

Psychiatric Quarterly
<https://doi.org/10.1007/s11126-024-10075-w>

ORIGINAL PAPER



Cognitive, Metacognitive, Motivational, and Emotional Predictors of the Intensity of Internet Gaming Disorder among Adolescents

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Accepted: 2 June 2024

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Abstract

Internet gaming disorder (IGD) is multifaceted and can have significant negative consequences. The present study examined the contribution of cognitive, metacognitive, motivational, and emotional factors as predictors for IGD severity. In a cross-sectional study, 703 Iranian adolescents (36.8% females, mean age = 16.98 years [SD = 1.23]) completed an online survey. Hierarchical regression analysis showed that the cognitive, metacognitive, motivational, and emotional factors predicted 7.8%, 17.4%, 1.4%, and 1.9% of the variance in IGD symptoms, respectively. The findings indicated that the cognitive factors including some maladaptive cognitions, such as cognitive salience, regret, and perfectionism, and metacognitive factors including some maladaptive metacognitions (negative metacognitions regarding the uncontrollability of online gaming and negative metacognitions regarding the dangers of online gaming) were significant predictors of IGD severity, highlighting their importance in understanding and predicting problematic gaming behaviors. Although contributing to the variance in IGD, motivational factors (escape, coping, and skill development) and emotional factors including emotion regulation (especially reappraisal) played relatively smaller roles compared to cognitive and metacognitive factors. Of the examined predictive factors, metacognitions were the most important predictor of IGD severity. Exploratory moderator analyses showed significant interactions between three predictors of IGD (reappraisal, negative metacognitions, and cognitive salience) with loneliness, stress, anxiety, and depressive symptoms. Reappraisal was the most frequent predictor and had a significant interaction with these variables. Other predictors independently impacted IGD irrespective of the level of loneliness, stress, anxiety, or depressive symptoms. Based on these findings, special attention to metacognitive, cognitive, emotional, and motivational factors is suggested in the treatment of IGD.

Keywords Internet gaming disorder (IGD) · Cognitions · Metacognitions · Motives · Emotion Regulation

1. Introduction

The popularity of online videogames as a leisure activity is on the rise, with a growing number of players across the world. According to the 2022 Global Games Market Report, the global number of online gamers has reached 3.2 billion, indicating a substantial increase compared

to the previous year (Newzoo, 2022). While the majority of individuals find playing videogames to be a harmless and enjoyable pastime, there is a small minority of players who appear to develop significant issues associated with their gaming habits (Kuss et al., 2018).

Internet gaming disorder (IGD), also referred to as gaming disorder, is characterized as a pattern of excessive and uncontrolled gaming behavior that leads to functional impairment or distress. This form of excessive gaming is recognized as a type of behavioral addiction and is classified as a gaming disorder in the eleventh revision of the *International Classification of Diseases* (ICD-11; World Health Organization, 2022) and IGD in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association, 2013).

Online gaming is more common among adolescents than adults (Hawi et al., 2018). A recent meta-analysis of 155 studies examined the prevalence of IGD among adolescents and young adults separately. The study found that the prevalence rate of IGD was 8.8% among adolescents and slightly higher at 10.4% among young adults. Additionally, when considering gender, the prevalence rate of IGD was higher among males (15.4%) compared to females (6.4%) (Gao et al., 2022).

IGD poses a major public health challenge due to the multitude of short and long-term harms it can inflict on both individuals and society (Chung, 2021). IGD has been associated with poor sleep quality, daytime sleepiness, insomnia (Alimoradi et al., 2019; Lin et al., 2021; Wong et al., 2020), lower self-esteem, social support, and life satisfaction (Teng et al., 2020), decreases in academic performance, and poorer understanding with their parents (Macur & Pontes, 2021), as well as higher levels of anxiety (Fumero et al., 2020; Bonnaire & Baptista, 2019) and depressive symptoms (Wartberg et al., 2020).

The Interaction of Person-Affect-Cognition-Execution (I-PACE) model outlines the psychological and neurobiological factors contributing to the addictive use of specific internet applications, such as online gaming (Brand et al., 2019). Several factors, including maladaptive cognitions and metacognitions (viewed as cognitive biases), motives (regarded as behavior-specific predisposing variables), problems in emotional regulation (regarded as affective biases),

and psychopathological elements such as loneliness, stress, depressive symptoms, and anxiety (regarded as general predisposing variables), have been extensively studied. However, the interaction effects between these factors regarding internet gaming disorder (IGD) remain under-examined. The present study addressed this gap by examining how cognitive, metacognitive, motivational, and emotional factors interact to predict IGD severity.

1.1. Metacognitions and IGD severity

Metacognitions are higher-order cognitions or thoughts about thoughts. They play an important role in how individuals perceive, interpret, and respond to their own internal experiences (Wells, 2011). Maladaptive metacognitions can contribute to IGD (Casale et al., 2021), as well as problematic internet use (Akbari, 2017; Caselli et al., 2020), problematic social media use (Marino et al., 2019), and problematic smartphone use (Casale et al., 2020).

In general, metacognitions can be categorized into two types: positive and negative. Positive metacognitions involve perceiving the advantages of using specific coping strategies for cognitive and emotional regulation. Examples include beliefs such as “*worrying will help me control my thoughts*”. On the other hand, negative metacognitions relate to the perceived lack of control and potential negative outcomes associated with the chosen coping strategy. For instance, individuals may express concerns such as “*once I start worrying, I cannot stop*” (Marino et al., 2018). Spada and Caselli (2017) found that metacognitions regarding online games could be divided into three types: positive metacognitions about online games (P-MOG) (e.g., “*online gaming stops me from worrying*”), negative metacognitions about the uncontrollability of online games (N-MOG1) (e.g., “*I have no control over how much time I play*”), and negative metacognitions about the dangers of online gaming (N-MOG2) (e.g., “*Thoughts about online gaming are becoming my obsession*”).

Hui Zhou et al. (2023) identified positive beliefs about worry, cognitive confidence, and uncontrollability/danger metacognitions as salient dimensions associated with IGD. The study highlighted the significance of positive metacognitions, uncontrollability/danger metacognitions, and cognitive confidence in relation to IGD. According to the findings of Aydın et al. (2020),

metacognitions have a substantial influence on gaming disorder among adolescents. A systematic review by Silvia Casale et al. (2021) showed that positive beliefs about worry, negative beliefs about uncontrollability and danger of thoughts, beliefs about the need to control thoughts, and a lack of cognitive confidence were associated with IGD, as well as problematic internet, smartphone, and social networking site use.

Recent research has also shown that metacognitions can predict online gaming independently of gaming motives (Marino et al., 2020). Additionally, metacognitions have been found to impact cognitive and emotional conditions, leading to heightened involvement in online gaming (Caselli et al., 2020). Moreover, it has been proposed that metacognitions can mold and control an individual's thoughts related to online gaming (Marino & Spada, 2017), as well as influence coping mechanisms and motivations associated with online activities, such as utilizing gaming as a means to retreat from reality (Spada et al., 2008).

1.2. Gaming motives and IGD severity

Gaming motivations can play an important role in influencing the range of game behaviors and their consequences (Hellström, 2015) and can be associated with healthy or pathological online gameplay (Rafimanesh et al., 2022). According to motivation-focused models, IGD is associated with misguided motives, characterized by an excessive focus on the online gaming world at the expense of offline world activities (Dong & Potenza, 2014). An extensive and growing literature suggests that gaming motives have been identified as predictors of IGD (Laconi et al., 2017; Király et al., 2014; Kneer & Rieger, 2015; Moudiab & Spada, 2019).

Yee (2006) proposed a gamer motives model to comprehensively comprehend and evaluate individual variations and collective patterns of motivation in online gaming. Based on Bartle's (1996) Player Types, the study identified three fundamental motives for engaging in online gaming: achievement, social connection, and immersion. The achievement motive refers to the pursuit of power, progression, accumulation of in-game wealth/status, and/or competition. The social connection motive refers to the establishment of enduring meaningful relationships and collaboration in teamwork. The immersion motive refers to advancing in-game skills, engaging in

role-playing, creating self-representative fictional characters, and/or seeking escapism or avoidance from real-life issues. Employing exploratory factor analysis, Demetrovics et al. (2012) considered previous models and identified seven distinct motives for engaging in gaming: social connections, escaping from reality, competition with others, coping with distress, skill development, fantasy world engagement, and recreation.

There are differences among various studies regarding which motivations have a greater impact on the development of IGD. For example, one study highlighted coping and skills development as the significant predictors, even when considering negative affect and problematic internet use (Moudiab & Spada, 2019). However, other studies have identified the escape motive as the strongest predictor (e.g., Biegun et al., 2020; Kirby, Jones, & Copello, 2014). A recent systematic review and meta-analysis showed a strong association with achievement, while the most robust association was observed with escapism, a subcomponent of immersion. Cross-cultural variations have indicated that escapism has a stronger correlation with IGD in individualistic regions (Wang & Cheng, 2022). Additionally, a recent study in Iran found that recreation, competition, and skill development were prominent motivation domains for gaming, while the social domain was less common. The fantasy and competition domains exhibited a stronger association with pathological gaming (Rafimanesh et al., 2022).

1.3. Cognitions and IGD severity

A meta-analysis conducted to identify risk factors for IGD found that the most risk strongly correlated risk factors with IGD were motivations and maladaptive cognitions (Ji et al., 2022). Maladaptive cognitions refer to distorted thought patterns and detrimental beliefs related to gaming (Billieux et al., 2020). These cognitions are considered proximal sufficient causes that are activated by underlying necessary causes such as reinforcement and psychopathology. They have a direct impact on the development and maintenance of specific internet use disorders (Davis, 2001). The collective findings from multiple studies examining maladaptive cognitions in IGD consistently demonstrate that they serve as strong predictors of IGD (Forrest et al., 2016; King & Delfabbro, 2014, 2016; Moudiab & Spada, 2019; Wang et al., 2023a, 2023b; Yang et al., 2023a). The presence

of maladaptive gaming-related cognitions can contribute to the persistence and excessive engagement in online gaming activities (Forrest et al., 2017).

In a comprehensive review, King and Delfabbro (2014) examined 36 studies examining maladaptive cognitions associated with IGD. They found that adolescents with IGD may have specific maladaptive beliefs that differentiate them from other gaming populations, including adolescents without IGD who are highly engaged in videogame playing. These cognitions were categorized as follows: (1) the overvaluation of gaming rewards and identities, (2) inflexible rules and biases that arise in gaming situations, (3) over-reliance on gaming to meet self-esteem needs, and (4) gaming as a method of gaining social acceptance. They clarified that these cognitions themselves were not inherently pathological, but their impact on the development of problematic online gaming behaviors depends on their intensity and frequency of activation. Another systematic review indicated a linear positive relationship between the presence of maladaptive gaming cognitions (particularly maladaptive rules concerning gaming and gaming-based self-esteem) and IGD symptomatology (Sugaya et al., 2019).

1.4. Emotion regulation-related variables and IGD severity

Emotion regulation refers to the process through which individuals manage and modulate their emotional experiences, expressions, and responses in order to adaptively navigate and regulate their emotions (Gross, 1998; Thompson, 1994). It involves various cognitive, behavioral, and physiological strategies employed to influence the intensity, duration, and expression of emotions (Gross & Thompson, 2007). Previous studies have offered valuable insights into the relationship between IGD and emotion regulation, suggesting that emotion regulation may serve as an important predictive factor of IGD. Bender et al. (2020) found that emotion dysregulation is a potential risk factor for gaming disorder which contains both online and offline gaming. In a recent study, Giordano et al. (2023) investigated the predictive capacity of emotion regulation, while accounting for age, gender, and race, in relation to the severity of IGD. The findings showed that both gender and emotion regulation exhibited significant predictive abilities for IGD. More specifically, being male and exhibiting lower levels of emotion regulation significantly predicted the severity of IGD. Individuals with IGD were less likely to use cognitive reappraisal and more

likely to suppress their emotions (Yen et al., 2018). Another study reported that individuals with IGD had lower scores on emotion adjustment. Emotion adjustment was identified as the most relevant emotion regulation behavior in IGD, followed by emotion concealment. Furthermore, emotion adjustment showed a negative association with depression and hostility among those with IGD (Lin et al., 2020).

1.5. Emotion-related factors

Although the aforementioned variables have significant relationships with IGD, these relationships can be influenced by variables that play a moderating role. A recent study by Yang et al. (2023b) applied the General Strain Theory (Agnew, 1992), which suggests that external pressures can lead to negative emotions and, consequently, maladaptive behaviors such as problematic gaming. Their study aimed to understand the different roles of academic-related stress in emotional problems and IGD among adolescents. The study found that perceived academic stress was directly and indirectly associated with IGD through negative emotions. Academic stress was positively and indirectly associated with IGD through negative emotions, but negatively and directly associated with IGD.

Experiencing stress has also been reported as an external influence related to the initiation of addictive disorders (Koob & Schulkin, 2019; Fronk et al., 2020). Many adolescents diagnosed with IGD indicate they use gaming as a means to cope with feelings of stress (Fazeli et al., 2020). Stressful life events have been positively associated with adolescent IGD, and neuroticism has been reported as a moderator variable in this relationship (Li et al., 2022).

Individuals who are affected by internet addiction commonly experience feelings of loneliness (Kormas et al., 2011). The prevalence of loneliness among adolescents with IGD is also very high (Van Rooij et al., 2014). Dong et al. (2021) reported a relationship between IGD and loneliness and suggests that the functional connectivity between the prefrontal cortex and supplementary motor area moderates this relationship. Considering the association between loneliness and IGD, as well as the significant moderating role of loneliness in the relationship between internet gaming time and the likelihood of developing IGD among adolescent gamers (Yu

et al., 2022), it is imperative to address this research gap by examining the potential interactions between the theoretically hypothesized predictors of IGD and loneliness.

Adolescents with internet addiction are more likely to suffer from depression. Moreover, anxiety has been reported to partially mediate the relationship between internet addiction and depression (Zhao et al., 2023). Having high anxiety and depression is associated with IGD among males and among female gamers, depression has also been associated with IGD (Bonnaire & Baptista, 2019). Social anxiety has been reported as a potential moderator in the association between internet gaming time and probable IGD among adolescents (Yu et al., 2022)

However, negative emotions also influence the aforementioned predictors of IGD. Negative emotions influence a range of cognitive and early metacognitive processes (Geurten & Lemaire, 2024). Negative emotions can reduce visual working memory recall variability, impacting cognition (Xie et al., 2023). This suggests that negative emotions can influence metacognitions and motivations through altered memory processes. Another study showed that negative emotions serve as another aspect of motivation, and emotional experiences might precede subsequent cognitive activities (Shin & Han, 2016).

Given the influence of negative emotions on both IGD and its associated predictors, it is necessary to evaluate the influence of each predictor on IGD by considering their interactions with negative emotions. It is important to investigate the interactions between loneliness, stress, depressive symptoms, anxiety, and specific predictor variables. This would enhance the understanding of the complexity of these predictive relationships and their unique characteristics.

1.5. The present study

IGD is a multifaceted and complex issue that can have significant negative consequences. The objective of the present study was to examine the influence of various well-established predictors on the severity of symptoms related to IGD among Iranian adolescents. By exploring the combined contribution of cognitive factors (maladaptive cognitions), metacognitive factors, motivational factors, and emotional factors (emotion regulation), the study aimed to develop a comprehensive understanding of IGD. Based on the I-PACE model and in accordance with literature, the present study hypothesized that:

- There would be significant associations between cognitive factors and the severity of IGD (H₁).
- There would be significant associations between metacognitive factors and the severity of IGD (H₂).
- There would be significant associations between motivational factors and the severity of IGD (H₃).
- There would be significant associations between emotional factors and the severity of IGD (H₄).
- Metacognitive factors would have the strongest influence on the intensity of IGD (H₅).

The study also aimed to examine the combined predictive power of cognitive, metacognitive, motivational, and emotional factors in explaining the severity of IGD. By examining the relative contributions of these factors, the study sought to gain insights into their respective roles and significance in determining the severity of IGD. To achieve this, the study used hierarchical regression analysis given its appropriateness in assessing the contribution of different sets of predictors. This approach involves the addition of predictor variables in blocks, thereby enabling the evaluation of the unique variance accounted for by each set of predictors while controlling for previously entered variables. Therefore, it was hypothesized that:

- Cognitive, metacognitive, motivational, and emotional factors together would significantly predict the severity of IGD, with each set of predictors accounting for unique variance (H₆).

Given that all the included variables are theoretically considered predictors of IGD, it is worth exploring whether there are any significant interactions between these variables of interest (i.e., loneliness, stress, anxiety, and depressive symptoms). Therefore, an exploratory moderation analysis was conducted to investigate whether predictors have different effects on IGD based on different levels of moderators. This kind of analysis can help with case formulation by allowing better understanding of whether the effect of a particular predictor on IGD is the same across different levels of the other predictor (i.e., moderator) or whether its strength changes. Such

analysis can provide further insight on the complexity of IGD and lay the groundwork for further investigation of individual differences in IGD.

2. Methods

2.1. Participants and procedure

According to Austin and Steyerbeg's (2015) recommendation, it is enough to have two participants per variable for adequate estimation of regression coefficients, standard errors, and confidence intervals. However, a more common practice is to have a ratio of 10 participants per variable (Harrell et al., 1996). In the present study, since there were 23 variables, 10 participants per variable was applied, which resulted in a total of 230 participants minimum needed. However, the present study also aimed to include potential covariates in the model, so the aim was to double the minimum required sample size. Consequently, the final sample size of more than 700 participants met the aforementioned recommendations. The participants were recruited through the widespread dissemination of an online survey in specific Iranian online gaming communities (such as the *League of Legends* and *Genshin Impact* online forums) along with information about the purpose of the study and confidentiality of the data collected. Inclusion criteria were (i) being aged 13 to 18 years, (ii) being fluent in Persian, and (iii) providing written consent to participate from both the participant and parent/guardian, as described below. The study comprised 786 Iranian adolescents who completed the online survey. Out of these participants, 83 were excluded from the analysis due to being identified as outliers by the multivariate Mardia test. Consequently, the final sample comprised 703 Iranian adolescents (36.8% female, age range= 13 to 18 years, mean age=16.98 years [SD=1.23]). After participants voluntarily and anonymously communicated interest and provided consent to participate in the study, parental/guardian consent was also obtained. The first page included information on the study aims and measures for parents/guardians. With parental/guardian permission, participants were asked to respond to the survey without others around them. In terms of educational level, 12.1% were in the seventh grade, 5.7% in the eighth grade, 9.1% in the ninth grade, 12.8% in the tenth grade, 20.6% in the eleventh grade, and 49.6% were either in the twelfth grade or had completed their high school diploma. The participants provided data indicating that they spent an average of 4.22 hours (SD = 2.36) engaging

in online gaming and 8.65 hours (SD = 3.95) engaging in online activities daily. All procedures performed in studies involving human participants were approved by and in accordance with the ethical standards of the Ethics Committee of Kharazmi University of Tehran, Iran, and in accordance with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

2.2. Measures

Socio-demographic factors

The socio-demographic factors examined in the study included age, gender, school year, average daily time spent on the internet, average daily time spent gaming, preferred videogame genre, place where gaming takes place, devices on which online gaming takes place, and attitude towards gaming (whether gaming was perceived as detrimental or not).

2.2.1. Internet Gaming Disorder-20 (IGD-20)

The IGDT-20 (Pontes et al., 2014; Persian version: Vahidi et al. (2019) is a reliable and valid scale for assessing IGD. This tool consists of 20 items that reflect the nine criteria of IGD in the DSM-5. The tool has six dimensions, including ‘salience’, ‘mood modification’, ‘tolerance’, ‘withdrawal symptoms’, ‘conflict’, and ‘relapse’, which are essential components of addiction models. The IGD items (e.g., “*I usually think about my next gaming session when I am not playing*”) are assessed using a five-point Likert scale, ranging from ‘strongly disagree’ (1) to ‘strongly agree,’ (5). The scores range from 20 to 100, and a score above 71 is considered indicative of meeting diagnostic criteria for IGD. In the present study, the Cronbach's alpha for the IGDT-20 was 0.88.

2.2.2. Metacognitions about Online Gaming Scale (MOGS)

The MOGS (Spada & Caselli, 2017; Persian version: Akbari et al., 2021) is a reliable and valid scale assessing metacognitions concerning online gaming. It comprises 12 items and three factors: (1) positive metacognitions about online gaming (P-MOG; e.g., “*Online gaming reduces my negative feelings*”), (2) negative metacognitions about the uncontrollability of online gaming (N-MOGU; e.g., “*I have no control over how much time I play*”), and (3) negative metacognitions about the dangers of online gaming (N-MOGD; e.g., “*Thoughts about online gaming are*

becoming an obsession”). Each item is scored on a four-point Likert scale from ‘do not agree’ (1) to ‘agree very much’ (4). The scores range from 12 to 48, with higher scores indicating greater levels of maladaptation in metacognitions about online gaming. In the present study, Cronbach’s alpha was 0.72 for P-MOG, 0.75 for N-MOGU, and 0.93 for N-MOGD.

2.2.3. *Motives for Online Gaming Questionnaire (MOGQ)*

The MOGQ (Demetrovics et al., 2011; Persian version: Dowran et al., 2022) is a reliable and valid scale that assesses motives related to online gaming. It comprises 27 items and seven factors: escape, coping, fantasy, skill development, recreation, competition, and social motivation. Each item (e.g., “*I play online games because it makes me forget real life*”) is rated on a 5-point Likert scale from almost never/never (1) to almost always/always (5), with higher scores indicating greater motivation in that domain. Cronbach's alpha coefficients for the motives assessed in the present study were as follows: social motive (0.83), escape motive (0.87), competition motive (0.81), coping motive (0.72), skill development motive (0.83), fantasy motive (0.83), and recreation motive (0.77).

2.2.4. *Video-Game Related Cognitions Scale (VGCS)*

The VGCS (Forrest et al., 2016) is a reliable and valid scale that assesses maladaptive cognitions related to videogames. It comprises 18 items and four factors (i.e., perfectionism, cognitive salience, regret, and behavioral salience). Each item (e.g., “*I feel bad after playing for a long period of time*”) is scored on a five-point Likert scale from ‘never’ (1) to ‘always’ (5). Scores range from 18 to 90, with higher scores indicating greater levels of maladaptation in cognitions. Akbari et al. (2021) assessed the validity and reliability of the Persian version in their study. The findings of the research indicated that the Persian version exhibits favorable psychometric qualities. Moreover, a Cronbach's alpha coefficient of 0.79 was reported in the study. In the present study, Cronbach's alpha coefficients for the subscales were as follows: perfectionism (0.87), cognitive salience (0.80), regret (0.75), and behavioral salience (0.75).

2.2.5. *Depression, Anxiety and Stress Scale-21 (DASS-21)*

The DASS-21 (Lovibond & Lovibond, 1995; Persian version: Samani & Jokar, 2007) is a reliable and valid scale that assesses anxiety, depression, and stress. It comprises 21 items (7 for

each factor). Each item (e.g., “*I couldn’t seem to experience any positive feeling at all*”) is scored on a four-point Likert scale from ‘not at all’ (0) to ‘very much’ (3). Scores range from 0 to 21 on each subscale, with higher scores indicating greater levels of anxiety, depression, and stress. The three factors identified by the DASS-21 are common to general psychological distress (Henry & Crawford, 2005). The Cronbach alphas in the present study for depression, anxiety, and stress were 0.86, 0.83, and 0.86, respectively.

2.2.6. Emotion Regulation Questionnaire for Children and Adolescents (ERQ-CA)

The ERQ-CA (Gross & John, 2013; Persian version: Lotfi et al., 2019) is a reliable and valid scale that assesses two main emotion regulation strategies in children and adolescents: cognitive reappraisal and expressive suppression. Cognitive reappraisal refers to the change in emotional experience by reinterpreting the meaning of a situation, whereas expressive suppression refers to the inhibition of emotional expression. The ERQ-CA was developed based on the adult version of the ERQ and has been validated for use in children and adolescents aged 8 to 18 years old. It comprises 10 items (six items for reappraisal and four items for suppression). Each item (e.g., “*I keep my feelings to myself*”) is scored on a five-point Likert scale from ‘strongly disagree’ (1) to strongly agree (5). Higher scores on each scale indicate greater use of the corresponding emotion regulation strategy. The range of scores was 6 to 30 for the reappraisal subscale and 4 to 20 for the suppression subscale. In the present study the Cronbach alphas for reappraisal and suppression were 0.76 and 0.71, respectively.

2.2.7. Short Form of the UCLA Loneliness Scale

The original version of the scale (Russell et al. 1980) comprises 20 items, but a shorter version of the scale with three items is also available (Hughes et al., 2004; Persian version: Dehghani et al. 2015). The short version of the UCLA Loneliness Scale is a reliable and valid measure of loneliness. Each item (e.g., “*How often do you feel left out*”) is rated on a 3-point Likert scale from 1 (hardly ever) to 3 (often). Scores range from 3 to 9, with higher scores indicating greater levels of loneliness. In the present study, Cronbach's alpha of the short version of the UCLA Loneliness Scale was 0.79.

2.2.8. Conflict Behavior Questionnaire (CBQ)

The Conflict Behavior Questionnaire (CBQ; Robin & Foster, 1989; Persian version: Shariati & EmamiPour, 2015) is a 20-item (e.g., “*My mother doesn't understand me*”) true/false rating scale assessing communication and conflict in parent-adolescent interactions. This scale has two separate forms, one for mothers and one for fathers. It is scored as correct (1) or incorrect (0). With eight items being reverse-scored. The total score for each individual is calculated by summing the scores, ranging from 0 to 20. A higher score indicates greater conflict between the adolescent and parents. In the present study Cronbach’s alpha was 0.94 for father conflict, and 0.93 for mother conflict.

2.3. Data analysis

Before conducting regression analysis, an assessment was made to ensure that the fundamental assumptions of hierarchical regression were met. The Durbin-Watson (DW) test was employed to assess the absence of autocorrelation within the dataset. The results (autocorrelation = $-.01$, DW = 2.03 , $p = .736$) demonstrated that the assumption was satisfied. The presence of multicollinearity was assessed by employing the variance inflation factor (VIF) and its related tolerance value. The VIF exhibited a range of values between 1.05 and 3.67, while the tolerance value displayed a range between 0.27 and 0.94. Based on the observation that the VIF was below 10 and the tolerance value exceeded 0.25, there was no evidence suggesting multicollinearity. In addition, the presence of influential outliers was assessed using Cook's distance. This index's mean and standard deviation were determined to be 0.001 and 0.001, respectively. Based on the observed value being less than 0.50, there was no evidence indicating the presence of influential outliers. The Kolmogorov-Smirnov test assessed the normality assumption, yielding a statistic of 0.02 and a p -value of $.72$. Since the obtained p -value was greater than the significance level of $.05$, it was concluded that the assumption of normal distribution was satisfied. The absence of heteroskedasticity was examined using the Breusch-Pagan test (statistic = 28.6 , $p = .38$), and given the non-significant p -value ($>.05$), this assumption was also met. Homoscedasticity was assessed by visually examining residuals using a Q-Q plot, which indicated that the data exhibited

homoscedasticity. The final assumption, which involves a linear fit (null residuals), was assessed by a plot of the residuals against the fitted values, and this assumption was also satisfied.

As the percentage of missing values was less than 5%, and based on the results of Little's Missing Completely at Random (MCAR) test (chi-square = 3469.02, df = 3384, $p = .151$), there was no evidence of systematic missing data, and the missing values were considered to be completely random. To address this, the missing values were imputed using the mean of the respective series.

The severity of the variables was reported using mean scores and standard deviations along with skewness and kurtosis ($< \pm 3$ suggests normality). The relationships between variables of interest were examined using Pearson correlation analysis. To explore differences in game-related variables according to IGD level, independent t -tests were used. To explore the contribution of the variables of interest in predicting IGD, hierarchical regression analysis using the enter method was used. Moreover, interactions were tested between the variables of interest and significant interactions were reported in terms of slope analysis. Using the maximum likelihood estimation method for regression analyses, the statistical analysis was performed using Jamovi software (version 2.3.18).

3. Results

3.1. Descriptive statistics

Before the analyses, the mean scores of IGD were examined based on several characteristics related to gaming, as presented in Table 1. In relation to gender, males and females had comparable scores for IGD. Furthermore, the study found no significant differences in IGD levels among other game genres, including MMORPGs, strategy, sport, simulator, puzzle, cardboard, and casual games. However, individuals who engaged in shooter games had considerably higher IGD scores than those who did not. Moreover, it was observed that individuals who participated in *Game Net* (i.e., gaming clubs in Iran where individuals can go and play videogames) reported significantly greater scores than those who played games at home. Based on the utilized gaming devices, no significant differences were observed in the IGD levels across various platforms such as smartphones, Xbox, personal computers, and other devices. However, it

is worth noting that individuals who did not use *PlayStation* as a gaming medium had significantly higher IGD scores than those who used this gaming console. Finally, individuals who reported that gaming has had a detrimental impact on their lives had significantly higher IGD scores.

In addition to the theoretical confounders (parental disputes, loneliness, psychological distress, and age), variables showing significant variations in the proportion of IGD were incorporated as covariates in the hierarchical regression analysis. Table 2 displays the investigated variables' average scores, standard deviations, skewness, and kurtosis.

3.2. Predictors in IGD severity

Table 3 presents the results for predicting IGD scores from covariates (age, shooter genre, using *PlayStation*, game place, loneliness, negative functionality, psychological distress, and parental conflicts) [Step 1], emotion regulation [Step 2], metacognition about gaming [Step 3], cognitions related to games [Step 4], and gaming motives [Step 5]. The results indicated that covariates significantly predicted IGD, $F(11, 691) = 46, p < .01$, explaining 41% variance, and model fit measures were $AIC = 5278, BIC = 5337, \text{ and } RMSE = 10.14$. The addition of emotion regulation (Step 2) resulted in a significant regression equation, $F(11, 689) = 42, p < .001$, explaining an extra 1.9% of the variation in IGD, which was significant ($\Delta F(2, 689) = 11.95, p < .01$). The model fit measures were $AIC = 5258, BIC = 5327, \text{ and } RMSE = 9.97$, and the effect-size for the addition of Step 2 was Cohen's $f^2 = 0.03$. The inclusion of metacognitions about gaming (Step 3) resulted in a significant regression equation, $F(16, 686) = 68.9, p < .001$, accounting for an additional 17.4% of the variation explained in IGD scores, which was significant ($\Delta F(3, 686) = 103.91, p < .01$). The model fit measures were $AIC = 5001, BIC = 5083, \text{ and } RMSE = 8.27$, and the effect-size for the addition of Step 3 was Cohen's $f^2 = 0.45$. The addition of the cognitions (Step 4) resulted in a significant regression equation, $F(20, 682) = 80.9, p < .01$, accounting for an additional 8.7% of the variation in IGD scores, which was significant ($\Delta F(4, 682) = 49.96, p < .01$). The model fit measures were $AIC = 4828, BIC = 4928, \text{ and } RMSE = 7.27$, and the effect-size for the addition of Step 4 was Cohen's $f^2 = 0.28$. Finally, the addition of the gaming motives (Step 5) resulted in a significant regression equation, $F(27, 675) = 63.7, p < .01$, accounting for an additional 1.4% of the variation in IGD scores, which was also significant ($\Delta F(7, 675) = 5.01, p$

<.01). The model fit measures were AIC = 4807, BIC = 4939, and RMSE = 7.09, and the effect-size for the addition of Step 5 was Cohen's $f^2 = 0.05$.

The final model (Step 5) had superior fit metrics (lower AIC and RMSE) than earlier models (Steps 1, 2, 3, and 4) and predicted a 70.7% variance in IGD scores. According to Cohen's f^2 , the order of variables by their importance in predicting IGD were metacognitions about gaming (negative dangers and negative uncontrollability), cognitions (regret, cognitive salience, and perfectionism), and gaming motives (escape, coping, and skill development motives), and emotion regulation (reappraisal). Only reappraisal predicted IGD negatively, whereas all other variables predicted IGD positively.

3.3. Exploratory moderator analyses

To explore the interplay between variables of interest, they were centered prior to running the analysis to protect the results from potential multicollinearity, further tests were conducted to analyze the interactions between cognitive, metacognitive, motivational, and emotional predictors of loneliness, stress, anxiety, and depressive symptoms. In total, 64 interactions were tested using hierarchical regression analyses. The results of the significant interactions are presented in Table 4, which includes slope analyses. Out of the 64 interactions that were tested using hierarchical regression analyses, 11 were significant. The most frequent predictor of the IGD that significantly interacted with loneliness, stress, anxiety, and depressive symptoms was reappraisal. In addition, several significant predictors of IGD in Step 5 [Table 3] (i.e., negative uncontrollability, regret, perfectionism, escape motive, coping motive, and skill development motive) were found to be independent predictors of IGD, as they did not interact with loneliness, stress, anxiety, or depressive symptoms. This suggests that these factors may have a unique and direct impact on IGD, irrespective of the level of loneliness, stress, anxiety, or depressive symptoms.

3.3.1 Loneliness as a moderator

There was a significant negative interaction between reappraisal and loneliness, particularly at average mean scores. The results showed that when the level of loneliness was lower, the effect of reappraisal on IGD was stronger. However, further analysis showed that when the loneliness score was one standard deviation above the mean, the effect of reappraisal on IGD

became even stronger. Also, the fantasy motive and loneliness had significant and positive interactions at average mean scores. When the level of loneliness was higher, the effect of the fantasy motive on IGD was stronger. However, further analysis showed that when the loneliness score was one standard deviation below the mean, the effect of the fantasy motive on IGD became even stronger.

3.3.2 Depressive symptoms as a moderator

There was a significant negative interaction between reappraisal and depressive symptoms, particularly at average mean scores. The results showed that when the level of depressive symptoms was lower, the effect of reappraisal on IGD was stronger. However, further analysis showed that when the depressive symptoms score was one standard deviation above the mean, the effect of reappraisal on IGD became even stronger. Also, cognitive salience and depressive symptoms had significant and positive interactions at average mean scores. When the level of depressive symptoms was higher, the effect of cognitive salience on IGD was stronger. However, further analysis showed that when the loneliness score was one standard deviation below the mean, the effect of cognitive salience on IGD became even stronger.

3.3.3 Anxiety symptoms as a moderator

There was a significant negative interaction between reappraisal and anxiety symptoms, particularly at average mean scores. The results showed that when the level of anxiety symptoms was lower, the effect of reappraisal on IGD was stronger. Further analysis showed that when the anxiety symptoms score was one standard deviation below the mean, the effect of reappraisal on IGD became even stronger. Moreover, negative metacognitions concerning the dangers of online gaming and anxiety symptoms had significant and positive interactions at average mean scores. When the level of anxiety symptoms was higher, the effect of negative metacognitions concerning the dangers of online gaming on IGD was stronger. Further analysis showed that the effect of negative metacognitions concerning the dangers of online gaming on IGD was almost the same across different levels of anxiety symptoms.

Moreover, cognitive salience and anxiety symptoms had significant and positive interactions at average mean scores. When the level of anxiety symptoms was higher, the effect of

cognitive salience on IGD was stronger. Further analysis showed that when the anxiety score was one standard deviation below the mean, the effect of cognitive salience on IGD became even stronger. There was also a significant positive interaction between the fantasy motive and anxiety symptoms, particularly at average mean scores. The results showed that when the level of anxiety symptoms was lower, the effect of reappraisal on IGD was stronger. Finally, when the anxiety symptoms score was one standard deviation above the mean, the effect of the fantasy motive on IGD became smaller.

3.3.4 Stress symptoms as a moderator

There was a significant negative interaction between reappraisal and stress symptoms, particularly at average mean scores. The results showed that when the level of stress symptoms was lower, the effect of reappraisal on IGD was stronger. Further analysis showed that the effect of reappraisal on IGD was almost the same across different levels of stress symptoms. Moreover, negative metacognitions concerning the dangers of online gaming and stress symptoms had significant and positive interactions at average mean scores. When the level of anxiety symptoms was higher, the effect of negative metacognitions concerning the dangers of online gaming on IGD was stronger. Moreover, when the stress score was one standard deviation above the mean, the effect of negative metacognitions concerning the dangers of online gaming on IGD was lower. Cognitive salience and stress symptoms also had significant and positive interactions at average mean scores. When the level of stress symptoms was higher, the effect of cognitive salience on IGD was stronger. Further analysis showed that when the stress score was one standard deviation below the mean, the effect of cognitive salience on IGD became even stronger, and when the stress score was one standard deviation above the mean, the effect of cognitive salience on IGD became smaller.

4. Discussion

The present study investigated the role of cognitions, metacognitions, motivations, and emotion regulation in predicting the severity of IGD. It also investigated stress, anxiety, depressive symptoms, and loneliness as potential moderators in the relationship between theoretical predictors and IGD. The findings showed that cognitions accounted for 8.7% of the variance in IGD severity,

while metacognitions explained 17.4% of the variance. Additionally, motivations contributed to 1.4% of the variance in IGD severity, and emotion regulation accounted for 1.9% of the variance. These results highlight the significance of cognitive – and especially metacognitive – factors in understanding and predicting the severity of IGD. Furthermore, they suggest that motivations and emotion regulation play a much smaller (but still significant) role in explaining the variance in IGD severity. The findings from the present study contribute to the theoretical evolution of IGD by providing empirical support for the I-PACE model's emphasis on the interplay between various psychological factors.

The study examined the contribution of control variables in explaining the variance in IGD severity. The control variables accounted for a substantial proportion of the variance (i.e., 41% of the overall variance in IGD severity). In the step-by-step regression analysis, it was found that in the initial step, variables such as depression, anxiety, and conflict with both parents demonstrated meaningful relationships with IGD severity. The results of the present study are consistent with prior research indicating a positive association between anxiety, depression and stress with IGD (e.g., Loton et al., 2016; Mentzoni et al., 2011). However, in subsequent steps, when emotion regulation was introduced into the model, it was observed that anxiety and maternal conflict were no longer significantly associated with IGD severity. This suggests that the inclusion of emotion regulation in the model may have accounted for the shared variance between these variables and IGD severity.

Interestingly, in the same step, stress emerged as a significant predictor of IGD severity, suggesting its unique role in IGD development, independent of depression, anxiety, and parental conflict. However, when metacognitions were introduced in the subsequent step, the significance of depression, stress, and paternal conflict diminished. This indicates that metacognitions overshadowed these variables' predictive power, suggesting their key role in understanding and predicting IGD severity.

Both maternal and paternal conflicts have been found to be significantly associated with IGD severity. It is important to note that these conflicts can influence IGD both through the predictor variables (for instance maladaptive cognitions and escape motive) as well as be

independent of them. A systematic review by Schneider et al. (2017) reported that problematic gaming is associated with a poorer parent–child relationship (Choo et al., 2015; Da Charlie et al., 2011; Kim & Kim, 2015; Zhu et al., 2015). This relationship is further complicated by factors such as decreased engagement in social activities with parents (Jeong & Kim, 2011), increased parental hostility, decreased parental affection (Kwon et al., 2011), and lower quality parenting (Kim & Kim, 2015). Moreover, conflicts with parents can influence these predictors. A negative relationship with parents can contribute to the development of a maladaptive cognitive schema (Pellerone et al., 2017). Another study showed escape motives had the largest mediating effect on the parental attachment–addiction relationship (Soh et al., 2014).

Among the theoretical control variables, loneliness emerged as a significant predictor of IGD which is consistent with previous research (e.g., Tras, 2019; Yu et al, 2022). This finding suggests that individuals who reported higher levels of loneliness were more likely to exhibit symptoms of IGD. Individuals who experience insufficient family relationships may turn to online gaming as a way to cope with loneliness (Li and Wang, 2013). Online gaming provides socialization opportunities and a sense of belonging, which can be appealing to individuals seeking social connections (Smahel et al., 2008). However, relying heavily on online gaming to counteract feelings of loneliness can lead to the development of problematic behaviors, including internet addiction and IGD (Tras, 2019).

Game genre significantly influences IGD development (Eichenbaum et al., 2000). In the initial step of the step-by-step regression analysis (Step 1), no specific genre demonstrated a significant relationship with IGD. However, in Step 2, when emotion regulation was included, shooter games were associated with higher IGD scores compared to other genres (i.e., strategy, sport, simulator, puzzle games, card and board games, MMORPGs, and casual games). This pattern persisted throughout the analysis, suggesting that shooter game players tend to have higher IGD scores. This aligns with previous studies but contrasts with the lack of a significant relationship between the MMORPG genre and IGD in the present study. This result suggests players of shooter game tend to have higher IGD scores, aligning with previous studies (Lemmens & Hendriks, 2016; Metcalf & Pammer, 2014). However, unlike prior research (Liao et al, 2023;

Na et al., 2017; Trberti et al., 2018), no significant relationship was found between the MMORPG genre and IGD.

The present study found no significant gender difference in IGD scores, unlike previous research (Stevens et al., 2021; Su et al., 2020). This could be due to overlapping prediction intervals for individual scores across genders, suggesting that intra-group variability might exceed inter-group variability. Additionally, sampling differences could account for this finding. The participants were recruited through the widespread dissemination of an online survey in specific Iranian online gaming communities (such as *Genshin Impact* online forums). This sample may have unique characteristics, including high daily engagement in online gaming, which could potentially mitigate typical gender differences observed in other studies. The intensive involvement in gaming communities may create a more homogenized group where gender differences in IGD are less pronounced.

In the present study, three categories of maladaptive cognitions including cognitive salience, regret, and perfectionism emerged as influential predictors of IGD but did not have a meaningful relationship between behavioral salience and IGD which is in line with previous findings (Forrest et al., 2017). Among them, cognitive salience demonstrated the strongest relationship with IGD. The important role of cognitive salience is consistent with previous studies that reported that cognitive salience is a predictive factor of gaming disorder (both online and offline) (Bodi et al., 2021). The present study's results refine the cognitive-behavioral models of internet addiction (Davis, 2001), by demonstrating that specific cognitive biases (such as cognitive salience and regret) are particularly influential in IGD severity.

Further analyses showed that cognitive salience had a stronger predictive capacity for IGD when interacting with depressive symptoms, anxiety symptoms, and stress. This interaction was more pronounced at moderate levels of these symptoms and lessened with severe stress, suggesting a shift in coping mechanisms. These results underline the need to consider these interactions when developing IGD interventions.

In emotion regulation, reappraisal, the cognitive strategy of reevaluating a situation's significance, showed a significant negative association with IGD, unlike suppression, which

involves inhibiting emotional expressions. Higher levels of reappraisal correlated with lower IGD levels, suggesting its protective role against IGD. This aligns with past research showing lower cognitive reappraisal in gambling disorder (Williams et al., 2012) and IGD among young adults (Yen et., 2018). The complexity of the original observed negative association between the reappraisal subscale and IGD is further understood in the context of the exploratory moderator analyses. The protective effect of reappraisal against IGD was influenced by the individual's emotional state. For instance, adolescents with lower levels of negative emotional states like loneliness and depressive symptoms may use reappraisal more effectively to prevent unhealthy gaming. This effect intensifies during heightened loneliness and depressive symptoms. However, in the case of anxiety, the impact of reappraisal on IGD was most potent at levels one standard deviation below the mean, possibly suggesting that over-arousal may diminish the effectiveness of cognitive reappraisal. In contrast, the effectiveness of reappraisal on IGD demonstrated relative stability across varying stress levels. However, the findings of the present study indicate that emotion regulation, specifically reappraisal, was the least effective predictor of IGD severity. This suggests that while reappraisal has a protective effect, its impact is relatively minor in the context of IGD.

With regard to metacognitions, the findings indicated that metacognitions were the strongest predictive factor of IGD. In line with these findings, previous research has reported that metacognitions predicted problematic online gaming independently of personality traits, anxiety, depression, stress, and both gaming-related cognitions and gaming motives (Akbari et al., 2021). Negative metacognitions about the uncontrollability of online gaming and negative metacognitions about the dangers of online gaming were positively associated with IGD. However, positive metacognitions about online gaming did not have a significant relationship with IGD. This is in line with previous research which found that although positive metacognitions are important concerning technological addictions, it is negative metacognitions that are most closely associated with addictive behaviors (Hamonniere & Varescon, 2018). Such negative metacognitions about the uncontrollability and dangers of online gaming can lead to a sense of helplessness, potentially

fueling problematic gaming. Concerns about gaming's negative consequences, reinforced by these metacognitions, may perpetuate problematic gaming behaviors.

Metacognitions' predictive capability may stem from their impact on gaming time and influence on cognitive and emotional states (Caselli et al., 2020). They can shape thoughts about gaming (Marino & Spada, 2017), as well as coping strategies and motivations related to online engagement, such as using gaming as an escape from reality (Spada et al., 2008). Supporting this perspective, studies have demonstrated that metacognitions can predict other forms of addictive behavior, such as alcohol and nicotine use, independently of negative affect and cognitions (Casale et al., 2016, 2018; Nikcevic et al., 2017; Spada et al., 2007).

The present study's findings align with the metacognitive model of addictive behaviors (Spada et al., 2015), emphasizing perceived lack of control over thoughts and behavior. The results further refine this model by demonstrating that specific metacognitive biases, particularly negative metacognitions about the uncontrollability and dangers of gaming, have a significant impact on the severity of IGD. In the present study, the NMOGU factor played a more significant role in predicting IGDT-20 scores than any other variable. These beliefs, which may be activated during or after gaming, can lead to continued gaming as a means of reducing negative affect, paradoxically resulting in its escalation (Marino & Spada, 2017). Given that metacognitions play a key role in various behavioral addictions, including IGD (Akbari et al., 2020; Caselli et al., 2018, 2020; Hamonniere & Varescon, 2018; Marino et al., 2020; Spada et al., 2007, 2015), and considering that gaming is particularly appealing to adolescents and children who are at a higher risk for IGD (Hawi et al., 2018; Kuss & Griffiths, 2012), it may be worth exploring interventions that aim to modify metacognitions.

Metacognitive therapy (MCT) has shown effectiveness in treating psychological distress (Wells, 2013) and addictive behaviors (Caselli et al., 2018). These interventions may involve directly restructuring metacognitions and employing techniques that enhance attentional flexibility and interrupt rumination and worry. By doing so, valuable cognitive resources can be freed up for problem-solving and active engagement with the environment. The increasingly positive outcomes

of third-wave therapies in treating addictive behaviors emphasize the importance of focusing on process-oriented and transdiagnostic treatments (Garey et al., 2020).

Negative metacognitions about online gaming's dangers interacted positively with anxiety and stress in predicting IGD, especially at higher emotional symptom levels. This effect was constant across anxiety levels but decreased for high stress levels. These observations suggest that interventions addressing metacognitive beliefs should also consider the concurrent emotional symptoms.

The present study showed that motives for online gaming, particularly the motives of escape, coping, and skill development, had significant positive associations with IGD. This supports Wan and Chiou's (2006) argument that IGD is associated with using gaming as a coping mechanism and escape from real-life challenges (coping motives). Additionally, Yee (2006) posited that engaging in skilled activities during online gaming provides psychological benefits, further supporting the association between skills development motives and IGD. Among these motives, the escape motive was the strongest IGD predictor, aligning with the findings of other studies (Bányai et al., 2019; Kirby et al., 2014; Melodia et al., 2022). The findings from the present study challenge motivation-focused models (Dong & Potenza, 2014) by showing that while motivational factors contribute to IGD, their impact is less substantial compared to cognitive and metacognitive factors. This suggests that interventions targeting motivation alone may be less effective than those addressing cognitive and metacognitive aspects.

The analyses showed that the fantasy motive's influence on IGD intensified with moderate loneliness and decreased with high anxiety. This suggests that immersion in fantasy worlds as a coping mechanism may be more potent for those with some degree of loneliness, and less appealing for those with high anxiety. This could indicate that beyond a specific level of anxiety, the appeal of games' fantasy worlds may diminish because adolescents might resort to other coping strategies.

Moreover, the findings emphasize that negative emotions uniquely influence cognitive salience, reappraisal, and metacognitions about online gaming, modulating the severity of IGD in response to varying emotional symptom levels. It is important to conduct further research to

identify the general trends of how negative emotions interact with the various sets of variables particularly in different demographic groups or cultural contexts.

One important result of the present study is that the exploratory moderation analyses suggest that the cognitive, metacognitive and motivational aspects of IGD are not static but dynamically influenced by the emotional context of the individual. This nuanced understanding offers a critical evaluation of existing motivational, cognitive, and metacognitive models, highlighting their limitations in accounting for the variability of emotional states. For instance, by showing that the fantasy motive for gaming intensifies with moderate levels of loneliness and diminishes beyond a specific threshold of anxiety, the findings suggest that the interplay between cognitive, metacognitive, motivational, and emotional factors is more complex and fluid than previously conceptualized.

4.1 Limitations

The present study has a number of limitations that should be acknowledged. Firstly, the use of self-report data may introduce bias, such as social desirability and recall bias. It would be beneficial for future research to incorporate objective measures or multiple data sources to enhance the validity of findings. Secondly, the generalizability of the results to the clinical population with IGD is limited because the present study focused on the overall symptoms of IGD rather than specifically studying the clinical population. To address this limitation, future research could include a clinical interview to identify and recruit participants with clinically diagnosed IGD. This would provide insights into the specific characteristics and treatment needs of the clinical IGD population. Thirdly, the cross-sectional nature of the study prevents the determination of causality and understanding of the temporality of the findings. Future studies should consider employing longitudinal designs to investigate the developmental trajectories of IGD and explore the directionality of relationships. Fourthly, another limitation of the study is the potential increased risk of Type I errors due to the exploratory nature of the moderator analyses. As numerous tests were conducted to explore interactions between predictors and moderators without prior hypotheses justification, there is a possibility that some significant findings may be false positives

or chance findings. Replication studies with larger sample sizes and pre-registered hypotheses are needed to confirm and validate the observed interactions. Finally, it is important to note that the sample was imbalanced in terms of the number of male and female participants. Future research should aim for a more balanced representation of genders to ensure the robustness and generalizability of the findings.

4.3. Conclusion

Despite these limitations, findings from the present study have important implications in determining the predictive power of some most known predictors of IGD. The findings suggest that the cognition factor including some maladaptive cognitions (cognitive salience, regret, and perfectionism), and metacognition factors including some maladaptive metacognitions (negative metacognitions about the uncontrollability of online gaming, and negative metacognitions about the dangers of online gaming) were found to be significant predictors of IGD severity, highlighting their importance in understanding and predicting problematic gaming behaviors. Motivation factors (escape, coping, and skill development) and emotional factors including emotion regulation (reappraisal), although contributing to the variance in IGD severity, played much smaller (but significant) roles compared to cognitive and metacognitive factors. Based on the findings examining all the for mentioned predictive factors, metacognitions were the most important predictors of IGD.

Moreover, the study found that the effect of predictors on IGD varied based on the level of moderators, and in some cases, it was the same. The moderation analyses demonstrated that the fantasy motive and loneliness had significant and positive interactions at average mean scores. When the level of loneliness was higher, the effect of fantasy motive on IGD was stronger. However, further analysis showed that when the loneliness score was one standard deviation below the mean, the effect of fantasy motive on IGD became even stronger. Additionally, the slope analyses showed that although the interaction was negative, in some cases, such as higher depressive symptoms, cognitive reappraisal can be used more effectively to decrease the level of IGD. However, in the case of anxiety, higher anxiety can reduce the effect of cognitive salience on IGD. In summary, the moderation analysis suggested that individuals with different levels of

loneliness, stress, anxiety, and depressive symptoms may not benefit similarly from the enhancement of cognitive reappraisal. This finding may provide insight on why not all individuals with IGD would benefit from therapy because each requires a different case formulation and therapeutic strategy.

Acknowledgments

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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Table 1: IGD level differences based on gender, game genres, device, and negative functionality, independent t-test. (N = 703).

Variable	Level	<i>n</i>	\bar{x}	<i>SD</i>	<i>t</i> (<i>df</i>)	<i>p</i> -value	<i>d</i>
<i>Gender</i>							
	Male	444	51.4	13.7	-.051 (701)	.96	0.01
	Female	259	51.4	12.7			
<i>Genres</i>							
MMORG	Yes	561	51.46	13.36	.368 (701)	.71	0.03
	No	142	51	13.36			
Shooter	Yes	378	52.46	13.05	-2.35 (701)	.02	0.17
	No	325	50.11	13.61			
Strategy	Yes	246	50.82	12.73	.795 (701)	.42	0.06
	No	457	51.66	13.68			
Sport	Yes	80	53.05	13.80	1.19 (701)	.23	0.14
	No	623	51.16	13.29			
Simulator	Yes	146	51.67	12.51	.307 (701)	.76	0.03
	No	557	51.29	13.58			
Puzzle	Yes	106	49.63	13.42	1.46 (701)	.14	0.15
	No	597	51.68	13.35			
Card & Board	Yes	97	51.02	12.79	.282 (701)	.77	0.03
	No	606	51.43	13.45			
Casual	Yes	126	52.05	13.59	.630 (701)	.53	0.06
	No	577	51.22	13.31			
<i>Place</i>							
	Home	698	51.27	13.34	-2.32 (701)	.02	-1.04
	Game Net	5	65.20	6.68			
<i>Device</i>							
Play Station	Yes	97	43.36	12.32	2.40 (701)	.01	0.26
	No	606	51.85	13.46			
Smartphone	Yes	640	51.46	13.40	.589 (701)	.55	0.07
	No	63	50.42	12.90			
Xbox	Yes	26	52.92	13.22	.602 (701)	.54	0.12
	No	677	51.31	13.37			
PC	Yes	304	51.67	13.10	.489 (701)	.62	0.03
	No	399	51.16	13.56			
Other	Yes	29	50.58	16.06	.325 (701)	.74	0.06
	No	674	51.40	13.24			
<i>Negative functionality</i>							
	Yes	214	58.85	12.65	10.65 (701)	<.001	0.86
	No	489	48.10	12.31			

Table 2. Mean, standard deviation, and Pearson correlations between variables.

	\bar{x}	SD	S	K	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	51.38	13.36	0.06	-0.29	--																							
2	11.03	4.19	0.08	-0.81	.10**	--																						
3	12.42	4.70	-0.15	-0.98	.53**	.22**	--																					
4	12.41	4.36	-0.06	-0.86	.23**	.27**	.22**	--																				
5	12.55	3.68	-0.25	-0.43	.39**	.34**	.68**	.36**	--																			
6	13.10	4.09	-0.31	-0.58	.04	.49**	.31**	.35**	.59**	--																		
7	13.39	4.56	-0.34	-0.77	.38**	.32**	.57**	.28**	.56**	.45**	--																	
8	13.17	2.07	-0.50	-1.11	.05	.19**	.20**	.16**	.32**	.26**	.32**	--																
9	17.54	5.19	-0.01	-0.51	.54**	.11**	.40**	.54**	.36**	.19**	.36**	.15**	--															
10	14.39	4.91	0.42	-0.17	.76**	.15**	.49**	.30**	.38**	.14**	.43**	.09*	.61**	--														
11	6.76	2.95	0.65	-0.16	.53**	-0.05	.17**	.11**	.01	-.26**	.04	-.13**	.27**	.46**	--													
12	8.45	2.73	0.08	-0.43	.45**	.19**	.38**	.30**	.39**	.30**	.36**	.17**	.55**	.54**	.14**	--												
13	5.91	2.33	0.58	-0.47	.67**	.07*	.34**	.22**	.22**	-.03	.24**	.01	.44**	.66**	.53**	.38**	--											
14	4.98	2.13	1.04	0.46	.62**	.09*	.35**	.24**	.24**	-.03	.24**	-.03	.45**	.64**	.51**	.37**	.63**	--										
15	16.38	5.25	-0.31	-0.79	.35**	.31**	.68**	.19**	.68**	.42**	.48**	.28**	.28**	.34**	.01	.35**	.24**	.22**	--									
16	5.94	2.15	0.01	-1.37	.24**	.13**	.24**	.11**	.30**	.19**	.23**	.18**	.21**	.20**	.08*	.24**	.16**	.12**	.33**	--								
17	8.17	5.58	0.28	-0.91	.25**	.03	.29**	.12**	.25**	.14**	.26**	.05	.23**	.26**	.10**	.25**	.17**	.19**	.29**	.36**	--							
18	4.77	4.51	1.01	0.51	.47**	.04	.36**	.07*	.18**	-.06	.25**	-.01	.31**	.43**	.36**	.24**	.36**	.40**	.15**	.15**	.25**	--						
19	7.32	5.17	0.35	-0.70	.51**	-.01	.49**	.10**	.27**	-.01	.30**	-.01	.40**	.52**	.33**	.34**	.42**	.45**	.29**	.15**	.36**	.61**	--					
20	19.93	4.38	-0.57	0.71	.47**	.02	.39**	.07	.23**	-.03	.26**	-.02	.36**	.48**	.35**	.30**	.42**	.48**	.20**	.17**	.22**	.49**	.65**	--				
21	12.43	3.64	-0.06	-0.33	.53**	.01	.43**	.13**	.25**	-.05	.27**	.01	.44**	.52**	.40**	.31**	.46**	.53**	.24**	.18**	.24**	.57**	.75**	.75**	--			
22	27.35	5.97	0.42	-1.02	.31**	-.03	.29**	.06	.14**	.01	.15**	-.01	.20**	.30**	.15**	.16**	.25**	.26**	.13**	.02	.15**	.36**	.38**	.29**	.35**	--		
23	25.80	5.54	0.88	-0.24	.18**	-.05	.20**	.01	.08*	-.03	.10**	-.08*	.14**	.16**	.14**	.11**	.17**	.15**	.06	-.04	.07	.26**	.30**	.24**	.24**	.32**	--	

Note. \bar{x} = Mean; SD = Standard deviation; S=Skewness; K = Kurtosis; 1 = IGD; 2 = Social motive; 3 = Escape motive; 4 = Competition motive; 5 = Coping motive; 6 = Skill development motive; 7 = Fantasy motive; 8 = Recreation Motive; 9 = Perfectionism; 10 = Cognitive salience; 11 = Regret; 12 = Behavioral salience; 13 = Negative uncontrollability; 14 = Negative dangers; 15 = Positive metacognitions; 16 = Reappraisal; 17 = Suppression; 18 = UCLA; 19 = Depression; 20 = Anxiety; 21 = Stress; 22 = Father conflict; 23 = Mother conflict. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 3. Hierarchical regression model using enter method for predicting IGD.

Predictor	B	SE	β	LI	UI	<i>T</i>	<i>R</i>	<i>R</i> ²	Adjusted <i>R</i> ²	ΔR^2
Step 1							.65	.42	.41	41%
Age	0.10	0.32	0.01	-0.05	0.07	-0.83				
Shooter genre	2.43	0.79	0.09	0.03	0.15	0.31				
PlayStation Gamers	-	1.15	-0.04*	-0.10	0.02	3.07				
	1.48									
Game place	7.08	4.63	0.04	-0.01	0.10	1.29				
Negative functionality	-	0.87	-0.25	-0.31	-0.19	-1.53				
	7.19									
UCLA	0.95	0.24	0.15*	0.08	0.23	8.29				
Depression	0.38	0.12	0.16*	0.07	0.25	4.01				
Anxiety	0.26	0.13	0.09*	-0.01	0.18	3.32				
Stress	0.46	0.14	0.18	0.08	0.28	1.95				
Father conflict	0.18	0.07	0.08*	0.02	0.14	3.38				
Mother conflict	0.04	0.08	0.02*	0.08	0.04	2.45				
Step 2							.66	.44	.43	1.9%
Age	0.13	0.31	0.01	-0.04	0.07	0.41				
Shooter genre	2.40	0.78	0.09*	0.03	0.15	3.07				
PlayStation Gamers	-	1.13	-0.03	-0.09	0.03	-1.05				
	1.19									
Game place	7.81	4.59	0.05	-0.01	0.11	1.70				
Negative functionality	-	0.85	-0.25*	-0.30	-0.19	-8.34				
	7.12									
UCLA	0.87	0.23	0.14*	0.07	0.21	3.73				
Depression	0.35	0.12	0.15*	0.05	0.24	2.95				
Anxiety	0.23	0.13	0.08	-0.01	0.16	1.74				
Stress	0.44	0.14	0.17*	0.07	0.27	3.24				
Father conflict	0.19	0.07	0.08*	0.02	0.15	2.61				

Mother conflict	0.01	0.08	0.01	-0.06	0.06	0.07				
Suppression	0.11	0.12	0.03	-0.04	0.09	0.88				
	-	0.09	-0.13*	-0.07	-0.19	-4.23				
Reappraisal	0.40									
Step 3							.78	.61	.60	17.4%
Age	0.02	0.26	0.01	-0.04	0.05	0.09				
Shooter genre	1.90	0.65	0.07*	0.02	0.12	2.93				
PlayStation Gamers	-	0.95	-0.02	-0.06	0.03	-0.67				
	0.64									
Game place	2.77	3.82	0.02	-0.03	0.06	0.72				
Negative functionality	-	0.75	-0.13*	-0.18	-0.08	-4.96				
	3.72									
UCLA	0.70	0.20	0.11*	0.05	0.17	3.56				
Depression	0.19	0.10	0.08	0.01	0.16	1.92				
Anxiety	0.06	0.11	0.02	-0.05	0.09	0.51				
Stress	0.10	0.12	0.04	-0.05	0.13	0.88				
Father conflict	0.12	0.06	0.05	-0.01	0.11	1.94				
Mother conflict	0.02	0.06	0.01	-0.06	0.04	0.26				
Suppression	0.01	0.10	0.01	0.06	-0.05	0.11				
Reappraisal	-	0.08	-0.07*	-0.02	-0.12	-2.63				
	0.22									
Positive Metacognition	0.37	0.07	0.15*	0.09	0.20	5.45				
Negative Dangers	1.34	0.21	0.21*	0.15	0.28	6.42				
Negative	1.86	0.19	0.33*	0.26	0.39	10.06				
Uncontrollability										
Step 4							.84	.70	.69	8.7%
Age	0.03	0.23	0.01	-0.04	0.04	0.15				
Shooter genre	1.43	0.57	0.05*	0.01	0.10	2.49				
PlayStation Gamers	-	0.84	-0.02	-0.06	0.02	-0.99				
	0.83									
Game place	3.27	3.38	0.02	-0.02	0.06	0.97				

Stress	0.05	0.10	0.02	-0.06	0.10	0.54
Father conflict	0.08	0.05	0.03	-0.01	0.08	1.47
Mother conflict	0.03	0.05	0.01	-0.06	0.03	0.48
Suppression	0.06	0.09	0.02	-0.06	0.03	0.63
Reappraisal	-	0.07	-0.05*	-0.01	-0.10	-2.33
	0.17					
Positive Metacognition	0.01	0.08	0.01	-0.06	0.07	0.14
Negative Dangers	0.39	0.19	0.06*	0.01	0.12	2.02
Negative	0.90	0.18	0.16*	0.10	0.22	5.09
Uncontrollability						
Behavioural Salience	0.14	0.13	0.03	-0.02	0.08	1.08
Regret	0.55	0.13	0.12*	0.06	0.18	4.19
Cognitive Salience	0.96	0.10	0.35*	0.28	0.42	9.68
Perfectionism	0.20	0.08	0.08*	0.02	0.14	2.49
Social Motive	0.01	0.08	0.01	-0.05	0.05	0.09
Escape Motive	0.34	0.10	0.12*	0.05	0.19	3.33
Competition Motive	0.16	0.08	0.05	-0.11	0.01	1.94
Coping Motive	0.31	0.13	0.08*	0.01	0.16	2.32
Skill Development	0.22	0.10	0.07*	0.13	0.01	2.14
motive						
Fantasy Motive	0.09	0.08	0.03	-0.02	0.09	1.13
Recreation Motive	0.54	1.13	0.01	-0.06	0.03	0.48

Note. * $p < 0.05$.

Table 4: Slope analysis based on a different level of moderators, with IGD as the dependent variable.

	Moderator	Estimate^a	SE	Z	p
Reappraisal × Loneliness					
	Average	-0.56	0.10	-5.60	< .001
	Low (-1SD)	-0.48	0.12	-3.88	< .001
	High (+1SD)	-0.64	0.15	-4.28	< .001
Fantasy motive × Loneliness					
	Average	0.79	0.09	8.5	< .001
	Low (-1SD)	1.00	0.12	8.33	< .001
	High (+1SD)	0.58	0.14	4.17	< .001
Reappraisal × Depression					
	Average	-0.53	0.09	-5.51	< .001
	Low (-1SD)	-0.48	0.12	-3.95	< .001
	High (+1SD)	-0.59	0.14	-4.20	< .001
Cognitive salience × Depression					
	Average	1.91	0.06	29.20	< .001
	Low (-1SD)	2.14	0.09	22.00	< .001
	High (+1SD)	1.67	0.08	20.40	< .001
Reappraisal × Anxiety					
	Average	-0.50	0.10	-5.04	< .001
	Low (-1SD)	-0.60	0.12	-4.74	< .001
	High (+1SD)	-0.40	0.14	-2.76	0.006
Negative dangers × Anxiety					
	Average	3.43	0.19	17.5	< .001
	Low (-1SD)	3.81	0.29	12.9	< .001
	High (+1SD)	3.05	0.19	15.7	< .001
Cognitive salience × Anxiety					
	Average	1.93	0.06	29.3	< .001
	Low (-1SD)	2.19	0.09	23.1	< .001
	High (+1SD)	1.67	0.07	21.4	< .001
Fantasy motive × Anxiety					

	Average	0.72	0.09	7.71	<.001
	Low (-1SD)	1.09	0.12	8.91	<.001
	High (+1SD)	0.35	0.14	2.43	0.01
Reappraisal × Stress					
	Average	-0.47	0.09	-4.92	<.001
	Low (-1SD)	-0.44	0.12	-3.74	<.001
	High (+1SD)	-0.5	0.13	-3.61	<.001
Negative dangers × Stress					
	Average	3.19	0.19	16.4	<.001
	Low (-1SD)	3.57	0.30	11.6	<.001
	High (+1SD)	2.81	0.19	14.5	<.001
Cognitive salience × Stress					
	Average	1.87	0.06	28.8	<.001
	Low (-1SD)	2.14	0.09	22.5	<.001
	High (+1SD)	1.60	0.07	20.5	<.001

^aThe effect of predictor on IGD based on different level.