and neurobiological considerations regarding the development and maintenance of specific Internet-use disorders: An Interaction of Person-Affect-Cognition-Execution (I-PACE) model. *Neuroscience & Biobehavioral Reviews*, *71*, 252-266.

Brooks, G. A. & Clark, L. (2019). Associations between loot box use, problematic gaming and gambling, and gambling-related cognitions. *Addictive Behaviors*, *96*, 26-34.

Brunborg, G. S., Hanss, D., Mentzoni, R. A., & Pallesen, S. (2015). Core and peripheral criteria of video game addiction in the game addiction scale for adolescents. *Cyberpsychology, Behavior, and Social Networking*, *18*(5), 280-285.

Brunborg, G. S., Mentzoni, R. A., Melkevik, O. R., Torsheim, T., Samdal, O., Hetland, J., … Palleson, S. (2013). Gaming addiction, gaming engagement, and psychological health complaints among Norwegian adolescents. *Media psychology*, *16*(1), 115-128.

Calado, F., & Griffiths, M. D. (2016). Problem gambling worldwide: An update and systematic review of empirical research (2000–2015). *Journal of behavioral addictions*, *5*(4), 592-613.

Cao, F. -L., Su, L. -Y., & Gao, X. -P. (2007). Control study of group psychotherapy on middle school students with internet overuse. *Chinese Mental Health Journal, 21,* 346–349.

Carey, K. B., Scott-Sheldon, L. A., Carey, M. P., & DeMartini, K. S. (2007). Individual-level interventions to reduce college student drinking: A meta-analytic review. *Addictive behaviors*, *32*(11), 2469-2494.

Cauce, A., Domenech-Rodríguez, M., Paradise, M., Cochran, B., Shea, J., Srebnik, D., & Baydar, N. (2002). Cultural and contextual influences in mental health help seeking: A focus on ethnic minority youth. *Journal of Consulting and Clinical Psychology*, 70(1), 44–55.

Caudle, K., & Casey, B. J. (2013). Brain development and the risk for substance abuse.

Champion, V. L., & Skinner, C. S. (2008). The health belief model. *Health behavior and health education: Theory, research, and practice*, *4*, 45-65.

Charlton, J. P., & Danforth, I. D. (2007). Distinguishing addiction and high engagement in the context of online game playing. *Computers in human behavior*, *23*(3), 1531-1548.

Chau, C. L., Tsui, Y. Y. Y., & Cheng, C. (2019). Gamification for Internet Gaming Disorder Prevention: Evaluation of a Wise IT-Use (WIT) Program for Hong Kong Primary Students. *Frontiers in Psychology*, *10*, 2468.

Chen, G., Gully, S. M., & Eden, D. (2001). Validation of a new general self-efficacy scale. *Organizational Research Methods*, *4*(1), 62-83.

Chiu, Y. C., Pan, Y. C., & Lin, Y. H. (2018). Chinese adaptation of the Ten-Item Internet Gaming Disorder Test and prevalence estimate of Internet gaming disorder among adolescents in Taiwan. *Journal of Behavioral Addictions*, *7*(3), 719-726.

Choi, H. J., Krieger, J. L., & Hecht, M. L. (2013). Reconceptualizing efficacy in substance use prevention research: refusal response efficacy and drug resistance self-efficacy in adolescent substance use. *Health communication*, *28*(1), 40-52.

Clark, J. E., Lanphear, A. K., & Riddick, C. C. (1987). The effects of videogame playing on the response selection processing of elderly adults. *Journal of gerontology*, *42*(1), 82-85.

Clark, L. (2014). Disordered gambling: the evolving concept of behavioral addiction. *Annals of the New York Academy of Sciences*, *1327*, 46-61.

Clement, S., Schauman, O., Graham, T., Maggioni, F., Evans-Lacko, S., Bezborodovs, N., ... Thornicroft, G. (2015). What is the impact of mental health-related stigma on help-seeking? A systematic review of quantitative and qualitative studies. *Psychological Medicine*, *45*(1), 11-27.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences (2nd ed.)*. Hilllsdale, NJ: Erlbaum.

Colder Carras, M., & Kardefelt-Winther, D. (2018). When addiction symptoms and life problems diverge: A latent class analysis of problematic gaming in a representative multinational sample of European adolescents. *European Child & Adolescent Psychiatry*, *27*(4), 513-525.

Colder Carras, M., Carras, M., & Labrique, A. B. (2020). Stakeholders' Consensus on Strategies for Self-and Other-Regulation of Video Game Play: A Mixed Methods Study. *International Journal of Environmental Research and Public Health*, *17*(11), 3846.

Colder Carras, M., Kalbarczyk, A., Wells, K., Banks, J., Kowert, R., Gillespie, C., & Latkin, C. (2018). Connection, meaning, and distraction: A qualitative study of video game play and mental health recovery in veterans treated for mental and/or behavioral health problems. *Social Science & Medicine*, *216*, 124-132.

Colder Carras, M., Porter, A. M., van Rooij, A. J., King, D. L., Lange, A., … Labrique, A. J. (2018). Gamers' insights into the phenomenology of normal gaming and game "addiction": A mixed methods study. *Computers in Human Behavior, 79,* 238-246.

Colder Carras, M., Van Rooij, A. J., Van de Mheen, D., Musci, R., Xue, Q. L., & Mendelson, T. (2017). Video gaming in a hyperconnected world: A cross-sectional study of heavy gaming, problematic gaming symptoms, and online socializing in adolescents. *Computers in Human Behavior*, *68*, 472-479.

Cook, D. J., Mulrow, C. D., & Haynes, R. B. (1997). Systematic reviews: synthesis of best evidence for clinical decisions. *Annals of internal medicine*, *126*(5), 376-380.

Crino, R., Slade, T., & Andrews, G. (2005). The changing prevalence and severity of obsessive-compulsive disorder criteria from DSM-III to DSM-IV. *American Journal of Psychiatry*, *162*(5), 876-882.

Dakof, G.A., Tejeda, M., Liddle, H.A. (2001). Predictores of engagement in adolescent drug abuse treatment. *Journal of American Child Adolescent Psychiatry, 40,* 274-281.

Dalal, P. K., & Basu, D. (2016). Twenty years of Internet addiction… Quo Vadis? *Indian journal of psychiatry*, *58*(1), 6.

Dauriat, F. Z., Zermatten, A., Billieux, J., Thorens, G., Bondolfi, G., Zullino, D., & Khazaal, Y. (2011). Motivations to play specifically predict excessive involvement in massively multiplayer online role-playing games: evidence from an online survey. *European Addiction Research*, *17*(4), 185-189.

Davies, B., & Blake, E. (2016). Evaluating existing strategies to limit video game playing time. *IEEE Computer Graphics and Applications*, *36*(2), 47-57.

Deci, E. L., & Ryan, R. M. (1985). The general causality orientations scale: Self-determination in personality. *Journal of research in personality*, *19*(2), 109-134.

Deci, E. L., & Ryan, R. M. (1995). Human autonomy. In *Efficacy, agency, and self-esteem* (pp. 31-49). Springer, Boston, MA.

Deci, E. L., & Ryan, R. M. (2000). The" what" and" why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological inquiry*, *11*(4), 227-268.

Deci, E. L., & Ryan, R. M. (2010). *Self-determination*. John Wiley & Sons, Inc.

Degenhardt, L., Glantz, M., Evans-Lacko, S., Sadikova, E., Sampson, N., Thornicroft, G., ... Bruffaerts, R. (2017). Estimating treatment coverage for people with substance use disorders: an analysis of data from the World Mental Health Surveys. *World Psychiatry*, *16*(3), 299-307.

Deleuze, J., Nuyens, F., Rochat, L., Rothen, S., Maurage, P., & Billieux, J. (2017). Established risk factors for addiction fail to discriminate between healthy gamers and gamers endorsing DSM-5 Internet gaming disorder. *Journal of Behavioral Addictions, 6,* 516-524.

Delfabbro, P. H., & King, D. L. (2015). On finding the C in CBT: The challenges of applying gambling-related cognitive approaches to video-gaming. *Journal of Gambling Studies, 31,* 315-329.

Delfabbro, P. H., & King, D. L. (2020). The value of voluntary vs. mandatory limit-setting systems: A review of the evidence. *International Gambling Studies,*1-17.

Delfabbro, P. H., King, D., & Georgiou, N. (2020). Opportunity cost and gambling: Distinguishing between competing activities and harm. *Journal of Gambling Issues*, *44*.

Deng, L. Y., Liu, L., Xia, C. C., Lan, J., Zhang, J. T., & Fang, X. Y. (2017). Craving behavior intervention in ameliorating college students' internet game disorder: a longitudinal study. *Frontiers in psychology*, *8*, 526.

Derevensky, J. L., & Richard, J. (2019). Response to commentary: the future of gaming disorder research and player protection: What role should the video gaming industry and researchers play. *International Journal of Mental Health and Addiction*, 1-6.

Desai, R. A., Krishnan-Sarin, S., Cavallo, D., & Potenza, M. N. (2010). Video-gaming among high school students: health correlates, gender differences, and problematic gaming. *Pediatrics*, *126*(6), e1414-e1424.

Dietrich, S. K., Francis-Jimenez, C. M., Knibbs, M. D., Umali, I. L., & Truglio-Londrigan, M. (2016). Effectiveness of sleep education programs to improve sleep hygiene and/or sleep quality in college students: a systematic review. *JBI database of systematic reviews and implementation reports*, *14*(9), 108-134.

Ding, W. N., Sun, J. H., Sun, Y. W., Chen, X., Zhou, Y., Zhuang, Z. G., ... Du, Y. S. (2014). Trait impulsivity and impaired prefrontal impulse inhibition function in adolescents with internet gaming addiction revealed by a Go/No-Go fMRI study. *Behavioral and Brain Functions*, *10*, 20.

Dong, G., & Potenza, M. N. (2014). A cognitive-behavioral model of Internet gaming disorder: theoretical underpinnings and clinical implications. *Journal of Psychiatric Research*, *58*, 7-11.

Dong, G., DeVito, E., Du, X., & Cui, Z. (2012). Impaired inhibitory control in 'internet addiction disorder': a functional magnetic resonance imaging study. *Psychiatry Research: Neuroimaging*, *203*, 153-158.

Dong, G., DeVito, E., Huang, J., & Du, X. (2012). Diffusion tensor imaging reveals thalamus and posterior cingulate cortex abnormalities in internet gaming addicts. *Journal of Psychiatric Research*, *46*, 1212-1216.

Dong, G., Hu, Y., Lin, X., & Lu, Q. (2013). What makes Internet addicts continue playing online even when faced by severe negative consequences? Possible explanations from an fMRI study. *Biological Psychology*, *94*, 282-289.

Dong, G., Huang, J., & Du, X. (2011). Enhanced reward sensitivity and decreased loss sensitivity in Internet addicts: an fMRI study during a guessing task. *Journal of Psychiatric Research*, *45*, 1525-1529.

Dong, G., Lin, X., Hu, Y., Xie, C., & Du, X. (2015). Imbalanced functional link between executive control network and reward network explain the online-game seeking behaviors in Internet gaming disorder. *Scientific Reports*, *5*, 9197

Dong, G., Lu, Q., Zhou, H., & Zhao, X. (2010). Impulse inhibition in people with Internet addiction disorder: electrophysiological evidence from a Go/NoGo study. *Neuroscience letters*, *485*, 138-142.

Dong, G., Lu, Q., Zhou, H., & Zhao, X. (2011). Precursor or sequela: pathological disorders in people with Internet addiction disorder. *PloS One*, *6*, e14703.

Dong, G., Wang, L., Du, X., & Potenza, M. N. (2018). Gender-related differences in neural responses to gaming cues before and after gaming: implications for gender-specific vulnerabilities to Internet gaming disorder. *Social cognitive and affective neuroscience*, *13*(11), 1203-1214.

Dowling, N. A., Cowlishaw, S., Jackson, A. C., Merkouris, S. S., Francis, K. L., & Christensen, D. R. (2015). Prevalence of psychiatric co-morbidity in treatment-seeking problem gamblers: A systematic review and meta-analysis. *Australian & New Zealand Journal of Psychiatry*, *49*(6), 519-539.

Dreier, M., Wölfling, K., Duven, E., Giralt, S., Beutel, M. E., & Müller, K. W. (2017). Free-to-play: about addicted Whales, at risk Dolphins and healthy Minnows. Monetarization design and internet gaming disorder. *Addictive behaviors*, *64*, 328-333.

Drummond, A., Sauer, J. D., & Hall, L. C. (2019). Loot box limit-setting: a potential policy to protect video game users with gambling problems? *Addiction*, *114*(5), 935-936

Drummond, A., Sauer, J. D., Hall, L. C., Zendle, D., & Loudon, M. R. (2020). Why loot boxes could be regulated as gambling. *Nature Human Behaviour*, 1-3.

Du, Y., Jiang, W., & Vance, A. (2010). Longer term effect of randomized, controlled group cognitive behavioral therapy for Internet addiction in adolescent students in Shanghai. *Australian and New Zealand Journal of Psychiatry, 44*, 129-134.

Dullur, P. & Starcevic, V. (2018). Internet gaming disorder does not qualify as a mental disorder. *Australian and New Zealand Journal of Psychiatry, 52*, 110-111.

Dullur, P., & Hay, P. (2017). Problem Internet Use and Internet Gaming Disorder: a survey of health literacy among psychiatrists from Australia and New Zealand. *Australasian Psychiatry*, *25*, 140-145.

Durkee, T., Carli, V., Floderus, B., Wasserman, C., Sarchiapone, M., Apter, A., ... Cosman, D. (2016). Pathological internet use and risk-behaviors among European adolescents. *International Journal of Environmental Research and Public Health*, *13*(3), 294.

Dworak, M., Schierl, T., Bruns, T., & Strüder, H. K. (2007). Impact of singular excessive computer game and television exposure on sleep patterns and memory performance of school-aged children. *Pediatrics*, *120*, 978-985.

European Games Developer Foundation. Statement on WHO ICD-11 list and the inclusion of gaming. 2018 15 June. Available at: http://www.egdf.eu/wp-content/uploads/2018/06/ Industry-Statement-on-18-June-WHO-ICD-11.pdf (Archived at http://www.webcitation.org/70U6I0i4S)

Fam, J. Y. (2018). Prevalence of internet gaming disorder in adolescents: A meta-analysis across three decades. *Scandinavian journal of psychology*, *59*(5), 524-531.

Fang, X., Liu, L., Deng, L., Liu, Q., Su, W., Lan, J. (2015). The prevention and intervention of adolescent internet addiction. *Psychological Development and Education, 31,* 100-107.

Faulkner, G., Irving, H., Adlaf, E. M., & Turner, N. (2015). Subtypes of adolescent video gamers: a latent class analysis. *International Journal of Mental Health and Addiction*, *13*(1), 1-18.

Fauth-Bühler, M., & Mann, K. (2017). Neurobiological correlates of internet gaming disorder: Similarities to pathological gambling. *Addictive Behaviors*, *64*, 349-356.

Feng, W., Ramo, D., Chan, S., & Bourgeois, J. (2017). Internet gaming disorder: Trends in prevalence 1998–2016. *Addictive behaviors, 75*, 17.

Ferguson, C. J., & Colwell, J. (2018). A meaner, more callous digital world for youth? The relationship between violent digital games, motivation, bullying, and civic behavior among children. *Psychology of popular media culture, 7*(3), 202.

Festl, R., Scharkow, M., & Quandt, T. (2013). Problematic computer game use among adolescents, younger and older adults. *Addiction, 108*(3), 592-599.

Fineberg, N. A., Demetrovics, Z., Stein, D. J., Carazza, O., Ionnidis, K., Menchon, J., ... King, D.L., et al. (2018). Manifesto for a European Research Network into Problematic Usage of the Internet. *European Neuropsychopharmacology, 28*, 1232-1246.

Fisher, S. (1994). Identifying video game addiction in children and adolescents. *Addictive behaviors, 19*(5), 545-553.

Floyd, D. L., Prentice-Dunn, S., & Rogers, R. W. (2000). A meta-analysis of research on protection motivation theory. *Journal of applied social psychology, 30*(2), 407-429.

Fu, R., Gartlehner, G., Grant, M., Shamliyan, T., Sedrakyan, A., Wilt, T. J., ... Santaguida, P. (2011). Conducting quantitative synthesis when comparing medical interventions: AHRQ and the Effective Health Care Program. *Journal of Clinical Epidemiology, 64*(11), 1187-1197.

Gabbiadini, A., & Greitemeyer, T. (2017). Uncovering the association between strategy video games and self-regulation: A correlational study. *Personality and Individual Differences, 104*, 129-136.

Ge, L., Ge, X., Xu, Y., Zhang, K., Zhao, J., & Kong, X. (2011). P300 change and cognitive behavioral therapy in subjects with Internet addiction disorder: A 3-month follow-up study. *Neural Regeneration Research, 6*, 2037-2041

Gentile, D. (2009). Pathological video-game use among youth ages 8 to 18: A national study. *Psychological science, 20*(5), 594-602.

Glicksohn, J., Naor-Ziv, R., & Leshem, R. (2018). Sensation seeking and risk-taking. In *Developmental Pathways to Disruptive, Impulse-Control and Conduct Disorders* (pp. 183-208). Academic Press.

Gmel, G., Khazaal, Y., Studer, J., Baggio, S., & Marmet, S. (2019). Development of a short form of the compulsive internet use scale in Switzerland. *International Journal of Methods in Psychiatric Research*, *28*(1), e1765.

González-Bueso, V., Santamaría, J. J., Fernández, D., Merino, L., Montero, E., & Ribas, J. (2018). Association between internet gaming disorder or pathological video-game use and comorbid psychopathology: a comprehensive review. *International journal of environmental research and public health*, *15*(4), 668.

Granic, I., Lobel, A., & Engels, R. C. (2014). The benefits of playing video games. *American Psychologist*, *69*, 66-78.

Green, R., Delfabbro, P. H., & King, D. L. (2020). Avatar identification and problematic gaming: The role of self-concept clarity. *Addictive Behaviors*, *113*, 106694.

Greenberg, D. & Padesky, C. (1995). *Mind over mood: A cognitive treatment manual for clients*. New York: Guildford Publications.

Greer, N., Rockloff, M., Browne, M., Hing, N., & King, D. L. (2019). Esports betting and skin gambling: A brief history. *Journal of Gambling Issues, 43*,128-146.

Griffiths, M. D. (1996). Behavioural addiction: an issue for everybody? *Employee Councelling Today*.

Griffiths, M. D. (2005). A 'components' model of addiction within a biopsychosocial framework. *Journal of Substance Use*, *10*, 191-197

Griffiths, M. D. (2018). Conceptual issues concerning internet addiction and internet gaming disorder: Further critique on Ryding and Kaye (2017). *International journal of mental health and addiction*, *16*(1), 233-239.

Griffiths, M. D., & Pontes, H. M. (2019). The future of gaming disorder research and player protection: what role should the video gaming industry and researchers play?.*International Journal of Mental Health and Addiction*, 1-7.

Griffiths, M. D., King, D. L., & Demetrovics, Z. (2014). DSM-5 internet gaming disorder needs a unified approach to assessment. *Neuropsychiatry*, *4*, 1-4

Gross, J. J. (2001). Emotion regulation in adulthood: Timing is everything. *Current directions in psychological science*, *10*(6), 214-219.

Gwaltney, C. J., Metrik, J., Kahler, C. W., & Shiffman, S. (2009). Self-efficacy and smoking cessation: a meta-analysis. *Psychology of Addictive Behaviors*, *23*(1), 56-66.

Haagsma, M. C., Pieterse, M. E., & Peters, O. (2012). The prevalence of problematic video gamers in the Netherlands. *Cyberpsychology, Behavior, and Social Networking*, *15*(3), 162-168

Hak, T., van Rhee, H., & Suurmond, R. (2016). How to interpret results of meta-analysis (version 1.3). Rotterdam, The Netherlands: Erasmus Rotterdam Institute of Management. Accessed 20/6/2018. Available from: www.erim.eur.nl/research-support/meta-essentials/downloads

Han, D. H., Lee, Y. S., Shi, X., & Renshaw, P. F. (2014). Proton magnetic resonance spectroscopy (MRS) in on-line game addiction. *Journal of Psychiatric Research*, *58*, 63-68.

Harris, A. & Griffiths, M. D. (2017). A critical review of the harm-minimisation tools available for electronic gambling. *Journal of Gambling Studies*, *33*, 187-221.

Hedges, L. V., & Olkin, I. (1985). *Statistical methods for meta-analysis*. New York: Academic Press.

Helms, J. L. (2003). Barriers to help seeking among 12th graders. *Journal of Educational and Psychological Consultation*, *14*, 27–40.

Henchoz, Y., Studer, J., Deline, S., N'Goran, A. A., Baggio, S., & Gmel, G. (2016). Video gaming disorder and sport and exercise in emerging adulthood: A longitudinal study. *Behavioral Medicine, 42*(2), 105-111.

Higgins, J. P. (2011). Cochrane handbook for systematic reviews of interventions. Version 5.1. 0 [updated March 2011]. The Cochrane Collaboration. *www. cochrane-handbook. org*.

Higgins, J. P., Altman, D. G., Gøtzsche, P. C., Jüni, P., Moher, D., Oxman, A. D., ... Sterne, J. A. (2011). The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ, 343*, d5928.

Higgins, J. P., Thompson, S. G., Deeks, J. J., & Altman, D. G. (2003). Measuring inconsistency in meta-analyses. *Bmj, 327*(7414), 557-560.

Higuchi, S., Nakayama, H., Mihara, S., Maezono, M., Kitayuguchi, T., & Hashimoto, T. (2017). Inclusion of gaming disorder criteria in ICD-11: A clinical perspective in favor: Commentary on: Scholars' open debate paper on the World Health Organization ICD-11 Gaming Disorder proposal (Aarseth et al.). *Journal of Behavioral Addictions, 6*(3), 293-295.

Hodgins, H. S., & Knee, C. R. (2002). The integrating self and conscious experience. *Handbook of self-determination research, 87*, 100.

Hou, H., Jia, S., Hu, S., Fan, R., Sun, W., Sun, T., & Zhang, H. (2012). Reduced striatal dopamine transporters in people with internet addiction disorder. *BioMed Research International*, Article ID 854524.

Humphreys, G. (2019). Sharpening the focus on gaming disorder. *World Health Organization. Bulletin of the World Health Organization, 97*(6), 382-383.

Ilika, F., Jamshidimanesh, M., Hoseini, M., Saffari, M., & Peyravi, H. (2015). An evaluation of high-risk behaviors among female drug users based on Health Belief Model. *Journal of medicine and life, 8*(Spec Iss 3), 36.

Jacobson, L., Churchill, R., Donovan, C., Garralda, E., & Fay, J. (2002). Tackling teenage turmoil: primary care recognition and management of mental ill health during adolescence. *Family Practice*, *19*(4), 401-409.

Jeong, E. J., & Kim, D. H. (2011). Social activities, self-efficacy, game attitudes, and game addiction. *Cyberpsychology, Behavior, and Social Networking*, *14*(4), 213-221.

Jeromin, F., Rief, W., & Barke, A. (2016). Validation of the Internet Gaming Disorder Questionnaire in a sample of adult German-speaking internet gamers. *Cyberpsychology, Behavior, and Social Networking*, *19*, 453-459.

Jing, Z., Weiping, W., & Yong, X. (2010). Effects of cognitive behavioral training on college students with Internet addiction disorder. *China Journal of Health Psychology*, *7*, 855-857.

Kaner, E. F., Beyer, F. R., Muirhead, C., Campbell, F., Pienaar, E. D., Bertholet, N., ... Burnand, B. (2018). Effectiveness of brief alcohol interventions in primary care populations. *Cochrane database of systematic reviews*, (2).

Kaptsis, D., King, D. L., Delfabbro, P. H., & Gradisar, M. (2016). Withdrawal symptoms in Internet gaming disorder: A systematic review. *Clinical Psychology Review*, *43*, 58-66.

Kardefelt-Winther, D. (2014). A conceptual and methodological critique of internet addiction research: Towards a model of compensatory internet use. *Computers in Human Behavior*, *31*, 351-354.

Kardefelt-Winther, D. (2015). A critical account of DSM-5 criteria for internet gaming disorder. *Addiction Research & Theory*, *23*(2), 93-98.

Kardefelt-Winther, D. (2017). Conceptualizing Internet use disorders: Addiction or coping process? *Psychiatry and Clinical Neurosciences*, *71*(7), 459-466.

Kessler, R. C., Barker, P. R., Colpe, L. J., Epstein, J. F., Gfroerer, J. C., Hiripi, E., ... Zaslavsky, A. M. (2003). Screening for serious mental illness in the general population. *Archives of General Psychiatry*, *60*(2), 184-189.

Kessler, R. C., Chiu, W. T., Demler, O., & Walters, E. E. (2005). Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of general psychiatry*, *62*(6), 617-627.

Khazaal, Y., Chatton, A., Rothen, S., Achab, S., Thorens, G., Zullino, D., & Gmel, G. (2016). Psychometric properties of the 7-item game addiction scale among french and German speaking adults. *BMC psychiatry*, *16*(1), 132.

Khazaee-Pool, M., Zarei, F., Pashaei, T., & Shojaeizadeh, D. (2017). The effect of an educational intervention based on health belief model on improving smoking preventive behaviors among students. *Iranian Journal of Health Education and Health Promotion*, *4*(4), 300-308.

Khodaveisi, M., Khah, M. S., Bashirian, S., Karami, M., & Khodaveisi, M. (2018). The effect of health belief model-based training on preventive behaviors of hepatitis B in addicts. *International Journal of High-Risk Behaviors and Addiction*, *7*(2), 1-6.

Kim, D. J., Kim, K., Lee, H. W., Hong, J. P., Cho, M. J., Fava, M., ... Jeon, H. J. (2017). Internet game addiction, depression, and escape from negative emotions in adulthood: a nationwide community sample of Korea. *The Journal of nervous and mental disease*, *205*(7), 568-573.

Kim, E., Yim, H. W., Jeong, H., Jo, S. J., Lee, H. K., Son, H. J., & Han, H. H. (2018). The association between aggression and risk of Internet gaming disorder in Korean adolescents: the mediation effect of father-adolescent communication style. *Epidemiology and health*, *40*.

Kim, N., Hughes, T. L., Park, C. G., Quinn, L., & Kong, I. D. (2016). Altered autonomic functions and distressed personality traits in male adolescents with internet gaming addiction. *Cyberpsychology, Behavior, and Social Networking*, *19*(11), 667-673.

Kim, S. H., Baik, S. H., Park, C. S., Kim, S. J., Choi, S. W., & Kim, S. E. (2011). Reduced striatal dopamine D2 receptors in people with Internet addiction. *Neuroreport*, *22*, 407-411.

Kim, S. M., Han, D. H., Lee, Y. S., & Renshaw, P. F. (2012). Combined cognitive behavioral therapy and bupropion for the treatment of problematic on-line game play in adolescents with major depressive disorder. *Computers in Human Behavior, 28,* 1954-1959.

King, D. L., & Delfabbro, P. H. (2013). Issues for DSM-5: Video-gaming disorder? *Australian & New Zealand Journal of Psychiatry, 47,* 20-22.

King, D. L., & Delfabbro, P. H. (2014). The cognitive psychology of Internet gaming disorder. *Clinical Psychology Review, 34,* 298-308.

King, D. L., & Delfabbro, P. H. (2016). The cognitive psychopathology of Internet gaming disorder in adolescence. *Journal of Abnormal Child Psychology, 44,* 1635-1645.

King, D. L., & Delfabbro, P. H. (2017). Prevention and policy related to Internet gaming disorder. *Current Addiction Reports, 4,* 284-292.

King, D. L., & Delfabbro, P. H. (2018a). Predatory monetization schemes in video games (e.g., 'loot boxes') and internet gaming disorder. *Addiction, 113*(11), 1967-1969.

King, D. L., & Delfabbro, P. H. (2018b). The concept of "harm" in Internet gaming disorder. *Journal of Behavioral Addictions*.

King, D. L., & Delfabbro, P. H. (2019a). *Internet Gaming Disorder: Theory, Assessment, Treatment, and Prevention.* Cambridge, MA: Elsevier Academic Press.

King, D. L., & Delfabbro, P. H. (2019b). Video game monetization (e.g., 'loot boxes'): A blueprint for practical social responsibility measures. *International Journal of Mental Health and Addiction, 17,* 166-179.

King, D. L., & Delfabbro, P. H. (2019c). Loot box limit-setting is not sufficient on its own to prevent players from overspending: A reply to Drummond, Sauer, and Hall. *Addiction, 114,* 1324-1325.

King, D. L., & Gaming Industry Response Consortium. (2018). Comment on the global gaming industry's statement on ICD-11 gaming disorder: A corporate strategy to disregard harm and deflect social responsibility? *Addiction, 113,* 2145-2146.

King, D. L., & Potenza, M. N. (2020). Gaming Disorder Among Female Adolescents: A Hidden Problem? *Journal of Adolescent Health, 66*(6), 650-652.

King, D. L., Adair, C., Saunders, J. B., & Delfabbro, P. H. (2018). Clinical predictors of gaming abstinence in help-seeking adult problematic gamers. *Psychiatry Research, 261,* 581-588.

King, D. L., Billieux, J., Carragher, N., & Delfabbro, P. H. (2020). Face validity evaluation of screening tools for gaming disorder: Scope, language, and overpathologizing issues. *Journal of Behavioral Addictions, 9,* 1-13.

King, D. L., Chamberlain, S. R., Carragher, N., Billieux, J., Stein, D., Mueller, K., Potenza, M. N., Rumpf, H-J., Saunders, J., Starcevic, V., Demetrovics, Z., Brand, M., Lee, H. K., Spada, M., Lindenberg, K., Wu, A. M. S., Lemenager, T., Pallesen, S., Achab, S., … Delfabbro, P. H. (2020). Screening and assessment tools for gaming disorder: A comprehensive systematic review. *Clinical Psychology Review, 77,* 101831.

King, D. L., Delfabbro, P. H., Billieux, J., & Potenza, M. N. (2020). Problematic online gaming and the COVID-19 pandemic. *Journal of Behavioral Addictions, 9,* 184-186.

King, D. L., Delfabbro, P. H., Doh, Y. Y., Wu, A. M. S., Kuss, D. J., Mentzoni, R., Pallesen, S., Carragher, N., & Sakuma, H. (2018). Policy and prevention approaches for disordered and hazardous gaming and Internet use: An international perspective. *Prevention Science, 19,* 233-249.

King, D. L., Delfabbro, P. H., Gainsbury, S. M., Dreier, M., Greer, N., & Billieux, J. (2019). Unfair play? Video games as exploitative monetized services: An examination of game patents from a consumer protection perspective. *Computers in Human Behavior, 101,* 131-143.

King, D. L., Delfabbro, P. H., Griffiths, M. D., & Gradisar, M. (2012). Cognitive-behavioral approaches to outpatient treatment of Internet addiction in children and adolescents. *Journal of Clinical Psychology, 68,* 1185-1195.

King, D. L., Delfabbro, P. H., Perales, J. C., Deleuze, J., Király, O., Krossbakken, E., & Billieux, J. (2019). Maladaptive player-game relationships in problematic gaming and gaming disorder: A systematic review. *Clinical psychology review*, *73*, 101777.

King, D. L., Delfabbro, P. H., Potenza, M. N., Demetrovics, Z., Billieux, J., & Brand, M. (2018). Internet gaming disorder should qualify as a mental disorder. *Australian and New Zealand Journal of Psychiatry, 52,* 615–617.

King, D. L., Delfabbro, P. H., Potenza, M. N., Demetrovics, Z., Billieux, J., & Brand, M. (2019). Logic, evidence, and consensus: Towards a more constructive debate on gaming disorder. *Australian & New Zealand Journal of Psychiatry*, *53*(11), 1047-1049.

King, D. L., Delfabbro, P. H., Wu, A. M. S., Doh, Y. Y., Kuss, D. J., Mentzoni, R., Pallesen, S., Carragher, N., & Sakuma, H. (2017). Treatment of Internet gaming disorder: An international systematic review and CONSORT evaluation. *Clinical Psychology Review*, *54,* 123-33.

King, D. L., Delfabbro, P. H., Zwaans, T., & Kaptsis, D. (2013). Clinical features and axis I comorbidity of Australian adolescent pathological Internet and video game users. *Australian & New Zealand Journal of Psychiatry*, *47*(11), 1058-1067.

King, D. L., Delfabbro, P.H., Griffiths, M.D., & Gradisar, M. (2011). Assessing clinical trials of Internet addiction treatment: A systematic review and CONSORT evaluation. *Clinical Psychology Review, 31*, 1110-1116.

King, D. L., Haagsma, M. C., Delfabbro, P. H., Gradisar, M., & Griffiths, M. D. (2013). Toward a consensus definition of pathological video-gaming: A systematic review of psychometric assessment tools. *Clinical Psychology Review*, *33*(3), 331-342.

King, D. L., Herd, M. C., & Delfabbro, P. H. (2017). Tolerance in Internet gaming disorder: A need for increasing gaming time or something else?. *Journal of behavioral addictions*, *6*(4), 525-533.

King, D. L., Herd, M. C., & Delfabbro, P. H. (2018). Motivational components of tolerance in Internet gaming disorder. *Computers in Human Behavior*, *78*, 133-141.

King, D. L., Koster, E., & Billieux, J. (2019). Study what makes games addictive. *Nature*, *573*(7774), 346.

King, D. L., Wölfling, K., & Potenza, M. N. (2020). Taking Gaming Disorder Treatment to the Next Level. *JAMA Psychiatry*.

Király, O., Griffiths, M. D., & Demetrovics, Z. (2015). Internet gaming disorder and the DSM-5: Conceptualization, debates, and controversies. *Current Addiction Reports*, *2*(3), 254-262.

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

Király, O., Griffiths, M. D., Urbán, R., Farkas, J., Kökönyei, G., Elekes, Z., ... Demetrovics, Z. (2014). Problematic Internet use and problematic online gaming are not the same: Findings from a large nationally representative adolescent sample. *Cyberpsychology, Behavior, and Social Networking*, *17*(12), 749-754.

Király, O., Nagygyörgy, K., Griffiths, M. D., & Demetrovics, Z. (2014). Problematic online gaming. In *Behavioral addictions* (pp. 61-97). Academic Press.

Király, O., Potenza, M. N., Stein, D. J., King, D. L., Hodgins, D. C., Saunders, J. B., ... Abbott, M. W. (2020). Preventing problematic internet use during the COVID-19 pandemic: Consensus guidance. *Comprehensive Psychiatry*, 152180.

Király, O., Tóth, D., Urbán, R., Demetrovics, Z., & Maraz, A. (2017). Intense video gaming is not essentially problematic. *Addictive Behaviors*, *31*, 807-817.

Knight, J. R., Sherritt, L., Harris, S. K., Gates, E. C., & Chang, G. (2003). Validity of brief alcohol screening tests among adolescents: a comparison of the AUDIT, POSIT, CAGE, and CRAFFT. *Alcoholism: Clinical and experimental research*, *27*(1), 67-73.

Knight, J. R., Sherritt, L., Shrier, L. A., Harris, S. K., & Chang, G. (2002). Validity of the CRAFFT substance abuse screening test among adolescent clinic patients. *Archives of pediatrics & adolescent medicine*, *156*(6), 607-614.

Ko, C. H., Hsieh, T. J., Chen, C. Y., Yen, C. F., Chen, C. S., Yen, J. Y., ... Liu, G. C. (2014). Altered brain activation during response inhibition and error processing in subjects with Internet gaming disorder: a functional magnetic imaging study. *European Archives of Psychiatry and Clinical Neuroscience*, *264*, 661-672.

Komiya, N., Good, G.E., & Sherrod, N.B. (2000). Emotional openness as a predictor of college students' attitudes toward seeking psychological help. *Journal of Counselling Psychology, 47,* 138 –143

Koo, H. J., Han, D. H., Park, S. Y., & Kwon, J. H. (2017). The structured clinical interview for DSM-5 Internet gaming disorder: Development and validation for diagnosing IGD in adolescents. *Psychiatry investigation*, *14*(1), 21.

Kovess-Masfety, V., Keyes, K., Hamilton, A., Hanson, G., Bitfoi, A., Golitz, D., ... Otten, R. (2016). Is time spent playing video games associated with mental health, cognitive and social skills in young children?. *Social psychiatry and psychiatric epidemiology*, *51*(3), 349-357.

Kuss, D. J. (2018). Policy, prevention, and regulation for Internet Gaming Disorder. *Journal of behavioral addictions*.

Kuss, D. J., & Griffiths, M. D. (2012a). Internet gaming addiction: A systematic review of empirical research. *International Journal of Mental Health and Addiction*, *10*, 278-296.

Kuss, D. J., & Griffiths, M. D. (2012b). Internet and gaming addiction: a systematic literature review of neuroimaging studies. *Brain sciences*, *2*(3), 347-374.

Kuss, D. J., & Lopez-Fernandez, O. (2016). Internet addiction and problematic Internet use: A systematic review of clinical research. *World journal of psychiatry*, *6*(1), 143.

Kuss, D. J., Griffiths, M. D., & Pontes, H. M. (2017). Chaos and confusion in DSM-5 diagnosis of Internet Gaming Disorder: Issues, concerns, and recommendations for clarity in the field. *Journal of behavioral addictions*, *6*(2), 103-109.

Kuss, D. J., Griffiths, M. D., Karila, L., & Billieux, J. (2014). Internet addiction: A systematic review of epidemiological research for the last decade. *Current pharmaceutical design*, *20*(25), 4026-4052.

Kuss, D. J., Van Rooij, A. J., Shorter, G. W., Griffiths, M. D., & van de Mheen, D. (2013). Internet addiction in adolescents: Prevalence and risk factors. *Computers in Human Behavior*, *29*(5), 1987-1996.

Ladouceur, R. L., Blaszczynski A., & Lalande. D.R. (2012). Precommitment in gambling: a review of the empirical evidence. *International Gambling Studies, 12*, 215-230.

Ladouceur, R. L., Goulet, A., & Vitaro, F. (2013). Prevention programmes for youth gambling: a review of the empirical evidence. *International Gambling Studies*, *13*(2), 141-159.

Lafrenière, M. A. K., Verner-Filion, J., & Vallerand, R. J. (2012). Development and validation of the Gaming Motivation Scale (GAMS). *Personality and individual differences*, *53*(7), 827-831.

Lawrence, A. J., Luty, J., Bogdan, N. A., Sahakian, B. J., & Clark, L. (2009). Impulsivity and response inhibition in alcohol dependence and problem gambling. *Psychopharmacology*, *207*, 163-172.

Lee, H. K. & Son, C. N. (2008). The effects of the group cognitive behavioral therapy on game addiction level, depression, and self-control of the high school students with Internet game addiction. *The Korean Journal of Stress Research, 16,* 409-417.

Lee, S. J. (2013). Parental restrictive mediation of children's internet use: Effective for what and for whom? *New media & society*, *15*(4), 466-481.

Leménager, T., Gwodz, A., Richter, A., Reinhard, I., Kämmerer, N., Sell, M., & Mann, K. (2013). Self-concept deficits in massively multiplayer online role-playing games addiction. *European Addiction Research, 19*(5), 227-234.

Lemmens, J. S., Valkenburg, P. M., & Peter, J. (2011). Psychosocial causes and consequences of pathological gaming. *Computers in Human Behavior, 27*(1), 144-152.

Li, H. & Wang, S. (2013). The role of cognitive distortion in online game addiction among Chinese adolescents. *Children and Youth Services Review, 35,* 1468-1475.

Li, H., Zou, Y., Wang, J., & Yang, X. (2016). Role of stressful life events, avoidant coping styles, and neuroticism in online game addiction among college students: a moderated mediation model. *Frontiers in psychology*, *7*, 1794.

Li, Q., Wang, Y., Yang, Z., Dai, W., Zheng, Y., Sun, Y., & Liu, X. (2020). Dysfunctional cognitive control and reward processing in adolescents with Internet gaming disorder. *Psychophysiology*, *57*(2), e13469.

Li, W., Mills, D., & Nower, L. (2019). The relationship of loot box purchases to problem video gaming and problem gambling. *Addictive Behaviors, 97*, 27-34.

Lim, S. S. (2010). Regulatory initiatives for managing online risks and opportunities for youths–the East Asian experience.

Lin, C. Y., Imani, V., Broström, A., Årestedt, K., Pakpour, A. H., & Griffiths, M. D. (2019). Evaluating the psychometric properties of the 7-item Persian Game Addiction Scale for Iranian adolescents. *Frontiers in psychology*, *10*, 149.

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

Liu, Q. X., Fang, X. Y., Yan, N., Zhou, Z. K., Yuan, X. J., Lan, J., & Liu, C. Y. (2015). Multi-family group therapy for adolescent Internet addiction: Exploring the underlying mechanisms. *Addictive Behaviors, 42,* 1-8.

Long, J., Liu, T., Liu, Y., Hao, W., Maurage, P., & Billieux, J. (2018). Prevalence and correlates of problematic online gaming: A systematic review of the evidence published in Chinese. *Current Addiction Reports*, *5*(3), 359-371.

Lopez-Fernandez, O., Williams, A. J., & Kuss, D. J. (2019). Measuring female gaming: gamer profile, predictors, prevalence, and characteristics from psychological and gender perspectives. *Frontiers in psychology*, *10*, 898.

Lopez-Fernandez, O., Williams, A. J., Griffiths, M. D., & Kuss, D. J. (2019). Female gaming, gaming addiction, and the role of women within gaming culture: A narrative literature review. *Frontiers in Psychiatry*, *10*, 454.

Lortie, C. L., & Guitton, M. J. (2013). Internet addiction assessment tools: Dimensional structure and methodological status. *Addiction*, *108*(7), 1207-1216.

Lynch, T., Tompkins, J. E., van Driel, I. I., & Fritz, N. (2016). Sexy, strong, and secondary: A content analysis of female characters in video games across 31 years. *Journal of Communication*, *66*(4), 564-584.

Mak, K. K., Lai, C. M., Ko, C. H., Chou, C., Kim, D. I., Watanabe, H., & Ho, R. C. (2014). Psychometric properties of the revised chen internet addiction scale (CIAS-R) in Chinese adolescents. *Journal of abnormal child psychology*, *42*(7), 1237-1245.

Männikkö, N., Billieux, J., Nordström, T., Koivisto, K., & Kääriäinen, M. (2017). Problematic gaming behaviour in Finnish adolescents and young adults: relation to game genres, gaming motives and self-awareness of problematic use. *International Journal of Mental Health and Addiction*, *15*(2), 324-338.

Mantler, T. (2013). A systematic review of smoking Youths' perceptions of addiction and health risks associated with smoking: Utilizing the framework of the health belief model. *Addiction Research & Theory*, *21*(4), 306-317.

Maraz, A., Griffiths, M. D., & Demetrovics, Z. (2016). The prevalence of compulsive buying: a meta-analysis. *Addiction, 111*(3), 408-419.

Marino, C., & Spada, M. M. (2017). Dysfunctional cognitions in online gaming and internet gaming disorder: A narrative review and new classification. *Current Addiction Reports, 4*(3), 308-316.

Marionneau, V., & Järvinen-Tassopoulos, J. (2017). Consumer protection in licensed online gambling markets in France: the role of responsible gambling tools. *Addiction Research & Theory, 25*, 436-443.

Markey, P. M., & Ferguson, C. J. (2017a). Internet gaming addiction: Disorder or moral panic? *American Journal of Psychiatry, 174*, 195-196.

Markey, P. M., & Ferguson, C. J. (2017b). Teaching us to fear: The violent video game moral panic and the politics of game research. *American Journal of Play, 10*, 99-115.

Markey, P. M., & Ferguson, C. J. (2017c). *Moral combat: Why the war on violent video games is wrong*. BenBella Books, Inc.

McCambridge, J., & Strang, J. (2004). The efficacy of single-session motivational interviewing in reducing drug consumption and perceptions of drug-related risk and harm among young people: results from a multi-site cluster randomized trial. *Addiction*, *99*(1), 39-52.

McGonigal, J. (2011). *Reality is broken: Why games make us better and how they can change the world*. Penguin.

McKay, J. R. (2017). Making the hard work of recovery more attractive for those with substance use disorders. *Addiction, 112*(5), 751-757.

McLean, L., & Griffiths, M. D. (2013). Female gamers: A thematic analysis of their gaming experience. *International Journal of Game-Based Learning (IJGBL)*, *3*(3), 54-71.

Mentzoni, R. A., Brunborg, G. S., Molde, H., Myrseth, H., Skouverøe, K. J. M., Hetland, J., & Pallesen, S. (2011). Problematic video game use: estimated prevalence and

associations with mental and physical health. *Cyberpsychology, behavior, and social networking*, *14*(10), 591-596.

Messer, K., Vijayaraghavan, M., White, M. M., Shi, Y., Chang, C., Conway, K. P., ... Pierce, J. P. (2015). Cigarette smoking cessation attempts among current US smokers who also use smokeless tobacco. *Addictive Behaviors*, *51*, 113-119.

Messerlian, C., Derevensky, J., & Gupta, R. (2005). Youth gambling problems: A public health perspective. *Health Promotion International*, *20*(1), 69-79.

Mihara, S., & Higuchi, S. (2017). Cross-sectional and longitudinal epidemiological studies of I nternet gaming disorder: A systematic review of the literature. *Psychiatry and clinical neurosciences*, *71*(7), 425-444.

Mihara, S., Osaki, Y., Nakayama, H., Sakuma, H., Ikeda, M., Itani, O., ... Higuchi, S. (2016). Internet use and problematic Internet use among adolescents in Japan: A nationwide representative survey. *Addictive behaviors reports*, *4*, 58-64.

Milani, L., La Torre, G., Fiore, M., Grumi, S., Gentile, D. A., Ferrante, M., ... Di Blasio, P. (2018). Internet gaming addiction in adolescence: risk factors and maladjustment correlates. *International Journal of Mental Health and Addiction*, *16*(4), 888-904.

Mills, D. J., Milyavskaya, M., Mettler, J., & Heath, N. L. (2018). Exploring the pull and push underlying problem video game use: A self-determination theory approach. *Personality and Individual Differences*, *135*, 176-181.

Milne, S., Sheeran, P., & Orbell, S. (2000). Prediction and intervention in health-related behavior: A meta-analytic review of protection motivation theory. *Journal of applied social psychology*, *30*(1), 106-143.

Mitcheson, L., Maslin, J., Meynen, T., Wanigaratne, S., Morrison, T., & Hill, R. (2010). *Applied Cognitive and Behavioral Approaches to the Treatment of Addiction: A Practical Treatment Guide*. Hoboken, United States: John Wiley and Sons.

Moher, D., Liberati, A., Tetzlaff, J., Altman, D.G. (2009). The PRISMA Group. *Preferred Reporting Items for Systematic Reviews and Meta-Analyses:* The PRISMA Statement. *PLoS Me*d 6: e1000097.

Moher, D., Tsertsvadze, A., Tricco, A., Eccles, M., Grimshaw J., Sampson, M., & Barrowman N. (2008). When and how to update systematic reviews. *Cochrane Database of Systematic Reviews,* Issue 1. Art. No.: MR000023.

Möller-Leimkühler, A. M. (2002). Barriers to help-seeking by men: a review of sociocultural and clinical literature with particular reference to depression. *Journal of Affective Disorders, 71*, 1-9.

Morse, J. (2008). Confusing categories and themes. *Qualitative Health Research,*18, 727-728.

Müller, K. W., Beutel, M. E., Dreier, M., & Wölfling, K. (2019). A clinical evaluation of the DSM-5 criteria for Internet Gaming Disorder and a pilot study on their applicability to further Internet-related disorders. *Journal of Behavioral Addictions, 8,* 16-24.

Müller, K. W., Glaesmer, H., Brähler, E., Woelfling, K., & Beutel, M. E. (2014). Prevalence of internet addiction in the general population: results from a German population-based survey. *Behaviour & Information Technology*, *33*(7), 757-766.

Müller, K. W., Janikian, M., Dreier, M., Wölfling, K., Beutel, M. E., Tzavara, C., ... Tsitsika, A. (2015). Regular gaming behavior and internet gaming disorder in European adolescents: results from a cross-national representative survey of prevalence, predictors, and psychopathological correlates. *European child & adolescent psychiatry*, *24*(5), 565-574.

Müller, K. W., Wölfling, K., Beutel, M. E., Stark, B., Quiring, O., Aufenanger, S., ... Reinecke, L. (2018). Insights into aspects behind Internet-related disorders in adolescents: the interplay of personality and symptoms of adjustment disorders. *Journal of Adolescent Health*, *62*(2), 234-240.

Mun, S. Y. & Lee, B. S. (2015). Effects of an integrated Internet addiction prevention program on elementary students' self-regulation and Internet addiction. *Journal of Korean Academy of Nursing, 45*, 251–261.

Myrseth, H., & Notelaers, G. (2018). A latent class approach for classifying the problem and disordered gamers in a group of adolescence. *Frontiers in psychology*, *9*, 2273.

Nakayama, H., & Higuchi, S. (2015). Internet addiction. *Nihon rinsho. Japanese journal of clinical medicine*, *73*(9), 1559-1566.

Newzoo. (2020). *2020 Global games market report*. Newzoo. Retrieved online from: https://Newzoo.com/insights/trend-reports/Newzoo-global-games-market-report-2020-light-version/

NHMRC. (2009). *Levels of evidence and grades for recommendations.* Canberra: National Health and Medical Research Council.

Orben, A. (2020). The Sisyphean cycle of technology panics. *Perspectives on Psychological Science.*

Orwin, R. G. (1983). A fail-safe N for effect size in meta-analysis. *Journal of Educational Statistics*, *8*(2), 157-159.

Pápay, O., Urbán, R., Griffiths, M. D., Nagygyörgy, K., Farkas, J., Kökönyei, G., ... Demetrovics, Z. (2013). Psychometric properties of the problematic online gaming questionnaire short-form and prevalence of problematic online gaming in a national sample of adolescents. *Cyberpsychology, Behavior, and Social Networking*, *16*(5), 340-348.

Park, J. J., Booth, N., Bagot, K. L., & Rodda, S. N. (2020). A brief internet-delivered intervention for the reduction of gaming-related harm: A feasibility study. *Computers in Human Behavior Reports*, *2*, 100027.

Park, S. Y., Kim, S. M., Roh, S., Soh, M. A., Lee, S. H., Kim, H., ... Han, D. H. (2016). The effects of a virtual reality treatment program for online gaming addiction. *Computer Methods and Programs in Biomedicine, 129*, 99-108.

Parke, J., Rigbye, J., Parke, A., Wood, R. T. A., Sjenitzer, J., & Vaughan Williams, J. (2007). The global online gambling report: An exploratory investigation into attitudes and behaviours of internet casino and poker players. eCOGRA (e-Commerce and Online Gambling Regulation and Assurance). Press release (2007, January 24), World's largest study of the online gambler revealed, retrieved on September 9, 2011.

Parlove, A. E. (2002). *Acceptability and appeal of a web-based smoking prevention intervention for adolescents*. Unpublished doctoral dissertation.

Pawlikowski, M. & Brand, M. (2011). Excessive Internet gaming and decision making: do excessive World of Warcraft players have problems in decision making under risky conditions? *Psychiatry Research, 188*, 428-433.

Peretz, C., Korczyn, A. D., Shatil, E., Aharonson, V., Birnboim, S., & Giladi, N. (2011). Computer-based, personalized cognitive training versus classical computer games: a randomized double-blind prospective trial of cognitive stimulation. *Neuroepidemiology*, *36*(2), 91-99.

Peters, C. S. & Malesky Jr, L. A. (2008). Problematic usage among highly engaged players of massively multiplayer online role-playing games. *CyberPsychology & Behavior, 11*, 481-484

Petry, N. M. (2005). Cognitive-behavioral therapy. In *Pathological gambling: Etiology, comorbidity, and treatment*. (pp. 229-255). Washington, DC, US: American Psychological Association.

Petry, N. M., & O'Brien, C. P. (2013). Internet gaming disorder and the DSM-5.

Petry, N. M., Rehbein, F., Gentile, D. A., Lemmens, J. S., Rumpf, H. J., Mößle, T., ... Auriacombe, M. (2014). An international consensus for assessing internet gaming disorder using the new DSM-5 approach. *Addiction, 109*(9), 1399-1406.

Petry, N. M., Rehbein, F., Ko, C. H., & O'Brien, C. P. (2015). Internet gaming disorder in the DSM-5. *Current psychiatry reports*, *17*(9), 72.

Pine, D. S., Cohen, P., Brook, J., & Coplan, J. D. (1997). Psychiatric symptoms in adolescence as predictors of obesity in early adulthood: a longitudinal study. *American Journal of Public Health*, *87*(8), 1303-1310.

Plante, C. N., Gentile, D. A., Groves, C. L., Modlin, A., & Blanco-Herrera, J. (2019). Video games as coping mechanisms in the etiology of video game addiction. *Psychology of Popular Media Culture, 8*(4), 385.

Pontes, H. M., & Griffiths, M. D. (2014). Internet addiction disorder and internet gaming disorder are not the same. *Journal of Addiction Research & Therapy*, *5*(4).

Pontes, H. M., Macur, M., & Griffiths, M. D. (2016). Internet Gaming Disorder among Slovenian primary schoolchildren: Findings from a nationally representative sample of adolescents. *Journal of behavioral addictions, 5*(2), 304-310.

Portnoy, B. (1980). Effects of a controlled-usage alcohol education program based on the health belief model. *Journal of Drug Education*, *10*(3), 181-195.

Potenza, M. N. (2018). Do gaming disorder and hazardous gaming belong in the ICD-11? Considerations regarding the death of a hospitalized patient that was reported to have occurred while a care provider was gaming. *Journal of behavioral addictions*, *7*(2), 206-207.

Primack, B. A., Carroll, M. V., McNamara, M., Klem, M. L., King, B., Rich, M., ... Nayak, S. (2012). Role of video games in improving health-related outcomes: a systematic review. *American journal of preventive medicine*, *42*(6), 630-638.

Przepiorka, A. M., Blachnio, A., Miziak, B., & Czuczwar, S. J. (2014). Clinical approaches to Treatment of Internet addiction. *Pharmacological Reports*, *66*, 187-191.

Przybylski, A. K., Weinstein, N., & Murayama, K. (2017). Internet gaming disorder: Investigating the clinical relevance of a new phenomenon. *American Journal of Psychiatry, 174*(3), 230-236.

Quilty, L. C., Wardell, J. D., Thiruchselvam, T., Keough, M. T., & Hendershot, C. S. (2019). Brief interventions for problem gambling: A meta-analysis. *PloS one, 14*(4), e0214502.

Rakhshani, F., Esmaeili, A., Charkazi, A., Haftsavar, M., Shahnazi, H., Jan-esmaili, A. (2010) Effect of education on smoking prevention in student of Zahedan. *Journal of Health System Research, 6,* 267–275.

Raviv, A., Raviv, A., Vago-Gefen, I., & Fink, A. S. (2009). The personal service gap: Factors affecting adolescents' willingness to seek help. *Journal of Adolescence,* 32(3), 483–499.

Rehbein, F., Kliem, S., Baier, D., Mößle, T., & Petry, N. M. (2015). Prevalence of Internet gaming disorder in German adolescents: Diagnostic contribution of the nine DSM-5 criteria in a state-wide representative sample. *Addiction, 110*(5), 842-851.

Rehbein, F., Psych, G., Kleimann, M., Mediasci, G., & Mößle, T. (2010). Prevalence and risk factors of video game dependency in adolescence: results of a German nationwide survey. *Cyberpsychology, Behavior, and Social Networking, 13*, 269-277.

Reinert, D. F., & Allen, J. P. (2007). The alcohol use disorders identification test: an update of research findings. *Alcoholism: Clinical and Experimental Research, 31*(2), 185-199.

Robbins, M., Alexander, J., Newell, R., & Turner, C. (1996). The immediate effect of reframing on client attitude in family therapy. *Journal of Family Psychology,* 10(1), 28–34.

Rodda, S. N., Booth, N., Vacaru, M., Knaebe, B., & Hodgins, D. C. (2018). Behaviour change strategies for internet, pornography and gaming addiction: A taxonomy and content analysis of professional and consumer websites. *Computers in Human Behavior, 84,* 467-476.

Rogers, R. W. (1983). Cognitive and psychological processes in fear appeals and attitude change: A revised theory of protection motivation. *Social psychophysiology: A sourcebook*, 153-176.

Romano, J. L., & Hage, S. M. (2000). Prevention and counseling psychology: Revitalizing commitments for the 21st century. *The Counseling Psychologist*, *28*(6), 733-763.

Rosenstock, I. M. (1966). Why people use health services. *Milbank Memorial Fund Quarterly*, *44*, 94-124.

Rosenstock, I. M. (1974). Historical origins of the health belief model. *Health Education Monographs*, *2*, 1-8.

Rosenstock, I. M., Strecher, V. J., & Becker, M. H. (1988). Social learning theory and the health belief model. *Health education quarterly*, *15*(2), 175-183.

Rosenthal, R. (1979). The file drawer problem and tolerance for null results. *Psychological bulletin*, *86*(3), 638.

Rosenthal, R. (1993). Meta-analytic procedures for social research. Newbury Park, CA: Sage Publications.

Rumpf, H. J., Achab, S., Billieux, J., Bowden-Jones, H., Carragher, N., Demetrovics, Z., ... Saunders, J. B. (2018). Including gaming disorder in the ICD-11: The need to do so from a clinical and public health perspective: Commentary on: A weak scientific basis for gaming disorder: Let us err on the side of caution (van Rooij et al., 2018). *Journal of behavioral addictions*, *7*(3), 556-561.

Rumpf, H. J., Brand, M., Wegmann, E., Montag, C., Müller, A., Müller, K., ... Schlossarek, S. (2020). The COVID-19 Pandemic and Behavioral Addiction-New Challenges for Structural and Behavioral Prevention. *Sucht*, *66*(4).

Rumpf, H. J., Brandt, D., Demetrovics, Z., Billieux, J., Carragher, N., Brand, M., ... Borges, G. (2019). Epidemiological challenges in the study of behavioral addictions: A call for high standard methodologies. *Current Addiction Reports*, *6*(3), 331-337.

Ruscio, A. M., Stein, D. J., Chiu, W. T., & Kessler, R. C. (2010). The epidemiology of obsessive-compulsive disorder in the National Comorbidity Survey Replication. *Molecular psychiatry, 15*(1), 53-63.

Russoniello, C. V., O'Brien, K., & Parks, J. M. (2009). The effectiveness of casual video games in improving mood and decreasing stress. *Journal of CyberTherapy & Rehabilitation, 2*(1), 53-66.

Ryan, R. M., Rigby, C. S., & Przybylski, A. (2006). The motivational pull of video games: A self-determination theory approach. *Motivation and Emotion, 30*, 344-360.

Sakuma, H., Mihara, S., Nakayama, H., Miura, K., Kitayuguchi, T., Maezono, M., ... Higuchi, S. (2017). Treatment with the Self-Discovery Camp (SDiC) improves Internet Gaming Disorder. *Addictive Behaviors, 64*, 357-362.

Şalvarlı, Ş. İ., & Griffiths, M. D. (2019). Internet gaming disorder and its associated personality traits: A systematic review using PRISMA guidelines. *International Journal of Mental Health and Addiction*, 1-23.

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

Sarda, E., Bègue, L., Bry, C., & Gentile, D. (2016). Internet gaming disorder and well-being: A scale validation. *Cyberpsychology, Behavior, and Social Networking*, *19*(11), 674-679.

Saunders, J., Hao, W., Long, J., King, D. L., Mann, K. … Pozynak, V. (2017). Gaming disorder: Its delineation as a serious condition for diagnosis, management and prevention. *Journal of Behavioral Addictions, 6*, 271-279.

Sawyer, M., Miller-Lewis, L., & Clark, J. (2007). The mental health of 13-17-year-olds in Australia: Findings from the National Survey of Mental Health and Well-Being. *Journal of Youth and Adolescence,* 36, 185–194.

Schulz, K.F., Altman, D.G., & Moher, D. (2010). CONSORT 2010 statement: Updated guidelines for reporting parallel group randomized trials. *Annals of Internal Medicine, 152,* 1-8.

Seok, S., & DaCosta, B. (2012). The world's most intense online gaming culture: Addiction and high-engagement prevalence rates among South Korean adolescents and young adults. *Computers in Human Behavior, 28*(6), 2143-2151.

Shahnazi, H., Ahmadi-Livani, M., Pahlavanzadeh, B., Rajabi, A., Hamrah, M. S., & Charkazi, A. (2020). Assessing preventive health behaviors from COVID-19: a cross sectional study with health belief model in Golestan Province, Northern of Iran. *Infectious diseases of poverty*, *9*(1), 1-9.

Sharifi-rad, G., Hazavei, M. M., Hasan-zadeh, A., & Danesh-amouz, A. (2007). The effect of health education based on health belief model on preventive actions of smoking in grade one, middle school students. *Journal of Arak University of Medical Sciences*, *10*(1), 79-86.

Shead, N. W., Walsh, K., Taylor, A., Derevensky, J. L., & Gupta, R. (2011). Youth gambling prevention: Can public service announcements featuring celebrity spokespersons be effective? *International Journal of Mental Health and Addiction*, *9*(2), 165-179.

Shek, D. T., & Sun, R. C. (2010). Effectiveness of the tier 1 program of project PATHS: findings based on three years of program implementation. *The Scientific World Journal, 10*.

Shek, D. T., & Yu, L. (2012). A stakeholder-collaborative evaluation of intervention for students with greater psychosocial needs. *International journal of adolescent medicine and health*, *24*(3), 223-230.

Sheu, H.B., & Sedlacek, W.E. (2004). An exploratory study of help-seeking attitudes and coping strategies among college students by race and gender. *Measurement & Evaluation in Counselling & Development*, 37, 130 –14

Shi, J., Potenza, M. N., & Turner, N. E. (2020). Commentary on: "The Future of Gaming Disorder Research and Player Protection: What Role Should the Video Gaming Industry and Researchers Play?" *International Journal of Mental Health and Addiction, 18,* 791-799.

Shi, J., Renwick, R., Turner, N. E., & Kirsh, B. (2019). Understanding the lives of problem gamers: The meaning, purpose, and influences of video gaming. *Computers in Human Behavior*, *97*, 291-303.

Shiue, I. (2015). Self and environmental exposures to drinking, smoking, gambling or video game addiction are associated with adult hypertension, heart and cerebrovascular diseases, allergy, self-rated health and happiness: Japanese General Social Survey, 2010. *International journal of cardiology*, *181*, 403-412.

Silveri, M. M., Tzilos, G. K., Pimentel, P. J., & Yurgelun-Todd, D. A. (2004). Trajectories of adolescent emotional and cognitive development: effects of sex and risk for drug use. *Annals of the New York Academy of Sciences*, *1021*(1), 363-370.

Sim, T., Gentile, D. A., Bricolo, F., Serpelloni, G., & Gulamoydeen, F. (2012). A conceptual review of research on the pathological use of computers, video games, and the Internet. *International Journal of Mental Health and Addiction*, *10*(5), 748-769.

Smith, L. J., Gradisar, M., & King, D. L. (2015). Parental influences on adolescent video game play: a study of accessibility, rules, limit setting, monitoring, and cybersafety. *Cyberpsychology, Behavior, and Social Networking*, *18*(5), 273-279.

Snodgrass, J. G., Lacy, M. G., Dengah II, H. F., Eisenhauer, S., Batchelder, G., & Cookson, R. J. (2014). A vacation from your mind: Problematic online gaming is a stress response. *Computers in Human Behavior*, *38*, 248-260.

Soper, W. B., & Miller, M. J. (1983). Junk-time junkies: An emerging addiction among students. *The School Counselor*, *31*(1), 40-43.

Starcevic, V. (2016) Tolerance and withdrawal symptoms may not be helpful to enhance understanding of behavioural addictions. *Addiction*, 111, 1307–1308.

Starcevic, V., & Aboujaoude, E. (2017). Internet addiction: Reappraisal of an increasingly inadequate concept. *CNS spectrums*, *22*(1), 7-13.

Statista. (2020). Number of active video gamers worldwide from 2015-2023 (in millions). Retrieved from https://www.statista.com/statistics/748044/number-video-gamers-world/

Steinberg, L. (2004). Risk taking in adolescence: what changes, and why?. In *Adolescent Brain Development: Vulnerabilities and Opportunities, Sep, 2003, New York, NY, US; This paper is the result of the aforementioned conference which was cosponsored by the New York Academy of Sciences and the University of Pittsburgh School of Medicine, Center for Continuing Education,* New York Academy of Sciences.

Stern, Y., Blumen, H. M., Rich, L. W., Richards, A., Herzberg, G., & Gopher, D. (2011). Space Fortress game training and executive control in older adults: a pilot intervention. *Aging, Neuropsychology, and Cognition*, *18*(6), 653-677.

Stevens, M. W. R., Delfabbro, P.H., & King, D.L. (2017). *Systematic review of the components of CBT for Internet gaming disorder*. [Unpublished manuscript]. School of Psychology, The University of Adelaide

Stevens, M. W. R., Delfabbro, P. H., & King, D. L. (2021a). Prevention strategies to address problematic gaming: An evaluation of strategy support among habitual and problem gamers. *Journal of Primary Prevention.*

Stevens, M. W. R., Delfabbro, P. H., & King, D. L. (2021b). Prevention approaches to problem gaming: A large-scale qualitative investigation. Computers in Human Behavior, *115*, 106611.

Stevens, M. W. R., Dorstyn, D., Delfabbro, P. H., & King, D. L. (2020). Global prevalence of gaming disorder: A systematic review and meta-analysis. *Australian & New Zealand Journal of Psychiatry*, 0004867420962851.

Stevens, M. W. R., King, D. L., Dorstyn, D., & Delfabbro, P. H. (2019). Cognitive-behavioral therapy for Internet gaming disorder: A systematic review and meta-analysis. *Clinical Psychology and Psychotherapy, 26,* 191-203.

Stice, E., Shaw, H., Bohon, C., Marti, C. N., & Rohde, P. (2009). A meta-analytic review of depression prevention programs for children and adolescents: factors that predict magnitude of intervention effects. *Journal of consulting and clinical psychology, 77*(3), 486.

Strittmatter, E., Kaess, M., Parzer, P., Fischer, G., Carli, V., Hoven, C. W., ... Bobes, J. (2015). Pathological Internet use among adolescents: Comparing gamers and non-gamers. *Psychiatry research, 228*(1), 128-135.

Strittmatter, E., Parzer, P., Brunner, R., Fischer, G., Durkee, T., Carli, V., ... Resch, F. (2016). A 2-year longitudinal study of prospective predictors of pathological Internet use in adolescents. *European child & adolescent psychiatry*, *25*(7), 725-734.

Sugaya, N., Shirasaka, T., Takahashi, K., & Kanda, H. (2019). Bio-psychosocial factors of children and adolescents with internet gaming disorder: a systematic review. *BioPsychoSocial medicine*, *13*(1), 3.

Taylor, M. (2020). UK Games Industry Census: Understanding diversity in the UK games industry workforce. Retrieved from: https://www.ukie.org.uk/UK-games-industry-census-2020

Thege, B. K., Colman, I., el-Guebaly, N., Hodgins, D. C., Patten, S. B., Schopflocher, D., ... Wild, T. C. (2015). Social judgments of behavioral versus substance-related addictions: A population-based study. *Addictive Behaviors, 42,* 24-31.

Thompson, D., Baranowski, T., Buday, R., Baranowski, J., Thompson, V., Jago, R., & Griffith, M. J. (2010). Serious video games for health: How behavioral science guided the development of a serious video game. *Simulation & Gaming*, *41*(4), 587-606.

Throuvala, M. A., Griffiths, M. D., Rennoldson, M., & Kuss, D. J. (2019). School-based prevention for adolescent Internet addiction: Prevention is the key. A systematic literature review. *Current Neuropharmacology, 17(6),* 507-525.

Tian, M., Chen, Q., Zhang, Y., Du, F., Hou, H., Chao, F., & Zhang, H. (2014). PET imaging reveals brain functional changes in internet gaming disorder. *European Journal of Nuclear Medicine and Molecular Imaging, 41,* 1388-1397.

Tiego, J., Lochner, C., Ioannidis, K., Brand, M., Stein, D. J., Yücel, M., ... Chamberlain, S. R. (2019). Problematic use of the Internet is a unidimensional quasi-trait with impulsive and compulsive subtypes. *BMC Psychiatry, 19,* 348.

Ting, J.Y., & Hwang, W.C. (2009). Cultural influences on help-seeking attitudes in Asian American students. *American Journal of Orthopsychiatry*, *79*(1), 125-132.

Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*, 19, 349-357.

Tong, K. K., Chen, J. H., & Wu, A. M. (2019). Application of health belief model to practice of responsible gambling. *Journal of Gambling Studies*, *35*(3), 1047-1062.

Torres-Rodríguez, A., Griffiths, M. D., Carbonell, X., & Oberst, U. (2018). Internet gaming disorder in adolescence: Psychological characteristics of a clinical sample. *Journal of behavioral addictions, 7*(3), 707-718.

Turner, N. E., Paglia-Boak, A., Ballon, B., Cheung, J. T., Adlaf, E. M., Henderson, J., ... Mann, R. E. (2012). Prevalence of problematic video gaming among Ontario adolescents. *International Journal of Mental Health and Addiction, 10*(6), 877-889.

Upadhyay, S., Lord, J., & Gakh, M. (2019). Health-Information Seeking and Intention to Quit Smoking: Do Health Beliefs Have a Mediating Role? *Tobacco use insights*, *12*, 1179173X19871310.

Ustinavičienė, R., Škėmienė, L., Lukšienė, D., Radišauskas, R., Kalinienė, G., & Vasilavičius, P. (2016). Problematic computer game use as expression of Internet

addiction and its association with self-rated health in the Lithuanian adolescent population. *Medicina*, *52*(3), 199-204.

Vadlin, S., Åslund, C., & Nilsson, K. W. (2018). A longitudinal study of the individual-and group-level problematic gaming and associations with problem gambling among Swedish adolescents. *Brain and Behavior*, *8*(4), e00949.

Vadlin, S., Åslund, C., Hellström, C., & Nilsson, K. W. (2016). Associations between problematic gaming and psychiatric symptoms among adolescents in two samples. *Addictive behaviors*, *61*, 8-15.

Vadlin, S., Åslund, C., Rehn, M., & Nilsson, K. W. (2015). Psychometric evaluation of the adolescent and parent versions of the Gaming Addiction Identification Test (GAIT). *Scandinavian Journal of Psychology*, *56*(6), 726-735.

Van Den Eijnden, R., Koning, I., Doornwaard, S., Van Gurp, F., & Ter Bogt, T. (2018). The impact of heavy and disordered use of games and social media on adolescents' psychological, social, and school functioning. *Journal of Behavioral Addictions*, *7*(3), 697-706.

van Rooij, A. J., Ferguson, C. J., Colder Carras, M., Kardefelt-Winther, D., Shi, J., Aarseth, E., ... Deleuze, J. (2018). A weak scientific basis for gaming disorder: Let us err on the side of caution. *Journal of Behavioral Addictions*, *7*, 1-9.

van Rooij, A. J., Meerkerk, G. J., Schoenmakers, T. M., Griffiths, M., & Van de Mheen, D. (2010). Video game addiction and social responsibility. *Addiction Research & Theory*, *18*(5) 489-493.

Van Rooij, A. J., Schoenmakers, T. M., Vermulst, A. A., Van Den Eijnden, R. J., & Van De Mheen, D. (2011). Online video game addiction: identification of addicted adolescent gamers. *addiction*, *106*(1), 205-212.

van Rooj, A.J., Kuss, D.J., Griffiths, M.D., Shorter, G.W., Schoenmakers, M.T., & van de Mheen, D. (2014). The (co-) occurrence of problematic video gaming, substance use,

and psychosocial problems in adolescents. *Journal of Behavioral Addictions*, *3*, 157-165.

Vink, J. M., Van Beijsterveldt, T. C., Huppertz, C., Bartels, M., & Boomsma, D. I. (2016). Heritability of compulsive I nternet use in adolescents. *Addiction biology*, *21*(2), 460-468.

Von Der Heiden, J. M., Braun, B., Müller, K. W., & Egloff, B. (2019). The association between video gaming and psychological functioning. *Frontiers in Psychology*, *10*, 1731.

Vondráčková, P., & Gabrhelik, R. (2016). Prevention of Internet addiction: A systematic review. *Journal of behavioral addictions*, *5*(4), 568-579.

Walther, B., Hanewinkel, R., & Morgenstern, M. (2014). Effects of a brief school-based media literacy intervention on digital media use in adolescents: Cluster randomized controlled trial. *Cyberpsychology, Behavior, and Social Networking*, *17*, 616-623.

Wang, C. W., Chan, C. L., Mak, K. K., Ho, S. Y., Wong, P. W., & Ho, R. T. (2014). Prevalence and correlates of video and Internet gaming addiction among Hong Kong adolescents: A pilot study. *The Scientific World Journal*, *2014*.

Wang, C. W., Ho, R. T., Chan, C. L., & Tse, S. (2015). Exploring personality characteristics of Chinese adolescents with internet-related addictive behaviors: Trait differences for gaming addiction and social networking addiction. *Addictive behaviors*, *42*, 32-35.

Wang, H. R., Cho, H., & Kim, D. J. (2018). Prevalence and correlates of comorbid depression in a nonclinical online sample with DSM-5 internet gaming disorder. *Journal of Affective Disorders*, *226*, 1-5.

Wang, Q., Ren, H., Long, J., Liu, Y., & Liu, T. (2019). Research progress and debates on gaming disorder. *General psychiatry*, *32*(3).

Wang, Z., Hu, Y., Zheng, H., Yuan, K., Du, X., & Dong, G. (2019). Females are more vulnerable to Internet gaming disorder than males: Evidence from cortical thickness abnormalities. *Psychiatry Research: Neuroimaging*, *283*, 145-153.

Wartberg, L., Kriston, L., & Thomasius, R. (2017). The prevalence and psychosocial correlates of internet gaming disorder: analysis in a nationally representative sample of 12-to 25-Year-Olds. *Deutsches Ärzteblatt International*, *114*(25), 419.

Wartberg, L., Kriston, L., Kammerl, R., Petersen, K. U., & Thomasius, R. (2015). Prevalence of pathological internet use in a representative German sample of adolescents: Results of a latent profile analysis. *Psychopathology*, *48*(1), 25-30.

Wartberg, L., Kriston, L., Zieglmeier, M., Lincoln, T., & Kammerl, R. (2019). A longitudinal study on psychosocial causes and consequences of Internet gaming disorder in adolescence. *Psychological medicine*, *49*(2), 287-294.

Wartberg, L., Thomsen, M., Moll, B., & Thomasius, R. (2014). [Pilot study on the effectiveness of a cognitive behavioural group programme for adolescents with pathological internet use]. *Praxis der Kinderpsychologie und Kinderpsychiatrie*, *63*, 21-35.

Wegmann, E., Oberst, U., Stodt, B., & Brand, M. (2017). Online-specific fear of missing out and Internet-use expectancies contribute to symptoms of Internet-communication disorder. *Addictive Behaviors Reports*, *5*, 33-42.

Wei, H.T., Chen, M.H., Huang, P.C., & Bai, Y.M. (2012). The association between online gaming, social phobia and depression: An internet survey. *BMC Psychiatry*, *12*, 92

Winkler, A., Dörsing, B., Rief, W., Shen, Y., & Glombiewski, J.A. (2013). Treatment of internet addiction: A meta-analysis. *Clinical Psychology Review*, *33*, 317-329.

Witkiewitz, K. & Marlatt, G. A. (2004). Relapse prevention for alcohol and drug problems: that was Zen, this is Tao. *American Psychologist*, *59*, 224.

Wittek, C. T., Finserås, T. R., Pallesen, S., Mentzoni, R. A., Hanss, D., Griffiths, M. D., & Molde, H. (2016). Prevalence and predictors of video game addiction: A study based on a national representative sample of gamers. *International journal of mental health and addiction*, *14*(5), 672-686.

Wohl, M. J., Gainsbury, S., Stewart, M. J., & Sztainert, T. (2013). Facilitating responsible gambling: The relative effectiveness of education-based animation and monetary limit setting pop-up messages among electronic gaming machine players. *Journal of Gambling Studies, 29*, 703-717.

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

Wölfling, K., Müller, K. W., Dreier, M., Ruckes, C., Deuster, O., Batra, A., ... Hanke, S. (2019). Efficacy of short-term treatment of internet and computer game addiction: a randomized clinical trial. *JAMA Psychiatry*, *76*, 1018-1025.

World Health Organization. (2019). Gaming disorder (6C51). Accessed 15/6/2020. Available from: https://icd.who.int/browse11/l-m/en#/http://id.who.int/icd/entity/1448597234

Xu, Z., Turel, O., & Yuan, Y. (2012). Online game addiction among adolescents: motivation and prevention factors. *European Journal of Information Systems*, *21*(3), 321-340.

Yang, M. K., & Oh, W. O. (2007). Effects of the internet game addiction prevention educational program on self-control and time spent on internet games by elementary school students. *Child Health Nursing Research*, *13*(3), 282-290.

Yee, N. (2006). The demographics, motivations, and derived experiences of users of massively multi-user online graphical environments. *Presence: Teleoperators and virtual environments*, *15*(3), 309-329.

Yen, J. Y., Liu, T. L., Wang, P. W., Chen, C. S., Yen, C. F., & Ko, C. H. (2017). Association between Internet gaming disorder and adult attention deficit and hyperactivity disorder and their correlates: Impulsivity and hostility. *Addictive Behaviors*, *64*, 308-313.

Yeun, Y. R. & Han, S. J. (2016). Effects of psychosocial interventions for school-aged children's internet addiction, self-control and self-esteem: meta-analysis. *Healthcare Informatics Research, 22,* 217-230.

Young, K. S. & Brand, M. (2017). Merging theoretical models and therapy approaches in the context of Internet Gaming Disorder: A personal perspective. *Frontiers in Psychology: Psychopathology, 8,* article 1853.

Young, K. S. (1996). Psychology of computer use: XL. Addictive use of the Internet: a case that breaks the stereotype. *Psychological Reports*, *79*, 899-902.

Young, K. S. (1998a). Internet addiction: The emergence of a new clinical disorder. *Cyberpsychology & Behavior*, *1*, 237-244.

Young, K. S. (1998b). *Caught in the net: How to recognize the signs of internet addiction--and a winning strategy for recovery*. New Jersey: John Wiley & Sons.

Young, K. S. (2007). Cognitive behavior therapy with Internet addicts: Treatment outcomes and implications. *CyberPsychology & Behavior, 10,* 671-679.

Young, K. S. (2013). Treatment outcomes using CBT-IA with Internet-addicted patients. *Journal of Behavioral Addictions, 2,* 209-215.

Yu, H., & Cho, J. (2016). Prevalence of internet gaming disorder among Korean adolescents and associations with non-psychotic psychological symptoms, and physical aggression. *American journal of health behavior, 40*(6), 705-716.

Yue, Z., Li, C., Weilin, Q., & Bin, W. (2015). Application of the health belief model to improve the understanding of antihypertensive medication adherence among Chinese patients. *Patient education and counseling*, *98*(5), 669-673.

Zajac, K., Ginley, M. K., & Chang, R. (2020). Treatments of internet gaming disorder: a systematic review of the evidence. *Expert review of neurotherapeutics*, *20*(1), 85-93.

Zajac, K., Ginley, M. K., Chang, R., & Petry, N. M. (2017). Treatments for Internet gaming disorder and Internet addiction: A systematic review. *Psychology of Addictive Behaviors*, *31*, 979-994.

Zamani, E., Kheradmand, A., Cheshmi, M., Abedi, A., & Hedayati, N. (2010). Comparing the social skills of students addicted to computer games with normal students. *Addiction & Health*, *2*, 59-65.

Zendle, D. (2019). Problem gamblers spend less money when loot boxes are removed from a game: a before and after study of Heroes of the Storm. *PeerJ*, *7*, e7700.

Zhang, J., Hu, Y., Wang, Z., Wang, M., & Dong, G. H. (2020). Males are more sensitive to reward and less sensitive to loss than females among people with internet gaming disorder: fMRI evidence from a card-guessing task. *BMC psychiatry*, *20*(1), 1-14.

Zimbardo, P. G. & Duncan, N. (2012). The demise of guys: Why boys are struggling and what we can do about it. TED Conferences, LLC.

Zimmerman, P., & Iwanski, A. (2014). Emotion regulation from adolescence to emerging adulthood and middle adulthood: age differences, gender differences and emotion specific development variations.