



Problematic Gaming and Academic Achievement: A Systematic Review and Meta-Analysis

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Abstract

Purpose of Review The extant research on the relationship between problematic gaming (PG) and academic achievement (AA) has been summarized in a recent systematic review. However, the data was not statistically synthesized, imposing a limit to their conclusions. The current study aimed to address this limitation by conducting a new systematic review and meta-analysis to synthesize the data.

Recent Findings A systematic review of the relationship between PG and AA concluded that the findings are mixed and there are limited longitudinal studies. Specifically, it is currently unclear if PG is a risk factor or negative consequence of AA. For example, individuals with PG might spend a disproportionate amount of time on games, neglecting their studies and leading to lower AA. Alternatively, individuals with lower AA might engage in PG to escape negative moods or to satisfy their unmet need for achievement.

Summary A comprehensive search was conducted on the databases PsycInfo, PubMed, Scopus, and Web of Science from inception to 25 March 2025. The data was analyzed using Meta-Essentials and the random effects model was used to obtain the pooled estimate of the effect size. A total of 23 articles containing 25 effect sizes were included (total participant N = 16067). An overall pooled effect size of -0.17 was found. However, significant heterogeneity was found across the effect sizes and it could be explained by study design. Specifically, longitudinal effect sizes (AA → PG) had the largest effect size ($r = -0.29$), followed by cross-sectional effect sizes ($r = -0.18$) and longitudinal effect sizes (PG → AA) ($r = -0.09$). This suggested that PG is more likely a negative consequence than a risk factor of AA. Limitations include the small impact of publication bias and the exclusion of a number of relevant articles without effect sizes. Future research could conduct more longitudinal studies to examine the causal relationships between the variables (i.e., both PG → AA and AA → PG) and examine potential mediators like the escape motivation to understand the mechanisms underlying the AA → PG relationship.

Keywords Problematic gaming · Academic achievement · Systematic review · Meta-analysis

Introduction

Numerous studies have been conducted to examine the relationship between problematic gaming (PG) and academic achievement (AA), and the extant research have been summarized in a recent systematic review [1]. However, the relationships between the variables have not been statistically synthesized, imposing a limit to the conclusions.

Consequently, the current study aimed to address this limitation by conducting a new systematic review and meta-analysis to synthesize the data.

Problematic Gaming

Most gamers engage in nonproblematic gaming and enjoys a range of positive benefits associated with that activity [2]. However, a minority of gamers engage in PG, leading to a range of negative consequences. Consequently, PG was added to Sect. 3 of the *Diagnostic and Statistical Manual of Mental Disorders*, 5th edition (DSM-5) as a condition for further study [3]. PG is defined as the “persistent and

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recurrent use of the Internet to engage in games, often with other players, leading to clinically significant impairment or distress as indicated by five (or more) of the following in a 12-month period” [3]. The criteria include (1) preoccupation, (2) withdrawal symptoms, (3) tolerance, (4) unsuccessful attempts to control gaming behavior, (5) loss of interest in other activities, (6) continued gaming despite problems, (7) deception, (8) gaming to escape or to relive negative moods, and (9) risk or loss of a relationship, job, or educational or career opportunity. Currently, meta-analyses have reported a prevalence rate of about 3.0% for PG, with a higher prevalence of 6.6% for children and adolescents [4, 5].

The risk factors of PG are well documented. For example, males are at higher risk for PG than females [6]. With regards to the Big Five personality factors, PG was positively correlated with neuroticism, and negatively correlated with conscientiousness, extraversion, and agreeableness [7]. In addition, gaming time is positively associated with PG. Specifically, a study involving 123,262 gamers from 168 countries found that PG is associated with an average of 34.53 h of gaming per week [8]. However, it should be noted that gaming time alone is not a sufficient indicator of PG [3, 9]. Finally, because gaming is often used as a coping strategy to escape or to relive negative moods, PG is also associated with emotional dysregulation [10] and low distress tolerance [11]. Taken together, these studies provided a detailed profile of individuals at risk for PG.

The negative consequences of PG are also well documented. First, PG is correlated with negative emotional states like depression, anxiety, and stress [12, 13]. It is likely that PG and negative emotional states affect each other in a bidirectional manner, leading to a vicious cycle that maintains or exacerbate PG symptoms. Second, because of the increased amount of time spent playing games [8], gamers with PG procrastinate on their bedtime, leading to poorer sleep quality [14, 15]. Finally, PG is also associated lower satisfaction with life [16, 17]. Overall, these studies highlight the severity of the condition and supports the inclusion of PG in the DSM-5.

The relationship between PG and AA has been extensively studied and the extant research summarized in a recent systematic review [1]. AA is defined as the measurable performance of students’ knowledge and skills in academic settings and are often assessed using test scores or grade point average (GPA) [18]. The review is noteworthy because it is the first to systematically summarize the research on PG and AA to identify research gaps and practical implications. The review examined 27 studies and concluded that the findings are mixed and there are limited

longitudinal studies. Specifically, it is currently unclear if PG is a risk factor or negative consequence of AA. For example, individuals with PG might spend a disproportionate amount of time on games, neglecting their studies and leading to lower AA. Alternatively, individuals with lower AA might engage in PG to escape negative moods or to satisfy their unmet need for achievement. Unfortunately, the data in the systematic review have not been statistically synthesized, precluding a clarification of the mixed findings and an examination of the direction of the effect for the variables.

The current study aimed to conduct a new systematic review and meta-analysis to address the limitation of the previous systematic review [1]. First, the data was statistically synthesized and potential moderators were explored to clarify the mixed findings. Second, for longitudinal studies, the effect sizes for the two different directions of the effect (i.e., PG → AA vs. AA → PG) were examined to determine if PG is a risk factor or negative consequence of AA.

Method

Search Strategy

A comprehensive search was conducted on the databases PsycInfo, PubMed, Scopus, and Web of Science from inception to 25 March 2025 using the following search terms: (“gam* disorder” OR “gam* addiction” OR “gam* dependence” OR “pathological gaming” OR “excessive gaming” OR “problematic gaming” OR “problematic game use”) AND (“academic achievement” OR “academic performance” OR “academic success” OR “academic outcome” OR “grade point average” OR “GPA”). The reference list of a systematic review was also screened for relevant articles [1]. The study was preregistered with PROSPERO (CRD420251004124) and conducted according to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines [19].

Inclusion and Exclusion Criteria

Articles were included if they (a) were original peer-reviewed research in an academic journal, (b) assessed AA using objective methods like test scores or GPA, (c) examined the relationships between PG and AA, (d) used a general or student sample, (e) reported sufficient data for the calculation of effect sizes (i.e., Pearson product-moment correlation coefficient), and (f) were written in the English language. Articles were excluded if they (a) were literature

reviews or qualitative studies, (b) assessed AA using subjective methods like self-report questionnaires, or (c) used a clinical sample. Two authors (PKHC and YJY) independently screened the articles and assessed them against the criteria for inclusion in the meta-analysis.

Data Extraction

The data from the included articles were extracted to a spreadsheet. The following data was extracted: (a) name of authors, (b) year of publication, (c) sample size, (d) nationality of sample, (e) gender (% males), (f) age range, M , and SD , group (adolescents, young adults, or both), (g) study design (cross-sectional and/or longitudinal), (h) PG measure, (i) AA measure, and (j) effect size. To avoid duplicate entries in the meta-analysis, for articles that reported multiple effect sizes (e.g., cross-sectional and longitudinal effect sizes), we prioritized the extraction of one effect size in the following order based on scarcity in the literature: (a) longitudinal effect sizes (AA \rightarrow PG), (b) longitudinal effect sizes (PG \rightarrow AA), and (c) cross-sectional effect sizes. Two authors (YJY and RD) independently extracted the data from the articles to a spreadsheet and compared them for accuracy.

Quality Assessment

The quality of the included articles was evaluated using the Appraisal tool for Cross-Sectional Studies (AXIS tool) [20]. The AXIS tool consists of 20 items designed to assess the quality of a journal article (e.g., Was the selection process likely to select subjects/participants that were representative of the target/reference population under investigation?). Because a scoring system was not provided, the current study reversed scored negatively worded items and assigned 0 = *No/Do not know*, 0.5 = *Yes to a certain extent*, and 1 = *Yes* for the items, resulting in a range of 0 to 20 for each article, with higher scores indicative of higher quality [e.g., see 7]. Two authors (YJY and RD) independently conducted the risk of bias assessment and compared them for accuracy.

Data Analysis

The data was analyzed using Meta-Essentials [21]. First, the random effects model was used to obtain the pooled estimate of the effect size [22]. Second, the heterogeneity across articles was assessed using Cochran's Q and the I^2 statistic [23]. If significant heterogeneity is found (i.e., a significant

Q statistic and $I^2 >= 75%$), the reasons for the heterogeneity will be explored using random-effects meta-regressions and subgroup analyses. Lastly, publication bias was examined using the funnel plot, Egger's [24] test, and the trim and fill procedure [25, 26].

Results

The flow diagram of the screening and selection of articles is presented in Fig. 1. A total of 457 articles were identified from the databases. After the removal of 192 duplicate articles, the title and abstract of the remaining 265 articles were screened. This process resulted in the exclusion of 186 irrelevant articles. A further 9 articles were added from a manual search and the reference list of the systematic review [1], resulting in 88 full-text articles were assessed for eligibility. Among these articles, 32 articles did not report sufficient data for the calculation of effect sizes and the authors of these articles were emailed for the information. Out of these 32 articles, 6 provided the effect size, 3 indicated that the data is unavailable, and 23 did not respond to our request. The 26 articles without effect sizes were excluded. Furthermore, 39 articles were also excluded based on the inclusion and exclusion criteria (e.g., AA not assessed using objective methods), resulting in a total of 23 included articles containing 25 effect sizes (Table 1).

The articles were published from 2009 to 2024 and the sample size ranged from 91 to 3427 (total $N = 16067$). Participants were from 14 countries from 4 regions: Asia (10 articles; China, India, Indonesia, Malaysia, Pakistan, South Korea, and Thailand), Europe (5 articles; Germany, Netherlands, and Norway), Middle East (7 articles; Egypt, Lebanon, and Turkey), and North America (3 articles; USA). Their age ranged from 8 to 31, with 9 articles recruiting adolescents, 12 articles recruiting young adults, and 2 articles recruiting both adolescents and young adults. The most common study design was cross-sectional ($k = 19$), followed by longitudinal (PG \rightarrow AA) ($k = 4$) and longitudinal (AA \rightarrow PG) ($k = 2$). The most commonly used PG measure was the Game Addiction Scale for Adolescents ($k = 5$) [50], followed by the Internet Gaming Disorder Scale ($k = 3$) [51] and the Internet Gaming Disorder Test-20 ($k = 3$) [52]. The most commonly used AA measure was the GPA ($k = 19$). The articles appear to be relatively high in quality and free from bias ($M = 18.50$, $SD = 0.89$, range = 16.50 to 20.00).

The meta-analysis showed that the effect sizes ranged from -0.44 to -0.02 , and found an overall pooled effect size of -0.17 , $p < .001$, with a 95% confidence interval of

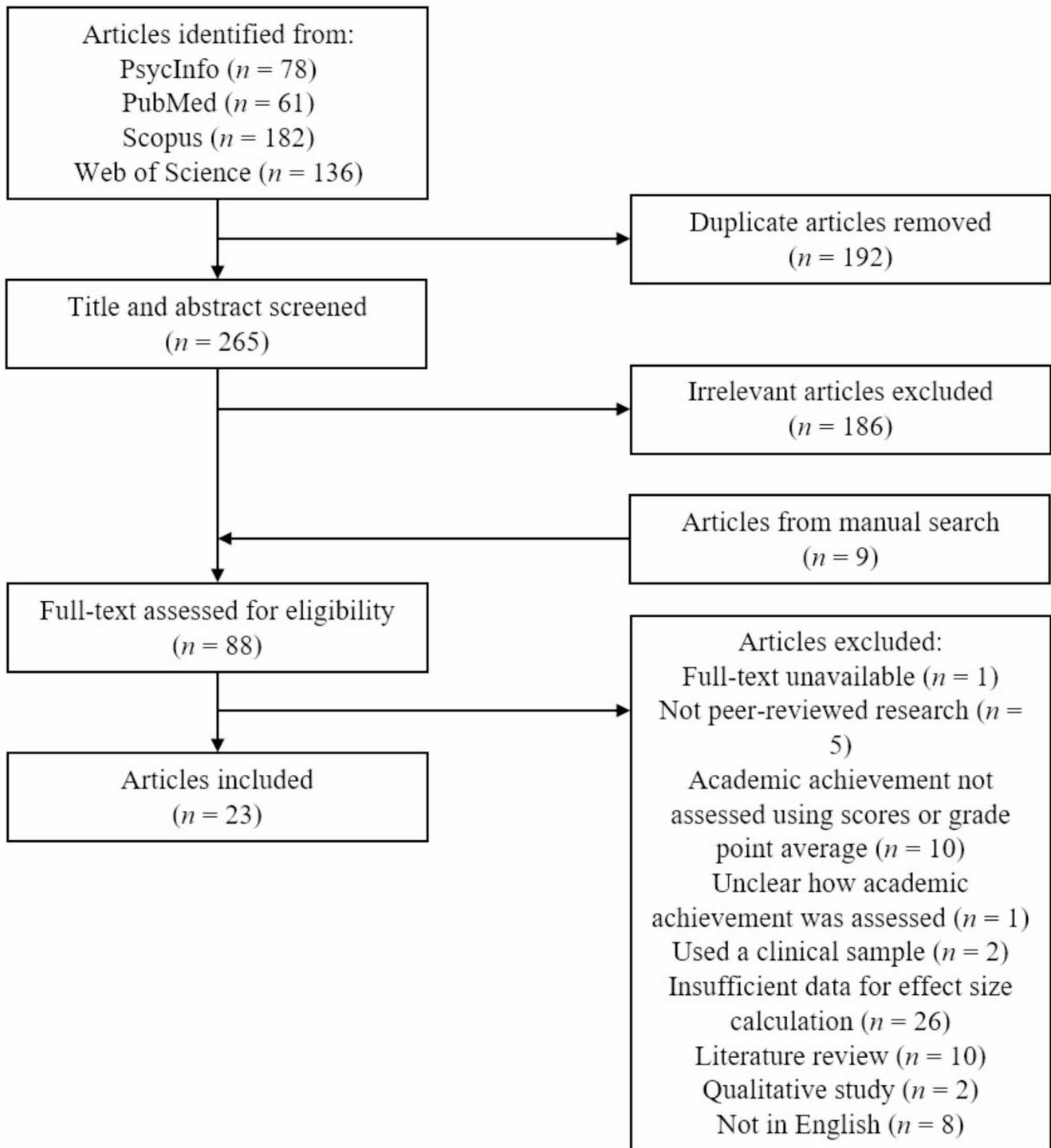


Fig. 1 Flow Diagram of The Screening and Selection of Articles

-0.22 to -0.13, and a 95% prediction interval of -0.36 to 0.03. The forest plot is presented in Fig. 2. Significant heterogeneity was found across the effect sizes, $Q=154.23$, $p < .001$, $I^2=84.44\%$. Consequently, random-effects meta-regressions and subgroup analyses were used to explore the reasons for the heterogeneity.

A series of random-effects meta-regressions were conducted with gender and risk of bias as the predictor variable and effect sizes as the criterion variable. Furthermore, a series of random-effects subgroup analyses were conducted with region, age group, and study design. The results are presented in Table 2. Gender, risk of bias, region, and age

Table 1 Descriptives of included articles on the relationship between problematic gaming (PG) and academic achievement (AA)

Articles	N	Nationality	Age			Group	Study Design	PG Measure	AA Measure	r	RoB
			Gender (% males)	Range	M (SD)						
Ahmer et al. [27]	400	Pakistan	50.50	18–25	-	2	1	IGDS9-SF	GPA	-0.24	20.0
Cirs et al. [28]	559	Turkey	57.60	14–18	-	1	1	GASA	GPA	-0.05	18.5
ELNahas et al. [29]	996	Egypt	44.10	-	19.60 (1.60)	2	1	IGDS	Grades	-0.03	17.0
Ferguson and Ceranoglu [30]	144	USA	52.80	-	12.70 (1.96)	1	2	Ad Hoc	GPA	-0.07	18.0
Gentile [31]	1178	USA	49.92	8–18	-	1	1	PGS	Grades	-0.30	18.0
Hawi and Samaha [32]	348	Lebanon	73.90	17–26	19.93 (2.08)	2	1	IGD-20	GPA	-0.18	18.0
Jaafar et al. [33]	411	Malaysia	39.90	19–25	21.81 (1.42)	2	1	IGDS9-SF	GPA	-0.44	20.0
Jeong and Kim [34]	600	South Korea	43.20	12–18	-	1	1	Modified IAT	GPA	-0.12	17.5
Karnadi and Pangestu [35]	390	Indonesia	42.82	16–25	19.17 (1.07)	2	1	IGD-20	GPA	-0.15	16.5
Kristensen et al. [36] – Males	1429	Norway	100	16–31	-	3	1	GASA	GPA	-0.22	18.5
Kristensen et al. [36] – Females	1424	Norway	0	16–31	-	3	1	GASA	GPA	-0.19	18.5
Paschke et al. [37]	1221	Germany	59.90	10–17	13.01 (2.36)	1	1	GASA	Grades	-0.08	19.0
Pattanaseri et al. [38]	224	Thailand	49.60	-	21.02 (0.69)	2	1	GAST	GPA	-0.24	19.0
Phetphum et al. [39]	3427	Thailand	43.70	-	17.85 (2.11)	3	1	GAST	GPA	-0.11	20.0
Polat and Topal [40]	289	Turkey	55.40	9–12	-	1	1	GASA	GPA	-0.26	17.5
Sahin et al. [41]	370	Turkey	54.30	14–18	16.18 (1.10)	1	1	GASA	GPA	-0.20	18.5
Samaha and Hawi [42]	345	Lebanon	73.90	-	19.93 (2.08)	2	1	IGD-20	GPA	-0.18	18.5
Schmitt and Livingston [43]	477	USA	100	-	18.00	2	2	PGS	GPA	-0.17	18.5
Suryawanshi et al. [44]	91	India	46.20	-	-	2	1	IGDS	Exam Scores	-0.02	19.0
Ting et al. [45]	332	Malaysia	70.80	19–28	20.90 (1.26)	2	1	Ad Hoc	GPA	-0.04	18.5
Van Den Eijnden et al. [46] – Males	263	Netherlands	100	-	12.96 (0.78)	1	2	IGDS	GPA	-0.06	19.0
Van Den Eijnden et al. [46] – Females	275	Netherlands	0	-	12.84 (0.68)	1	2	IGDS	GPA	-0.03	19.0
Yang et al. [47]	195	China	29.90	18–22	19.86	2	3	Modified IAT	GPA	-0.38	19.0
Zhang et al. [48]	283	China	39.60	18–27	20.47 (1.15)	2	3	DSM-5 IGD	GPA	-0.20	19.0
Zorbaz et al. [49]	396	Turkey	49.60	10–11	-	1	1	SGAC	GPA	-0.27	18.0

Age Group: 1 = Adolescents (< 18 years old), 2 = Young Adults (> 18 years old), and 3 = Both Adolescents and Young Adults; Study Design: 1 = Cross-sectional, 2 = Longitudinal (PG → AA); 3 = Longitudinal (AA → PG); RoB = Risk of Bias: Risk of bias was assessed using a critical appraisal tool [20] and the scores range from 0 to 20 for each article, with higher scores indicative of higher quality; IGDS9-SF = Internet Gaming Disorder Scale-Short-Form; GPA = Grade Point Average; GASA = Game Addiction Scale for Adolescents; IGDS = Internet Gaming Disorder Scale; PGS = Pathological Gaming Scale; IGD-20 = Internet Gaming Disorder Test-20; Modified IAT = Modified Internet Addiction Test; GAST = Game Addiction Screening Test; DSM-5 IGD = Internet Gaming Disorder Criteria in the DSM-5; SGAC = Scale of Game Addiction for Children

group were not significantly associated with effect sizes. The relationship between study design and effect sizes was close to significance, $p = .05$. Longitudinal effect sizes (AA → PG) had the largest effect size ($r = -.29$), followed by cross-sectional effect sizes ($r = -.18$) and longitudinal effect sizes (PG → AA) ($r = -.09$). Except for the longitudinal effect sizes (PG → AA) subgroup for study design, all other subgroups showed significant heterogeneity across the effect sizes.

Publication bias was examined. First, the funnel plot appears to be symmetrical. Second, Egger’s [24] test was nonsignificant, $p = .80$. Finally, the trim and fill procedure resulted in two imputed data points on the right of the funnel plot [25, 26]. The adjusted overall pooled effect size was -0.15 , with a 95% confidence interval of -0.21 to -0.10 , and a 95% prediction interval of -0.38 to 0.08 . While the funnel plot and Egger’s test suggested an absence of publication bias, the trim and fill procedure suggested that publication bias is present and had a small impact on the results, reducing the overall pooled effect size from -0.17 to -0.15 .

Discussion

The current study addressed the limitation of the previous systematic review [1] by conducting a new systematic review and meta-analysis to statistically synthesize the data on the relationships between PG and AA. The results showed that the effect sizes ranged from -0.44 to -0.02 , with an overall pooled effect size of -0.17 . While the systematic review concluded that the findings in the literature are mixed, the current study showed that PG shared a small but significant negative correlation with AA, with higher PG associated with lower AA. However, significant heterogeneity was found across the effect sizes and subsequent analyses showed that it could be explained by study design. Gender, region, and age group were not significant moderators of the effect sizes.

Study design significantly moderated the effect sizes. Specifically, longitudinal effect sizes (AA → PG) had the largest effect size ($r = -.29$), followed by cross-sectional effect sizes ($r = -.18$) and longitudinal effect sizes (PG → AA) ($r = -.09$). It appears that PG is more likely a negative

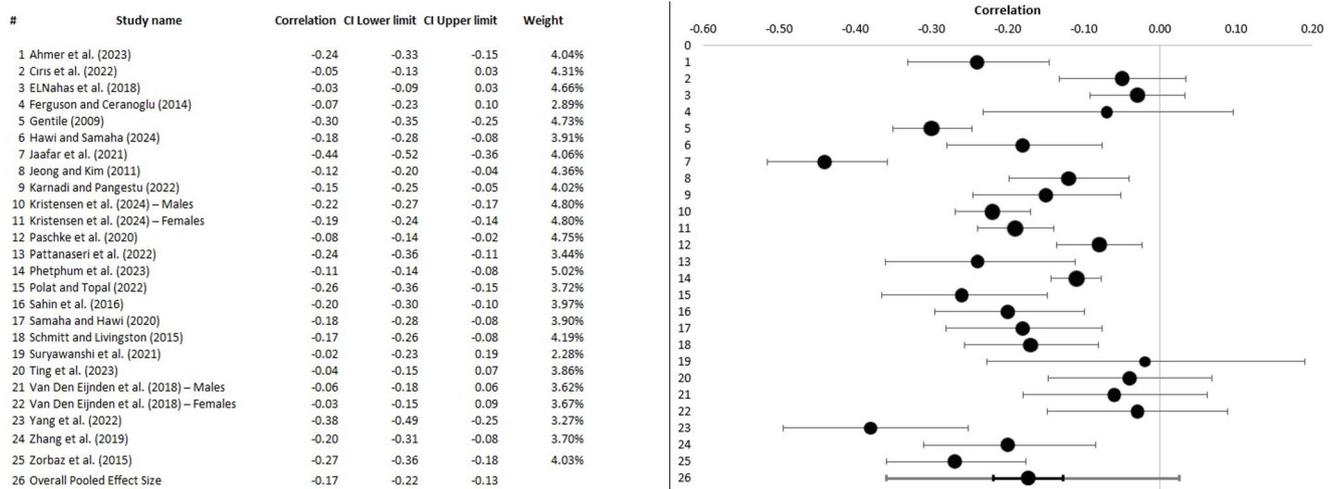


Fig. 2 Forest Plot of the Relationships between Problematic Gaming and Academic Achievement

Table 2 Random-Effects Meta-Regressions and subgroup analyses on the relationship between problematic gaming (PG) and academic achievement (AA)

Variable	k	Beta	95% CI [LL, UL]			p
Gender	25	0.08	0.00, 0.00			0.68
Risk of Bias	25	-0.22	-0.08, 0.03			0.27
Variable	k	r	95% CI [LL, UL]	Q	I ²	p
Region						0.58
Asia	10	-0.20	-0.30, -0.10	71.60***	87.43%	
Europe	5	-0.13	-0.23, -0.02	22.11***	81.91%	
Middle East	7	-0.16	-0.25, -0.07	30.98***	80.64%	
North America	3	-0.20	-0.46, 0.09	11.60**	82.76%	
Age Group						0.70
Adolescents	10	-0.15	-0.22, -0.07	59.24***	84.81%	
Young Adults	12	-0.19	-0.28, -0.11	78.22***	85.94%	
Both	3	-0.17	-0.31, -0.03	15.50***	87.10%	
Study Design						0.05
Cross-sectional	19	-0.18	-0.23, -0.13	134.15***	86.58%	
Longitudinal (PG → AA)	4	-0.09	-0.20, 0.02	4.31	30.35%	
Longitudinal (AA → PG)	2	-0.29	-0.91, 0.74	4.43*	77.45%	

Subgroup Analyses were based on separate estimates of *tau* and the *p* values were based on *Q*_{between} of the ANOVA table

p* < .05, *p* < .01, ****p* < .001

consequence than a risk factor of AA. As mentioned, individuals with lower AA might play games either to escape negative moods (e.g., disappointment with GPA) or to satisfy their unmet need for achievement (e.g., achieving a rare item in game as a substitute for not achieving academically) [1]. This process reinforces their gaming behavior and over time, some of these individuals might engage in PG. However, the results should be interpreted with caution for two reasons. First, consistent with the conclusions of the systematic review [1], there are limited longitudinal studies that have examined the relationship between PG and AA. In the current study, there were 19 cross-sectional effect sizes and only 6 longitudinal effect sizes. Second, out of the 6

longitudinal effect sizes, there were only 2 effect sizes for PG as a negative consequence (i.e., AA → PG). These two articles employed a relatively small sample size (*n* = 195 and 283) of students from China [47, 48], a country with a relatively higher prevalence rate of PG (13.6%) compared to other countries [53]. Consequently, the relatively large effect size could be due to the sample size, the relatively higher prevalence rate of PG, or academic experiences unique to students from China (e.g., sitting for the highly competitive and stressful *Gaokao*, China’s National College Entrance Examination). Clearly, more research is needed in this area using larger sample sizes from other regions of the world.

Gender, region, and age group were not significant moderators of the effect sizes. However, it should be noted that the subgroups showed significant heterogeneity across the effect sizes. This could be due to the grouping of articles for ease of comparison. For example, seven countries (e.g., China, India, and etc.) were grouped under the Asia region even though there could be significant differences across those countries with regards to PG and AA. Specifically, the prevalence rates of PG differ among these countries (e.g., a prevalence rate of 5.4% in Thailand vs. 13.6% in China) [53, 54] and that could contribute to the observed heterogeneity. Furthermore, potential differences could be obscured by significant heterogeneity among other variables. For example, within each age group, there was significant heterogeneity with regards to region and PG measure used. Those differences could obscure potential differences across age groups, resulting in the nonsignificant results. Taken together, it is important that these variables be studied in future research to ascertain their importance in moderating the relationship between PG and AA.

Limitations of the study should be noted. First, there is some evidence of publication bias. Although the impact appears to be small, future meta-analyses could address this limitation by also searching for grey literature and unpublished manuscripts. Second, while a number of articles were relevant to the aims of the current study, they did not report sufficient data for the calculation of effect sizes nor respond to our request for data. In fact, while there were 25 effect sizes in the current study, a total of 26 articles without effect sizes were excluded. In other words, the current study analyzed and presented only half of the relevant literature. Future research could report the Pearson product-moment correlation coefficient routinely as part of the descriptives to enable more comprehensive and rigorous meta-analyses.

Conclusions and Future Directions

Future research directions might include conducting more longitudinal studies to examine the causal relationships between the variables (i.e., both $PG \rightarrow AA$ and $AA \rightarrow PG$). Second, potential mediators like the escape motivation or need for achievement could be examined to understand the mechanisms underlying the $AA \rightarrow PG$ relationship. Finally, nonsignificant results could be due to a variety of factors and should not be used as evidence of absence [55]. Future research could use Bayesian analysis to examine the nonsignificant moderators in the current study (e.g., age group) and quantify the support in favor of the null hypothesis [56].

In summary, the findings of this study are important because it appears to be the first meta-analysis of the

relationship between PG and AA. The current study found an overall pooled effect size of -0.17, suggesting that higher PG was associated with lower AA. More importantly, the current study found that PG is more likely a negative consequence than a risk factor of AA. Overall, the results extended on the systematic review [1] and has implications for our understanding of PG.

Key References

- Alzahrani AKD, Griffiths MD (2024) Problematic gaming and students' academic performance: A systematic review. *Int J Ment Health Addiction*. <https://doi.org/10.1007/s11469-024-01338-5>.
 - A systematic review of the relationship between problematic gaming and academic achievement.

Author Contributions PKHC conceptualized the study, screened the articles and assessed them against the criteria for inclusion in the meta-analysis, analyzed the data, and wrote the manuscript. YJY screened the articles and assessed them against the criteria for inclusion in the meta-analysis, extracted the data from the articles to a spreadsheet and compared them for accuracy, and conducted the risk of bias assessment and compared them for accuracy. RD extracted the data from the articles to a spreadsheet and compared them for accuracy and conducted the risk of bias assessment and compared them for accuracy. All authors reviewed the manuscript.

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Data Availability Data is provided within the manuscript.

Declarations

Human and Animal Rights and Informed Consent No human or animal subjects were used in this study.

Competing Interests The authors declare no competing interests.

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References

- Alzahrani AKD, Griffiths MD. Problematic gaming and students' academic performance: A systematic review. *Int J Ment Health Addiction* [Internet]. 2024 June 10 [cited 2024 Dec 30]; Available from: <https://doi.org/10.1007/s11469-024-01338-5>
- Granic I, Lobel A, Engels RCME. The benefits of playing video games. *Am Psychol*. 2014;69(1):66–78.
- American Psychiatric Association. *Diagnostic and statistical manual of mental disorders*. 5th ed. Arlington, VA: American Psychiatric Publishing; 2013.
- Kim HS, Son G, Roh EB, Ahn WY, Kim J, Shin SH, et al. Prevalence of gaming disorder: A meta-analysis. *Addict Behav*. 2022;126:107183.
- Stevens MWR, Dorstyn D, Delfabbro PH, King DL. Global prevalence of gaming disorder: A systematic review and meta-analysis. *Australian New Z J Psychiatry*. 2021;55(6):553–68.
- Su W, Han X, Yu H, Wu Y, Potenza MN. Do men become addicted to internet gaming and women to social media? A meta-analysis examining gender-related differences in specific internet addiction. *Comput Hum Behav*. 2020;113:106480.
- Chew PKH. A meta-analytic review of internet gaming disorder and the big five personality factors. *Addict Behav*. 2022;126:107193.
- Pontes HM, Schivinski B, Kanne C, Montag C. The interplay between time spent gaming and disordered gaming: A large-scale world-wide study. *Soc Sci Med*. 2022;296:114721.
- World Health Organization. ICD-11 [Internet]. *International Classification of Diseases 11th Revision*. 2019 [cited 2021 Apr 21]. Available from: <https://icd.who.int/en>
- Estupiñá FJ, Bernaldo-de-Quirós M, Vallejo-Achón M, Fernández-Arias I, Labrador F. Emotional regulation in gaming disorder: A systematic review. *Am J Addictions*. 2024;33(6):605–20.
- Hew YC, Chew PKH. Distress tolerance as a risk factor for specific internet-use disorders. *J technol behav sci* [Internet]. 2025 Feb 13 [cited 2025 Feb 13]; Available from: <https://doi.org/10.1007/s41347-025-00489-z>
- Chew PKH, Naidu KNC, Shi J, Zhang MWB. Prevalence and correlates of (internet) gaming disorder among young adults in Singapore. *Psychiatr Q*. 2025.
- Wong HY, Mo HY, Potenza MN, Chan MNM, Lau WM, Chui TK, et al. Relationships between severity of internet gaming disorder, severity of problematic social media use, sleep quality and psychological distress. *Int J Environ Res Public Health*. 2020;17(6):1879.
- Krishnan A, Chew PKH. Impact of social media addiction and internet gaming disorder on sleep quality: serial mediation analyses. *Psychiatr Q*. 2024.
- Wang Q, Mati K, Cai Y. The link between problematic internet use, problematic gaming, and psychological distress: does sleep quality matter? *BMC Psychiatry*. 2021;21(1):103.
- Bargeron AH, Hormes JM. Psychosocial correlates of internet gaming disorder: Psychopathology, life satisfaction, and impulsivity. *Comput Hum Behav*. 2017;68:388–94.
- Peeters M, Koning I, van den Eijnden R. Predicting internet gaming disorder symptoms in young adolescents: A one-year follow-up study. *Comput Hum Behav*. 2018;80:255–61.
- Kumar S, Agarwal M, Agarwal N. Defining and measuring academic performance of Hei students- A critical review. *Turkish J Comput Math Educ*. 2021;12(6):3091–105.
- Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021;372:1–9.
- Downes MJ, Brennan ML, Williams HC, Dean RS. Development of a critical appraisal tool to assess the quality of cross-sectional studies (AXIS). *BMJ Open*. 2016;6(12):e011458.
- Suurmond R, van Rhee H. Introduction, comparison, and validation of Meta-Essentials: A free and simple tool for meta-analysis. *Res Synthesis Methods*. 2017;8(4):537–53.
- Borenstein M, Hedges LV, Higgins JPT, Rothstein HR. *Introduction to Meta-Analysis*. 1st edition. Chichester, U.K: Wiley; 2009. 452 p.
- Higgins JPT, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. *BMJ* 2003 Sept 4;327(7414):557–60.
- Egger M, Smith GD, Schneider M, Minder C. Bias in meta-analysis detected by a simple, graphical test. *BMJ* 1997 Sept 13;315(7109):629–34.
- Duval S, Tweedie R. A nonparametric trim and fill method of accounting for publication bias in meta-analysis. *J Am Stat Assoc*. 2000;95(449):89–98.
- Duval S, Tweedie R. Trim and fill: A simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. *Biometrics*. 2000 June;56(2):455–63.
- Ahmer Z, Shafique MA, Haseeb A, Mazhar R, Khan L, Ahmed F. How common is internet gaming addiction among undergraduates of health sciences programs active on social media in karachi? A cross-sectional survey. *J Dow Univ Health Sci*. 2023;17(2):71–6.
- Ciris V, Baskonus T, Kartal T, Tasdemir A. A study on digital game addictions of adolescents in the covid-19 pandemic. *JSEH*. 2022;8(2):168–86.
- ELNahas G, Elella EA, Hewedi D, Elhabiby M, Elkholy H, Mansour O, et al. Problematic online gaming among a sample of university students in Egypt. *Addict Disorders their Treat*. 2018;17(4):161–7.
- Ferguson CJ, Ceranoglu TA. Attention problems and pathological gaming: resolving the 'chicken and egg' in a prospective analysis. *Psychiatr Q*. 2014;85(1):103–10.
- Gentile D. Pathological video-game use among youth ages 8 to 18: A National study. *Psychol Sci*. 2009;20(5):594–602.
- Hawi N, Samaha M. Relationships of gaming disorder, ADHD, and academic performance in university students: A mediation analysis. *PLoS ONE*. 2024;19(4):e0300680.
- Jaafar NR, Baharudin A, Tajjudin I, Ling LS, Safarudin MA, Sufia DS, et al. Factors correlated with internet gaming disorder among Malaysian university students. *Malaysian J Med Health Sci*. 2021;17(2):54–62.
- Jeong EJ, Kim DH. Social activities, self-efficacy, game attitudes, and game addiction. *Cyberpsychology Behav Social Netw*. 2011;14(4):213–21.
- Karnadi EB, Pangestu S. Does internet gaming disorder hinder academic performance? *Jurnal Kajian Bimbingan Dan Konseling*. 2022;6(1):1–15.
- Kristensen SM, Jørgensen M, Haug E. I want to play a game: examining sex differences in the effects of pathological gaming, academic self-efficacy, and academic initiative on academic performance in adolescence. *Educ Inform Technol*. 2024;29(15):19711–28.
- Paschke K, Austermaier MI, Thomasius R. Assessing icd-11 gaming disorder in adolescent gamers: development and validation of the gaming disorder scale for adolescents (GADIS-A). *J Clin Med*. 2020;9(4):1–22.
- Pattanaseri K, Atsariyasing W, Pornnoppadol C, Sanguanpanich N, Sriyungfung M. Mental problems and risk factors for depression among medical students during the COVID-19 pandemic: A cross-sectional study. *Med (Baltim)*. 2022;101(38):e30629.
- Phetphum C, Keeratisiroj O, Prajongjeep A. The association between mobile game addiction and mental health problems and

- learning outcomes among Thai youths classified by gender and education levels. *Asian J Social Health Behav.* 2023;6(4):196–202.
40. Polat A, Topal M. Relationship between digital game addiction with body mass index, academic achievement, player types, gaming time: A cross-sectional study. *JETOL.* 2022;5(4):901–15.
 41. Sahin M, Gumus YY, Dincel S. Game addiction and academic achievement. *Educational Psychol.* 2016;36(9):1533–43.
 42. Samaha M, Hawi N. Internet gaming disorder and its relationships with student engagement and academic performance. *Int J Cyber Behav Psychol Learn.* 2020;10(4):14–33.
 43. Schmitt ZL, Livingston MG. Video game addiction and college performance among males: results from a 1 year longitudinal study. *Cyberpsychology Behav Social Netw.* 2015;18(1):25–9.
 44. Suryawanshi DM, Rajaseharan D, Venugopal R, Mathew M, Joy A, Goyal R. The association between gaming practices and scholastic performance among medical students in india: Case-control study. *JMIR Med Educ* 2021 Sept 9;7(3):e22235.
 45. Ting TT, Lee KT, Lim SM, Lai CC, Omar MA, Alin J et al. Assessing the identity of digital technology in education in the age of digital communication. *Online Journal of Communication and Media Technologies [Internet].* 2023;13(4). Available from: <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85178421002&doi=10.30935%2fojcm%2f13695&partnerID=40&md5=f6b7829447d80b283b73ac952840a742>
 46. Van Den Eijnden R, Koning I, Doornwaard S, Van Gorp F, Ter Bogt T. The impact of heavy and disordered use of games and social media on adolescents' psychological, social, and school functioning. *J Behav Addictions.* 2018 Sept;7(3):697–706.
 47. Yang HM, Tong KK, Li Y, Tao VYK, Zhang MX, Wu AMS. Testing the influence of social axioms on internet gaming disorder tendency with a cross-lagged panel model: A one-year longitudinal study. *Int J Mental Health Addict.* 2022;20(5):2587.
 48. Zhang MX, Wang X, Yu SM, Wu AMS. Purpose in life, social support, and internet gaming disorder among Chinese university students: A 1-year follow-up study. *Addict Behav.* 2019;99:106070.
 49. Zorbaz SD, Ulas O, Kizildag S. Relation between video game addiction and interfamily relationships on primary school students. *Kuram Ve Uygulamada Egitim Bilimleri/Educational Sciences: Theory Pract.* 2015;15(2):489–97.
 50. Lemmens JS, Valkenburg PM, Peter J. Development and validation of a game addiction scale for adolescents. *Media Psychol.* 2009;12(1):77–95.
 51. Lemmens JS, Valkenburg PM, Gentile DA. The internet gaming disorder scale. *Psychol Assess.* 2015;27(2):567–82.
 52. Pontes HM, Király O, Demetrovics Z, Griffiths MD. The conceptualisation and measurement of DSM-5 internet gaming disorder: the development of the IGD-20 test. *PLoS ONE.* 2014;9(10):e110137.
 53. Yu Y, Yang X, Wang S, Wang H, Chang R, Tsamtag L, et al. Serial multiple mediation of the association between internet gaming disorder and suicidal ideation by insomnia and depression in adolescents in Shanghai, China. *BMC Psychiatry.* 2020 Sept;23(1):460.
 54. Taechoyotin P, Tongrod P, Thaweerungruangkul T, Towattananon N, Teekapakvisit P, Aksornpusitpong C, et al. Prevalence and associated factors of internet gaming disorder among secondary school students in rural community, thailand: a cross-sectional study. *BMC Res Notes.* 2020;13(1):11.
 55. Altman DG, Bland JM. Absence of evidence is not evidence of absence. *BMJ: Br Med J.* 1995;311(7003):485–485.
 56. Wagenmakers EJ, Marsman M, Jamil T, Ly A, Verhagen J, Love J, et al. Bayesian inference for psychology. Part I: theoretical advantages and practical ramifications. *Psychon Bull Rev.* 2018;25(1):35–57.

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