Personality and Individual Differences 251 (2026) 113584

Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

Problematic gaming: A cluster analysis using gaming motivations and negative emotional states

Peter K.H. Chew [a,*]

[a] James Cook University, 149 Sims Drive, Singapore, 387380, Singapore

ARTICLE INFO

Keywords:
Problematic gaming
Gaming motivations
Negative emotional states
Cluster analysis

ABSTRACT

Studies have identified different subtypes of problematic gamers. However, these studies were either conducted among adolescents or adults who played World of Warcraft, imposing a limit to the generalizability of the results. Consequently, the current study aims to address this limitation by recruiting adult gamers of varied game genres. Participants were a representative of sample of 1001 young adults (50.15 % females; 74.43 % Chinese, 13.29 % Malays, 9.29 % Indians, and 3.00 % Others). They completed instruments that assess gaming motivations, negative emotional states, and problematic gaming. The results identified three clusters: participants with high risk, moderate risk, and low risk for problematic gaming. The current study provided evidence of homogeneity among problematic gamers (i.e., Cluster 1 only), with the cluster reporting the highest scores on gaming motivations and negative emotional states. Limitations include the potential overrepresentation of the action, adventure, and role-playing game genres by participants. Future research directions include comparing the number and type of clusters between different demographic segments and exploring various combinations of clustering variables on the number and type of clusters.

Gaming is a ubiquitous activity. However, despite the cognitive, social, and emotional benefits of playing games (Granic et al., 2014), some gamers engage in problematic gaming, resulting in a range of negative consequences. Consequently, Internet gaming disorder (IGD) was added to the *Diagnostic and Statistics Manual of Mental Disorders*, 5th edition (DSM-5) as a condition that warrants further study (American Psychiatric Association, 2013) while gaming disorder (GD) was added to the *International Classifications of Diseases*, 11th edition (ICD-11) (World Health Organization, 2019).

IGD is defined 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). Individuals who meet five or more of the following criteria during the past 12 months would meet the diagnostic criteria for IGD: (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) relieve negative moods, and (i) loss of a relationship or job. In contrast, GD is defined as a pattern of persistent online or offline gaming behavior (World Health Organization, 2019). Individuals who meet all of the following criteria during the past 12 months would meet the diagnostic criteria for GD: (a) impaired control over gaming, (b) increasing priority given to gaming, (c) continued gaming despite problems, and (d) impairment in various life domains.

The Interaction of Person-Affect-Cognition-Execution (I-PACE) model is often used to frame problematic gaming research (Young & Brand, 2017). According to this model, an individual's core characteristics interact with cognitive and affective variables, leading to a decision to play games for gratification. Over time due to positive reinforcement, the frequency of gaming is maintained or increased, elevating the individual's risk for developing IGD or GD. The I-PACE model has been supported by the extant research. For example, with regards to core characteristics, research has showed that gender (i.e., males) (Wartberg et al., 2023) and personality traits (i.e., neuroticism) (Chew, 2022) are risk factors for problematic gaming. Furthermore, research has identified gaming motivations and negative emotional states as correlates of problematic gaming, respectively. Specifically, individuals who were motivated to play games for any of the seven reasons, (a) social, (b) escape, (c) competition, (d) coping, (f) skill development, (g) fantasy, or (h) recreation, tended to also engage in problematic gaming (Laconi et al., 2017; Rafiemanesh et al., 2022; Wu

* Corresponding author.
E-mail address: peter.chew@jcu.edu.au.

https://doi.org/10.1016/j.paid.2025.113584
Received 6 October 2025; Received in revised form 21 November 2025; Accepted 24 November 2025
Available online 29 November 2025

et al., 2016). In addition, negative emotional states such as depression, anxiety, and stress are positively correlated with problematic gaming (Bargeron & Hormes, 2017; Bonnaire & Baptista, 2019; Rajab et al., 2020; Taechoyotin et al., 2020; Wong et al., 2020). More importantly, longitudinal studies also support the role of negative emotional states as risk factors for problematic gaming (Dang et al., 2024; S. Kim et al., 2022; Li et al., 2026).

The inclusion of problematic gaming in the DSM-5 is not without controversy. For example, it has been argued that the IGD criteria do not distinguish between highly engaged gamers and addicted gamers (Charlton & Danforth, 2007). Indeed, when the nine criteria were categorized accordingly, the two criteria indicative of engagement (preoccupation and tolerance) did not predict known negative consequences of gaming (Chew & Au, 2024). More importantly, among the seven criteria indicative of addiction, only three (withdrawal, deception, and relieve negative moods) predicted known negative consequences of gaming. There are also issues with the validity of the diagnostic criteria. For example, individuals who meet the IGD diagnostic criteria do not differ on known risk factors for addiction (e.g., impulsivity) than individuals who do not meet the criteria (Deleuze et al., 2017). Finally, the IGD criteria has been criticized for assuming homogeneity among problematic gamers when research has identified different subtypes of problematic gamers, each with their own defining features and different responsiveness to interventions (Billieux et al., 2015).

The subtypes of problematic gamers are often identified using cluster analysis. Currently, at least two studies have been conducted among adolescents (Fernández-Arias et al., 2023; Jeong et al., 2020) and only one study among adults (Billieux et al., 2015). In these studies, risk and protective factors for problematic gaming were identified (e.g., gaming motivations and negative emotional states) and used as clustering variables to identify subtypes of problematic gamers. For example, three subtypes of adolescent gamers were identified: (a) those with psychological and social issues, (b) those with social issues only, and (c) those with no issues (nonproblematic) (Jeong et al., 2020). For adults gamers, five subtypes were identified: (a) unregulated achievers, (b) regulated social role-players (nonproblematic), (c) unregulated escapers, (d) hardcore gamers, and (e) regulated recreational gamers (nonproblematic) (Billieux et al., 2015). Overall, these studies provided evidence for heterogeneity among problematic gamers.

There are a few limitations with the cluster analytic study among adults (Billieux et al., 2015). First, the study recruited gamers who played World of Warcraft, a popular Massively Multiplayer Online Role-Playing Game (MMORPG). Accordingly, Yee's (2006) conceptualization of gaming motivations, which was developed based on MMORPG gamers, was used as the clustering variables. However, given that there are other game genres (e.g., first-person shooter, puzzle, etc.), and that problematic gaming varies across game genres (Laconi et al., 2017; Na et al., 2017), this imposes a limit to the generalizability of the results. Second, problematic gaming was assessed using the Internet Addiction Test. This is a limitation because the instrument assesses internet addiction instead of problematic gaming, a related but distinct construct (Griffiths, 2014; Király et al., 2014). In other words, while the identified subtypes significantly differ on internet addiction, their relationship with problematic gaming is currently unknown.

1. The current study

The current study aimed to extend on the previous study by addressing the aforementioned limitations (Billieux et al., 2015) with the I-PACE model as a framework (Young & Brand, 2017). First, individuals' core characteristics like gaming motivations and negative emotional states were used based on their robust relationships with problematic gaming (Bargeron & Hormes, 2017; Bonnaire & Baptista, 2019; Dang et al., 2024; S. Kim et al., 2022; Laconi et al., 2017; Li et al., 2026; Rafiemanesh et al., 2022; Rajab et al., 2020; Taechoyotin et al., 2020; Wong et al., 2020; Wu et al., 2016). Second, the study did not impose a restriction on the type of games played by the participants. Accordingly, Demetrovics et al.'s (2011) conceptualization of gaming motivations, which was developed based on gamers of varied game genres, was used as the clustering variables. Specifically, the current study used the Motives for Online Gaming Questionnaire (Demetrovics et al., 2011), an instrument with excellent psychometric properties that has been validated across multiple countries (Bäcklund et al., 2024; Evren et al., 2020; B.-N. Kim & Kang, 2021; Wu et al., 2016). Finally, the study used instruments to assess problematic gaming based on the DSM-5 (American Psychiatric Association, 2013) and ICD-11 (World Health Organization, 2019) criteria. Consistent with previous research (Billieux et al., 2015; Fernández-Arias et al., 2023; Jeong et al., 2020), it was hypothesized that there would be heterogeneity among subtypes of problematic gamers (i.e., different characteristics, severity, and etc.).

2. Method

2.1. Participants

A representative sample of 1001 young adults were recruited by a survey panel based on the following criteria: Singaporeans or permanent residents, played at least one game on any device (e.g., gaming console, mobile phone, computer, etc.) in the past 12 months, and between 18 and 40 years of age. The age of the sample ranged from 18 to 40 years (M = 28.47, SD = 6.21). The gender and ethnic distribution of the sample (50.15 % females; 74.43 % Chinese, 13.29 % Malays, 9.29 % Indians, and 3.00 % Others) is representative of the population in Singapore (51.10 % females; 74.30 % Chinese, 13.50 % Malays, 9.00 % Indians, and 3.20 % Others) (Singapore Department of Statistics, 2020). The five most selected favorite game genres include Action (20.40 %), Adventure (18.60 %), Role-Playing (8.40 %), Music (8.10 %) and Strategy (6.70 %). More details of the demographic and gaming-related information can be found in a previous paper (Chew et al., 2025).

2.2. Instruments

2.2.1. The Motives for Online Gaming Questionnaire

The 27-item Motives for Online Gaming Questionnaire assesses seven factors of gaming motivations: (a) social, (b) escape, (c) competition, (d) coping, (f) skill development, (g) fantasy, and (h) recreation (Demetrovics et al., 2011). Participants provided their responses on a 5-point Likert scale that ranges from 1 = *Almost Never/Never* to 5 = *Almost Always/Always*. The scores for each factor are summed, with higher scores indicating higher levels of the respective gaming motivation. The scores range from 4 to 20 for each factor, with the exception of recreation, which range from 3 to 15.

2.2.2. The Depression Anxiety Stress Scale

The 12-item Depression Anxiety Stress Scale assesses three factors of negative emotional states: (a) depression, (b) anxiety, and (c) stress (Ali et al., 2022). Participants provided their responses on a 4-point Likert scale that ranges from 1 = *Did not apply to me at all* to 4 = *Applied to me very much, or most of the time*. The scores for each factor are summed, with higher scores indicating higher levels of the respective negative emotional state. The scores for each factor range from 4 to 16.

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

The 9-item IGDS9-SF assesses the nine criteria of IGD in the DSM-5 (Pontes & Griffiths, 2015). Participants reported on their gaming activity during the past 12 months and provided their responses on a 5-point Likert scale that ranges from 1 = *Never* to 5 = *Very Often*. The scores are summed, with higher scores indicating higher levels of IGD. The scores for the instrument range from 9 to 45.

2.2.4. The Gaming Disorder Test (GDT)

The 4-item GDT assesses the four criteria of GD in the ICD-11 (Pontes

et al., 2021). Participants reported on their gaming activity during the past 12 months and provided their responses on a 5-point Likert scale that ranges from 1 = *Never* to 5 = *Very Often*. The scores are summed, with higher scores indicating higher levels of GD. The scores for the instrument range from 4 to 20.

2.3. Procedure

This study is part of a larger study to examine the state of gaming behavior among young adults in Singapore. The study was conducted online via Qualtrics. First, participants provided informed consent before completing a screener question to ensure that they have played games in the past 12 months. Second, participants completed a background information form that asks for demographic (e.g., gender) and gaming-related information (e.g., favorite game genres). Finally, participants completed the Motives for Online Gaming Questionnaire (Demetrovics et al., 2011), the Depression Anxiety Stress Scale (Ali et al., 2022), the IGDS9-SF (Pontes & Griffiths, 2015), the GDT (Pontes et al., 2021), and one instrument unrelated to the aims of the current study, in a randomized order to control for fatigue and order effects. Data collection was conducted and completed in August 2023. The study was conducted in accordance with the Declaration of Helsinki and approved by the university's Human Research Ethics Committee (approval number: H9100).

2.4. Data analyses

SPSS Version 21 was used to analyze the data. A series of cluster analyses were conducted based on best practices to identify subgroups of participants (Sarstedt & Mooi, 2019). First, the seven gaming motivations and three negative emotional states were selected as the clustering variables. Two assumptions are associated with this step: the clustering variables should not be highly correlated (i.e., $r < 0.90$) and the sample size should be sufficient given the number of clustering variables (i.e., $n \geq 100$ x number of clustering variables). Second, a hierarchical cluster analysis was first conducted to identify the number of clusters. Specifically, Ward's linkage algorithm was used with squared Euclidean distance as a measure of similarity on z-standardized variables. The number of clusters were determined by an inspection of the dendrogram. Subsequently, a k-means cluster analysis was conducted to form the clusters for interpretation. Third, the validity of the clustering solution was examined by evaluating the ability of the solution to differentiate the data. Specifically, a series of *t*-tests or ANOVAs were conducted to examine if the clusters significantly differ across the clustering variables and the criterion variables. Criterion variables are theoretically related to the clustering variables but are not included in the cluster analyses. In the current study, these variables include gender, time spent playing games on a weekday, time spent playing games on a weekend, IGD, and GD. Finally, the clustering solution was interpreted and labelled by examining their relationships with the criterion variables and the mean scores of the clustering variables.

3. Results

The descriptives and the intercorrelations of the clustering variables are presented in Table 1. Most of the variables are moderately correlated with one another, with the highest correlation found between depression and stress, $r(999) = 0.84$, $p < .001$. Given that these correlations are <0.90, it appears that the clustering variables are not highly correlated. Furthermore, the current sample size of 1001 exceeds the minimum sample size requirement of at least 1000 (i.e., 100 × 10 clustering variables).

A hierarchical cluster analysis was conducted to identify the number of clusters. Specifically, the dendrogram was inspected to identify the area where no clusters have been combined for a long distance. The results showed that the area was between a rescaled distance of 5 (three clusters) to a rescaled distance of 15 (two clusters). Consequently, a k-means cluster analysis was conducted to form three clusters for interpretation. All clustering variables could discriminate across the three clusters, all p values < .001. Overall, 248 (24.78 %) participants were in Cluster 1, 496 (49.55 %) in Cluster 2, and 257 (25.67 %) in Cluster 3.

Prior to interpretation, the validity of the three-cluster solution was examined. Specifically, a chi-square test of independence and a series of one-way between-subjects ANOVAs were conducted to examine differences across the three clusters with regards to the clustering variables and the criterion variables (see Table 2). First, a chi-square test of independence found a significant association between the three clusters and gender, $\chi^2(2, n = 1001) = 38.31$, $p < .001$, $phi = 0.20$. Cluster 1 had more males than females (64.10 % vs. 35.90 %), Cluster 2 had similar numbers of males and females (49.60 % vs 50.40 %), and Cluster 3 had fewer males than females (36.60 % vs. 63.40 %). Finally, a series of ANOVAs found that the three clusters significantly differ on all clustering variables and the criterion variables. Specifically, Cluster 1 had the highest IGD and GD scores ($M = 28.55$, $SD = 7.63$ and $M = 12.50$, $SD = 4.01$), followed by Cluster 2 ($M = 20.18$, $SD = 6.27$ and $M = 8.70$, $SD = 3.24$) and Cluster 3 ($M = 14.02$, $SD = 5.30$ and $M = 6.04$, $SD = 2.51$). Given these relationships, it appears that Clusters 1, 2, and 3 represent participants with high risk, moderate risk, and low risk for problematic gaming, respectively.

Table 1
Descriptives and Intercorrelations of the Clustering Variables.

Variables	1	2	3	4	5	6	7	8	9	10
Gaming motivations										
1. Social	–									
2. Escape	0.647***	–								
3. Competition	0.683***	0.671***	–							
4. Coping	0.689***	0.814***	0.746***	–						
5. Skill Development	0.741***	0.679***	0.731***	0.776***	–					
6. Fantasy	0.689***	0.781***	0.696***	0.751***	0.687***	–				
7. Recreation	0.510***	0.651***	0.571***	0.695***	0.644***	0.564***	–			
Negative emotional states										
8. Depression	0.403***	0.450***	0.389***	0.393***	0.356***	0.474***	0.202***	–		
9. Anxiety	0.476***	0.426***	0.447***	0.407***	0.399***	0.488***	0.182***	0.787***	–	
10. Stress	0.432***	0.474***	0.451***	0.451***	0.409***	0.502***	0.260***	0.841***	0.811***	–
M	10.53	11.47	11.08	11.68	11.45	10.95	9.92	8.00	7.78	8.19
SD	4.00	4.19	4.12	3.90	4.13	4.35	3.10	3.39	3.07	3.12
Cronbach's alpha	0.84	0.87	0.85	0.82	0.88	0.87	0.82	0.90	0.83	0.84

*** $p < .001$.

Table 2
Descriptives and inferential tests of the three clusters on the clustering variables and criterion variables.

Variables	Cluster 1	Cluster 2	Cluster 3	$F(2, 998) =$	$p <$	$\eta_p^2 =$
	M (*SD*)	*M* (*SD*)	*M* (*SD*)			
Clustering variables						
Social	14.79 (2.87)	10.62 (2.67)	6.26 (2.25)	669.73	0.001	0.57
Escape	15.89 (2.33)	11.85 (2.62)	6.48 (2.44)	900.53	0.001	0.64
Competition	15.17 (2.57)	11.49 (2.80)	6.35 (2.43)	709.98	0.001	0.59
Coping	15.70 (2.24)	12.18 (2.15)	6.82 (2.40)	1012.66	0.001	0.67
Skill Development	15.64 (2.59)	11.80 (2.62)	6.73 (2.67)	734.65	0.001	0.60
Fantasy	15.49 (2.49)	11.42 (2.81)	5.65 (2.00)	960.49	0.001	0.66
Recreation	12.17 (1.93)	10.30 (2.29)	7.02 (3.19)	285.35	0.001	0.36
Depression	10.89 (3.20)	7.66 2.88)	5.87 (2.50)	199.36	0.001	0.29
Anxiety	10.57 (3.00)	7.43 (2.55)	5.74 (1.92)	239.15	0.001	0.32
Stress	11.12 (2.80)	7.79 (2.58)	6.13 (2.17)	256.01	0.001	0.34
Criterion variables						
Gaming time (weekday)	3.97 (3.37)	2.84 (2.57)	2.32 (2.03)	24.93	0.001	0.05
Gaming time (weekend)	5.56 (3.67)	4.17 (3.05)	3.31 (2.44)	34.14	0.001	0.07
Internet gaming disorder	28.55 (7.63)	20.18 (6.27)	14.02 (5.30)	327.13	0.001	0.40
Gaming disorder	12.50 (4.01)	8.70 (3.24)	6.04 (2.51)	246.50	0.001	0.33

Note. All Tukey HSD post hoc tests were significant.

4. Discussion

The results of this study did not support the hypothesis that there would be heterogeneity among subtypes of problematic gamers. Instead, the results provided evidence of homogeneity among problematic gamers (i.e., Cluster 1 only), with the cluster reporting the highest scores on all seven gaming motivations and three negative emotional states. This cluster also had more males than females, and had significantly higher scores on gaming time, IGD, and GD than participants in the other clusters. Overall, the results were inconsistent with previous studies that found heterogeneity among adolescent (Fernández-Arias et al., 2023; Jeong et al., 2020) and adult (Billieux et al., 2015) problematic gamers.

The inconsistency might be due to two reasons. First, there are demographic differences between the samples of the previous studies (Fernández-Arias et al., 2023; Jeong et al., 2020) and the current study. Specifically, the significant changes in brain structure and function during adolescence (Dumontheil, 2016) might lead to heterogeneity among adolescent problematic gamers (Fernández-Arias et al., 2023; Jeong et al., 2020). Second, given the wide range of risk factors for problematic gaming, different clustering variables were used across the studies. For example, despite some overlaps, clustering variables unique to previous studies include impulsiveness (Billieux et al., 2015), social support (Jeong et al., 2020), and engagement (Fernández-Arias et al., 2023). Given that clustering variables were used to identify and form the clusters, it is unsurprising that these differences could lead to different numbers and types of clusters.

Limitations of the study should be noted. First, some game genres appear to be more popular among the participants. Specifically, Action (20.40 %), Adventure (18.60 %), and Role-Playing (8.40 %) were selected as a favorite genre by almost half of the participants. This imposes a limit to the generalizability of the results if this distribution is not representative of game genre popularity in the population. Second, problematic gaming was assessed using the DSM-5 (American Psychiatric Association, 2013) and ICD-11 (World Health Organization, 2019) criteria. As mentioned, criticisms have been directed at the validity of the DSM-5 criteria (Charlton & Danforth, 2007; Chew & Au, 2024; Deleuze et al., 2017). If the criteria change in the future, the differences across the clusters might no longer be significant.

Nevertheless, the findings of this study are important because it is the first to examine potential subtypes of problematic adult gamers of varied game genres. There are theoretical and clinical implications of the current study. First, the results support the role of gaming motivations and negative emotional states as an individual's core characteristics in the I-PACE model (Young & Brand, 2017). Second, the results support the current diagnostic criteria for IGD and GD that assumes homogeneity among problematic gamers. Specifically, the seven gaming motivations and three negative emotional states showed a simultaneous increase from Cluster 3 (low risk) to Cluster 1 (high risk). Finally, the results suggest that interventions can be developed for problematic adult gamers who play action, adventure, and role-playing games without the need to tailor them based on subtypes (c.f. Billieux et al., 2015).

Future research directions might include comparing the number and type of clusters between different demographic segments. Specifically, researchers could compare between adolescent gamers and adult gamers, and between gamers of different game genres. Furthermore, future research could explore the effects of various combinations of clustering variables on the number and type of clusters. If the addition of a clustering variable consistently results in heterogeneity among problematic gamers, that variable could be critical to our understanding of problematic gaming. Overall, as cluster analytic studies accumulate, their results could inform the validity of the diagnostic criteria and the development and implementation of interventions.

CRediT authorship contribution statement

Peter K.H. Chew: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Consent to participate

Participants provided their informed consent to participate in the study.

Consent for publication

Participants provided their informed consent to publish the study.

Ethics approval

The study was conducted in accordance with the Declaration of Helsinki and approved by James Cook University's Human Research Ethics Committee (Approval number: H9100).

Clinical trial number

Not applicable.

Funding

The study was funded by James Cook University's Internal Research Grant Scheme (Number: IRG20230005).

Declaration of competing interest

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

Data availability

Data will be made available on request.

References

Ali, A. M., Hori, H., Kim, Y., & Kunugi, H. (2022). The depression anxiety stress scale 8-items expresses robust psychometric properties as an ideal shorter version of the depression anxiety stress scale 21 among healthy respondents from three continents. *Frontiers in Psychology, 13*, Article 799769. https://doi.org/10.3389/fpsyg.2022.799769

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

Bäcklund, C., Eriksson Sörman, D., Gavelin, H. M., Demetrovics, Z., Király, O., & Ljungberg, J. K. (2024). Validating the motives for online gaming questionnaire (MOGQ) within the WHO and APA gaming disorder symptoms frameworks. *Computers in Human Behavior Reports, 16*, Article 100504. https://doi.org/10.1016/j.chbr.2024.100504

Bargeron, A. H., & Hormes, J. M. (2017). Psychosocial correlates of internet gaming disorder: Psychopathology, life satisfaction, and impulsivity. *Computers in Human Behavior, 68*, 388–394. https://doi.org/10.1016/j.chb.2016.11.029

Billieux, J., Thorens, G., Khazaal, Y., Zullino, D., Achab, S., & Van der Linden, M. (2015). Problematic involvement in online games: A cluster analytic approach. *Computers in Human Behavior, 43*, 242–250. https://doi.org/10.1016/j.chb.2014.10.055

Bonnaire, C., & Baptista, D. (2019). Internet gaming disorder in male and female young adults: The role of alexithymia, depression, anxiety and gaming type. *Psychiatry Research, 272*, 521–530. https://doi.org/10.1016/j.psychres.2018.12.158

Charlton, J. P., & Danforth, I. D. W. (2007). Distinguishing addiction and high engagement in the context of online game playing. *Computers in Human Behavior, 23*(3), 1531–1548. https://doi.org/10.1016/j.chb.2005.07.002

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

Chew, P. K. H., & Au, J. Q. M. (2024). Internet gaming disorder in the DSM-5: Engagement vs. addiction. *Journal of Technology in Behavioral Science, 9*(4), 652–660. https://doi.org/10.1007/s41347-023-00364-9

Chew, P. K. H., Naidu, K. N. C., Shi, J., & Zhang, M. W. B. (2025). Validation of the internet gaming disorder scale–short-form and the gaming disorder test in Singapore. *Asian Journal of Social Health and Behavior, 8*(3), 125–132. https://doi.org/10.4103/shb.shb_327_24

Dang, L., Yang, H. M., Spada, M. M., & Wu, A. M. S. (2024). A three-wave longitudinal study on the underlying metacognitive mechanism between depression and internet gaming disorder. *Journal of Behavioral Addictions, 13*(1), 215–225. https://doi.org/10.1556/2006.2023.00072

Deleuze, J., Nuyens, F., Rochat, L., Rothen, S., Maurage, P., & Billieux, J. (2017). Established risk factors for addiction fail to discriminate between healthy gamers and gamers endorsing DSM-5 internet gaming disorder. *Journal of Behavioral Addictions, 6*(4), 516–524. https://doi.org/10.1556/2006.6.2017.074

Demetrovics, Z., Urbán, R., Nagygyörgy, K., Farkas, J., Zilahy, D., Mervó, B., Reindl, A., Ágoston, C., Kertész, A., & Harmath, E. (2011). Why do you play? The development of the motives for online gaming questionnaire (MOGQ). *Behavior Research Methods, 43*(3), 814–825. https://doi.org/10.3758/s13428-011-0091-y

Dumontheil, I. (2016). Adolescent brain development. *Current Opinion in Behavioral Sciences, 10*, 39–44. https://doi.org/10.1016/j.cobeha.2016.04.012

Evren, C., Evren, B., Dalbudak, E., Topçu, M., & Kutlu, N. (2020). Psychometric validation of the Turkish motives for online gaming questionnaire (MOGQ) across university students and video game players. *ADDICTA: The Turkish Journal on Addictions, 7*(2), 81–89.

Fernández-Arias, I., Labrador, M., Bernaldo-de-Quirós, M., Estupiñá, F. J., Vallejo-Achón, M., Sanchez-Iglesias, I., … Labrador, F. J. (2023). Cognitive patterns and problematic use of video games in adolescents: A cluster analysis. *International Journal of Environmental Research and Public Health, 20*(24), Article 24. https://doi.org/10.3390/ijerph20247194

Granic, I., Lobel, A., & Engels, R. C. M. E. (2014). The benefits of playing video games. *American Psychologist, 69*(1), 66–78. https://doi.org/10.1037/a0034857

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

Jeong, H., Yim, H. W., Jo, S.-J., Lee, S.-Y., Lee, H. K., Gentile, D. A., … Choi, J.-S. (2020). Gaming patterns and related symptoms in adolescents using cluster analysis: Baseline results from the internet user cohort for unbiased recognition of gaming disorder in early adolescence (iCURE) study. *Environmental Research, 182*, Article 109105. https://doi.org/10.1016/j.envres.2019.109105

Kim, B.-N., & Kang, H. S. (2021). Korean validation of the motives for online gaming questionnaire: Focusing on its factor structure and incremental validity. *Addictive Behaviors, 122*, Article 107019. https://doi.org/10.1016/j.addbeh.2021.107019

Kim, S., Champion, K. E., Gardner, L. A., Teesson, M., Newton, N. C., & Gainsbury, S. M. (2022). The directionality of anxiety and gaming disorder: An exploratory analysis of longitudinal data from an Australian youth population. *Frontiers in Psychiatry, 13*, 1–11. https://doi.org/10.3389/fpsyt.2022.1043490

Király, O., Griffiths, M. D., Urbán, R., Farkas, J., Kökönyei, G., Elekes, Z., … 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

Laconi, S., Pirès, S., & Chabrol, H. (2017). Internet gaming disorder, motives, game genres and psychopathology. *Computers in Human Behavior, 75*, 652–659. https://doi.org/10.1016/j.chb.2017.06.012

Li, X., Luo, L., Zhao, Y., Yang, C., Zhang, Y., Zhou, Z., … Li, W. (2026). Longitudinal bidirectional relations between perceived stress and internet gaming disorder among adolescents: The mediating role of depressive symptoms. *Addictive Behaviors, 173*, Article 108532. https://doi.org/10.1016/j.addbeh.2025.108532

Na, E., Choi, I., Lee, T.-H., Lee, H., Rho, M. J., Cho, H., … Kim, D.-J. (2017). The influence of game genre on internet gaming disorder. *Journal of Behavioral Addictions, 6*(2), 248–255. https://doi.org/10.1556/2006.6.2017.033

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

Pontes, H. M., Schivinski, B., Sindermann, C., Li, M., Becker, B., Zhou, M., & Montag, C. (2021). Measurement and conceptualization of gaming disorder according to the world health organization framework: The development of the gaming disorder test. *International Journal of Mental Health and Addiction, 19*(2), 508–528. https://doi.org/10.1007/s11469-019-00088-z

Rafiemanesh, H., Farnam, R., Sangchooli, A., Rahimi, J., Hamzehzadeh, M., Ghani, K., … Rahimi-Movaghar, A. (2022). Online gaming and internet gaming disorder in Iran: Patterns, motivations, and correlates. *Current Psychology, 42*, 13517–13531. https://doi.org/10.1007/s12144-021-02490-0

Rajab, A. M., Zaghloul, M. S., Enabi, S., Rajab, T. M., Al-Khani, A. M., Basalah, A., … Saquib, N. (2020). Gaming addiction and perceived stress among Saudi adolescents. *Addictive Behaviors Reports, 11*, 1–7. https://doi.org/10.1016/j.abrep.2020.100261

Sarstedt, M., & Mooi, E. (2019). *A concise guide to market research: The process, data, and methods using IBM SPSS statistics*. Springer. https://doi.org/10.1007/978-3-662-56707-4

Singapore Department of Statistics. (2020). Singapore census of population 2020, statistical release 1: Demographic characteristics, education, language and religion. http://www.singstat.gov.sg/publications/reference/cop2020/cop2020-sr1/census20_stat_release1.

Taechoyotin, P., Tongrod, P., Thaweerungruangkul, T., Towattananon, N., Teekapakvisit, P., Aksornpusitpong, C., Sathapornpunya, W., Hempatawee, N., Rangsin, R., Mungthin, M., & Piyaraj, P. (2020). Prevalence and associated factors of internet gaming disorder among secondary school students in rural community, Thailand: A cross-sectional study. *BMC Research Notes, 13*(1), 11. https://doi.org/10.1186/s13104-019-4862-3

Wartberg, L., Potzel, K., Spindler, C., & Kammerl, R. (2023). The big five personality domains and their facets: Empirical relations to problematic use of video games, social media and alcohol. *Behavioral Science, 13*(6), 444. https://doi.org/10.3390/bs13060444

Wong, H. Y., Mo, H. Y., Potenza, M. N., Chan, M. N. M., Lau, W. M., Chui, T. K., … 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), Article 6. https://doi.org/10.3390/ijerph17061879

World Health Organization. (2019). ICD-11. International Classification of Diseases 11th Revision. https://icd.who.int/en.

Wu, A. M. S., Lai, M. H. C., Yu, S., Lau, J. T. F., & Lei, M. (2016). Motives for online gaming questionnaire: Its psychometric properties and correlation with internet gaming disorder symptoms among Chinese people. *Journal of Behavioral Addictions, 6*(1), 11–20. https://doi.org/10.1556/2006.6.2017.007

Yee, N. (2006). Motivations for play in online games. *Cyberpsychology & Behavior, 9*(6), 772–775. https://doi.org/10.1089/cpb.2006.9.772

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