**Dysfunctional cognitions in online gaming and Internet Gaming Disorder:**

**A narrative review and new classification**

*Current Addiction Reports*

Word count: 5,570

Date of first submission: 20/02/2017

Date of second submission: 13/05/2017

Date of third submission: 27/05/2017

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**Abstract**

**Purpose of review:** Over the last two decades Internet Gaming Disorder (IGD) has emerged as potential clinical entity. Dysfunctional cognitions relating to IGD have been the object of debate by scholars in the field. The aim of the current paper is to provide a narrative review and new classification of dysfunctional cognitions involved in IGD.

**Recent findings:** A wide range of dysfunctional cognitions have been investigated in online gaming. Recent research has indicated the importance and value of distinguishing dysfunctional cognitions from dysfunctional metacognitions in IGD.

**Summary:** We propose a new classification which distinguishes between dysfunctional cognitions and metacognitions in IGD. Future studies should compare these two forms of cognitive constructs using longitudinal and experimental designs and examine their relative contribution in predicting IGD and efficacy of different treatments.

**Key words:** Cognitive-Behavioural Therapy; dysfunctional cognitions; dysfunctional metacognitions; Internet Gaming Disorder; Metacognitive Therapy; online gaming.

**Introduction**

Over the last twenty-five years research on problematic Internet uses has been growing and concerns have arisen about the emergence of a new clinical entity: Internet Gaming Disorder (IGD), also variously termed “online gaming addiction,” “video gaming dependence,” “pathological gaming,” or “problematic online gaming” [1-4]. Notwithstanding inconsistencies in definition and measures employed, previous representative studies indicated that the prevalence of IGD ranges between 1.6% to 8.5% among Western young people (see [5] for an overview). Moreover, it has been showed that IGD often co-occurs with other psychological disorders, including attention deficit hyperactivity disorder, anxiety, depression and social phobia [5-6••], indicating a clear need to understand this phenomenon in greater depth. Henceforth, “online gaming” will be referred to as “gaming”.

IGD is characterized by an extensive participation in gaming activities in terms of time and personal engagement (to the neglect of other important activities), and withdrawal and tolerance-like symptoms [7]. As a result, gamers may experience school/college failure, job loss, relationships failure, family and physical problems [8]. Given the variety of negative effects on daily living and psycho-social well-being caused by uncontrolled gaming, IGD had been included in Section III of the DSM-5 as a condition warranting further study [9] in order to provide evidence for being potentially recognized as a legitimate clinical disorder [1]. The American Psychiatric Association describes the clinical diagnosis for IGD as the persistent and recurrent use of the Internet aimed at engaging in gaming behavior which leads to significant impairment or distress over a period of 12 months, and also endorsing at least five of nine criteria proposed [9]. Nonetheless, there is still no consensus on whether problematic gaming could be considered as a proper behavioural addiction or not. Based on the recently proposed operational definition of behavioural addiction [10], future studies are warranted in order to establish whether gaming behaviour is a genuine addiction or a form of coping.

*Dysfunctional cognitions in online gaming: Cognitive and metacognitive domains*

To date, several scholars have investigated the presence of a wide range of dysfunctional cognitions in IGD [11, 12, 13]. To the best of our knowledge, two reviews were published between 2014 and 2015 on this area [14••, 15•]. King and Delfabbro proposed a classification of such cognitions [14••] whereas Pontes and Griffiths highlighted additional studies on this topic [15•].

A growing body of research has investigated the association between dysfunctional cognitions and IGD [1, 16, 17]. According to classical cognitive theories of psychological dysfunction [e.g., 18], dysfunctional cognitions (also termed “dysfunctional beliefs”) are crucial in the development and maintenance of psychopathology. For example, applying Beck’s cognitive model [18], Davis proposed dysfunctional cognitions as proximal factors of both generalized and specific pathological Internet use, and hence problematic gaming [19]. Specifically, obsessive thoughts about online activity, preference for online social interactions, and thinking and anticipating being online, were identified as some of the key Internet-related dysfunctional cognitions responsible for negative consequences in psycho-social well-being [19]. Thenceforth a wide range of dysfunctional cognitions have been identified [e.g. 14••, 20] in IGD, including irrational or erroneous thoughts about gaming and ruminative-type style of thinking [21].

Over the last 20 years a growing body of research has begun to highlight the importance of separating classical Beckian dysfunctional cognitions from dysfunctional metacognitions [22, 23]. Evidence now suggests that dysfunctional metacognitions (unhelpful beliefs we hold about our cognitive-affective experiences) are strong predictors of a wide array of forms of psychological distress when controlling for dysfunctional cognitions [23, 24]. Dysfunctional metacognitions have been divided into two broad areas [23]: (1) negative beliefs concerning the significance, controllability and danger of particular types of thoughts, e.g. “It is bad to think thought X” or “I need to control thought X”; and (2) positive beliefs about coping strategies that impact on mental states such as “worrying will help me get things sorted out in my mind” or “If I use alcohol I will be able to control my mind”. In a recent study by Spada and Caselli [6••] both positive and negative dysfunctional metacognitions were identified to play a predictive role in problematic gaming [6••].

An examination of previous studies highlights a lack of separation between dysfunctional cognitions and metacognitions related to IGD. For example, dysfunctional cognitions about rumination have been considered as beliefs related to gaming rewards [14••] or a cognitive distortion [25] rather than a dysfunctional metacognition pertaining to a mental control strategy. Moreover, in the last few years, further studies focusing on gaming dysfunctional cognitions have emerged thus sustaining the need to update our understanding of specific dysfunctional cognitions and metacognitions related to gaming and IGD.

Given the relevance of the topic, the aim of the current article was to: (i) review and integrate findings from the most recent studies focused on dysfunctional cognitions in IGD; (ii) propose a new classification of dysfunctional cognitions and metacognitions involved in IGD; (iii) provide hints and directions for future studies.

**Method**

A literature research was conducted using PsycINFO, PubMed, and Google Scholar databases. To gather the most recent findings on the topic, the research was limited to articles published within the past 2 years (after the previous two published reviews; January 1, 2015 to February 28, 2017). The search strategy combined the following key terms: Internet or online, problematic gam\*, gam\* addiction, gam\* disorder, dysfunctional cognition, maladaptive cognition, distorted cognition, metacognition. Potential articles were identified, first based on a preliminary review of titles and abstracts, and then by thorough examination. Overall, 6 new articles were selected on the basis of containing a measure of dysfunctional cognitions about gaming or an investigation of the cognitive processes involved in IGD. Moreover, we included the lists of dysfunctional cognitions from the two previous review articles as starting point material for the current narrative review and in order to provide an updated classification of dysfunctional cognitions involved in IGD.

As a first step, 35 types of dysfunctional cognitions and metacognitions involved in IGD were identified across the 6 new articles. As a second step, we added the 15 dysfunctional cognitions as grouped by King and Delfabbro [14••] and 3 additional ones drawing from studies reviewed by Pontes and Griffiths [15•]. Because different labels were often used to indicate very similar concepts, dysfunctional cognitions with similar meaning, or referring to the same beliefs about gaming, were grouped in the same categories. The previous four-factor classification of IGD cognitions proposed by King and Delfabbro [14••] was considered a valuable starting point and was taken into account in the current narrative review to re-classify the identified cognitions. Therefore, as a third step, two main factors (that is dysfunctional cognitions and dysfunctional metacognitions) were proposed in order to distinguish between content-related beliefs (that is, “what” gamers think about various gaming benefits or features) and metacognitive-related beliefs (that is, what gamers think will be the impact of gaming on controlling their mind), respectively. The first factor (dysfunctional cognitions about gaming) included four categories: (i) beliefs about social benefits; (ii) beliefs about individual benefits; (iii) beliefs about gaming rewards/expectancies; and (iv) beliefs about behavioural rules. The second factor (dysfunctional metacognitions about gaming) included two categories: (i) positive metacognitions about gaming; and (ii) negative metacognitions about gaming. Dysfunctional cognitions and metacognitions related to gaming are presented in Table 1.

**A new classification of online gaming: Dysfunctional cognitions and metacognitions**

The main aim of the current narrative review was to propose an updated classification of dysfunctional cognitions involved in IGD based on previous findings and recent studies focused on this topic. Existing literature addressing this issue was found to be lacking the crucial distinction between dysfunctional cognitions and metacognitions involved in the development and maintenance of IGD.

Drawing on Davis’ model of generalized problematic Internet use [19] and the metacognitive tenet [26], we proposed a theoretically-based two-factor classification of dysfunctional cognitions that may underlie IGD. Specifically, Davis’ cognitive-behavioural model suggests that dysfunctional cognitions maintain gaming. Such cognitions include thoughts about the self (e.g. self-doubt, low self-efficacy), thoughts about the world (e.g. generalization such as “the Internet is the only place I can feel safe”), and rumination (that is, negative repetitive thinking about gaming) [19]. It could be argued that considering rumination among dysfunctional cognitions about gaming indirectly sustains the need to address not only the content of gaming-related thoughts (that is the “what”) but also the mechanism underlying the activation and persistence of such dysfunctional cognitions (that is the “how”). In this view, self-regulation strategies to control maladaptive cognitions appeared to be crucial when investigating the potential dysfunctional cognitions involved in IGD. According to the metacognitive tenet [26], metacognitions are thought to play a crucial role in the activation and persistence of maladaptive coping strategies to control thoughts about gaming, such as perseverative thinking, thought suppression and gaming itself which could cause negative thoughts and emotions to persist. Taken together, these theoretical models were used as roadmaps to re-organize existing dysfunctional cognitions and metacognitions about gaming. A summary of the dysfunctional cognitions and metacognitions, accompanied by an illustrative item or a short description, classified in the current narrative review is presented in Table 1. It should be noted that certain types of dysfunctional metacognitions (e.g. obsession) belong to more than one category depending on whether the positive or the negative metacognitive process is considered.

***Dysfunctional cognitions about gaming***

This factor specifically referred to the content of cognitions related to gaming. Drawing from Davis’ model [19] and building on King and Delfabbro’s four-factor classification [14••], gamers are considered to be like to develop distorted perceptions of the value of gaming rewards and items and, then start to follow inflexible mental rules in order to achieve psychological fulfillment. In this view, cognitions developed, strengthen, and are maintained by persistent gaming. Therefore, this factor consists of four subcategories: (i) beliefs about social benefits; (ii) beliefs about individual benefits; (iii) beliefs about gaming rewards/expectancies; and (iv) beliefs about behavioural rules.

*Beliefs about social benefits*

This category included beliefs about the social benefits provided by gaming, that is cognitions about gaming as a source of sense of belonging and interpersonal recognition that gamers expect to achieve within an online community. In other words, gamers may tend to play games to avoid “real life” stressors, as well as to feel a sense of belonging to a community believed unattainable offline. Specifically, drawing from the King and Delfabbro’s factor of “gaming as a method of gaining social acceptance” [14••], dysfunctional cognitions in the first category of the current narrative review included (1) “social relatedness” and (2) “sense of acceptance and belonging,” described by King and Delfabbro [14••, 27] as the perceptions of being better understood and accepted by other gamers online rather than people in real life. Very similar perceptions have been expressed in the third cognition: (3) “cognitive distortion about the world” (that is, the beliefs to be respected in the online world only [28]). Moreover, two dysfunctional cognitions described by Komnenic and colleagues [29] also highlighted the acceptance and affective appreciation expected by gamers in an online environment: (4) “social comfort,” and (5) “online game appreciations.”

*Beliefs about individual benefits*

This category referred to the benefits for the self that gamers believe to gain by playing games, such as increasing self-esteem, feeling safer in the online world, and compensating for perceived self-deficits by demonstrating to be of value in gaming context. Drawing from the King and Delfabbro’s factor of “over-reliance on gaming to meet self-esteem needs” [14••], the second category of the current narrative review specifically included (1) the “cognitive distortion about the self” described by Peng and Liu [28] as the feeling to be worthless offline but to be someone in the online world; and four categories obtained from King and colleagues works [14••, 21, 27]: (2) “gaming self-esteem” or gaming to compensate for low self-esteem, (3) “vulnerability” or “real life vulnerability” or the perception of being safer when online, (4) “achievement (belief)” or gaming for individual accomplishment, (5) “competition” or the perception to be more successful than others, and (6) “perfectionism” or thoughts about wanting to be “the best” at a particular game or games [21]. Moreover, this second category included the “general sense of comfort” described by Komnenic [29] as the feeling to be safer online, and the four categories identified by Beard and Wickham [30] who sustained the argument that fragile self-worth is associated with gaming to affirm self-worth [30]. Specifically, these authors proposed a cognitively-based conceptualization of IGD with a new measure of gaming-contingent self-worth, including a series of beliefs such as: “validation seeking” (that is, feeling pressurized to play in order to attain self-esteem needs); “reward sensitivity” (that is, the transfer of positive self-esteem rewards from online to offline context); “competition” (that is, the influence of competitive behaviors and social comparisons on self-worth; and “detached”(that is, distinguishing from self-esteem and gaming achievement) [30].

*Beliefs about gaming rewards/expectancies*

This category encompassed the over-valuation of rewards gained from gaming and specific expectancies gamers beliefs to satisfy by playing games. Specifically, this third category included two cognitions identified by King and Delfabbro [14••] in the “belief about game rewards and tangibility” factor: (1) “reward value and tangibility” or the perception that gaming items and rewards are more important than other real life activities; (2) “avatar attachment” or the gamer’s identification with his/her avatar [27]. Moreover, in this category positive and negative expectancies about gaming are included. Specifically, the dysfunctional cognitions referred to the perception to feel bad when not online and to feel better (3 – “positive-negative expectancy” or “expectancy beliefs” [14••, 27]) and protected from the problems of the real world when online (4 – “social avoidance” [14••, 27]; and (5) “immersion/escapism” [29]).

*Beliefs about behavioural rules*

This category included the self-imposed rules gamers tend to follow about behaviours during their gaming sessions. Drawing from King and Delfabbro classification [14••], this category reflects what they labeled “maladaptive and inflexible rules about video-gaming behaviour” (that is, cognitions related to rigidity and consistency in the gamers’ patterns of gaming, so that they might continue to play in order to justify their previous actions and commitment, despite evidence of negative effects in daily life). Specifically, the fourth category of the current narrative review included five dysfunctional cognitions identified and operationalized by King and Delfabbro [14••, 27]: (1) “sunk cost bias” or the thought that it would be a shame to stop after having invested many time in gaming; (2) “behaviour completion” or the perception to would be unsatisfied until a the game goal would be achieved; (3) “procrastination” [14••] or “prioritization” [27] or thinking that game takes priority before other things in real life; (4) “rule-setting (time/completion)” [14••] or the feeling that time to play is never enough; and (5) “(cognitive) regret” [27] or thoughts related to personal responsibility for the negative consequences of gaming. In this category the (6) dysfunctional belief labeled “distraction” and described by Komnenic has been included as it refers to the preference for gaming rather than for other things [29]. Finally, thoughts related to the need to repeat in-game activities (7 – “behavioral salience”) and thoughts about becoming sick, failing a class or feeling bad about oneself if engaged in gaming (8 - cognitive appraisal of risky events related to gaming) were included in this category as they specifically referred to the need to play and to the possible, but neglected, negative consequences derived gaming, respectively [21].

***Dysfunctional metacognitions about gaming***

This factor included two categories of dysfunctional metacognitions about gaming relating to mental control. In accordance with the metacognitive tenet [26], existing dysfunctional cognitions and metacognitions retrieved from recent studies were examined and organized in positive and negative metacognitions about gaming. Following this classification, dysfunctional metacognitions related to self-regulatory strategies were allocated among the positive beliefs and dysfunctional metacognitions related to the uncontrollability of thoughts were allocated to the negative beliefs.

*Positive metacognitions about gaming*

Positive metacognitions about gaming referred to the usefulness of gaming as cognitive-affective self-regulatory strategy and appear to play a crucial role in motivating people to engage in gaming. These type of metacognitions referred to the advantages of worrying and ruminating. Specifically this category included (1) “positive metacognitions” as described by Spada and Caselli [6••] or the beliefs that online gaming helps to control negative thoughts; (2) “obsession (rumination/planning)” or constantly thinking about gaming [14••, 27]; (3) “cognitive diversion” [31] or engagement in gaming as a stress-management strategy; and (4) “(lack of real life) control” or gaming to feel in more control [14••, 27].

*Negative metacognitions about gaming*

Negative beliefs about control and consequences of gaming are thought to play a central role in the perpetuation of IGD because they are activated during and following the engagement in gaming and may trigger negative affect that compels the gamer to remain online [32]. These types of metacognitions refer to the uncontrollability of thinking and behaviours related to online gaming. Specifically, this category included: (1) “negative metacognitions about the uncontrollability of online gaming” or thinking that gaming makes the gamer to lose control [6••]; (2) “negative metacognitions about the dangers of online gaming” or thinking that intrusive thoughts about gaming interfere with the gamer’s functioning [6••]; (3) “obsession (rumination/planning)” defined as ruminating about games when not playing or the tendency to think about gaming when offline [27]; (4) “cognitive salience” defined as thoughts related to being unable to function without video-games [21]; (5) “diminished impulse control” or thinking about the inability to stop playing [29]; and (6) the “flow experience” described by Smith and colleagues [33] as feeling like playing is automatic and the gamer can’t stop playing.

**Treatment approaches for dysfunctional cognitions in IGD**

The classification of dysfunctional cognitions and metacognitions related to IGD listed in the present paper should to be taken into account by researchers and clinicians to update their extant knowledge about the different types of (meta)cognitive factors involved in IGD and so to refine the treatment of IGD. In fact, knowledge about the efficacy of treatments for IGD is at a very early stage in development and currently lacks rigorous methodology [34, 35] as the definition of IGD itself, as a behavioural addiction or the result of a coping strategy, is not conclusive.

Nevertheless, it has been argued that the cognitive-behavioural therapy (CBT) might be a worthy choice to address Internet addiction and IGD [e.g. 29, 36-39]. Indeed, CBT focuses on changing dysfunctional emotions and behaviours through the modification of maladaptive and irrational thoughts that cause and maintain problematic behaviour [e.g., 18, 40]. As such, it is plausible to expect that changing dysfunctional cognitions about gaming would help to deal with IGD but, unfortunately, previous CBT studies failed in including measures of preoccupation and other specific dysfunctional cognitions [14••] preventing the possibility to demonstrate this. For this reason, despite the benefit of CBT in tackling other addictive behaviours like gambling, Delfabbro and King highlighted the need to address gaming-specific problems in CBT interventions and to evaluate their efficacy [41]. A first attempt to indirectly modify dysfunctional gaming cognitions is represented by a recent study by King and colleagues who tested the efficacy of a brief intervention [34].

An alternative and more recent approach to deal with maladaptive behaviours is Metacognitive Therapy (MCT) [26, 32]. Briefly, MCT aims at modifying dysfunctional metacognitions that give rise and maintain dysfunctional thinking patterns such as worry, rumination, inflexible attention and threat monitoring. The findings by Spada and Caselli [6••] provide the basis for developing a metacognitive understanding of IGD, suggesting the value of modifying positive and negative metacognitions about gaming in order to tackle IGD. Moreover, since metacognitions concern the aspect of cognition that is assumed to control thinking, acting on modifying dysfunctional metacognitions may be worthwhile when different thoughts about gaming become difficult to control. Indeed, while the content of cognitions may vary considerably from person to person, the process people use to respond to such cognitions remains constant. For example, different dysfunctional cognitions regarding impulse control and cognitive salience about certain gaming-related thoughts that have been found by previous studies [e.g. 27, 29] are likely to be activated by maladaptive metacognitive processes (e.g. rumination). Future studies are needed to: (1) ascertain the role of dysfunctional metacognitions in the development and maintenance of IGD using longitudinal designs; and (2) to evaluate the efficacy of MCT for IGD using randomized controlled trials.

**Conclusions**

Aside from preoccupation about online games (i.e. constantly thinking about gaming) that stands out in the first DSM-5 criterion [9], in the last few years, scholars have also investigated several dysfunctional cognitions and metacognitions related to IGD. The present narrative review proposed an updated new classification of dysfunctional cognitions and metacognitions related to IGD. Building on the most frequently cited theoretical models explaining a wide range of problematic behaviours, including gaming, this classification distinguished between dysfunctional cognitions (i.e. beliefs about social benefits, beliefs about individual benefits, beliefs about gaming rewards/expectancies, and beliefs about behavioural rules) and dysfunctional metacognitions (i.e. positive and negative metacognitions about gaming). Among concerns that interventions that focus solely on attaining thought content changes (that is “what gamers think”) may be ineffective if underlying metacognitions are not addressed, an emerging body of literature had attempted to identify specific metacognitions related to IGD (that is “how gamers think”) [6••]. Future studies should compare these different forms of dysfunctional cognitions and metacognitions and evaluate the efficacy of different treatments (e.g. CBT and MCT) in order to bring to light efficacious and evidence-based treatment for IGD.

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Table 1. Classification of dysfunctional cognitions and dysfunctional metacognitions related to IGD.

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| --- | --- | --- | --- |
| **Factor** | **Category**  | *Labels from previous studies* | *Description/illustrative item* |
| *Dysfunctional cognitions about gaming* | *Beliefs about social benefits* | Social relatednessa,b | e.g. “Non-gamers do not understand an important part of who I am”  |
|  | Sense of acceptance and belonginga,b | e.g. “When I do well in a game, players notice and respect me”  |
|  | Cognitive distortion about the worldc | e.g. “The online world is the only place I am respected” |
|  | Social comfortd | e.g. “People accept me for who I am in online games” |
|  | Online game appreciationsd | e.g. “Few people love me other than those I know via online games” |
| *Beliefs about individual benefits* | Cognitive distortion about the self c | e.g. “I am worthless offline, but in the online world I am someone” |
|  | Gaming self-esteema,b  | e.g. “I am proud of myself for what I have achieved in games”  |
|  | Vulnerability/Real life vulnerabilitya,b | e.g. “I feel safer or more comfortable gaming than dealingwith real life”; “I could not cope with stress without videogames”  |
|  | Achievement (belief)a,b | e.g. “I can achieve more in a game than I can anywhere else”  |
|  | Competitiona,b  | e.g. “It is important to me that I am better at the game than others, e.g., higher level, better gear, etc.”  |
|  | Perfectionisme |  e.g. “I feel I must be the best at any game I undertake” |
|  | General sense of comfortd | e.g. “I feel safest when I play online games” |
|  | Validation seekingf | e.g. “I must play because otherwise I would feel bad about myself” |
|  | Reward sensitivityf | e.g. “When I do better in the game, I feel better in general” |
|  | Competition focusedf | e.g. “Being the best in the game gives me confidence in real life” |
|  | Detachedf | e.g. “My self-esteem is not related to how well I am doing in the game” |
| *Beliefs about gaming rewards/expectancies* | Reward value and tangibilitya,b | e.g. “Game rewards are as meaningful to me as anything else in life”  |
|  | Avatar attachment/identificationa,b | e.g. “I feel a connection to my game character, like it is a part of who I am”  |
|  | Positive-negative expectancy/ Expectancy beliefsa,b | e.g. “I can count on video games to make me feel better”; “I feel bad when I don’t get my usual gaming time”  |
|  | Social avoidancea,b  | e.g. “Gaming protects me from people that make uncomfortable”  |
|  | Immersion/escapismd | e.g. “When I play online games, I don’t need to think about offline problems” |
| *Beliefs about behavioural rules* | Sunk cost biasa,b | e.g. “It would be a waste to stop playing because I have invested so much time and energy”  |
|  | Behaviour completiona,b | e.g. “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/prioritisationa,b | e.g. “The game takes priority before other things I need to do”  |
|  | Rule-setting/ (time/completion)a,b | e.g. “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” |
|  | (Cognitive) Regreta,b | e.g. “When I make mistakes or fail in a game, I must retry until I succeed.”  |
|  | Distractiond | e.g. “ When I play online games I don’t think about my responsibilities” |
|  | Behavioral saliencee | e.g. “I find it hard to give up once I've invested so much time in a game” |
|  | Cognitive appraisal of risky events related to gamingg | e.g. “ How likely is it that you would experience some negative consequence [become sick, be injured, lose money, suffer legal consequences, fail a class or feel bad about oneself] if engaged in gaming?” |
| *Dysfunctional metacognitions about gaming* | *Positive metacognitions* | Positive metacognitionsh | e.g. “Online gaming helps me to control my negative thoughts”; “Online gaming distracts my mind from problems”. |
|  | Obsession (rumination/planning)a,b | e.g. “I often plan or think about the next thing I need to do in a game” |
|  | Cognitive diversioni | e.g. “Please rate the extent to which you played WoW to relax and combat stress” |
|  | (Lack of real life) Control a,b | e.g. “I am more in control when I’m playing the game” |
| *Negative metacognitions* | Negative metacognitions about the uncontrollability of online gamingh  | e.g. “Online gaming makes me lose control” |
|  | Negative metacognitions about the dangers of online gaming h | e.g. “Thoughts about online gaming interfere with my functioning” |
|  | Obsession (rumination/planning) a,b | e.g. “I tend to think about video-games when I am not playing” |
|  | Cognitive saliencee | e.g. “ I keep thinking about something I experienced in a video-game well after I have stopped playing”; “I can't stop thinking about video-games” |
|  | Diminished impulse controld | e.g. “I am bothered by my inability to stop playing online games so much” |
|  | Flow experienceg | e.g. “I feel like I can’t stop playing”; “playing seems automatic” |

Notes= a= King & Delfabbro, 2014; b= King & Delfabbro, 2016; c= Peng & Liu, 2010 (from Pontes & Griffiths, 2015); d= Komnenic, Filipović, & Vukosavljević-Gvozden, 2015; e= Forrest, King, & Delfabbro 2016; f= Beard & Wickham, 2016; g= Smith, Gradisar, King, Short, 2017; h= Spada & Caselli, 2017; i= Snodgrass, Lacy, Dengah, et al., 2013 (from Pontes & Griffiths, 2015).