

Research paper

Emotion dysregulation and Internet gaming disorder in young people: Mediating effects of negative affect and metacognitions

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ABSTRACT

Background: Recent studies have found that emotion dysregulation, negative affect, and metacognitions about online gaming are risk factors for Internet gaming disorder (IGD). However, few studies investigated the mechanisms underlying these interactions. The present study aimed to explore the relationships between emotion dysregulation and IGD, and the mediating effects of negative affect and metacognitions about online gaming.

Methods: An online survey was conducted with young people (aged 10–24 years) who played video games. 1768 participants were included in this study. Observed variables, including emotion dysregulation, IGD, depression, anxiety, and metacognitions, were measured with self-report scales. Structural equation modeling (SEM) was used to analyze the relationships among the variables.

Results: The results showed that emotion dysregulation positively predicted IGD through a fully mediated model which included the independent mediating effects of negative affect and metacognitions about online gaming and their sequential mediating effect. The model explained 76.1 % of the variance in IGD.

Limitations: This was a cross-sectional study which could not infer causality.

Conclusions: This study emphasizes that negative affect and metacognitions about online gaming mediate the effect of emotion dysregulation on IGD; moreover, metacognition may be a proximal factor of IGD. Thus, improving emotional regulation and modifying maladaptive metacognitions in young people may improve the prevention and treatment of IGD.

1. Introduction

Internet gaming disorder (IGD), also known as gaming disorder, is a pattern of excessive and uncontrolled gaming behavior that results in functional impairment or distress. In 2013, IGD was first introduced in the research appendix section of DSM-5 (the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders) (APA, 2013). However, as research has further substantiated its harmful and addictive nature, in 2018, it was named “gaming disorder” and officially included in the addiction disease chapter of the 11th Revision of the International

Classification of Diseases (ICD-11) (WHO, 2018). The prevalence of IGD varies from 0.3 % to 17.7 % in different regions and populations (prevalence is higher among Asians, males, and adolescents) (Kim et al., 2022; Stevens et al., 2021). In East Asia, the overall pooled prevalence of IGD is 6 %, which has attracted the attention of many researchers (Liao et al., 2022).

In the last few years, research on IGD has increased dramatically in an effort to better understand the disease mechanisms and develop effective treatments. These studies have found that the occurrence and development of IGD is associated with multiple biological-psycho-social

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factors, such as biogenetic traits, gender, age, personality traits, impulsiveness, emotion dysregulation, depression, anxiety, maladaptive cognitions, metacognitions, etc. (Casale et al., 2021; Ji et al., 2022; Liao et al., 2020; Rho et al., 2017). Brand et al. built the Interaction of Person-Affect-Cognition-Execution (I-PACE) model to explain the mechanism of behavioral addiction, including IGD (Brand et al., 2016). In this model, IGD is the result of the interaction among susceptibility factors, emotional-cognitive responses to internal or external stimuli, and executive function abnormalities (Brand et al., 2019). According to previous findings and the I-PACE model, it can be assumed that emotion and cognition are important for the development of IGD.

In the emotion dysregulation model of anxiety and depression, the persistence of negative emotion states depends on individual's ability to regulate their emotions (Hofmann et al., 2012). Moreover, it has been suggested that when people with emotion dysregulation experience negative emotions, they are more likely to engage in addictive behaviors, including excessive gaming (Guerrini Usubini et al., 2022; Lin et al., 2020; Weiss et al., 2022). Consequently, it is necessary to explore the potential correlation mechanism between emotion dysregulation, negative affect, and IGD to facilitate effective treatment and prevention. In 2001, Davis proposed a cognitive behavioral model of Internet addiction, which emphasized that maladaptive cognition is a core factor (sufficient condition) contributing to pathological Internet use (PIU) (Davis, 2001). Maladaptive cognition acts as a proximal factor mediating the influence of distal risk factors (e.g., negative life event, and negative affect) on Internet addiction (Davis, 2001). Similarly, Ji et al. found that maladaptive cognition is strong predictor of Internet Gaming Disorder (IGD) (Ji et al., 2022). They proposed a motivation-cognition-behavior model for IGD, highlighting the role of maladaptive cognition as a proximal factor. It not only directly leads to pathological gaming but also mediates the impact of distal factors like anxiety, depression, and personality on IGD (Ji et al., 2022). For instance, personality traits, impulsivity, and self-control have been linked to IGD through the mediation of maladaptive cognitions (Tian et al., 2021; Y. Yu et al., 2021). Furthermore, metacognition, which refers to higher-level cognition regarding cognitive phenomena (Flavell, 1979), has also been significantly associated with IGD (Casale et al., 2021). Based on these findings, it is hypothesized that metacognition may play a significant role in linking negative affect, emotion dysregulation, and IGD. Hence, this study aims to investigate the impact of emotional and cognitive factors on IGD, focusing particularly on the effects of emotion dysregulation, negative affect, and metacognitions.

1.1. Emotion dysregulation and IGD

Emotion dysregulation refers to difficulties in recognizing, understanding, and accepting emotions as well as problems regulating different emotions through appropriate strategies and avoiding impulsive behavior when in distress (Gratz and Roemer, 2004). Individuals with emotion dysregulation tend to adopt maladaptive coping strategies to alleviate emotional problems, and this often leads to further emotional imbalance and mental disorders such as anxiety, depression, and addiction (Çiray et al., 2022; D'Agostino et al., 2017; Xu et al., 2022). Emotion dysregulation is reportedly associated with higher rates of various addictive behaviors, such as alcohol abuse, nicotine dependence, gambling disorder, and PIU (Bonnaire and Baptista, 2019; Poormahdy et al., 2022; Shahbazirad and Azizi, 2018). For young people, playing video games may be the most convenient way to vent negative emotions. This coping style might increase the risk of IGD (Lin et al., 2020). Previous studies have reported that emotion dysregulation has a significant impact on IGD (Di Blasi et al., 2019; Estévez et al., 2017), and neuroimaging studies have shown that players with excessive gaming have abnormalities in brain regions related to emotion regulation, such as the prefrontal cortex and cingulate gyrus (F. Yu et al., 2021; Zhang et al., 2020). However, the causal relationship between emotion dysregulation and IGD remains inconclusive, as well as the

mechanisms involved in the interaction.

1.2. The mediating role of negative affect

Due to their inability to understand and adjust their emotions in a timely manner, people with emotional dysregulation are more likely to develop psychological distress, especially when faced with negative emotions (D'Agostino et al., 2017). According to previous research, emotion dysregulation is characteristic of emotional problems, including depression and anxiety (Cancian et al., 2019; Hofmann et al., 2012; Young et al., 2019). For example, maladaptive emotional regulation strategies, such as avoidance and rumination, are linked with depression and anxiety symptoms (Cookson et al., 2020; Josefsson et al., 2022).

The compensatory hypothesis suggests that individuals with psychological distress are more likely to engage in excessive gaming, which increases their susceptibility to IGD (Karddefelt-Winther, 2014). Previous findings seem consistent with this hypothesis. For example, negative affect, especially in terms of depression and anxiety, has been found to be a risk factor of IGD (Rho et al., 2017; Shi et al., 2020; Teng et al., 2021; Zhang et al., 2022). Moreover, longitudinal studies found that baseline depression levels predicted IGD severity over the next 6–12 months (Jeong et al., 2019; Teng et al., 2021). Based on these findings, negative affect may be a mediator in the relationship between emotion dysregulation and IGD.

1.3. The mediating role of metacognitions

Metacognition is defined as the awareness of one's cognitive processes and mental content, specifically including any knowledge or cognitive processes related to appraising, regulating, and monitoring thinking (Wells, 2000). Over the past few decades, metacognition has been associated with the development and maintenance of psychological disturbances (Wells and Matthews, 1994). According to the self-regulatory executive function (S-REF) model (Wells and Matthews, 1996), maladaptive metacognitions perpetuate the activation of ineffective coping strategies (e.g., thought rumination, thought suppression, worry, and desire thinking), thus leading to the persistence of distress and even the development of psychological disorders. Previous research has demonstrated that metacognition is associated with various psychiatric disorders, such as eating disorders, depression, anxiety, and addiction (Capobianco et al., 2020; Spada et al., 2015; Sun et al., 2017).

Studies about metacognition and addictive behaviors have shown that metacognitive beliefs are significantly related to the severity of addictive behaviors, including smoking, alcohol abuse, gambling, PIU, and IGD (see, for a review, (Hamonniere and Varescon, 2018)). Some researchers suggest that specific metacognitions about addictive behavior are important for the development and maintenance of addiction through a triphasic metacognitive formulation, and they categorize these beliefs into positive and negative metacognitions about addictive behavior (Spada et al., 2015). In this formulation, positive metacognitions regard addictive behaviors as strategies for regulating and controlling cognition and affect, which facilitates the engagement in addictive behaviors. Negative metacognitions focus on the dangers and uncontrollability of addictive behaviors and related thoughts, which contributes to the persistence of addictive behaviors (Spada et al., 2015). In previous studies, metacognitions about online gaming have been proved to be an independent predictor of IGD (Akbari et al., 2021; Spada and Caselli, 2017).

Studies on emotion dysregulation and addiction have reported the mediating effects of metacognition, particularly on addictive behavior. For example, emotion dysregulation predicts Internet addiction through the mediation of positive metacognitions about Internet use (Akbari, 2017; Casale et al., 2016). Metacognition has also been found to mediate the relationship between negative affect and addictive behaviors. For instance, metacognitions about online gaming have been found to

mediate the relationship between social anxiety and IGD (Marino et al., 2020); metacognitions fully mediated the correlation between anxiety/depression and gambling disorder (Jauregui et al., 2016). Based on these findings, it can be hypothesized that metacognition may have a similar mediating effect in the relationships among emotion dysregulation, negative affect, and IGD.

In summary, this study aimed to explore the relationships among emotion dysregulation, negative affect, metacognitions about online gaming, and IGD, as well as the mechanisms involved. We propose three hypotheses: negative affect (H1) and metacognitions about online gaming (H2) may respectively mediate the relationship between emotion dysregulation and IGD; negative affect and metacognitions about online gaming may have sequential mediating effects on the relationship between emotion dysregulation and IGD (H3). By testing three specific hypotheses, this study hopes to provide new evidence to support the treatment and prevention of IGD, as well as draw social attention to the development of adolescents' emotional regulation.

2. Methods

2.1. Participants and procedure

As young people are the most dominant group of video game users and have a higher risk of IGD, this study was conducted among young people aged 10–24 years (covering adolescents and youth) (Patton et al., 2016). All participants were recruited from June to November 2021 through an online questionnaire. Recruitment advertisements linked to the questionnaire were posted on social networking sites and gaming forums. After reading the introduction to the survey, individuals could choose whether to continue participating in the anonymous, unpaid survey, which took an average of 10–15 min to complete. The inclusion criteria were as follows: (1) being between the ages of 10–24 years; (2) playing video games at least once a week, on average, over the previous year; and (3) understanding Chinese and consenting to participate.

A total of 1896 individuals participated in this survey. Fifty-three participants were excluded because they did not meet the inclusion criteria, and 73 invalid questionnaires were excluded because the respondents answered the question “Are your answers true and reliable?” negatively or gave the same answers to different questions consecutively. The final sample size for this study was 1768 (mean age = 17.96 years, SD = 3.04 years; male = 1132, 64.0 %).

This study was approved by the Clinical Research Ethics Committee of Second Xiangya Hospital, Central South University, China (Ref No: 2020-004, date: 2 July 2020). All participants were informed of the purpose and content of the study and signed an online informed consent form. The minors were required to inform their guardians and obtain consent before participating in the survey. This study was anonymous, and all data could only be viewed by the researchers.

2.2. Measures

2.2.1. Socio-demographic characteristics

Data about socio-demographic characteristics, including gender, age, years of education, whether they were from a single-child family, and the average gaming hours on each working day and rest day (working days refer to weekdays, rest days refer to weekends and legal holidays), were collected through a basic information form.

2.2.2. Internet gaming disorder (IGD)

IGD levels were assessed using the Internet Gaming Disorder Scale-Short Form (IGDS9-SF) (Pontes and Griffiths, 2015). This is a 9-item self-rated scale developed from the core criteria for IGD in the DSM-5, which is used to measure the adverse effects of gaming behavior. Each item is rated on a 5-point scale (1 = never to 5 = very often). Scores range from 9 to 45, with higher scores representing more severe IGD symptoms. The Chinese version of the IGDS9-SF has been proven to have

adequate reliability (Cronbach's $\alpha \geq 0.90$) (Qin et al., 2020; Yam et al., 2019). Cronbach's α in the present study was 0.89.

2.2.3. Emotion dysregulation

The brief version of the Difficulties in Emotion Regulation Scale (DERS-16) was used to measure emotion dysregulation (Bjureberg et al., 2016). The DERS-16 is a simplification of the DERS-36 designed by Gratz and Roemer (2004). This scale contains 16 items divided into five dimensions: lack of emotional clarity (Clarity); difficulties in goal-oriented behavior (Goals); impulse control difficulties (Impulse); nonacceptance of emotional responses (Nonacceptance); and lack of effective emotion regulation strategies (Strategies). All items are scored on a 5-point scale (1 = very rarely to 5 = almost always). Higher scores represent greater difficulty in emotion regulation. This scale has been proven to be a valid and reliable measurement of emotion dysregulation (Cronbach's $\alpha = 0.70$ –0.95) (Lawlor et al., 2021; Sörman et al., 2022). The Chinese version of this scale also shows good reliability and factorial validity (Wang et al., 2021). In this study, Cronbach's α for the total scale and each subscale ranged from 0.70 to 0.94.

2.2.4. Metacognitions

Participants' specific metacognitions about playing online games were measured by the Metacognitions about Online Gaming Scale (MOGS) (Spada and Caselli, 2017). This scale contains 12 items divided into three dimensions: negative metacognitions about the uncontrollability of online gaming (N-MOGU), negative metacognitions about the dangers of online gaming (N-MOGD), and positive metacognitions about online gaming (P-MOG) (Akbari et al., 2021). Responses were provided using a 4-point scale (“1 = do not agree” to “4 = agree very much”). The MOGS has been proven to have good validity and reliability (Cronbach's $\alpha \geq 0.79$) (Akbari et al., 2021; Dang et al., 2022; Spada and Caselli, 2017). In our previous study, the psychometric properties of the Chinese MOGS were verified, indicating that the Chinese version was applicable to Chinese people with adequate structural validity (goodness of fit indices: $\chi^2/df = 3.88$, GFI = 0.930, CFI = 0.956, TLI = 0.943, SRMR = 0.059, RMSEA = 0.081) and internal reliability (Cronbach's α was 0.89 for the total scale and 0.79–0.92 for the three subscales). In the present study, the Cronbach's α was 0.88 for the total scale and 0.79–0.91 for the subscales.

2.2.5. Negative affect

Negative affect refers to negative feelings or adverse moods experienced by individuals, including depression, anger, tension, anxiety, fear, hatred. Among them, depression and anxiety are the most common emotional disorders associated with mental health (Chen et al., 2022; Li et al., 2022). Numerous studies have shown a close correlation between anxiety, depression and addictive behaviors (González-Bueso et al., 2018; Zhang et al., 2022). Moreover, there are many validated and recognized instruments that can effectively measure anxiety and depression. Therefore, anxiety and depression were chosen as evaluation indicators in this study, which can effectively evaluate the negative affective state of individuals.

The Patient Health Questionnaire-9 (PHQ-9) was used to assess participants' depression levels (Kroenke et al., 2001; Wang et al., 2014). It is a 9-item screening scale used to assess depression severity. All items are scored on a 4-point scale from “0 = not at all” to “3 = nearly every day.” Higher scores mean greater depression severity, ranging from 0 to 27. Previous studies have shown that the Chinese version of the scale has adequate reliability (internal consistency values > 0.85, test-retest reliability values > 0.86) (Wang et al., 2014; Zhang et al., 2013). In this study, the Cronbach's α was 0.90.

The Generalized Anxiety Disorder-7 (GAD-7) was used to assess anxiety levels over the previous two weeks (Spitzer et al., 2006). All seven items are rated on a 4-point scale from “0 = not at all” to “3 = nearly every day.” The total score ranges from 0 to 21, with higher scores representing more severe anxiety. The Chinese version of the

GAD-7 has been confirmed to be an assessment tool with good validity and reliability (Cronbach's $\alpha = 0.93\text{--}0.95$) (Sun et al., 2021). In the current sample, the Cronbach's α was 0.92.

2.3. Statistical analyses

First, basic statistical analyses, including descriptive statistical analysis and Pearson's correlation analysis, were performed with SPSS version 25.0. Second, structural equation modeling (SEM) using the maximum-likelihood method was performed using AMOS version 24.0 to investigate the mediating effects of negative affect and metacognitions between emotion dysregulation and IGD. Age and gender were included to the model as covariates. Several fit indices were applied to appraise the goodness of model fit, including the chi-squared/degree of freedom ratio ($\chi^2/df < 5$), goodness-of-fit index (GFI > 0.90), Tucker-Lewis Index (TLI > 0.90), comparative fit index (CFI > 0.90), standardized root of the mean square residual (SRMR < 0.08), and root mean square error of approximation (RMSEA < 0.08) (Hu and Bentler, 1999). Third, bootstrapping (with 5000 resamples) was performed to test the significance of the indirect effects between emotion dysregulation and IGD. In this process, the indirect effect was significant if the 95 % confidence interval (CI) did not cover zero.

3. Results

3.1. Descriptive statistics

Participants' socio-demographic characteristics are presented in Table 1. Almost half of the participants were aged between 15 and 19 years (49.6 %). Most had >12 years of education (65.4 %), and 34.6 % were from single-child families. On average, participants played video games for 1.87 h (SD = 1.82 h) and 3.45 h (SD = 2.47 h) on each working and rest day, respectively.

3.2. Correlation analysis

Table 2 shows the correlations among the variables observed in this study, along with their means, standard deviations, skewness, and kurtosis. The results showed emotion dysregulation was positively correlated with IGD, metacognitions about online gaming, depression, and anxiety. Moreover, significant positive relationships were found between IGD and metacognitions about online gaming, depression, and anxiety.

3.3. Mediation analysis

Based on the significant correlations among the objective variables, we tested the mediating role of negative affect (depression and anxiety)

Table 1
Socio-demographic characteristics of the sample.

Variables	M (SD)	Count (%)
Age (years)	17.96 (3.04)	
10–14		329 (18.6 %)
15–19		877 (49.6 %)
20–24		562 (31.8 %)
Gender		
Male		1132 (64.0 %)
Female		636 (36.0 %)
Years of education		
≤12 years		611 (34.6 %)
>12 years		1157 (65.4 %)
Single-child		
Yes		702 (39.7 %)
No		1066 (60.3 %)
Gaming hours on working days	1.87 (1.82)	
Gaming hours on days off	3.45 (2.47)	

Table 2
The correlations among variables.

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. IGD	1												
2. MOGS	0.732**	1											
3. N-MOGU	0.726**	0.739**	1										
4. N-MOGD	0.688**	0.699**	0.703**	1									
5. P-MOG	0.440**	0.837**	0.308**	0.261**	1								
6. Emotion dysregulation	0.516**	0.484**	0.465**	0.486**	0.284**	1							
7. Clarity	0.385**	0.353**	0.365**	0.365**	0.190**	0.716**	1						
8. Goals	0.416**	0.426**	0.401**	0.396**	0.269**	0.822**	0.494**	1					
9. Impulse	0.470**	0.437**	0.422**	0.478**	0.238**	0.866**	0.557**	0.648**	1				
10. Nonacceptance	0.421**	0.381**	0.344**	0.362**	0.244**	0.835**	0.533**	0.577**	0.650**	1			
11. Strategies	0.477**	0.436**	0.426**	0.443**	0.251**	0.942**	0.625**	0.698**	0.770**	0.755**	1		
12. Depression	0.537**	0.458**	0.451**	0.500**	0.247**	0.643**	0.498**	0.479**	0.556**	0.504**	0.643**	1	
13. Anxiety	0.488**	0.432**	0.403**	0.447**	0.254**	0.643**	0.504**	0.473**	0.539**	0.530**	0.639**	0.805**	1
M ± SD	18.74 ± 7.10	21.73 ± 7.05	5.29 ± 2.31	4.66 ± 2.09	11.77 ± 4.64	36.84 ± 14.72	4.28 ± 2.04	8.51 ± 3.50	6.02 ± 3.26	6.79 ± 3.05	11.24 ± 5.33	7.17 ± 5.66	5.14 ± 4.88
Skewness	0.982	1.124	1.19	1.641	0.813	0.775	0.968	0.212	1.134	0.745	0.838	1.115	1.24
Kurtosis	0.874	1.434	0.869	2.471	0.053	0.061	0.445	-0.925	0.513	-0.07	-0.085	1.118	1.35

Note: IGD, Internet Gaming Disorder; MOGS, Metacognitions about online gaming; N-MOGU, Negative Metacognitions about the Uncontrollability of Online Gaming; N-MOGD, Negative Metacognitions about the Dangers of Online Gaming; P-MOG, Positive Metacognitions about Online Gaming; M, mean; SD, standard deviation.

** $p < 0.01$.

and metacognitions about online gaming (N-MOGU, N-MOGD, and P-MOG) in the relationship between emotion dysregulation and IGD using SEM. The hypothetical model is illustrated in Fig. 1. The model fit was good ($\chi^2/df = 8.113$, GFI = 0.960, TLI = 0.956, CFI = 0.966, SRMR = 0.043, RMSE = 0.063). Standardized coefficients for each path in the mediation model were significant ($p < 0.005$), except for the direct path between emotion dysregulation and IGD ($\beta = -0.026$, $p > 0.05$). Age and gender appeared to be weakly correlated with IGD. The total model explained 76.1 % of the variance in IGD.

The bootstrapping results revealed that the direct path between emotion dysregulation and IGD was not significant, and three indirect paths were significant (Table 3). These findings supported the hypothesis that negative affect mediated the effect of emotion dysregulation on IGD ($\beta = 0.076$, 95 % CI 0.023–0.129, H1 holds), accounting for 13.62 % of the total indirect effect. The mediating effect of metacognitions about online gaming in the relationship between emotion dysregulation and IGD ($\beta = 0.249$, 95 % CI 0.168–0.329, H2 holds) was also supported, and this effect accounted for 44.62 % of the total indirect effect. In addition, the sequential mediating effect of negative affect and metacognitions about online gaming in the relationship between emotion dysregulation and IGD was also proven to be significant ($\beta = 0.233$, 95 % CI 0.168–0.301, H3 holds), accounting for 41.76 % of the total indirect effects. Therefore, all three hypotheses were confirmed, with negative affect and metacognitions about online gaming fully mediating the influence of emotion dysregulation on IGD.

4. Discussion

The current study investigated the relationships between emotion dysregulation and IGD and the mediating role of negative affect and metacognitions about online gaming in a sample of young people who play video games. The results showed that while the direct effect of emotion dysregulation on IGD was not significant, but it did indirectly

Table 3
Bootstrapping analysis results of the model.

Paths	Effect	SE	95 % Bias corrected CI	
			Lower	Upper
Direct path of Emotion dysregulation to Internet gaming disorder	-0.026	0.031	-0.088	0.034
Indirect paths				
Emotion dysregulation → Negative affect → Internet gaming disorder	0.076	0.027	0.023	0.129
Emotion dysregulation → Metacognitions about online gaming → Internet gaming disorder	0.249	0.041	0.168	0.329
Emotion dysregulation → Negative affect → Metacognitions about online gaming → Internet gaming disorder	0.233	0.034	0.168	0.301
Total indirect effect	0.558	0.033	0.498	0.623

affected IGD via the independent mediating effects of negative affect (H1) and metacognitions about online gaming (H2), as well as their sequential mediating effect (H3). Negative affect and metacognitions about online gaming fully mediated the effects of emotion dysregulation on IGD.

As predicted, the path analysis demonstrated the mediating role of negative affect between emotion dysregulation and IGD. Previous research has shown that emotion dysregulation is a risk factor for psychological distress such as anxiety and depression (Joormann and Quinn, 2014; Young et al., 2019). Action control theory suggests emotion regulation has an important influence on action control (Kuhl, 1984; Rui et al., 2015). Individuals with low emotional regulation tend to be state-orientated, and they are more likely to dwell on the negative affect caused by difficulties or failed events rather than take action to resolve the difficulties (Jiang et al., 2022). As a result, these individuals are more likely to experience emotional problems such as anxiety and

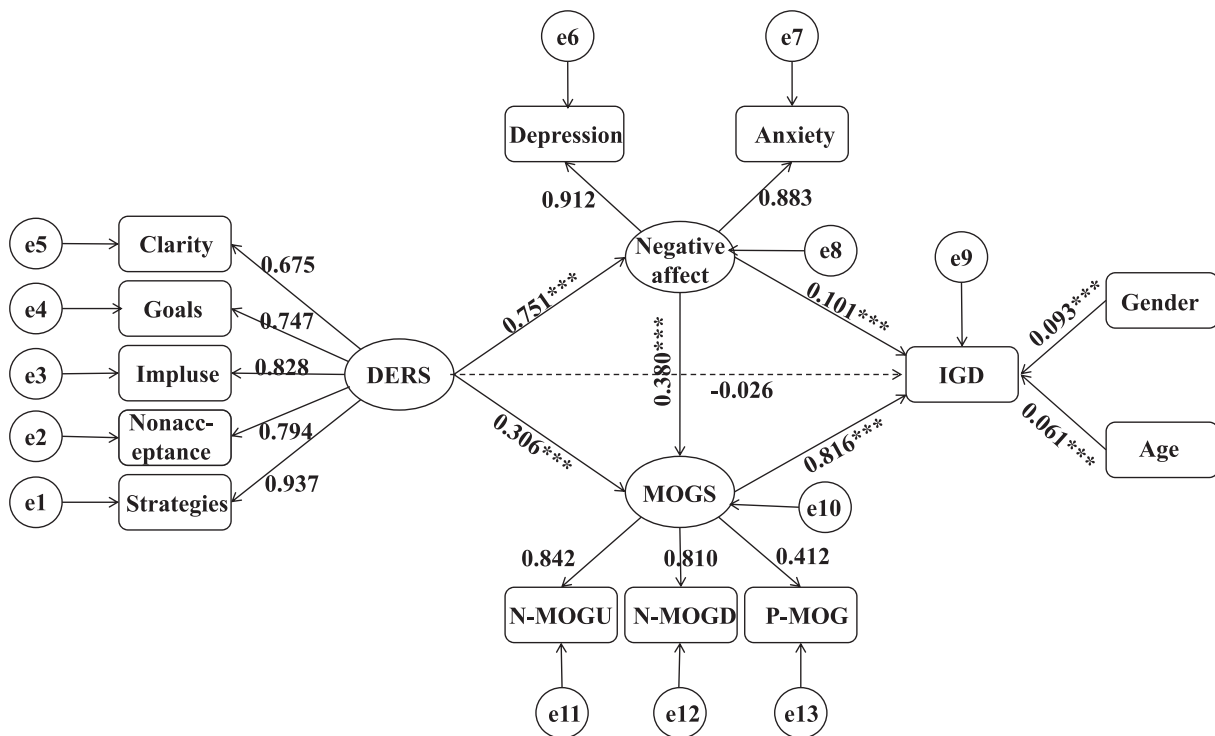


Fig. 1. Mediation model between emotion dysregulation and IGD.

Notes: DERS, Difficulty in Emotion regulation Scale (Emotion dysregulation); MOGS, Metacognitions about Online Gaming; N-MOGU: Negative Metacognitions about the Uncontrollability of Online Gaming; N-MOGD: Negative Metacognitions about the Dangers of Online Gaming; P-MOG: Positive Metacognitions about Online Gaming; IGD, Internet Gaming Disorder; all path coefficients were standardized; the dashed line indicates the single nonsignificant path, *** $P < 0.001$, ** $P < 0.01$.

depression (Hofmann et al., 2012; Young et al., 2019). In addition, individuals with emotion dysregulation usually lack effective emotion regulation strategies. Therefore, when their emotions are out of balance, they tend to adopt maladaptive strategies such as rumination, thought suppression, and avoidance, which not only fail to improve their emotional state but perpetuate negative emotions and even lead to mood disorder development. Previous research has shown that individuals in a negative psychological state are more likely to seek help from addictive substances or behaviors, such as nicotine, alcohol, the Internet, and video games (Marzilli et al., 2020; Ostinelli et al., 2021; Virtanen et al., 2020). For young people, video games are more accessible, thus increasing the risk of IGD. The compensatory hypothesis posits that IGD is a consequence of psychological distress and lack of gratification (Kardesfelt-Winther, 2014). Individuals in a persistent negative emotional state may keep increasing the frequency of playing video games to escape psychological distress and gain gratification, thus promoting the development of IGD (Teng et al., 2021). In summary, individuals with emotion dysregulation are more susceptible to falling into a negative affective state, which in turn increases the risk of IGD.

The mediating effect of metacognitions about online gaming between emotion dysregulation and IGD is consistent with previous research on other addictive behaviors (Casale et al., 2016; Dragan, 2015; Poormahdy et al., 2022). Individuals with emotion dysregulation are prone to adopt maladaptive emotion regulation strategies, including substance abuse and addictive behaviors (Gioia et al., 2021; Weiss et al., 2022). When they generate thoughts such as “gaming can improve my mood” and “playing games stops me from worrying,” positive metacognitions about online gaming will be activated. That is, they believe that playing video games contributes to cognitive-emotional regulation (Di Blasi et al., 2019; Gioia et al., 2021; Spada and Caselli, 2017). These positive metacognitions drive individuals to escape or vent their emotions by playing games when they experience emotional problems. In the early stages of IGD, positive metacognitions about online gaming promote gaming engagement, which may lead to short-term excessive video game use (Spada et al., 2015). Similar findings have been reported in other studies on addictive behaviors. For example, positive Internet use metacognitions had a positive correlation with PIU (Casale et al., 2016), and positive metacognitions about social media use were predictors of social media addiction (Casale et al., 2018). With an increase in gaming engagement, individuals experience loss of control over gaming and activate negative metacognitions about online gaming, including thoughts about the danger of gaming (e.g., “playing games makes my mood worse”) and the uncontrollability of gaming (e.g., “once I start online gaming, I cannot stop”) (Spada and Caselli, 2017). These negative metacognitions trap them into ambivalent thinking wherein they believe that playing games is harmful but uncontrollable, which worsens mood and diminishes efforts to control gaming behavior (Marino et al., 2020; Spada et al., 2015). To return to the desired mental state, individuals engage in gaming again, thus creating a vicious cycle that eventually leads to IGD development. In short, people with emotion dysregulation are susceptible to metacognitions about online gaming, which ultimately leads to IGD.

Moreover, we found that negative affect and metacognitions had a sequential mediating effect on the relationship between emotion dysregulation and IGD. As mentioned above, people with emotion dysregulation are vulnerable to negative affect. Gamers with negative affect who have positive metacognitions about online gaming are likely to over engage in games in the short term, while the activation of negative metacognitions about online gaming may result in pathological gaming behavior, even IGD (Poormahdy et al., 2022). Ji et al. conducted a meta-analysis of risk and protective factors for IGD, found that maladaptive cognition and motivation were the strongest predictors of IGD, and proposed a motivation–cognition–behavior model of IGD (Ji et al., 2022). This model divides the risk factors for IGD into proximal (maladaptive cognitions and motivations) and distal factors (e.g., personality and family factors). Proximal factors can directly affect pathological

gaming, whereas distal factors indirectly influence pathological gaming through the proximal factors (Ji et al., 2022). Metacognition, as a high level of cognition, may also be a proximal factor of IGD. Our findings that metacognitions about online gaming can not only directly affect IGD but also mediate the effects of emotion dysregulation and negative affect on IGD seem to confirm this view. This result inspired us to suggest that interventions targeting maladaptive metacognition (metacognitive therapy) may be effective in treating IGD.

The current findings have significant clinical implications. Our results suggest that addressing emotion dysregulation, negative affect, and maladaptive metacognition about online gaming can effectively help young people reduce problematic gaming behavior. Emotional regulation is a crucial ability that promotes stable emotions and healthy psychology (Menefee et al., 2022). Conversely, individuals with difficulties in emotion regulation are more susceptible to negative affect and IGD. This study emphasizes the significance of parents and educational institutions prioritizing the cultivation of children's emotional regulation ability, thereby enabling them to develop flexible and appropriate strategies for regulating their emotions. Moreover, considering metacognition about online gaming as a proximal factor of IGD that directly influences its occurrence, targeted modification of maladaptive metacognitions through metacognitive therapy holds promise for the clinical treatment of IGD.

However, it must be noted that this study had certain limitations. First, it was a cross-sectional study, and causality could not be determined. Although SEM analysis has a statistical basis to provide clues for the relationship between emotion dysregulation, negative affect, metacognitions, and IGD, longitudinal studies are necessary to further investigate their potential causal relations as well as mechanisms of interaction. Second, this study adopted a convenience sample, which limited the generalizability of the findings. Further studies could use random sampling to include participants from different regions and age groups to improve the representativeness of the sample. Third, all data was collected through self-report questionnaires which may be affected by respondents' self-bias and social desirability. Finally, IGD is a complex disease influenced by multiple biopsychosocial factors, while the current study only discussed the effects of emotional problems and metacognitions about online gaming on IGD, which is not sufficient to fully explain the occurrence of the disease. Therefore, further studies are needed to explore the mechanism of IGD by combining multiple factors from different dimensions.

5. Conclusions

In general, this study revealed that emotion dysregulation positively predicts IGD mainly through the mediating role of negative affect and metacognitions about online gaming, including the independent mediating effects of negative affect and metacognitions, as well as their sequential mediating effect. Individuals with emotion dysregulation are more likely to be bothered by negative emotions, which in turn activates maladaptive metacognitions about gaming, leading to excessive and uncontrolled gaming behavior and even IGD. Furthermore, the sequential mediating effects suggest that metacognition about online gaming may be a proximal factor to IGD, which not only directly influences IGD but also mediates the effects of other factors on IGD. Therefore, improving emotional regulation and modifying maladaptive metacognitions in young people may contribute to the prevention and clinical treatment of IGD.

CRedit authorship contribution statement

Study design: SL, XC, ZL, YL, QH, HS. Data collection: SL, LT, XC, ZL, YL, YT, YS, JH, XW. Statistical analysis: SL, XC, ZL, YL, YS, JH, XW. Data interpretation: SL, LT, QH, HS. Manuscript preparation: SL, QH, HS, LT. Study supervision: QH, HS, LT. Funding acquisition: HS, QH, SL. All authors reviewed and approved the final version of the manuscript.

Declaration of competing interest

The authors report no financial or other relationship relevant to the subject of this article.

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