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Internet Gaming Disorder in the DSM-5: Personality and Individual Differences

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Abstract
Research that has examined the relationships between Internet gaming disorder (IGD) and personality traits has been limited by the use of instruments based on inappropriate criteria. Furthermore, the personality traits have seldom been studied concurrently, precluding an examination of the relative importance of each trait in predicting IGD. The current study aimed to address those limitations by concurrently examining the Big Five Personality Factors, sensation seeking, impulsivity, and aggression, as potential predictors of IGD. Participants were a convenience sample of 123 gamers (57.7% females). A hierarchical multiple regression was conducted with age and gender in Step 1 and the personality traits in Step 2. The results showed that only impulsivity and gender significantly predicted IGD. Limitations include the conceptualization of impulsivity as a negative construct and the unreliability of the openness to experience subscale. Future research directions include using impulsivity as a core characteristic of an individual and examine its interaction with a range of affective and cognitive factors.

Keywords Internet gaming disorder · Big five personality factors · Sensation seeking · Impulsivity · Aggression

The majority of research that has examined personality traits as risk factors of Internet gaming disorder (IGD) have used instruments based on inappropriate or outdated criteria (Şalvarlı & Griffiths, 2019). Also, personality traits have seldom been studied concurrently, precluding an examination of the relative importance of each trait in predicting IGD. These limitations precluded a contemporary understanding of the risk factors of IGD based on the *Diagnostic and Statistical Manual of Mental Disorders*, 5th edition (DSM-5) criteria (American Psychiatric Association, 2013). Consequently, the current study aimed to address this limitation by concurrently examining the Big Five Personality Factors, sensation seeking, impulsivity, and aggression, as potential predictors of DSM-5 IGD.

Internet Gaming Disorder

The prevalence rates of IGD vary widely. A literature review found prevalence rates that ranged from 0.5 to 9.9% (Petry et al., 2015). Prevalence rates tended to be higher in Asian countries. Indeed, a meta-analysis of eight IGD studies in Southeast Asia found rates that ranged from 5.4 to 17.7%, with a pooled prevalence rate of 10.1% (Chia et al., 2020). The wide range of prevalence rates could be due to the use of different criteria for IGD. Specifically, before the inclusion of IGD in Section III of the DSM-5 as a condition that warrants further studies (American Psychiatric Association, 2013), researchers have adapted criteria for substance use disorders, gambling disorder, impulse-control disorder, or Internet addiction to assess IGD (Petry et al., 2014). These disparate approaches resulted in differences in definition, conceptualization, measurement, and consequently, prevalence rates of IGD (Petry et al., 2015). Although the DSM-5 IGD criteria is still being extensively debated and critiqued (Griffiths et al., 2016; Kardefelt-Winther, 2015; Petry et al., 2014), it provides an adequate framework for future research and could address the high variability of prevalence rates.

The DSM-5 defined IGD as "a pattern of excessive and prolonged Internet gaming that results in a cluster of cognitive and behavioral symptoms, including progressive loss of control over gaming, tolerance, and withdrawal symptoms, analogous to the symptoms of substance use disorders" (American Psychiatric Association, 2013, p. 796). Specifically, the nine criteria are (1) preoccupation with gaming, (2) withdrawal symptoms like irritability or

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anxiety when unable to play games, (3) tolerance – the need to increase time spent on games, (4) unsuccessful attempts to reduce or stop gaming, (5) loss of interest in other activities because of gaming, (6) continued gaming despite problems, (7) deceiving family members or others about the amount of gaming, (8) gaming to escape or to relive negative moods, (9) risk or loss of a relationship, job, or educational or career opportunity because of gaming. Individuals who meet five or more criteria during the past 12 months would meet the diagnostic criteria for IGD.

The negative consequences of IGD have been well-documented. First, IGD is associated with poorer mental health. For example, studies have reported positive correlations between IGD and negative emotional states like depression, anxiety, and stress (Pontes, 2017; Wong et al., 2020). Second, IGD is associated with poorer sleep quality (see Lam, 2014 for a review). For example, one study found that IGD significantly predicts poorer sleep quality after controlling for demographic variables (Wong et al., 2020). Also, individuals with IGD had lesser hours of sleep per night (Hawi et al., 2018) and more sleep problems (Satghare et al., 2016) than those without IGD. Third, IGD is associated with interpersonal problems. For example, a qualitative study of adolescents undergoing treatment for IGD found that all participants experienced an increased in family conflicts (Seok et al., 2018). Fourth, IGD is associated with lower academic achievement. For example, individuals with IGD had lower grades than those without IGD (Hawi et al., 2018). Taken together, it is unsurprising that IGD is also associated with lower quality of life (Beranuy et al., 2020). Given these negative consequences, researchers have sought to identify risk factors for IGD.

Research on risk factors is partially motivated by two models. The continuum model of IGD suggests that risk factors (e.g., personality traits) lead to IGD, which in turn, leads to negative consequences (Kuss & Griffiths, 2012). In contrast, the Interaction of Person-Affect-Cognition-Execution model postulates that core characteristics of an individual (e.g., personality traits) interact with a range of affective and cognitive factors to result in the development and maintenance of IGD (Young & Brand, 2017). Differences notwithstanding, both models emphasize the role of personality traits as predisposing factors for IGD. Two literature reviews found that commonly studied risk factors for IGD include the Big Five personality factors, sensation seeking, impulsivity, and aggression (Gervasi et al., 2017; Şalvarlı & Griffiths, 2019).

The Big Five personality factors have been examined as risk factors for IGD. These factors refer to a hierarchical organization of personality traits into five basic dimensions: openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism (Costa & McCrae, 1992; Goldberg et al., 2006). Openness to experience refers to an inclination for a diverse and broad range of new experiences. Conscientiousness refers to a tendency to exhibit goal-directed behavior, such as persistence, organization, and motivation. Extraversion is characterized by being outgoing and active, along with a tendency to seek and to prefer the company of others. Agreeableness is the tendency to be compassionate, good natured, and eager to cooperate and avoid conflict. Lastly, neuroticism is the tendency to be sensitive, emotional, and prone to experience negative emotions. While the literature reviews concluded that the relationships between IGD and the Big Five Personality Factors are mixed (Gervasi et al., 2017; Şalvarlı & Griffiths, 2019), a recent meta-analysis clarified those results by statistically synthesizing the data of 13 articles (Chew, 2022). The study found that IGD was not significantly correlated with openness to experience. In contrast, IGD was negatively correlated with conscientiousness, extraversion, and agreeableness, and positively correlated with neuroticism. However, it should be noted that only one article in the meta-analysis assessed IGD based on the DSM-5 criteria.

Sensation seeking, impulsivity, and aggression have also been examined as risk factors for IGD. Sensation seeking is defined as "the need for varied, novel, and complex sensations and experiences and the willingness to take physical and social risks for the sake of such experiences" (Zuckerman, 1979, p. 10). The relationship between IGD and sensation seeking is mixed. Research has either found no relationship (Collins et al., 2012; Khazaal et al., 2016; Walther et al., 2012), a positive relationship (Hu et al., 2017), or a negative relationship (Mehroof & Griffiths, 2010; Müller et al., 2016) between the two variables. Impulsivity refers to the "tendency to display behavior characterized by little or no reflection, forethought, and/or consideration of the consequences" (Gervasi et al., 2017, p. 296). With some exceptions (Collins et al., 2012), research has found a consistent positive relationship between IGD and impulsivity (Blinka et al., 2016; Choi et al., 2014; Hu et al., 2017; Walther et al., 2012). Aggression is defined as the tendency to be angry and hostile and to engage in physical and/or verbal aggression (Buss & Perry, 1992). Research has found a consistent positive relationship between IGD and aggression (Collins et al., 2012; Festl et al., 2013; Kim et al., 2008; Mehroof & Griffiths, 2010).

There are two limitations associated with the extant literature. First, most studies are limited by the use of instruments based on inappropriate or outdated criteria. For example, some studies adapted Young's (1996) Internet Addiction Test to assess IGD (e.g., Ok, 2021). This procedure is problematic for three reasons (Griffiths, 2014; Király et al., 2014; Kuss et al., 2017). First, the Internet is a medium that could facilitate addiction rather than the object of an addiction

per se. Second, the Internet Addiction Test was developed to assess all online behaviors; nuances associated with specific technology-related addiction are ignored. Lastly, gaming takes place both offline (i.e., video gaming) and online (i.e., online gaming). In contrast, other studies used criteria associated with substance use disorder (e.g., Braun et al., 2016) or gambling disorder (e.g., Kesici, 2020). While the DSM-5 IGD criteria was partially developed by drawing on the criteria for those two disorders (Petry et al., 2015), it is a unique disorder by itself. For example, the preoccupation with gaming criteria is similar to the preoccupation criteria in gambling disorder. However, no such criteria exist for substance use disorder. More important, research has found that IGD had a moderate relationship with Internet addiction, and weak relationships with substance use disorder and gambling disorder, suggesting that these are related but distinct constructs (Sigerson et al., 2017).

Second, the aforementioned personality traits have seldom been studied concurrently, precluding an examination of the relative importance of each trait in predicting IGD. For example, studies have studied the Big Five personality factors (Braun et al., 2016), sensation seeking (Müller et al., 2016), impulsivity (Choi et al., 2014), and aggression (Festl et al., 2013) independently of each other. While some studies have examined all of those personality traits concurrently, correlational analyses were used to analyze the data (Collins et al., 2012). This procedure quantifies the relationship between two variables without considering the effects of other variables. However, it is important to control for the effects of other personality traits since they are correlated with each other. Furthermore, the identification of the most important personality traits has theoretical and clinical implications for practice. Specifically, existing models could be refined by indicating specific personality traits implicated in IGD (Kuss & Griffiths, 2012; Young & Brand, 2017). Also, instead of assessing all personality traits, clinicians can save time by assessing the most important traits to identify at-risk individuals for interventions. Overall, these two limitations precluded a contemporary understanding of the risk factors of IGD.

The Current Study

The current study aimed to address those limitations by concurrently examining the Big Five Personality Factors, sensation seeking, impulsivity, and aggression, as potential predictors of DSM-5 IGD. Furthermore, given that IGD is associated with age and gender differences (Stevens et al., 2021), both variables were controlled for in the current study. We do not have specific hypotheses given some of the mixed findings in the literature, and the exploratory nature and novelty of the current study.

Method

Participants

Participants were a convenience sample of 123 gamers (57.7% females). Their age ranged from 18 to 59 years ($M = 25.02$, $SD = 5.34$). Given the rule of thumb of $N > = 104 + m$ (where $m =$ number of predictors) (Green, 1991) and nine predictors in the current study, the current sample size exceeds the required number of 113 participants.

Instruments

The Internet Gaming Disorder Scale-Short-Form (IGDS9-SF)

The IGDS9-SF is a 9-item instrument designed to assess the nine criteria of IGD in the DSM-5: (a) preoccupation, (b) withdrawal, (c) tolerance, (d) unsuccessful attempts to stop, (e) loss of interest in other activities, (f) continued gaming despite problems, (g) deception, (h) relive negative moods, and (i) loss of a relationship or job (Pontes & Griffiths, 2015). Participants were asked to report on their gaming activity during the past 12 months. Responses are made on a 5-point Likert scale that ranges from 1 = *Never* to 5 = *Very Often*. The item scores are summed, with higher scores indicating high levels of gaming disorder. Scores for the instrument range from 9 to 45. Participants who provided a response of 4 (i.e. *Often*) or higher to at least 5 items meet the diagnostic criteria of IGD (American Psychiatric Association, 2013). The unidimensional structure of the instrument has been supported by exploratory and confirmatory factor analysis (Pontes & Griffiths, 2015). In addition, the instrument had an acceptable internal consistency of 0.87.

The International Personality Item Pool-Short-Form (Mini-IPIP)

The Mini-IPIP is a 20-item instrument designed to assess the Big Five Personality Factors: (a) Openness to experience (e.g., have a vivid imagination), (b) Conscientiousness (e.g., get chores done right away), (c) Extraversion (e.g., am the life of the party), (d) Agreeableness (e.g., sympathize with others' feelings), and (e) Neuroticism (e.g., have frequent mood swings) (Donnellan et al., 2006). Responses are made on a 5-point Likert scale that ranges from 1 = *Very Inaccurate* to 5 = *Very Accurate*. Negatively worded items are reverse scored and appropriate item scores are summed for each factor, with higher scores indicating higher levels of the respective personality factor. Scores for each factor range from 4 to 20. The five-factor structure of the instrument has been supported by confirmatory factor analysis (Donnellan et al., 2006). In addition, the factors had internal

consistencies of 0.65 to 0.70 (openness to experience), 0.69 to 0.75 (conscientiousness), 0.77 to 0.82 (extraversion), 0.70 to 0.75 (agreeableness), and 0.68 to 0.70 (neuroticism) across two studies.

The Brief Sensation Seeking Scale

The Brief Sensation Seeking Scale is an 8-item instrument designed to assess sensation seeking (e.g., I would like to explore strange places) (Hoyle et al., 2002). Responses are made on a 5-point Likert scale that ranges from 1 = *Strongly Disagree* to 5 = *Strongly Agree*. The item scores are summed, with higher scores indicating high levels of sensation seeking. Scores for the instrument range from 8 to 40. The unidimensional structure of the instrument has been supported by confirmatory factor analysis (Hoyle et al., 2002). In addition, the instrument had an acceptable internal consistency of 0.76.

The Barratt Impulsiveness Scale Version 11

The Barratt Impulsiveness Scale Version 11 is a 30-item instrument designed to assess impulsivity (e.g., I "squirm" at plays or lectures) (Patton et al., 1995). Responses are made on a 4-point Likert scale that ranges from 1 = *Rarely/Never* to 4 = *Almost Always/Always*. Negatively worded items are reverse scored and item scores are summed, with higher scores indicating higher levels of impulsivity. Scores for the instrument range from 30 to 120. Although exploratory factor analyses suggested a six-factor structure, the high intercorrelations between the factors and the total score suggested that the total score should be used for future research (Fossati et al., 2001; Patton et al., 1995). The instrument had an acceptable internal consistency of 0.82.

The Buss-Perry Aggression Questionnaire

The Buss-Perry Aggression Questionnaire is a 29-item instrument designed to assess four factors of aggression: (a) Physical Aggression (e.g., If somebody hits me, I hit back), (b) Verbal Aggression (e.g., I often find myself disagreeing with people), (c) Anger (e.g., Some of my friends think I'm a hothead), and (d) Hostility (e.g., I am suspicious of overly friendly strangers) (Buss & Perry, 1992). Responses are made on a 5-point Likert scale that ranges from 1 = *Extremely Uncharacteristic of Me* to 5 = *Extremely Characteristic of Me*. Negatively worded items are reverse scored and appropriate item scores are summed for each factor, with higher scores indicating higher levels of the respective aggression factor. Scores for range from 9 to 45 for physical aggression, 5 to 25 for verbal aggression, 7 to 35 for anger, and 8 to 40 for hostility. The four-factor structure of the instrument has been supported by exploratory and confirmatory factor analysis (Buss & Perry, 1992). In addition, the factors had internal consistencies of 0.85 (physical aggression), 0.72 (verbal aggression), 0.83 (anger), and 0.77 (hostility).

Procedure

Participants completed the study online via Qualtrics. The link to the Qualtrics survey was posted on gaming discord servers, telegram groups, the university's research participation system, and the second author's Instagram and Facebook page from 5 October 2021 to 2 March 2022. The link was posted once without reminders. To hide the true nature of the study, participants were told that the study aims to examine gaming habits and personality. Upon providing informed consent, participants completed the IGDS9-SF (Pontes & Griffiths, 2015), the Mini-IPIP (Donnellan et al., 2006), the Brief Sensation Seeking Scale (Hoyle et al., 2002), the Barratt Impulsiveness Scale Version 11 (Patton et al., 1995), and the Buss-Perry Aggression Questionnaire (Buss & Perry, 1992). The instruments were administered in a randomized order to control for fatigue and order effects. Subsequently, participants completed a demographic form that asks for demographic information (age and gender). Finally, participants were debriefed about the true nature of the study. Eligible participants received course credits. The study took no more than 30 min to complete. This procedure was approved by the university's Human Research Ethics Committee (Approval number: H8550).

Results

The results were analyzed with IBM SPSS Statistics Version 21 with the alpha level set at 0.05. The descriptives are presented in Table 1. Only three participants (2.4%) met the diagnostic criteria for IGD (American Psychiatric Association, 2013). An independent samples *t*-test showed that males had higher IGD scores ($M = 19.69$, $SD = 6.22$) than females ($M = 16.63$, $SD = 5.37$), $t(121) = -2.92$, $p = 0.004$. A series of Pearson product-moment correlations showed that IGD is negatively correlated with conscientiousness ($r = -0.29$, $p < 0.01$) and positively correlated with impulsivity ($r = 0.39$, $p < 0.01$) and aggression ($r = 0.29$, $p < 0.01$). With a Cronbach's alpha of 0.55, the openness to experience subscale is unreliable. Furthermore, Cronbach's alpha will not improve with the removal of any items. Consequently, the subscale was omitted from subsequent analysis.

A hierarchical multiple regression was conducted to examine the ability of personality traits to predict IGD after controlling for demographic variables. Assumptions testing found no violations of the independence of errors, normality, linearity, and homoscedasticity assumptions. Furthermore,

Table 1 Descriptives and intercorrelations of Internet gaming disorder, age, and personality traits

Variables	1	2	3	4	5	6	7	8	9	10
1. Internet gaming disorder	-									
2. Age	−0.10	-								
3. Openness to experience	−0.03	0.11	-							
4. Conscientiousness	−0.29**	0.23*	0.33***	-						
5. Extraversion	−0.12	0.04	0.17	0.15	-					
6. Agreeableness	−0.11	−0.12	0.53***	0.34***	0.33***	-				
7. Neuroticism	0.15	−0.29**	−0.02	−0.18	−0.02	0.08	-			
8. Sensation seeking	0.14	−0.13	−0.06	−0.24**	0.26**	−0.11	0.14	-		
9. Impulsivity	0.39**	−0.24**	−0.32***	−0.69***	−0.19*	−0.36***	0.29**	0.39***	-	
10. Aggression	0.29**	−0.20*	−0.23**	−0.30**	0.07	−0.19*	0.39***	0.48***	0.53***	-
M	17.93	25.02	13.94	13.30	11.35	14.68	11.55	25.76	64.49	76.06
SD	5.92	5.34	2.55	3.58	3.33	2.83	3.15	5.98	10.50	20.39
Cronbach's Alpha	0.87	-	0.55	0.75	0.72	0.74	0.72	0.78	0.85	0.93

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

there were no univariate or multivariate outliers. The results are presented in Table 2. Age and gender (0 = female and 1 = male) were entered in Step 1. The variables explained 8.6% of the variance in IGD, $F(2, 120) = 5.64$, $p = 0.005$. The addition of conscientiousness, extraversion, agreeableness, neuroticism, sensation seeking, impulsivity, and aggression in Step 2 explained an additional 14.9% of the variance in IGD, F change $(7, 113) = 3.14$, $p = 0.005$. The total variance explained by the model was 23.5%, $F(9, 113) = 3.85$, $p < 0.001$. Impulsivity was the most important significant predictor ($beta = 0.30$, $p = 0.025$) followed by gender ($beta = 0.27$, $p = 0.004$).

Discussion

The results of this study showed that impulsivity and gender were the only significant predictors of IGD. The results were consistent with previous studies that found a positive relationship between impulsivity and IGD (Blinka et al., 2016; Choi et al., 2014; Hu et al., 2017; Walther et al., 2012). In other words, individuals who behave without regards to consequences were more likely to engage in problematic gaming. In addition, the current study extended on previous findings by showing that the relationship persists after controlling for the effects of other personality traits. While

Table 2 Hierarchical multiple regression with demographic variables and personality traits as predictors and Internet gaming disorder as criterion

Predictors	*B*	*SE*	95% CI		*Beta*	*p*
			LL	*UL*		
Step 1						
Age	−0.16	0.10	−0.35	0.03	−0.14	0.106
Gender	3.30	1.05	1.22	5.39	0.28	0.002
Step 2						
Age	−0.02	0.10	−0.22	0.18	−0.02	0.860
Gender	3.18	1.08	1.05	5.31	0.27	0.004
Conscientiousness	−0.07	0.19	−0.45	0.31	−0.04	0.730
Extraversion	−0.18	0.17	−0.52	0.15	−0.10	0.282
Agreeableness	0.14	0.21	−0.27	0.55	0.07	0.507
Neuroticism	0.14	0.19	−0.23	0.50	0.07	0.458
Sensation seeking	−0.05	0.10	−0.24	0.15	−0.05	0.636
Impulsivity	0.17	0.08	0.02	0.32	0.30	0.025
Aggression	0.03	0.03	−0.04	0.09	0.09	0.447

Gender was coded as 0 = female and 1 = male

SE standard error, *CI* confidence interval, *LL* lower limit, *UL* upper limit

conscientiousness and aggression were correlated with IGD, their effects were reduced after controlling for impulsivity. These results highlight the importance and superiority of impulsivity over the other traits in predicting IGD. The results were also consistent with previous studies that found gender differences in IGD (Stevens et al., 2021). Specifically, males had a higher risk for IGD than females. Similarly, this effect was found after controlling for the effects of other personality traits. Overall, it appears that impulsivity and gender and important risk factors for IGD.

There are theoretical and clinical implications of the results. First, existing models IGD (Kuss & Griffiths, 2012; Young & Brand, 2017) did not include gender as a risk factor despite the robust evidence for this variable (Stevens et al., 2021). The current study reinforces the importance of gender as a risk factor since it predicts IGD after controlling for other predictors. Also, the models are vague on the specific personality traits involved in IGD. This could be due to the mixed findings in the literature (Gervasi et al., 2017; Şalvarlı & Griffiths, 2019). The current study showed that impulsivity appears to be a key personality trait involved in IGD and should be emphasized in existing models. Second, with an emphasis on prevention over treatment, clinicians could target males with high impulsivity scores for interventions.

Limitations of this study should be noted. First, impulsivity was conceptualized as a negative construct in the current study (Gervasi et al., 2017). However, some researchers have made a distinction between functional and dysfunctional impulsivity (Dickman, 1990). Functional impulsivity is considered a positive construct since it refers to being impulsive in situations where a quick response or decision would be ideal (e.g., in sports). These two forms of impulsivity could be differentially related to IGD. Second, the openness to experience subscale was unreliable and omitted from subsequent analysis. This omission prevented the current study from examining its ability to predict IGD. However, for the sake of completeness, the hierarchical multiple regression was repeated by including openness to experience as a predictor. The results remain the same with impulsivity and gender as the only significant predictors of IGD. Third, only three participants (2.4%) met the diagnostic criteria for IGD (American Psychiatric Association, 2013), suggesting a predominantly healthy sample. Different personality traits might act as risk factors for a clinical IGD sample. In the future these limitations might be controlled by considering functional impulsivity, using a better instrument to assess the Big Five Personality Factors, and replicating the study using a clinical IGD sample.

Future research directions might include using impulsivity as a core characteristic of an individual and examine its interaction with a range of affective and cognitive factors (Young & Brand, 2017). The results have the potential to understand the development and maintenance of IGD. Also, future research could conduct longitudinal studies to examine if impulsivity leads to IGD. The results could inform interventions for IGD. Specifically, interventions could be developed with a focus on reducing impulsivity. Taken together, with a better understanding of IGD, clinicians would be better equipped to reduce IGD and its associated negative consequences.

Author Contributions All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Peter K. H. Chew and Charmaine M. H. Wong. The first draft of the manuscript was written by Peter K. H. Chew and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Declarations

Ethics Approval This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the university's Human Research Ethics Committee (Approval number: H8550).

Consent to Participate Informed consent was obtained from all individual participants included in the study.

Competing Interests The authors have no relevant financial or non-financial interests to disclose.

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References

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Publishing.

Beranuy, M., Machimbarrena, J. M., Vega-Osés, M. A., Carbonell, X., Griffiths, M. D., Pontes, H. M., & González-Cabrera, J. (2020). Spanish validation of the internet gaming disorder scale–short form (IGDS9-SF): Prevalence and relationship with online gambling and quality of life. *International Journal of Environmental Research and Public Health, 17*(5), 1562. https://doi.org/10.3390/ijerph17051562

Blinka, L., Škařupová, K., & Mitterova, K. (2016). Dysfunctional impulsivity in online gaming addiction and engagement.

Cyberpsychology: Journal of Psychosocial Research on Cyberspace, *10*(3), article 5. https://doi.org/10.5817/CP2016-3-5

Braun, B., Stopfer, J. M., Müller, K. W., Beutel, M. E., & Egloff, B. (2016). Personality and video gaming: Comparing regular gamers, non-gamers, and gaming addicts and differentiating between game genres. *Computers in Human Behavior, 55*, 406–412. https://doi.org/10.1016/j.chb.2015.09.041

Buss, A. H., & Perry, M. (1992). The aggression questionnaire. *Journal of Personality and Social Psychology*, *63*(3), 452–459. https://doi.org/10.1037/0022-3514.63.3.452

Chew, P. K. H. (2022). A meta-analytic review of Internet gaming disorder and the Big Five personality factors. *Addictive Behaviors*, *126*, 107193. https://doi.org/10.1016/j.addbeh.2021.107193

Chia, D. X. Y., Ng, C. W. L., Kandasami, G., Seow, M. Y. L., Choo, C. C., Chew, P. K. H., Lee, C., & Zhang, M. W. B. (2020). Prevalence of internet addiction and gaming disorders in Southeast Asia: A meta-analysis. *International Journal of Environmental Research and Public Health, 17*(7), 2582–2598. https://doi.org/10.3390/ijerph17072582

Choi, S.-W., Kim, H., Kim, G.-Y., Jeon, Y., Park, S., Lee, J.-Y., Jung, H., Sohn, B., Choi, J.-S., & Kim, D.-J. (2014). Similarities and differences among Internet gaming disorder, gambling disorder and alcohol use disorder: A focus on impulsivity and compulsivity. *Journal of Behavioral Addictions, 3*(4), 246–253. https://doi.org/10.1556/jba.3.2014.4.6

Collins, E., Freeman, J., & Chamarro-Premuzic, T. (2012). Personality traits associated with problematic and non-problematic massively multiplayer online role playing game use. *Personality and Individual Differences, 52*(2), 133–138. https://doi.org/10.1016/j.paid.2011.09.015

Costa, P. T. Jr., & McCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI) professional manual*. Psychological Assessment Resources.

Dickman, S. J. (1990). Functional and dysfunctional impulsivity: Personality and cognitive correlates. *Journal of Personality and Social Psychology*, *58*(1), 95–102. https://doi.org/10.1037/0022-3514.58.1.95

Donnellan, M. B., Oswald, F. L., Baird, B. M., & Lucas, R. E. (2006). The mini-IPIP scales: Tiny-yet-effective measures of the big five factors of personality. *Psychological Assessment*, *18*(2), 192–203. https://doi.org/10.1037/1040-3590.18.2.192

Festl, R., Scharkow, M., & Quandt, T. (2013). Problematic computer game use among adolescents, younger and older adults. *Addiction, 108*(3), 592–599. https://doi.org/10.1111/add.12016

Fossati, A., Ceglie, A. D., Acquarini, E., & Barratt, E. S. (2001). Psychometric properties of an Italian version of the Barratt Impulsiveness Scale-11 (BIS-11) in nonclinical subjects. *Journal of Clinical Psychology, 57*(6), 815–828. https://doi.org/10.1002/jclp.1051

Gervasi, A. M., La Marca, L., Costanzo, A., Pace, U., Guglielmucci, F., & Schimmenti, A. (2017). Personality and internet gaming disorder: A systematic review of recent literature. *Current Addiction Reports, 4*(3), 293–307. https://doi.org/10.1007/s40429-017-0159-6

Goldberg, L. R., Johnson, J. A., Eber, H. W., Hogan, R., Ashton, M. C., Cloninger, C. R., & Gough, H. G. (2006). The international personality item pool and the future of public-domain personality measures. *Journal of Research in Personality, 40*(1), 84–96. https://doi.org/10.1016/j.jrp.2005.08.007

Green, S. B. (1991). How many subjects does it take to do a regression analysis. *Multivariate Behavioral Research, 26*(3), 499–510. https://doi.org/10.1207/s15327906mbr2603_7

Griffiths, M. D. (2014). Internet addiction disorder and internet gaming disorder are not the same. *Journal of Addiction Research & Therapy*, *05*(04). https://doi.org/10.4172/2155-6105.1000e124

Griffiths, M. D., van Rooij, A., Kardefelt-Winther, D., Starcevic, V., Király, O., Pallesen, S., Müller, K., Dreier, M., Colder Carras, M., Prause, N., King, D., Aboujaoude, E., Kuss, D., Pontes, H., Lopez-Fernandez, O., Nagygyörgy, K., Achab, S., Billieux, J., Quandt, T., & Demetrovics, Z. (2016). Working towards an international consensus on criteria for assessing internet gaming disorder: A critical commentary on Petry et al (2014). *Addiction*, *111*(1), 167–175. https://doi.org/10.1111/add.13057

Hawi, N. S., Samaha, M., & Griffiths, M. D. (2018). Internet gaming disorder in Lebanon: Relationships with age, sleep habits, and academic achievement. *Journal of Behavioral Addictions, 7*(1), 70–78. https://doi.org/10.1556/2006.7.2018.16

Hoyle, R. H., Stephenson, M. T., Palmgreen, P., Lorch, E. P., & Donohew, R. L. (2002). Reliability and validity of a brief measure of sensation seeking. *Personality and Individual Differences, 32*(3), 401–414. https://doi.org/10.1016/S0191-8869(01)00032-0

Hu, J., Zhen, S., Yu, C., Zhang, Q., & Zhang, W. (2017). Sensation seeking and online gaming addiction in adolescents: A moderated mediation model of positive affective associations and impulsivity. *Frontiers in Psychology, 8*, 1–8. https://doi.org/10.3389/fpsyg.2017.00699

Kardefelt-Winther, D. (2015). A critical account of DSM-5 criteria for internet gaming disorder. *Addiction Research & Theory, 23*(2), 93–98. https://doi.org/10.3109/16066359.2014.935350

Kesici, A. (2020). The effect of conscientiousness and gender on digital game addiction in high school students. *Journal of Education and Future*, *18*, 43–53. https://doi.org/10.30786/jef.543339

Khazaal, Y., Chatton, A., Rothen, S., Achab, S., Thorens, G., Zullino, D., & Gmel, G. (2016). Psychometric properties of the 7-item game addiction scale among French and German speaking adults. *BMC Psychiatry, 16*(1), 132. https://doi.org/10.1186/s12888-016-0836-3

Kim, E. J., Namkoong, K., Ku, T., & Kim, S. J. (2008). The relationship between online game addiction and aggression, self-control and narcissistic personality traits. *European Psychiatry, 23*(3), 212–218. https://doi.org/10.1016/j.eurpsy.2007.10.010

Király, O., Griffiths, M. D., Urbán, R., Farkas, J., Kökönyei, G., Elekes, Z., Tamás, D., & Demetrovics, Z. (2014). Problematic internet use and problematic online gaming are not the same: Findings from a large nationally representative adolescent sample. *Cyberpsychology, Behavior, and Social Networking, 17*(12), 749–754. https://doi.org/10.1089/cyber.2014.0475

Kuss, D. J., & Griffiths, M. D. (2012). Internet gaming addiction: A systematic review of empirical research. *International Journal of Mental Health and Addiction, 10*(2), 278–296. https://doi.org/10.1007/s11469-011-9318-5

Kuss, D. J., Griffiths, M. D., & Pontes, H. M. (2017). Chaos and confusion in DSM-5 diagnosis of Internet Gaming Disorder: Issues, concerns, and recommendations for clarity in the field. *Journal of Behavioral Addictions, 6*(2), 103–109. https://doi.org/10.1556/2006.5.2016.062

Lam, L. T. (2014). Internet gaming addiction, problematic use of the internet, and sleep problems: A systematic review. *Current Psychiatry Reports*, *16*(4). https://doi.org/10.1007/s11920-014-0444-1

Mehroof, M., & Griffiths, M. D. (2010). Online gaming addiction: The role of sensation seeking, self-control, neuroticism, aggression, state anxiety, and trait anxiety. *Cyberpsychology, Behavior, and Social Networking, 13*(3), 313–316. https://doi.org/10.1089/cyber.2009.0229

Müller, K. W., Dreier, M., Beutel, M. E., & Wölfling, K. (2016). Is sensation seeking a correlate of excessive behaviors and behavioral addictions? A detailed examination of patients with gambling disorder and internet addiction. *Psychiatry Research, 242*, 319–325. https://doi.org/10.1016/j.psychres.2016.06.004

Ok, C. (2021). Extraversion, loneliness, and problematic game use: A longitudinal study. *Personality and Individual Differences, 168*, 1–6. https://doi.org/10.1016/j.paid.2020.110290

Patton, J. H., Stanford, M. S., & Barratt, E. S. (1995). Factor structure of the Barratt impulsiveness scale. *Journal of Clinical Psychology,*

51(6), 768–774. https://doi.org/10.1002/1097-4679(199511)51:6%3c768::AID-JCLP2270510607%3e3.0.CO;2-1

Petry, N. M., Rehbein, F., Gentile, D. A., Lemmens, J. S., Rumpf, H.-J., Mößle, T., Bischof, G., Tao, R., Fung, D. S. S., Borges, G., Auriacombe, M., Ibáñez, A. G., Tam, P., & O'Brien, C. P. (2014). An international consensus for assessing internet gaming disorder using the new DSM-5 approach. *Addiction, 109*(9), 1399–1406. https://doi.org/10.1111/add.12457

Petry, N. M., Rehbein, F., Ko, C.-H., & O'Brien, C. P. (2015). Internet gaming disorder in the DSM-5. *Current Psychiatry Reports, 17*(9), 72. https://doi.org/10.1007/s11920-015-0610-0

Pontes, H. M. (2017). Investigating the differential effects of social networking site addiction and Internet gaming disorder on psychological health. *Journal of Behavioral Addictions, 6*(4), 601–610. https://doi.org/10.1556/2006.6.2017.075

Pontes, H. M., & Griffiths, M. D. (2015). Measuring DSM-5 internet gaming disorder: Development and validation of a short psychometric scale. *Computers in Human Behavior, 45*, 137–143. https://doi.org/10.1016/j.chb.2014.12.006

Şalvarlı, Şİ, & Griffiths, M. D. (2019). Internet gaming disorder and its associated personality traits: A systematic review using PRISMA guidelines. *International Journal of Mental Health and Addiction*. https://doi.org/10.1007/s11469-019-00081-6

Satghare, P., Abdin, E., Vaingankar, J., Chua, B., Pang, S., Picco, L., Poon, L., Chong, S., & Subramaniam, M. (2016). Prevalence of sleep problems among those with internet gaming disorder in Singapore. *ASEAN Journal of Psychiatry, 17*(2), 1–11.

Seok, H. J., Lee, J. M., Park, C.-Y., & Park, J. Y. (2018). Understanding internet gaming addiction among South Korean adolescents through photovoice. *Children and Youth Services Review, 94*, 35–42. https://doi.org/10.1016/j.childyouth.2018.09.009

Sigerson, L., Li, A.Y.-L., Cheung, M.W.-L., & Cheng, C. (2017). Examining common information technology addictions and their relationships with non-technology-related addictions. *Computers in Human Behavior, 75*, 520–526. https://doi.org/10.1016/j.chb.2017.05.041

Stevens, M. W., Dorstyn, D., Delfabbro, P. H., & King, D. L. (2021). Global prevalence of gaming disorder: A systematic review and meta-analysis. *Australian & New Zealand Journal of Psychiatry, 55*(6), 553–568. https://doi.org/10.1177/0004867420962851

Walther, B., Morgenstern, M., & Hanewinkel, R. (2012). Co-occurrence of addictive behaviours: Personality factors related to substance use, gambling and computer gaming. *European Addiction Research, 18*(4), 167–174. https://doi.org/10.1159/000335662

Wong, H. Y., Mo, H. Y., Potenza, M. N., Chan, M. N. M., Lau, W. M., Chui, T. K., Pakpour, A. H., & Lin, C.-Y. (2020). Relationships between severity of internet gaming disorder, severity of problematic social media use, sleep quality and psychological distress. *International Journal of Environmental Research and Public Health, 17*(6), 1879. https://doi.org/10.3390/ijerph17061879

Young, K. S. (1996). Internet addiction: The emergence of a new clinical disorder. *CyberPsychology & Behavior, 1*(3), 237–244.

Young, K. S., & Brand, M. (2017). Merging theoretical models and therapy approaches in the context of internet gaming disorder: A personal perspective. *Frontiers in Psychology, 8*, 1–12. https://doi.org/10.3389/fpsyg.2017.01853

Zuckerman, M. (1979). *Sensation seeking: Beyond the optimal level of arousal*. Erlbaum.

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