J Abnorm Child Psychol (2016) 44:1635–1645
DOI 10.1007/s10802-016-0135-y

# The Cognitive Psychopathology of Internet Gaming Disorder in Adolescence

**Daniel L. King**[1] · **Paul H. Delfabbro**[1]

Published online: 15 February 2016


**Abstract** Adolescents are known to be an at-risk population for developing Internet gaming disorder (IGD). A recent clinical model has proposed that adolescents with IGD may endorse a unique set of maladaptive beliefs that underlie persistent and excessive involvement in Internet gaming activities. These include (a) beliefs about game reward value and tangibility, (b) maladaptive and inflexible rules about gaming behaviour, (c) over-reliance on gaming to meet self-esteem needs, and (d) gaming as a method of gaining social acceptance. A sample of 824 adolescents (402 male and 422 female) were recruited from multiple secondary schools and administered a survey that included measures of IGD symptomatology, problematic Internet gaming cognition, and psychological distress. The results showed that adolescents with IGD report significantly more maladaptive gaming beliefs than adolescents without IGD, including those who play Internet games for more than 30 h per week. The size of observed effects were large. The strong association between gaming cognitions and IGD symptoms still held after controlling for measures of gaming activity and psychological distress. These findings indicate that adolescents with IGD have distinct problematic thoughts about gaming, and highlight the importance of addressing these cognitions in therapeutic interventions for the disorder.

**Keywords** Adolescent · Internet gaming disorder · Video-gaming · Cognition · CBT · Psychopathology

✉ Daniel L. King
daniel.king@adelaide.edu.au

[1] School of Psychology, The University of Adelaide, Level 4, Hughes Building, Adelaide, SA 5005, Australia

Children and adolescents are known to be particularly susceptible to psychological problems associated with persistent Internet gaming (Ferguson, Coulson, and Barnett 2011; King et al. 2013a; Kuss and Griffiths 2012; Mentzoni et al. 2011; van Rooij, Schoenmakers, Vermulst, van de Eijnden, and van de Mheen 2010). Commonly reported problems include interference with or displacement of life responsibilities (e.g., schoolwork, chores), social and leisure pursuits (e.g., sport, hobbies, social events), health and lifestyle behaviours (e.g., sleep, diet, exercise) (Pies 2009; Porter, Starcevic, Berle, and Fenech 2010), and increased risk of psychopathology (King et al. 2013a, b; Thomas and Martin 2010). A dominant clinical conceptualisation of excessive Internet gaming in the academic literature over the last 15 years has been the model of behavioural addiction (King and Delfabbro 2014a). In recognition of this, Internet Gaming Disorder (IGD) was included in the appendix of the DSM-5 as a condition warranting further study (American Psychiatric Association 2013). The IGD classification is most similar in nature to pathological gambling (or *Gambling disorder* in the DSM-5) and involves symptomatology including preoccupation, tolerance and withdrawal, loss of control over gaming, and psychosocial problems resulting from excessive play. Although there have been some attempts to adapt these criteria to cognitive-behavioural terminology and models (Caplan 2010; Davis 2001; Pawlikowski and Brand 2011), currently there is a lack of an evidence base on IGD cognition that extends beyond the criterion of preoccupation (King and Delfabbro 2014b; Petry et al. 2014).

Preoccupation or cognitive salience is central to most definitions of problematic video-gaming (Kuss and Griffiths 2012; Shapira et al. 2003). For example, a systematic review by King, Haagsma, Delfabbro, Gradisar, and Griffiths (2013b) reported that the majority (i.e., 14 out of 18) of assessment tools for problematic video-gaming include this criterion.

Despite this, there have been concerns that this criterion lacks clinical validity because it does not appear to distinguish between non-problem and problematic Internet gamers (Charlton 2002; Charlton and Danforth 2007). This may be due partly to measurement issues, such as ambiguous item wording or lack of qualifying information, and/or inadequate severity ratings to measure a clinical subtype of preoccupation. Another possibility is that adhering to a broad definition of preoccupation (i.e., thinking about Internet games and planning the next session of play) may fail to identify specific problematic beliefs about Internet gaming (King and Delfabbro 2014b). For example, using the example of eating disorders, many people report having daily thoughts about their body shape and/or appearance, whereas only individuals with diagnosed anorexia nervosa will report significantly distorted thinking about body image and a pathological fear of gaining weight. Similarly, regular gamblers may report a frequent tendency to think about and plan gambling sessions, whereas pathological gamblers will report irrational beliefs related to the long-term profitability and degree of player control involved in gambling. Following this reasoning, it may be that adolescents with IGD endorse a similarly idiosyncratic set of maladaptive beliefs related to Internet gaming that underlie persistent and excessive involvement in these activities.

## Models of Internet Gaming Cognition

IGD-related cognition represents a rapidly growing field of clinical psychology (Forrest, King, and Delfabbro 2016). A frequently cited cognitive-behavioural conceptualisation of relevance to IGD is Davis' (2001) model of generalised problematic Internet use. Davis' (2001) model suggests that pathological Internet use results from "problematic cognitions coupled with behaviours that either intensify or maintain the maladaptive response" (p 191). Maladaptive cognitions include two main subtypes: (1) thoughts about the self, and (2) thoughts about the world. Thoughts about the self include self-doubt, low self-efficacy, and negative self-appraisal. In essence, the individual has a negative view of his or herself and uses the Internet to achieve positive social interaction and feedback from others. Notably, these cognitions are very similar to negative thinking styles described in Beck's (1964) cognitive theory of depression. Cognitions about the self may include such thoughts as, "I am only good on the Internet" or "I am worthless offline, but online I am someone". Cognitive distortions about the world involve generalising specific events to global trends. These may include thoughts such as "The Internet is the only place I can feel safe" or "Nobody loves me offline". These two cognitive distortions are triggered by stimuli associated with the Internet, and initiate and maintain excessive behavioural patterns of Internet use.

An alternative but similar model by Caplan (2010) has proposed two cognitive features of pathological Internet use. These features include: (1) *preference for online social interaction* (POSI), defined as the belief that one is safer, more efficacious, more confident, and more comfortable with online interpersonal interactions and relationships than with face-to-face social activities, and (2) *preoccupation*, defined as obsessive thought patterns concerning Internet use. The POSI concept was proposed as an extension of Davis' (2001) cognitive distortions about the self. The notion that the Internet enables an individual to fulfil basic wellbeing and social needs has been advanced several times previously in the literature. For example, a recent (non-clinical) motivational model of video-gaming by Przybylski Rigby, and Ryan (2010) suggests that the appeal of video games is based on their potential to satisfy basic psychological needs for competence, autonomy, and relatedness. Similarly, Lortie and Guitton (2013) and Charlton and Danforth (2007) have identified social motivations underlying Internet use as potentially clinical relevant. In summary, although prevailing cognitive models of Internet use are useful in conceptualising the negative core beliefs among general Internet users (see King, Delfabbro, and Griffiths 2012), primarily these models are quite speculative in nature, are adapted from negative thinking styles described in depression, and very limited in their reference to cognitions specific to video-gaming activities and IGD by extension.

## The Four-Factor Model of IGD Cognition

A new model of IGD cognition was proposed in a systematic review by King and Delfabbro (2014a). The authors identified four cognitive factors underlying problematic gaming: (a) beliefs about game reward value and tangibility (or, 'overvaluing'), (b) maladaptive and inflexible rules about gaming behaviour (or, 'maladaptive rules'), (c) over-reliance on gaming to meet self-esteem needs (or, 'gaming self-esteem'), and (d) gaming as a method of gaining social acceptance (or, 'gaming acceptance'). Each factor included specific sub-cognitions. For example, the factor relating to beliefs about video-gaming rewards included the following cognitions: (1) *reward value and tangibility*, or the overvaluation of gaming items, rewards, and/or virtual currency such that they are perceived to be tangible and of significantly greater value than all other life activities, (2) *avatar attachment*, the perception of one's avatar or online identity as a friend or intimate partner, or an extension of oneself, and (3) *obsession,* or the general preoccupation with Internet gaming, associated with constant planning and anticipation of the next Internet gaming session. The authors concluded that there may be several important and distinct cognitive factors that underlie Internet gaming disorder, and that these factors required further evaluation within studies employing both general

population and clinical samples. To date, however, this typology has not been subject to empirical investigation.

## The Present Study

There currently exists a need to better understand the cognitive factors that underlie Internet gaming disorder in adolescence. Prevailing cognitive-behavioural models of problematic Internet gaming (e.g., Davis 2001; Caplan 2010) have been based on the concept of preoccupation (i.e., obsessive thought patterns) as well as general maladaptive beliefs about the self, others, and the world. In this way, these models have lacked detailed exploration of the ways in which the user 'mentalises' (e.g., evaluates, categorises, plans, and reasons) problematic Internet gaming experiences. The aim of the present study was therefore to quantitatively describe and examine the presence of problematic gaming beliefs in a sample of adolescents with and without IGD. It was hypothesised that adolescents with IGD would report a significantly higher number of problematic Internet gaming cognitions than non-IGD adolescents. Specifically, it was expected that IGD adolescents would: (i) be more likely to overvalue gaming rewards, items, and identities, (ii) have more inflexible rules and biases that increase gaming behaviours, and (iii) be more reliant on gaming for their self-esteem and social identity. An additional objective of the study was to identify the specific gaming cognitions that contributed to increased risk of IGD symptomatology.

## Method

### Design and Procedure

This study represents Stage 2 of a large-scale cross-sectional survey project on adolescent mental health and electronic media use in Australia. Stage 1 of the project has been described in detail elsewhere (King et al. 2013a, b; King, Delfabbro, Kaptsis, and Zwaans 2014). In Stage 1, 50 secondary schools in the metropolitan region of Adelaide, South Australia, were randomly selected and invited from a comprehensive list of public and private schools. In total, seven co-educational schools (four public, three private) consented to participate. Stage 2 involved recontacting these schools to re-participate in the 2014 intake round. Four secondary schools (two private, two public) agreed to participate. All students aged 12 years and older were invited to participate. Remaining schools declined on the basis of competing demands. A total of 824 high school students were recruited, including 402 males and 422 females. The average age was 14.1 years ($SD = 1.5$). The sample was 92.7 % Caucasian.

Data were collected from June to August 2014. Data collection was facilitated by two research assistants and teachers at each of the secondary schools during class hours. An online version of the questionnaire was available via an online survey portal, however this option was declined in favour of a paper-and-pencil format. Completed survey responses were entered and analysed using SPSS for Windows (v22.0). A total of 20 responses were excluded due to erroneous responses or missing data.

### Measures

A standardised questionnaire assessed basic demographic information (i.e., age, gender, school, grade, ethnic background, primary language) and aspects of video-gaming activity (i.e., ownership and accessibility, frequency of use in a typical week period over the previous 3-month period, function and social context of gaming, and types of games played). Psychometric assessment involved administration of the following instruments:

**Internet Gaming Disorder (IGD)** *checklist*. The IGD checklist is a 12-item self-report questionnaire used to assess problematic use of Internet video games. The measure includes all nine items listed in the DSM-5 classification of Internet Gaming Disorder, including: (A) preoccupation; (B) withdrawal symptoms; (C) tolerance; (D) loss of control; (E) loss of interest in other activities; (F) continued use despite harm; (G) deception of others; (H) escape; and (I) harm. Item wording of the scale adhered to recommendations suggested by Petry et al.'s (2014) consensus statement on assessment. In line with the DSM-5 guidelines, an individual must endorse five or more items to meet the clinical classification. Only the first 9 items that directly correspond to DSM-5 criteria were employed for scoring purposes. All items were scored using a yes/no format. The internal reliability of the 9 items was adequate, with a Cronbach's alpha of 0.78. As a validity check (and a measure of participant insight/awareness), two additional items asked whether the respondent (1) personally believed that they had a video-gaming problem (yes/no), and (2) whether others had stated whether they have a gaming problem (yes/no). The final item on the scale refers to the course of symptoms, with response categories including '0–3 months', '3–6 months', '6–12 months' or 'Over 12 months'.

**Internet Gaming Cognition Scale** The Internet Gaming Cognition Scale is a 24-item measure designed to assess problematic gaming-specific cognitions that occur in Internet gaming disorder (King and Delfabbro 2014a, b). Conceptually, the measure extends the DSM-5 criterion of *preoccupation* (i.e., persistence, obsessiveness, and intrusiveness of thoughts) to examine the *content* of beliefs about Internet gaming (Delfabbro and King 2015; King and Delfabbro 2014b). Scale conceptualisation was based on King and Delfabbro's

(2014a) four-factor model of gaming cognition, which refers to the following cognitive processes: (a) *overvaluing gaming rewards*, (b) *maladaptive and inflexible rules about gaming*, (c) *gaming self-esteem beliefs*, and (d) *gaming for social identity*. Table 1 provides a comprehensive account of the 17 sub-cognitions and their corresponding scale items, as described by King and Delfabbro (2014a). Respondents are asked to indicate whether they agree or do not agree with a series of self-referent statements. Item response categories included 0: *Do not agree*, 1: *Agree* and 2: *Strongly agree*. Agreement indicates the presence of a problematic cognition. Subscale scores were calculated by summing relevant items. Total scores range from 0 to 48. The internal reliability of the measure was excellent, with Cronbach's alpha values including 0.87 for *Overvaluing*, 0.81 for *Maladaptive rules*, 0.90 for *Gaming self-esteem*, and 0.85 for *Gaming social acceptance*. A copy of this measure is available free by request of the corresponding author.

**Depression Anxiety Stress Scales** *21-item version* (DASS-21). The DASS-21 (henceforth, DASS) is a widely used measure of distress arising from Axis I disorder symptomatology (Lovibond and Lovibond 1995). The Depression scale assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest/involvement, anhedonia, and inertia. The Anxiety scale assesses autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect. The Stress scale is sensitive to levels of chronic non-specific arousal, and assesses difficulty relaxing, nervous arousal, and being easily upset/agitated, irritable/over-reactive and impatient. The scales are suitable for use in adult and adolescent samples in both clinical and non-clinical settings.

**Table 1** Problematic cognitions related to internet gaming: Subtypes and scale items

| Types | Subtypes | Scale items |
|---|---|---|
| Overvaluing of game rewards | *Reward value and tangibility* | *Game rewards are as meaningful to me as anything else in life.* |
| | *Avatar identification* | *I feel a connection to my game character, like it is a part of who I am.* |
| | *Obsession (rumination/planning)* | *I tend to think about video-games when I am not playing.* |
| | | *I often plan or think about the next thing I need to do in a game.* |
| Maladaptive and inflexible gaming rules | *Sunk cost bias* | *It would be a waste to stop playing because I have invested so much time and energy.* |
| | *Cognitive regret* | *When I make mistakes or fail in a game, I must retry until I succeed.* |
| | *Behavior completion* | *When I have a goal in a game, I must complete it as soon as possible. I am not satisfied until I have done everything I want to in a game.* |
| | *Procrastination/ Prioritisation* | *The game takes priority before other things I need to do.* |
| | *Rule-setting (time/completion)* | *I tell myself 'just a few more minutes', but then play much longer. I won't stop playing if I have uncompleted goals. No amount of gaming time ever feels like long enough.* |
| Gaming-based self-esteem | *Gaming self-esteem* | *I am proud of myself for what I have achieved in games.* |
| | *Expectancy beliefs* | *I can count on video games to make me feel better. I feel bad when I don't get my usual gaming time.* |
| | *Lack of real life control* | *I am more in control when I'm playing the game.* |
| | *Real life vulnerability* | *I feel safer or more comfortable gaming than dealing with real life. I could not cope with stress without video-games.* |
| | *Achievement belief* | *I can achieve more in a game than I can anywhere else.* |
| Gaming to gain social acceptance | *Social relatedness* | *Non-gamers do not understand an important part of who I am.* |
| | *Competition* | *It is important to me that I am better at the game than others, e.g., higher level, better gear, etc.* |
| | *Social avoidance* | *Gaming protects me from people that make uncomfortable.* |
| | *Sense of acceptance and belonging* | *When I do well in a game, players notice and respect me. Other players admire and respect my gaming achievements.* |

All items scored: '0: No agreement', '1: Agree', '2: Strongly Agree'. An alternative version may employ additional disagreement response categories to account for protective cognitions

The DASS has published Australian norms for adolescents (Tully, Zajac, and Venning 2009). Although the scales are non-diagnostic, it is possible to assign severity ratings to symptoms (see Lovibond and Lovibond 1995). In the present study, the measure's internal reliability was high, with Cronbach's alpha values of 0.92 for *Depression*, 0.86 for *Anxiety*, and 0.89 for *Stress*.

### Data Analysis

Initial descriptive analyses, independent-samples *t*-tests, and one-way ANOVAs were performed on the dataset to determine differences in demographic, cognition, and distress scores according to IGD status. Specific IGD subgroups were created by applying DSM-5 criteria to identify 'non-problem' and 'clinical' cases. Note that the term 'clinical' is employed in this paper as a short-hand to denote a probable but unverified diagnosis given the best available information. It is also acknowledged that the DSM-5 IGD formulation is preliminary and warranting further study. To evaluate potential differences in cognitive profiles across IGD and gaming activity groups, analysis of variance (ANOVA) techniques were employed. A hierarchical regression was employed to examine the relationship between gaming cognition variables and IGD symptomatology. A dimensional approach was employed because it enabled greater sensitivity in modelling the change and progression of cognitive variables along the spectrum of IGD risk.

## Results

### The Prevalence, Characteristics and Course of IGD Symptoms

Table 2 presents a summary of the demographic and psychological characteristics of the overall sample ($N = 824$). Three groups of participants were delineated: (1) *Non-problem* (1–2 symptoms); (2) *At-risk* (3–4 IGD symptoms); and (3) *Clinical* (5 or more IGD symptoms, as per DSM-5 guidelines). The prevalence of IGD in the sample was 3.1 %. This was consistent with a recent meta-review that reported an adjusted worldwide prevalence rate of 3.1 % across 30 studies conducted internationally (Ferguson et al. 2011). The most commonly reported symptoms among clinical cases in our sample were *escape* (96 %), *preoccupation* (92 %), *tolerance* (77 %), and *continued use despite harm* (77 %). Clinical cases predominantly played shooting action games (96 %) and massively multiplayer online gamers (81 %). The majority (96 %) of clinical cases had a personal computer (PC) or gaming console in their bedroom, and spent, on average, about two-thirds (65 %) of their gaming playing alone or with strangers online.

Although time spent gaming is known to be not directly indicative of harm (Gentile et al. 2011), it was noted that clinical cases reported, on average, at least 3 h per day playing video games. This amount exceeds the recommended screen time guidelines (i.e., <2 h per day) for adolescents set forth by multiple health guidelines internationally (Department of Health and Ageing, 2004; Council on Communications and Media, 2013). Only 11 (42 %) clinical cases indicated 'yes' to a query about whether they believed that they had a video-gaming problem (an additional 6 responded ambivalently to this question). Similarly, 13 (50 %) clinical cases indicated that others had stated that they have a video-gaming problem (5 responded 'sometimes'). Only 3 (11 %) clinical cases denied having a gaming problem that was either self-identified or identified by others. The majority of clinical cases who identified having a gaming problem reported a symptom course greater than 12 months ($N = 13$, 72 %).

### Comparisons of Study Variables According to IGD Classification

A one-way ANOVA revealed significant between-group differences in total weekly hours spent video-gaming, with Tukey HSD post-hoc tests indicating an upward trend in gaming hours according to IGD classification. Clinical cases reported spending 5 times as many gaming hours per week than non-problem comparison cases. This effect size was moderate (Cohen 1992). Significant between-group differences in gaming cognition scores were observed. Clinical cases scored significantly higher than at-risk cases on all cognition subscales who, in turn, scored significantly higher than comparison cases. Notably, both non-problem and at-risk cases indicated agreement with, on average, no more than 5 items on the 24-item video-gaming cognition scale. In contrast, clinical cases, on average, endorsed 15 items on the cognition scale. This effect size was large and greater than between-group differences in time spent playing video-games. There were statistically significant between-group differences on DASS subscales, but the observed effect sizes were relatively small and group mean scores tended to fall within the 'mild' to 'moderate' range for symptom severity, indicating relatively low clinical significance. There were no statistically significant age differences in IGD classification. However, there was a small effect of gender on IGD classification, with a greater tendency toward males reporting IGD symptoms.

### Assessment of Cognitive Profiles of Clinical Cases

To further examine between-group differences in cognition according to IGD classification, a separate analysis involved identification of two subgroups of participants: (1) *clinical cases* (meeting 5 or more IGD criteria, as noted above), and (2) *highly engaged players* (zero reported IGD symptoms, and

**Table 2** Demographic and psychological characteristics of the overall sample ($N = 824$) categorised by IGD classification groups

| | Non-problem ($N = 757$) | | At-risk ($N = 41$) | | Clinical ($N = 26$) | | Group differences | | Effect size | Post hoc[2] |
|---|---|---|---|---|---|---|---|---|---|---|
| | M | SD | M | SD | M | SD | F (df = 2) | p | $\eta^2$ | |
| Age | 14.1 | 1.5 | 14.5 | 1.3 | 14.5 | 1.2 | 2.1 | 0.12 | <0.01 | – |
| Gender[1] | 1.5 | 0.5 | 1.2 | 0.4 | 1.1 | 0.3 | 21.4 | <0.01 | 0.05 | C = R > N |
| VG hours/week | 4.8 | 8.1 | 20.8 | 16.3 | 27.8 | 13.3 | 141.9 | <0.01 | 0.26 | C > R > N |
| Gaming cognition | | | | | | | | | | |
| Overvaluing | 0.8 | 1.6 | 3.5 | 3.4 | 7.8 | 3.9 | 153.6 | <0.01 | 0.38 | C > R > N |
| Maladaptive rules | 1.3 | 2.0 | 5.6 | 3.2 | 8.7 | 3.5 | 153.4 | <0.01 | 0.38 | C > R > N |
| Gaming self-esteem | 0.8 | 1.6 | 3.8 | 2.8 | 7.4 | 2.8 | 184.8 | <0.01 | 0.42 | C > R > N |
| Gaming acceptance | 0.5 | 1.5 | 3.1 | 2.9 | 5.5 | 3.0 | 125.8 | <0.01 | 0.34 | C > R > N |
| Total score | 2.8 | 4.9 | 14.8 | 10.0 | 29.8 | 12.4 | 206.7 | <0.01 | 0.48 | C > R > N |
| DASS | | | | | | | | | | |
| Depression | 4.3 | 4.5 | 7.4 | 6.9 | 7.0 | 6.2 | 5.6 | <0.01 | 0.02 | C = R > N |
| Anxiety | 4.4 | 4.5 | 6.1 | 4.4 | 6.9 | 5.8 | 7.6 | <0.01 | 0.02 | C = R > N |
| Stress | 5.4 | 5.4 | 7.4 | 5.7 | 8.7 | 5.7 | 7.8 | <0.01 | 0.03 | C = R > N |

[1] Gender coding: *1* Male, *2* Female. [2] N, Non-problem, *R* At-risk, *C* Clinical. [2] Tukey HSD test. *VG* Video Gaming

playing at least 25 h per week of video-gaming; see Charlton and Danforth (2007) for discussion of *high engagement*). Groups did not differ significantly in gender ($t = 0.19$, $p = 0.85$) or age ($t = 0.19$, $p = 0.85$). These selection criteria yielded a non-clinical gaming group to directly compare with clinical cases along psychological variables, given an assumed matching on video gaming use, knowledge or familiarity, and history. The identified non-clinical group reported significantly higher video-gaming activity than the clinical group using this selection method. As indicated in Table 3, independent-samples t-tests indicated that clinical cases scored significantly higher than highly engaged players (i.e., healthy controls) on all cognition-related measures. The effect sizes for these differences ranged from large to very large. In particular, clinical cases scored over one standard deviation higher than controls on *overvaluing* and *gaming self-esteem* scales as well as total cognition scores. Comparisons of DASS scores across groups also identified large differences in Axis I disorder symptomatology, but DASS symptom severity was relatively low in clinical terms across groups.

## The Role of Cognition in Internet Gaming Disorder

Further multivariate analysis was conducted to assess the statistical utility of cognition variables in predicting IGD symptomatology. Table 4 presents Pearson's correlations employed to assess bivariate relationships between demographics, video-gaming activity, cognition variables, and DASS

**Table 3** A comparison of highly engaged video-gamers with and without IGD on cognition and psychological distress

| | No IGD[1] ($N = 39$) | | IGD group[2] ($N = 22$) | | Group differences | | Effect size |
|---|---|---|---|---|---|---|---|
| Variable | Mean | SD | Mean | SD | *t* | *p* | Cohen's d |
| Video-gaming hours/week | 38.2 | 10.2 | 30.6 | 12.4 | 2.54 | <0.05 | 0.73 |
| COGNITION | | | | | | | |
| *Overvaluing* | 4.0 | 3.4 | 8.7 | 3.2 | 4.17 | <0.05 | 1.41 |
| *Maladaptive rules* | 5.8 | 3.4 | 9.0 | 3.3 | 2.81 | <0.01 | 0.95 |
| *Gaming self-esteem* | 4.1 | 3.1 | 7.6 | 2.8 | 3.63 | <0.01 | 1.17 |
| *Gaming acceptance* | 3.1 | 3.1 | 5.5 | 3.0 | 2.39 | <0.01 | 0.78 |
| Total score | 13.8 | 10.1 | 31.0 | 12.3 | 3.78 | <0.01 | 1.57 |
| DASS | | | | | | | |
| *Depression* | 4.0 | 4.2 | 7.0 | 5.8 | 2.15 | <0.01 | 0.62 |
| *Anxiety* | 4.5 | 3.6 | 6.6 | 5.2 | 2.09 | <0.01 | 0.50 |
| *Stress* | 5.4 | 4.3 | 8.6 | 5.4 | 3.26 | <0.01 | 0.68 |

[1] Playing video-games for 25+ hours per week and endorsing zero IGD symptoms. [2] Endorsement of 5 or more IGD criteria

**Table 4** Zero-order correlations between demographics, video-gaming frequency, IGD symptoms, cognitive factors, and psychological distress

| Variable | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Age | 0.07 | 0.08 | 0.06 | 0.26* | 0.27* | 0.25* | 0.25* | 0.23* | 0.17* | 0.22* |
| 2. Gender | | 0.55* | 0.35* | 0.32* | 0.32* | 0.40* | 0.34* | 0.18* | 0.16* | 0.15* |
| 3. Video-gaming frequency[a] | | | 0.59* | 0.55* | 0.56* | 0.57* | 0.53* | 0.03 | 0.01 | 0.02 |
| 4. IGD symptoms | | | | 0.51* | 0.61* | 0.59* | 0.59* | 0.16* | 0.14* | 0.17* |
| 5. Cognition: *Overvaluing* | | | | | 0.68* | 0.70* | 0.63* | 0.18* | 0.20* | 0.25* |
| 6. Cognition: *Maladaptive rules* | | | | | | 0.69* | 0.62* | 0.25* | 0.24* | 0.28* |
| 7. Cognition: *Gaming self-esteem* | | | | | | | 0.70* | 0.20* | 0.21* | 0.21* |
| 8. Cognition: *Gaming social acceptance* | | | | | | | | 0.18* | 0.21* | 0.21* |
| 9. DASS *Depression* | | | | | | | | | 0.79* | 0.80* |
| 10. DASS *Anxiety* | | | | | | | | | | 0.78* |
| 11. DASS *Stress* | | | | | | | | | | |

* < 0.05. [a] Weekly video-gaming hours

measures. Notably, this analysis identified significant and strong correlations between gender and cognition variables and IGD symptoms, video-gaming activity and IGD symptoms, and IGD symptoms and cognition variables. Additional significant but relatively weaker correlations were observed across multiple variables. Correlations between all items within cognition variables and IGD symptom score were conducted, which identified the following significant relationships: positive expectancy belief (r = 0.62), negative expectancy belief (r = 0.58), preoccupation with unfinished objectives (r = 0.52), planning the next action in a video game (r = 0.53), a sense of being more in control when gaming (r = 0.58), and the belief that one would be unable to cope without gaming (r = 0.57).

Given that IGD scores were related to gaming frequency, psychological distress, as well as the cognition scores, it was important to examine the relationship between cognitions and IGD after controlling for these variables. The hierarchical regression analysis involved entering age, gender, gaming frequency and DASS variables on the first step (Model 1), followed by cognition variables on the second step (Model 2). As presented in Table 5, Model 2 significantly predicted IGD symptomatology and explained 60 % of the variance in IGD symptoms. Cognition variables accounted for 14 % of this variance in the model based on differences in adjusted R square values. DASS variables were not significant predictors in the final model. Although gender was a significant predictor, it accounted for less variance in IGD symptomatology than the combined influence of cognition variables. The two strongest cognition predictors of IGD symptoms were *maladaptive rules* and *gaming self-esteem*. Every unit increase in these two cognitions increased the likelihood of endorsing IGD criteria by 121 %.

## Discussion

This study has found that adolescents with Internet gaming disorder (IGD) may have specific maladaptive beliefs that differentiate them from other gaming populations, including adolescents without IGD who are highly engaged in video-gaming. These cognitions were categorised as follows: (1) the overvaluation of gaming rewards and identities, (2) inflexible rules and biases that arise in gaming situations, and (3) over-reliance on gaming to meet self-esteem needs, and (4) gaming as a method of gaining social acceptance. The results indicated that there is a linear positive relationship between the presence of maladaptive gaming cognitions and IGD symptomatology. Further, large practical differences (i.e., greater than one standard deviation) in cognition types were evident between IGD risk groups and non-problem gamers. These results provide preliminary empirical support for King and Delfabbro's (2014a) four-factor typology of IGD cognition. These findings suggest that there is potential for measures of IGD cognition to be included in future epidemiological studies and clinical trials on disordered gaming. Notably, the association between gaming cognitions and IGD symptoms could not be accounted for by psychological distress. This suggests that some presentations of disordered gaming should be

**Table 5** Hierarchical multiple regression models of demographic, gaming, cognitive, and psychological distress factors predicting IGD symptoms

| Model 1 | B | SE | β | t | Sig. | 95 % CI | |
|---|---|---|---|---|---|---|---|
| | | | | | | Upper | Lower |
| Constant | 1.67 | 1.38 | | | | | |
| Age | 0.13 | 0.10 | 0.04 | 1.31 | 0.19 | –0.06 | 0.32 |
| Gender | −1.80 | 0.31 | –0.18 | −5.82 | <0.05 | −2.44 | −1.21 |
| Gaming frequency | 0.28 | 0.05 | 0.56 | 18.43 | <0.05 | 0.25 | 0.32 |
| DASS Depression | 0.09 | 0.05 | 0.09 | 1.7 | 0.08 | –0.01 | 0.20 |
| DASS Anxiety | 0.05 | 0.06 | 0.05 | 0.92 | 0.36 | –0.06 | 0.17 |
| DASS Stress | 0.06 | 0.05 | 0.06 | 1.07 | 0.29 | –0.04 | 0.16 |
| Model 2 | | | | | | | |
| Constant | 0.27 | 2.32 | | | | | |
| Age | –0.97 | 0.17 | 0.05 | 1.69 | 0.11 | –0.07 | 0.61 |
| Gender | 0.17 | 0.35 | –0.09 | −2.76 | <0.05 | −1.67 | –0.28 |
| Gaming frequency | 0.06 | 0.03 | 0.27 | 6.14 | <0.05 | 0.11 | 0.22 |
| DASS Depression | –0.05 | 0.07 | 0.05 | 0.84 | 0.40 | –0.07 | 0.19 |
| DASS Anxiety | 0.05 | 0.07 | –0.04 | –0.64 | 0.52 | –0.18 | 0.09 |
| DASS Stress | 0.06 | 0.06 | 0.05 | 0.99 | 0.32 | –0.06 | 0.18 |
| Cognition: *Overvaluing* | 0.06 | 0.17 | 0.02 | 0.35 | 0.72 | –0.27 | 0.39 |
| Cognition: *Maladaptive rules* | 0.42 | 0.12 | 0.20 | 3.39 | <0.05 | 0.18 | 0.66 |
| Cognition: *Gaming self-esteem* | 0.52 | 0.18 | 0.21 | 2.94 | <0.05 | 0.17 | 0.88 |
| Cognition: *Gaming social acceptance* | 0.35 | 0.19 | 0.11 | 1.81 | 0.07 | –0.03 | 0.72 |

Model 1: Age, Gender, Gaming frequency, DASS variables (R square: 0.45). $F$ (6433) = 63.8, $p < 0.05$

Model 2: All variables; R square: 0.597 (Model 2 R square change: 0.14). $F$ (10,429) = 66.0, $p < 0.05$

formulated as a distinct problem instead of a secondary issue linked to other disorders.

The main finding of the study was that gaming cognitions were strongly associated with IGD symptomatology. Notably, the effect size of the observed difference in cognition scores was very high and approached two standard deviations, which is typically indicative of a clinically significant difference in intervention studies (Jacobson and Truax 1991). It was notable that the comparison sample of highly engaged adolescent gamers without IGD symptoms also endorsed, to a lesser degree, some of the same cognitions as their IGD counterparts. This indicates that certain gaming cognitions may not be problematic when they occur in limited number and frequency. It could also be inferred on this basis that gaming cognition may be represented along a spectrum that ranges from normal to dysfunctional beliefs. The level of persistence, specificity, intrusiveness and intensity of cognitions is likely to influence the degree to which an individual is at risk of gaming problems. This notion would be consistent with current understanding of the cognitive processes of psychopathologies in normal and clinical populations, such as: cognitive bias in gambling (Griffiths 1994), fear within phobias (Ollendick, Matson, and Helsel 1985), delusions in schizophrenia (Peters, Joseph, and Garety 1999), and body image concerns in eating disorders (Steiger, Goldstein, Mongrain, and Van der Feen 1990).

Non-problem and clinical IGD groups differed significantly on all four gaming cognition types. A regression analysis showed that two cognition types explained the most variance in IGD symptomatology. These two types were *maladaptive rules about gaming* and *gaming-based self-esteem*. Inspection of the correlations between gaming cognition scale items and disordered gaming symptoms identified the following variables of greatest significance: (1) positive and negative expectancy beliefs, (2) a greater sense of control when gaming, and (3) a belief that one could not cope without gaming. It is notable that these concepts are central to cognitive-behavioural models of substance abuse (Beck 1964) as well as the relapse prevention model (Marlatt and Gordon 1985). Specifically, these gaming cognitions may align with fundamental processes described by Wright et al. (1993), including *anticipation* (i.e., gaming-related expectancies), *relief* (i.e., providing a sense of control), and *facilitating* (i.e., granting permission to continue gaming based on belief that one cannot cope with gaming). Further work is needed to understand these processes in IGD, including their associated affective and arousal responses.

Two conceptual issues in the field of gaming cognition arise in considering these findings, and suggest some interesting future avenues of research. The first relates to the role of positive expectancies in maintaining excessive gaming. The significant associations between all cognition factors may

suggest that expectancy beliefs could be regulated by beliefs related to overvaluing of gaming. In functional terms, it may be that individuals who place a higher value on gaming assets and identities are more likely to report positive expectancies and/or greater discomfort if unable to play a video game. A case-comparison control study could examine this possibility using a protocol involving abstinence-induced cognitive change in individuals with IGD, which may also provide insight into the withdrawal symptomatology of Internet gaming disorder (Kaptsis et al. 2016). The second issue that warrants consideration is the notion of user control in gaming. Gaming is an activity that involves a high degree of player decision-making and hand-eye coordination, unlike other addictive behaviours including gambling. Gaming experiences may therefore be more likely to foster a belief that one is able to exercise control and have agency within a game. It is possible that this perception of self-control may generalise to distorted beliefs that one is able to control their gaming behaviours, including the belief that they can stop or reduce gaming at any time.

From a clinical perspective, it is notable that only 42 % of the clinical group self-reported that they had a gaming problem. It is possible that these gamers may be in denial, or feel too embarrassed or ashamed to admit having a problem, or rationalise that gaming is not harmful due to its positive aspects such as online socialisation. Problem gaming was found to often occur in social isolation or with online strangers, which may contribute to a defensive mentality about gaming problems. Together, this suggests that the acknowledgement of addiction symptoms alone, including negative consequences of gaming, appears to be insufficient for many adolescents to recognise that their gaming may be a problem. A lack of insight is a major obstacle for seeking self-directed or professionally administered help to overcome gaming problems (King, Delfabbro, and Griffiths 2012). However, it is notable that the gamers with IGD were apparently less ambivalent, as a whole, when completing the gaming cognition scale, on the basis of clearer differentiation of scores between problem and non-problem users on this scale. This may suggest that the gaming scale may circumvent the common problem of insight and/or other biases that limit responses to clinical measures. This scale may therefore be a useful screener of gaming problems in populations with low insight, particularly as a precursor to structured cognitive-behavioural therapy where such information is useful in guiding intervention.

The gaming cognition scale shows significant promise as a clinical tool, but it is preliminary and warrants further study. This study was not primarily designed to be a validation study, although it does represent the first stage of a planned series of studies that aim to validate this measure. The gaming cognition measure may require further refinement for use in different populations, including adaptation to different types of Internet games. For example, the social aspects of Internet gaming in MMOs is more likely to contribute to gaming self-esteem and identity beliefs than those games that lack social features. Particular item wording may be required to capture these specific differences. The conceptual factors in the scale also deserve further exploration and critical analysis. For example, the notion of overvaluation of gaming rewards may be further clarified to distinguish it clinically from other common cognitive processes, such as obsessions and delusions. There also remains a need to understand the etiological and maintaining factors of these cognitive processes, perhaps by employing prospective research designs. King et al. (2014) have noted that CBT interventions studies for IGD have lacked measures to assess cognitive change related to Internet gaming aside from general preoccupation; therefore, the inclusion of a gaming cognition scale in treatment studies may have some clinical utility.

Conducting school-based survey research presents several methodological challenges, including obtaining ethical clearance and school support, as well as numerous practical considerations of data collection. In view of these issues, it was fortunate that the present study obtained a large overall sample with no significant differences in gender or school type. There was a bias in age toward the 13–to 15-year old age range, however this was not related to gender or school type. This study was not designed, nor adequately resourced, to be a nationally representative prevalence study of gaming-related problems. There were also multiple levels of barriers to surveying students after gaining initial approval (e.g., non-distribution of surveys or consent forms, sickness of responsible teacher/facilitator, non-return of surveys, rescheduling of survey time). For ethical reasons, the schools in the study were agreeable to assisting with data collection on the condition that they were able to do so with independent authority. Therefore, it was not possible to obtain access to student records of enrolment and/or attendance to document all aspects of data collection at a within-school level. Schools were also understandably unwilling to provide related administrative support due to the extra burden it presented to their teachers and other facilitators. Future studies with greater resources and collaborative support could investigate school- and population-level demographic and socioeconomic factors in relation to the observed effects in this study.

## Conclusions

This study suggests that dysfunctional gaming cognitions may be a useful discriminator of adolescent gamers with and without Internet gaming disorder. The identified Internet gaming beliefs may be useful to investigate further in research endeavours and clinical settings. However, the identification of systematic differences in IGD cognitive profiles represents only a starting point for understanding the internal mental processes of gaming disorders. Further work is needed to follow up on

these observations, particularly in diverse gaming populations, to better understand aetiology, prevalence, and associated risk factors. Internet gaming cognition may serve as a useful adjunct measure of outcomes in intervention studies, particularly in light of known issues related to participant insight into gaming problems. For practicing health professionals, identifying IGD cognitions may be helpful in developing a clinical formulation and informing treatment strategies for the adolescent client and family involved. It is hoped that this preliminary work may guide many further investigations in the new and growing research into the cognitive factors underlying Internet gaming disorder.

**Compliance with Ethical Standards**

**Financial Disclosure** This work received financial support from a 2014 Trevor Prescott Memorial Scholarship from the SA Masonic Foundation and a 2014 RIBG Small Research Grant funded by the School of Psychology, The University of Adelaide.

**Conflict of Interest** The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

**Ethical Approval** All authors complied with the APA ethical standards in the treatment of participants. This study was approved by the Human Research Ethics Subcommittee at the University of Adelaide, and the Department for Education and Child Development.

**Informed Consent** All participants and parents provided informed consent and participants were free to withdraw from the study at any time.

## References

American Psychiatric Association [APA]. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington: Author.

Beck, A. T. (1964). Thinking and depression II: Theory and therapy. *Archives of General Psychiatry, 10*, 561–575.

Caplan, S. E. (2010). Theory and measurement of generalized problematic Internet use: a two-step approach. *Computers in Human Behavior, 26*(5), 1089–1097.

Charlton, J. P. (2002). A factor-analytic investigation of computer 'addiction' and engagement. *British Journal of Psychology, 93*, 329–344.

Charlton, J. P., & Danforth, I. D. W. (2007). Distinguishing addiction and high engagement in the context of online game playing. *Computers in Human Behavior, 23*, 1531–1548.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*, 155–159.

Davis, R. A. (2001). A cognitive-behavioral model of pathological Internet use. *Computers in Human Behavior, 17*(2), 187–195.

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.

Ferguson, C. J., Coulson, M., & Barnett, J. (2011). A meta-analysis of pathological gaming prevalence and comorbidity with mental health, academic and social problems. *Journal of Psychiatric Research, 45*, 1573–1578.

Forrest, C., King, D. L., & Delfabbro, P. H. (2016). The measurement of maladaptive cognitions underlying problematic video game playing among adults. *Computers in Human Behavior, 55*, 399–405.

Gentile, D. A., Choo, H., Liau, A., Sim, T., Li, D., Fung, D., & Khoo, A. (2011). Pathological video game use among youths: a two-year longitudinal study. *Pediatrics, 127*, 319–327.

Griffiths, M. D. (1994). The role of cognitive bias and skill in fruit machine gambling. *British Journal of Psychology, 85*, 351–369.

Jacobson, N. S., & Truax, P. (1991). Clinical significance: a statistical approach to defining meaningful change in psychotherapy research. *Journal of Consulting and Clinical Psychology, 59*, 12–19.

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.

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

King, D. L., & Delfabbro, P. H. (2014b). Is preoccupation an oversimplification? a call to examine cognitive factors underlying internet gaming disorder. *Addiction, 109*, 1566–1567.

King, D. L., Delfabbro, P. H., & Griffiths, M. D. (2012). Clinical interventions for technology-based problems: excessive internet and video game use. *Journal of Cognitive Psychotherapy: An International Quarterly, 26*, 43–56.

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

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

King, D. L., Delfabbro, P. H., Kaptsis, D., & Zwaans, T. (2014). Adolescent simulated gambling via digital and social media: an emerging problem. *Computers in Human Behavior, 31*, 305–313.

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

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

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy, 33*(3), 335–343.

Marlatt, G. A., & Gordon, J. R. (1985). *Relapse prevention: Maintenance strategies in the treatment of addictive behaviors*. New York: Guilford Press.

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*, 591–596.

Ollendick, T. H., Matson, J. L., & Helsel, W. J. (1985). Fears in children and adolescents: normative data. *Behaviour Research and Therapy, 23*, 465–467.

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.

Peters, E. R., Joseph, S. A., & Garety, P. A. (1999). Measurement of delusional ideation in the normal population: Introducing the PDI (Peters et al. Delusions Inventory). *Schizophrenia Bulletin, 25*, 553–576.

Petry, N. M., Rehbein, F., Gentile, D. A., Lemmens, J. S., Rumpf, H.-J., Mößle, T., et al. (2014). An international consensus for assessing internet gaming disorder using the new DSM-5 approach. *Addiction, 109*, 1399–1406.

Pies, R. (2009). Should DSM-V designate "internet addiction" a mental disorder? *Psychiatry, 6*, 31–37.

Porter, G., Starcevic, V., Berle, D., & Fenech, P. (2010). Recognising problem video game use. *Australian and New Zealand Journal of Psychiatry, 44*, 120–128.

Shapira, N. A., Lessig, M. C., Goldsmith, T. D., Szabo, S. T., Lazoritz, M., Gold, M. S., & Stein, D. J. (2003). Problematic internet use: proposed classification and diagnostic criteria. *Depression and Anxiety, 17*, 207–216.

Steiger, H. S., Goldstein, C., Mongrain, M., & Van der Feen, J. (1990). Description of eating-disordered, psychiatric, and normal women along cognitive and psychodynamic dimensions. *International Journal of Eating Disorders, 9*, 129–140.

Thomas, N. J., & Martin, F. H. (2010). Video-arcade game, computer game and internet activities of Australian students: participation habits and prevalence of addiction. *Australian Journal of Psychology, 62*, 59–66.

Tully, P. H., Zajac, I., & Venning, A. (2009). The structure of anxiety and depression in a normative sample of younger and older Australian adolescents. *Journal of Abnormal Child Psychology, 37*, 717–726.

Wright, F. D., Beck, A. T., Newman, C. F., & Liese, B. S. (1993). Cognitive therapy of substance abuse: theoretical rationale. *NIDA Research Monograph, 137*, 123–123.

Van Rooij, A. J., Schoenmakers, T. M., Vermulst, A. A., van de Eijnden, R. J. J. M., & van de Mheen, D. (2010). Online video game addiction: identification of addicted adolescent gamers. *Addiction, 106*, 205–212.