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The association between Emotional Regulation and Internet Gaming Disorder

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ABSTRACT

Purpose: Lack of control over Internet gaming habits may result in negative consequences. This study aimed to evaluate the emotional regulation of adults with Internet gaming disorder (IGD) and the association of emotion regulation, depression, and hostility.

Methods: Advertisements were used to recruit 69 young adults with IGD, 69 sex- and age-matched controls, and 69 sex- and age-matched regular gamers. The diagnosis of IGD was according to diagnostic interviews based on DSM-5 IGD research criteria. Participants completed the Affective Style Questionnaire, the center of epidemiological studies depression scale and the short-form Chinese version of Buss-Durkee Hostility Inventory.

Results: In the IGD group, the emotion adjustment score was significantly lower, whereas the scores for depression, and hostility were significantly higher than in the other two groups. In addition, emotion adjustment is the most associated emotion regulation behavior of IGD, followed by emotion concealment. In IGD group, emotion adjustment had a negative correlation with depression and hostility.

Conclusions: Our study demonstrate that emotion adjustment is significantly associated with IGD. The depression and hostility mediated the association. Knowing that emotion adjustment plays a critical role in IGD, future interventions should focus on this subscale of emotion regulation.

1. INTRODUCTION

Diagnostic criteria for Internet gaming disorder (IGD) are proposed as research criteria in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5)(American Psychiatric Association, 2013). The main symptom of IGD is the persistent and recurrent use of the Internet to engage in games, often with other players, leading to clinically significant impairment or distress. It has been associated with mood-related psychopathological symptoms, such as depression and irritability(Chih-Hung Ko et al., 2014; C-H Ko, Yen, Yen, Chen, & Chen, 2012). The causal relationship between IGD and such comorbidities has not yet been examined. Therefore, understanding the psychopathology behind IGD and the respective comorbidities could facilitate treatment.

Emotion regulation is defined by the set of cognitive processes that influence emotional responses(James J Gross, 1998) and is a complex process that encompasses the initiation, inhibition, or modulation of emotion functioning. Emotions arise in response to external events and situations. Two emotion-regulation strategies are antecedent- and response-focused strategies(James J Gross, 2002). Cognitive reappraisal, a type of cognitive change that involves construing a potentially emotion-eliciting situation in a manner that changes its emotional effect, is an antecedent-focused strategy(Lazarus & Alfert, 1964). Expressive suppression, a type of response modulation that inhibits emotionally expressive behavior, is a response-focused strategy. According to the investigation of Gross et al., practicing reappraisal is associated with wellbeing, with increased positive emotion, and with better interpersonal functioning. Practicing suppression is associated with negative emotions and with inhibited interpersonal functioning.

Our literature review found that subjects with IGD were less likely to practice cognitive reappraisal and were more likely to suppress their emotions(J.-Y. Yen et al., 2017). Relatively few studies have demonstrated an association between emotion regulation and IGD. Further, studies have associated IGD with depression(Angelo Compare, Cristina Zarbo, Edo Shonin, William Van Gordon, & Chiara Marconi, 2014) and

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demonstrated a positive correlation between Internet gaming disorder and emotional difficulties such as depression[2]. Research also showed that young adults remitting from IGD had significant lower depression, anxiety, and hostility than those with IGD(P.-C. Lin, Su, Yen, & Ko, 2016). Depressive symptoms have been positively correlated with the amount of time spent playing online games(Hellstrom, Nilsson, Leppert, & Aslund, 2015; Wei, Chen, Huang, & Bai, 2012). Depression was also reported to predict the incidence of Internet addiction(C. H. Ko, Yen, Chen, Yeh, & Yen, 2009). Adults who frequently engage in online gaming express more hostile behaviors(J. Y. Yen, Yen, Wu, Huang, & Ko, 2011). One study suggested that shared mechanisms could explain this association(P.-C. Lin et al., 2016). A shared mechanism indicated that both IGD and depression have similar underlying factors that contribute to both IGD and depression. However, the nature of the shared mechanism has not been thoroughly evaluated.

Research demonstrated that emotion regulation is strongly associated with depression and mediates the role between depression and further psychological and somatic symptoms(A. Compare, C. Zarbo, E. Shonin, W. Van Gordon, & C. Marconi, 2014). Furthermore, emotion-regulation therapy has been reported to treat effectively the symptoms of emotional dysfunction such as depression or anxiety (Esbjorn, Bender, Reinholdt-Dunne, Munck, & Ollendick, 2012; D. S. Mennin, Fresco, Ritter, & Heimberg, 2015; Sloan et al., 2017). Emotion-regulation problems were strongly associated with high hostility in a study of young adults(Contardi, Imperatori, Penzo, Del Gatto, & Farina, 2016). Individuals with IGD had increased depression and hostility, so evaluating the emotion regulation of IGD might explain the shared mechanism between IGD and its emotional correlations.

This study aimed to evaluate the emotion regulation of adults—for a control group, for a group of regular gamers, and for an IGD group—and the correlation between emotion regulation and depression, hostility. We hypothesized that (1) emotion regulation, depression, and hostility are associated with IGD, (2) participants who practice less emotion regulation experience more depressed moods and hostile tendencies, (3) depression and hostility mediate the association between IGD and emotion regulation, and (4) emotion adjustment moderates the association between IGD and emotion concealment. Unlike other studies, our study included a group of regular gamers. The rationale of including a regular gamer group is that it is more representative of realistic situations for diagnosing IGD. No differential diagnosis is required for subjects not undertaking regular online gaming. Some Internet gamers do not display the core symptoms of IGD. Including such people in our study for group-to-group comparison allows those with IGD to be more effectively distinguished from the rest of the population.

2. METHODS

2.1. Participants

Individuals with IGD (the IGD group), matched regular gamers (the regular gamer group), and nongaming control participants without IGD (the control group) were recruited through advertisements on campuses and on university bulletin boards from April, 2017, to February, 2018. Based on a functional magnetic resonance imaging study of young adults with IGD[3], the following inclusion criteria were adopted for the study's IGD group: (1) aged 20–38 years with >12 years of education, (2) online video game activity of ≥ 4 hours per day on weekdays and ≥ 6 hours per day at weekends, and (3) maintaining a consistent pattern of Internet gaming for >2 years. In other words, the recruited participants spent more than half of their free time Internet gaming and had done so for a long time. For participants fulfilling the preceding criteria, a psychiatrist conducted an interview on the basis of the DSM-5 diagnostic criteria for IGD(American Psychiatric Association, 2013).

Participants in the regular gamer group and in the control group were frequency-matched by sex and age (± 3 years) with the participants in the IGD group. The recruitment criterion for the control group was nongaming, nonessential Internet use of <4 hours per day. The regular gamers undertook regular online gaming without subjective impairment or distress. These participants also underwent a diagnostic interview by a psychiatrist for inclusion in the regular gamer group or control group. Those diagnosed as fulfilling IGD criteria were recruited into the IGD group.

2.2. Measures

The diagnostic interview comprised two parts: (1) the Chinese version of the Mini International Neuropsychiatric Interview[26] to exclude participants with psychotic disorders, bipolar I disorder, and substance abuse disorders and (2) a history-taking interview to exclude mental retardation, severe physical disorder, and brain injury. In total, 207 participants—69 in each group—were included after they provided informed consent. This study was approved by the Institutional Review Board of Kaohsiung Medical University Hospital.

The DSM-5 diagnostic criteria for IGD comprise nine items (American Psychiatric Association, 2013). We developed a semi-structured interview schedule to examine the severity and frequency of each DSM-5 criterion for IGD. Participants fulfilling five or more criteria were included in the IGD group in accordance with the DSM-5 definition. If the diagnosis was confirmed, the duration to fulfill the criteria was recorded.

Our study utilized the Affective Style Questionnaire (ASQ) to assess participants' emotion regulation, because the questionnaire incorporates three broad affective styles: emotion concealment (8 items), adjustment (7 items), and tolerance. The ASQ is brief but psychometrically sound. Its internal consistency was acceptable, with emotional concealment ($\alpha = .84$), adjustment ($\alpha = .80$), and tolerance ($\alpha = .66$) subscales(Hofmann & Kashdan, 2010).

The severity of depression, and hostility were assessed with the Center for Epidemiological Studies' Depression Scale (CESD) (Radloff, 1977), and the Chinese version of the short-form Buss-Durkee Hostility Inventory (BDHIC-SF)(T. K. Lin et al., 2008).

All the matched participants of the IGD, regular gamer, and control groups underwent a diagnostic interview by a psychiatrist to determine the existence of each diagnostic criterion of IGD in DSM-5. All participants of the three groups also completed the ASQ, CESD, and BDHIC-SF after the diagnostic interview.

2.3. Statistical Analysis

Age, education level, subscale of emotion-regulation scores, depression, and hostility were compared among participants in the control group, the regular gamer group, and the IGD group, with a multivariate analysis of variance and Scheffe post hoc comparison.

Logistic regression was used to model the association between IGD and emotion regulation. Depression and hostility were then entered into the regression model to test their mediating effects in the association between IGD and emotion regulation. A further logistic regression model was used to compare the associations of the IGD and control groups with the interaction between emotion adjustment and emotion concealment after controlling for sex, age, and educational level. The logistic regression analysis was also used to compare the associations of the IGD and regular gamer groups with emotion regulation.

To understand the correlations between emotion regulation, depression, and hostility, Pearson's correlation was used to evaluate associations between emotion regulation, depression, and hostility among IGD group. For all analyses, which were performed using the SPSS software package, $p < .05$ was considered significant.

2.4. Ethics

A detailed explanation was provided, and informed consent was

Table 1
Age, education, emotion concealment, emotion adjustment, emotion tolerance, and depression and hostility scores for the IGD group, the regular gamer group, and the control group (Scheffe test).

Variables	Total (n = 207) Mean ± SD	Nongaming control (n = 69) Mean ± SD	Regular gamer (n = 69) Mean ± SD	IGD (n = 69) Mean ± SD	F	Post hoc comparison
Age (years)	25.59 ± 3.92	26.87 ± 3.82	24.59 ± 3.41	25.32 ± 4.20	6.38**	Control > regular gamer
Education level (year)	16.23 ± 1.25	16.65 ± 1.16	16.46 ± 1.15	15.58 ± 1.19	16.62***	Control = regular gamer > IGD
Emotion concealment	28.56 ± 5.33	27.93 ± 4.82	28.09 ± 5.82	29.67 ± 5.80	2.11	Control = regular gamer = IGD
Emotion adjustment	**25.14** ± 4.28	26.22 ± 3.78	25.99 ± 3.95	23.22 ± 4.48	11.55***	Control = regular gamer > IGD
Emotion tolerance	18.00 ± 2.58	18.26 ± 2.51	18.13 ± 2.50	17.59 ± 2.70	1.30	Control > regular gamer
Depression	16.36 ± 9.77	10.32 ± 7.51	14.84 ± 7.83	23.91 ± 8.62	51.66***	IGD > regular gamer = Control
Hostility	57.10 ± 13.50	49.80 ± 10.81	53.64 ± 10.59	67.87 ± 11.78	51.01***	IGD > regular gamer> Control

*p < .05; **p < .01; ***p < .001
Emotion concealment: emotion concealment subscale score from the Affective Style Questionnaire
Emotion adjustment: emotion adjustment subscale score from the Affective Style Questionnaire
Tolerance: tolerance subscale score from the Affective Style Questionnaire
Depression: Mandarin Chinese Version of the Center for Epidemiological Studies Depression Scale (CESD)
Hostility: Chinese version of the short-form Buss-Durkee Hostility Inventory (BDHIS-SF)

subsequently obtained from all participants.

3. RESULTS

A total of 207 participants, 162 (78.3%) of whom were male, were included in the final analysis. They were distributed equally into three groups: the control group, the regular gamer group, and the IGD group, with each group comprising 54 male and 15 female participants.

The three groups received scores for emotional concealment, emotion adjustment, tolerance, depression, and hostility through multivariate analysis (Table 1). The emotion adjustment score in the IGD group was significantly lower than that in the control group and the regular gamer group (F_2 = 11.546, p < .001). The scores for depression (F_2 = 51.664, p < .001), and hostility (F_2 = 51.010, p < .001) in the IGD group were significantly higher than in the other two groups (Table 1). A total of five participants with IGD was diagnosed as major depressive disorder, we re-evaluated the comparison after excluding these five participants. The significant results were remained unchanged in supplement table 2.

Table 2 presents the results of logistic regression analysis for the association of emotion regulation with the IGD and control groups. In Model 1 for IGD, emotion adjustment (Wald χ^2 = 19.307; p < .001; OR = 0.747; 95% CI [0.656, 0.851]) was the first factor entered into the model, followed by emotion concealment (Wald χ^2 = 10.849; p = .001; OR = 1.183; 95% CI [1.070, 1.307]) after controlling for sex, age, and educational age. This indicated that emotion adjustment was the form of emotion regulation most associated with IGD. The results of the regression indicated that the model explained 33.8% of the variance. Then, the interaction terms of emotion concealment and emotion adjustment were entered into the model to test their interaction effects on IGD. The results demonstrated that the interaction term was significantly associated with IGD (Wald χ^2 = 7.654; p = .006; OR = 1.033; 95% CI [1.010, 1.058]; Model 2 in Table 2).

Furthermore, depression and hostility were entered into Model 1 and controlled for to test the association of emotion concealment and emotion adjustment with IGD (Model 3 in Table 2). The result demonstrated no significant association between emotion adjustment and IGD (Wald χ2 = 2.099; df = 1; p = .147; OR = 0.874; 95% CI [0.728, 1.049]). The association between emotion concealment and IGD was lower (Wald χ^2 = 5.948; df = 1; p = .015; OR = 1.200; 95% CI [1.036, 1.389]).

To more thoroughly evaluate the interaction effect between emotion concealment and emotion adjustment, we divided the emotion adjustment scores in the IGD and control groups into high and low groupings by the mean of all subjects. The numbers of participants with low emotion adjustment scores were 52 in the IGD group and 35 in the control group. The numbers of participants with high emotion adjustment scores were 17 in the IGD group and 34 in the control group. In low emotion adjustment score groupings, emotion concealment displayed no significant association with IGD (p = .217). However, in high emotion adjustment score groupings, emotion concealment revealed a significant association with IGD (p = .002). This result demonstrated that only those exhibiting adequate emotion adjustment would exhibit an emotion concealment effect on IGD (Table 3).

Logistic regression analysis was used to test whether emotion regulation was significantly associated with IGD when compared with regular gamers (Table 4). In Model 1 for IGD, emotion adjustment (Wald χ^2 = 18.034; df = 1; p < .001; OR = 0.750; 95% CI [0.657, 0.857]) was the first factor entered into the model, followed by emotion concealment (Wald χ^2 = 11.663; df = 1; p = .001; OR = 1.191; 95% CI [1.077, 1.317]), after controlling for sex, age, and level of

Table 2
Forward logistic regression model for the association between the IGD group (versus the control group) and emotion regulation after controlling for sex, age, and education level.

Variables	Wald	Exp(β)	95% CI
IGD group versus Control group			
Model 1			
Sex	0.80	1.63	0.56-4.81
Age (year)	0.92	1.06	0.94-1.20
Education level (year)	16.37***	0.37	0.23-0.60
Emotion adjustment	19.31***	0.75	0.66-0.85
Emotion concealment	10.85**	1.18	1.07-1.31
Model 2			
Sex	1.16	1.88	0.60-5.91
Age (year)	2.21	1.10	0.97-1.26
Education level (year)	17.53***	0.36	0.18-0.54
Emotion adjustment	11.64**	0.27	0.13-0.57
Emotion concealment	4.52*	0.56	0.32-0.96
Emotion concealment X adjustment	7.65**	1.03	1.01-1.06
Model 3			
Sex	1.51	2.61	0.57-12.05
Age (year)	3.75	1.20	0.99-1.45
Education level (year)	13.14***	0.24	1.11-0.52
Emotion concealment	5.95*	1.20	1.04-1.39
Emotion adjustment	2.10	0.87	0.73-1.05
Depression	5.49	1.11	1.02-1.21
Hostility	15.53***	1.14	1.07-1.21

Emotion concealment: emotion concealment subscale score from the Affective Style Questionnaire
Emotion adjustment: emotion adjustment subscale score from the Affective Style Questionnaire
* p < .05;
** p < .01;
*** p < .001

Table 3
Difference in emotional concealment between the IGD group and the control group for low- and high-level emotion adjustment participants.

Variables	IGD Group Mean ± SD	Control Group Mean ± SD	T test
Low emotion adjustment participants (≦25)			
	N = 52	N = 35	
Emotion concealment	28.54 ± 5.84	27.09 ± 4.99	1.24
High emotion adjustment participants (>25)			
	N = 17	N = 34	
Emotion concealment	33.12 ± 4.17	28.79 ± 4.55	3.39**

*$p < .05$; **$p < .01$; ***$p < .001$

Table 4
Forward logistic regression model for the association between the IGD group (versus the regular gamer group) and emotion regulation after controlling for sex, age, and education level.

Variables	Wald	Exp(β)	95% CI
IGD group versus Regular gamer group			
Model 1			
Sex	0.26	1.32	0.46-3.76
Age (year)	6.91**	1.18	1.04-1.34
Education level (year)	15.75***	0.36	0.21-0.59
Emotion adjustment	11.66**	1.19	1.08-1.32
Emotion concealment	18.03***	0.75	0.66-0.86
Model 2			
Sex	0.30	1.35	0.46-3.92
Age (year)	7.41**	1.19	1.05-1.35
Education level (year)	16.95***	0.34	0.21-0.57
Emotion adjustment	5.84*	0.48	0.27-0.87
Emotion concealment	0.48	0.86	0.56-1.32
Emotion concealment X adjustment	2.38	1.01	0.99-1.03
Model 3			
Sex	0.12	1.26	0.34-4.75
Age (year)	7.91	1.27	1.08-1.50
Education level (year)	13.43***	0.27	0.14-0.55
Emotion concealment	10.12**	1.26	1.09-1.45
Emotion adjustment	2.69	0.86	0.72-1.03
Depression	2.56	1.07	0.99-1.15
Hostility	15.15***	1.12	1.06-1.18

Emotion concealment: emotion concealment subscale score from the Affective Style Questionnaire
Emotion adjustment: emotion adjustment subscale from the Affective Style Questionnaire
* $p < .05$;
** $p < .01$;
*** $p < .001$

education. The model indicated that emotion adjustment was the form of emotion regulation most associated with IGD. The regression results indicated that the model explained 32.3% of the variance. Then, the interaction terms of emotion concealment and emotion adjustment were entered into the model so that their interaction effect on IGD could be tested. The result demonstrated that the interaction term was not significantly associated with IGD (Wald $\chi^2 = 2.379$; $p = .123$; $df = 1$; OR = 1.014; 95% CI [0.996, 1.032]; Model 2 in Table 4).

Furthermore, depression and hostility were entered into Model 1 and controlled for to test the association between emotion concealment and emotion adjustment for IGD (Model 3 in Table 4). The result demonstrated no significant association with emotion adjustment in the IGD group (Wald $\chi^2 = 2.694$; $df = 1$; $p = .101$; OR = 0.862; 95% CI [0.721, 1.029]) and a slightly lower association with emotion concealment (Wald $\chi^2 = 10.121$; $df = 1$; $p = .001$; OR = 1.256; 95% CI [1.092, 1.446]).

In the IGD group, emotion adjustment was negatively correlated with depression and hostility, emotion concealment was negatively correlated with hostility ($r = -0.469$; $p < 0.001$), and emotion tolerance was negatively correlated with depression ($r = -0.299$; $p = .013$). (Table 5).

Table 5
Pearson's correlation between emotion regulation, depression, and hostility in the IGD group ($N = 69$).

	Depression	Hostility
Emotion concealment	-0.15	-0.47**
Emotion adjustment	-0.48**	-0.36**
Emotion tolerance	-0.30*	-0.09

*$p < .05$; **$p < 01$
Emotion concealment: emotion concealment subscale score from the Affective Style Questionnaire
Emotion adjustment: emotion adjustment subscale score from the Affective Style Questionnaire
Tolerance: tolerance subscale score from the Affective Style Questionnaire
Depression: Mandarin Chinese Version of The Center for Epidemiological Studies Depression scale (CESD)
Hostility: Chinese version of the short-form Buss-Durkee Hostility Inventory (BDHIS-SF)

4. DISCUSSION

This study investigated correlations between emotion regulation, depression, hostility, and Internet gaming addiction. Comparing the results with other results in research literature reveals some consistencies, differences, and surprising findings.

4.1. Relationship between emotion regulation and IGD

Our study demonstrated that the IGD group (versus the control group and the regular gamer group) displayed significant associations with emotion adjustment after controlling the variables of sex, age, and education level (Table 3). A meta-analysis study found Internet addiction to be related to emotional intelligence(Ranjbar & Bakhshi, 2018). Another study claimed that Internet addiction and emotional intelligence were unrelated(Sanghvi & Rai, 2015). No consensus currently exists. To our knowledge, only one study previously investigated emotion regulation, reporting the IGD group to have lower cognitive reappraisal and higher expressive suppression(J.-Y. Yen et al., 2017). The concept of cognitive reappraisal is similar to emotion adjustment, and suppression is similar to emotion concealment. The IGD group had a lower cognitive reappraisal. This conclusion is similar to our study's. However, participants were Taiwanese in both studies. Whether this result can apply to other cultures and races need further investigation.

4.2. Relationship between depression, hostility, and IGD

Individuals with IGD experience depression or irritation when they are prohibited from playing games online(American Psychiatric Association, 2013). Many studies have reported similar observations, suggesting that IGD or excessive online gaming may contribute to depression(Gentile et al., 2011; Hellstrom et al., 2015). In adolescents, IGD is also associated with aggression and hostility(Gentile et al., 2011; Lim et al., 2015). Moreover, use of violent video games may increase baseline aggression(Barlett, Harris, & Baldassaro, 2007). Our results, as well as those of other studies, demonstrate that the IGD group experienced greater depression and hostility than did the regular gamer and control groups (Table 1). In addition, IGD severity had a significant positive correlation with depression and hostility in the IGD group. Although no causal relationship can be interpreted here, reports have suggested a bidirectional association between depression and IGD or Internet addiction(Gentile et al., 2011; C. H. Ko et al., 2015). This is probably because the Internet provides a virtual reality that depressed

people can escape to(Kazakova, Cauberghe, Pandelaere, & De Pelsmacker, 2014), and the negative consequences of IGD could contribute to depression. These strongly support our findings that IGD is associated with depression and hostility. However, the causation of this correlation requires further investigation.

4.3. Mediating role of depression and hostility in the association between emotion regulation and IGD

Our study demonstrated a significant association with emotion adjustment in the IGD group after controlling for sex, age, and education level (Table 2). Our study also reported emotion adjustment to be significantly correlated with depression and hostility. Finally, our study reported that IGD had a higher depression and hostility. In the IGD group, emotion adjustment was related to depression ($r = -0.476$, $p < .001$) (Table 5). However, after controlling for depression and hostility, the IGD group displayed no significant association with emotion adjustment ($p = .147$) (Table 2). This result indicates that depression and hostility mediate the association between emotion adjustment and IGD(Baron & Kenny, 1986).

Appraisal theories focus on the meanings of events, rather than the events themselves(Collins, Ortony, & Clore, 1988; Folkman, Lazarus, Gruen, & DeLongis, 1986; Scherer, 1988). People have different emotional reactions to similar things, depending on their views and appraisals(Folkman & Lazarus, 1985; Scherer & Ceschi, 1997; Smith & Ellsworth, 1987). Subjects with dysfunctional emotion adjustment are therefore likely to experience negative emotions such as depression. When confronting the distress of IGD, poor emotion adjustment may raise negative emotions, such as depression, to their negative consequences caused by gaming. Without reasonable coping skill, individual with depression might escape to gaming to relieve the negative emotion and increased their risk of IGD. Thus, depression could paly a mediator in the association between emotional adjustment and Internet gaming addiction as current study report.

4.4. Moderating role of emotion adjustment on the association between emotion concealment and IGD

After controlling for emotion adjustment, individual with higher emotional concealing had higher odds ratio to be diagnosed as IGD. Furthermore, we observed that the interaction effect between emotion adjustment and emotion concealment had a significant effect on IGD. Then, we divided the emotion adjustment score in the IGD group and the control group into high and low groupings based on a score of 25 (Table 3). In low emotion adjustment score groups, emotion concealment displayed no significant association with IGD ($p = .217$). In high emotion adjustment score groups, individual with IGD had higher emotion concealment ($p = .002$). This indicated that emotion adjustment is a moderator variable between emotion concealment and IGD. This signifies that only individuals exhibiting adequate emotion adjustment capabilities would experience an effect from emotion concealment on IGD. However, high emotion adjustment participants present with higher emotion concealment in IGD group, which may indicates emotion concealment is not a good adaptation.

4.5. Clinical implications

The poor emotion regulation of subjects with IGD was associated with hostility and depression(C. H. Ko et al., 2015). Some evidence demonstrated that impairment of emotion adjustment is related to psychiatric diseases, such as depression, substance use disorder, and eating disorders(Berking & Wupperman, 2012). Emotion-regulation strategies may improve these psychopathological symptoms (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Clinically, for adults with IGD, we must evaluate emotion regulation and perform appropriate interventions. If we could intervene within potential IGD populations relatively early by implementing evidence-based emotion-regulation strategies, such as emotion-focused therapy (McCarthy & Barber, 2004), we might prevent IGD progression. We believe that improving emotion adjustment is the key to tackling the growing problem of Internet gaming addiction.

On the other hand, the individual with IGD had higher emotional concealing. Thus, intervention to attenuate emotional concealing was also necessary to provide to individual with IGD, particular among those with adequate emotional adjustment as its moderating effect.

4.6. Limitations

This study has several limitations. First, the statistical power is inadequate as a result of the small sample size, which was due to the strict inclusion criteria. Second, we conducted only interview questionnaires rather than analysis of real situations. Questionnaires may underestimate the severity of variables. Third, a cross section study makes cause and effect difficult to determine. In this study, we hypothesized that mediating role of depression and hostility in the association between emotion regulation and IGD and evaluated it. However, this result did not preclude the alternative model to explain the association within these factors. Finally, nonsignificant results in the high emotion adjustment group could be due to the small IGD group sample size.

5. Conclusion

Our study demonstrates that emotion adjustment is significantly negatively associated with IGD. After controlling for emotion adjustment, emotion concealment was also positively associated with IGD. Depression, hostility, or both could be the complete mediator(s) in the association between IGD and emotion adjustment. Furthermore, emotion adjustment moderates the association between emotion concealment and IGD.

IGD should be tackled from more diverse perspectives to pinpoint effective interventions. By employing emotion-focused therapy to intervene in the emotion-regulation deficit and addressing depression and hostility with psychosocial support, we believe that the numerous problems arising from the online gaming addiction could be partially resolved. Future research should explore and prove this claim. We hope that more studies from different perspectives may be undertaken to overcome various limitations and to reveal more potential IGD interventions.

Conflict of interest declaration: None

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2020.113060.

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