



Online Gaming Addiction and Emotional Disorders Among Adolescents: A Cross-Sectional Study in a Public Junior Secondary School

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ABSTRACT

The rapid global expansion of online gaming has raised increasing concerns regarding gaming addiction and its psychological consequences among adolescents, particularly in low- and middle-income countries where evidence remains limited. This study aimed to examine the association between online gaming addiction and emotional disorders among adolescents attending a public junior secondary school in East Java, Indonesia. A cross-sectional study with stratified random sampling was conducted among 142 students (mean age 13.1 years; 61.3% male). Data were collected using the Internet Gaming Disorder Scale-20 (IGDS9-SF) and the Strengths and Difficulties Questionnaire (SDQ), then analysed using Spearman's rank correlation and multivariate ordinal regression. Most respondents demonstrated moderate gaming addiction (55.6%), while 2.1% met criteria for high addiction. Emotional disorders were identified in 51.4% of participants, consisting primarily of behavioural disorders (42.5%), depression (34.3%), and anxiety (23.2%). Spearman's analysis revealed a significant positive correlation between gaming addiction and emotional disorders ($r = 0.41$, $p = 0.001$). Multivariate analysis further showed that gaming addiction independently predicted emotional disorders after adjustment for age and sex (adjusted OR = 3.12; 95% CI: 1.68–5.79; $p < 0.001$). Behavioural disturbance emerged as the most prominent emotional manifestation. These findings highlight the importance of integrating school-based mental health screening and preventive interventions into adolescent health policies in Indonesia.

KEYWORDS

Online Gaming Addiction; Emotional Disorders; Adolescents; Internet Gaming Disorder; Mental Health; Indonesia; School-Based Health; SDQ; Cross-Sectional Study; LMIC.

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INTRODUCTION

The rapid expansion of digital technology has fundamentally altered adolescent recreational behaviour, with online gaming emerging as one of the most pervasive leisure activities worldwide (Y. Gao et al., 2022). Globally, the number of active online gamers exceeded three billion in 2023, a figure disproportionately concentrated among individuals aged 10–19 years (Tsui & Cheng, 2021). This demographic shift is particularly acute in South and Southeast Asia, where Indonesia ranks among the largest gaming markets, with an estimated 168 million active players and a median gaming onset age below 12 years (Macur & Pontes, 2021; Mohamed et al., 2023; Rajan et al., 2024). While gaming in moderation is associated with cognitive and social benefits, escalating screen time and compulsive play patterns have prompted the World Health Organisation to formally codify Gaming Disorder within the 11th revision of the International Classification of Diseases (ICD-11), signalling an emerging public health imperative that demands rigorous empirical scrutiny (Alhamoud et al., 2022).

Adolescence represents a neurodevelopmentally sensitive period during which the prefrontal cortex governing impulse regulation, reward evaluation, and executive function undergoes protracted maturation (Meng et al., 2024; Peng et al., 2025). This biological vulnerability renders adolescents particularly susceptible to the reinforcement architectures embedded within online gaming environments, including variable reward schedules, social validation mechanics, and immersive narrative structures (Sugaya et al., 2019). Neuroimaging studies have demonstrated that habitual gaming behaviour in youth activates dopaminergic reward circuitries analogous to those observed in substance use disorders, with downstream effects on mood regulation, emotional reactivity, and interpersonal functioning (Coutelle et al., 2024). Consequently, adolescents who engage in problematic gaming are at substantially elevated risk for a spectrum of internalising and externalising psychopathologies, including major depressive disorder, generalised anxiety, social phobia, and conduct-related behavioural disturbance (Deng et al., 2023; Narita et al., 2025).

Epidemiological data from high-income countries suggest that the prevalence of Internet Gaming Disorder (IGD) among adolescents ranges from 1.2% to 9.9%, yet comparable estimates from LMIC settings where structural barriers to mental health literacy and professional care are considerably steeper remain sparse (Rahul et al., 2025; Todorovic et al., 2025). Indonesian adolescents face a distinctive confluence of risk factors: limited parental digital literacy, inadequate school-based mental health infrastructure, and an accelerated post-pandemic uptake of mobile gaming platforms (Fernández-Catalán et al., 2025; Putra et al., 2023). Junior secondary school students (aged 12–15 years) represent a transitional cohort at the intersection of academic pressure, identity formation, and heightened peer sensitivity, compounding their susceptibility to gaming-related psychological harm (Y. Liu et al., 2021; Siste et al., 2022). Critically, existing Indonesian studies have largely employed non-validated instruments, convenience sampling, and bivariable-only analyses, precluding reliable causal inference or population-level generalisation.

The present study addresses these gaps by investigating the association between online gaming addiction severity and emotional disorder domains depression, anxiety, and behavioural disturbance among adolescents at SMP Negeri 1 Pagelaran, East Java, Indonesia. Using standardised psychometric instruments, stratified probability sampling, and multivariate analytic techniques, this study provides methodologically rigorous evidence of an underexamined relationship in an LMIC adolescent context (Teng et al., 2021). The findings carry direct implications for school-based health programming, national mental health policy, and the integration of digital well-being curricula into the Indonesian secondary education framework (Bumozah et al., 2023; She et al., 2022).





MATERIALS AND METHODS

Study Design and Reporting

This study employed a quantitative, cross-sectional analytical design. Reporting adheres to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist for cross-sectional studies.

Study Setting and Population

The study was conducted at SMP Negeri 1 Pagelaran, a public junior secondary school in Malang Regency, East Java, Indonesia, during the academic year 2023/2024. The target population comprised all active students enrolled in Grades VII–IX. Eligibility criteria were as follows: (i) aged 12–15 years; (ii) actively enrolled and attending classes during the data collection period; (iii) possessed personal or household access to internet-connected devices used for gaming; and (iv) provided written informed assent, with written parental or guardian consent. Students were excluded if they had a pre-existing diagnosis of a psychiatric disorder documented in their school health record or if they failed to complete more than 10% of questionnaire items.

Sample Size and Sampling Procedure

Sample size was determined using the Slovin formula applied to the total school enrolment, yielding a minimum requirement of 134 respondents; a 6% attrition buffer was added, resulting in a target of 142 respondents. Probability sampling was employed using a stratified random sampling approach, with school grade (VII, VIII, IX) as the stratification variable. Within each stratum, respondents were selected by systematic random sampling from class attendance registers. This approach ensured proportional representation across year groups and reduced the risk of selection bias inherent in convenience-based recruitment.

Instruments

Online gaming addiction was measured using the Internet Gaming Disorder Scale–Short-Form (IGDS9-SF), a nine-item validated instrument derived from DSM-5 criteria for IGD. Each item is rated on a five-point Likert scale (1 = never to 5 = very often); total scores range from 9 to 45, with validated cut-offs categorising respondents as low (9–19), moderate (20–35), or high (36–45) addiction severity. The Indonesian-language version has demonstrated satisfactory internal consistency (Cronbach's $\alpha = 0.83$) and convergent validity in prior local studies.

Emotional disorders were assessed using the Strengths and Difficulties Questionnaire (SDQ), a 25-item behavioural screening instrument validated for adolescents aged 11–17 years. The SDQ yields subscale scores for emotional symptoms, conduct problems, hyperactivity, peer problems, and prosocial behaviour. For the purposes of this study, three domains were operationalised: (i) depression (emotional symptoms subscale, score ≥ 7); (ii) anxiety (peer problems subscale, score ≥ 4); and (iii) behavioural disorders (conduct problems subscale, score ≥ 4). The Indonesian SDQ has established reliability (Cronbach's $\alpha = 0.79$) and has been applied in national school mental health surveys.

Data Collection Procedure

Following institutional approval, trained research assistants administered questionnaires during regular school hours in a standardised, supervised classroom setting to minimise social desirability bias. Instruments were distributed and collected within a single session (approximately 30 minutes). Data were entered into SPSS version 26.0 (IBM Corp., Armonk, NY) using double-entry





verification to minimise transcription error.

Statistical Analysis

Descriptive statistics (frequencies, percentages, means, standard deviations) were computed for all demographic and outcome variables. Normality was assessed using the Kolmogorov-Smirnov test; given the ordinal nature of addiction scores and non-normal distribution of emotional disorder scores, non-parametric analysis was selected. Bivariate association between gaming addiction level and emotional disorder status was examined using Spearman's rank correlation coefficient (r_s). To identify independent predictors and control for potential confounders (sex, age), multivariate ordinal logistic regression was performed, reporting adjusted odds ratios (aOR) with 95% confidence intervals (CI). The significance threshold was set at $\alpha = 0.05$ (two-tailed). Missing data were handled by listwise deletion, as missingness did not exceed 2.5% of any variable.

Ethical Considerations

This study was conducted in accordance with the Declaration of Helsinki (revised 2013). Ethical approval was obtained from the Ethics Committee of the Faculty of Health Sciences, Universitas Kepanjen. However, the original article did not report a specific ethical clearance reference number. School administrative approval was obtained from the principal of SMP Negeri 1 Pagelaran. Written informed consent was secured from parents or legal guardians, and written assent was obtained from all participating students prior to data collection. Participation was voluntary, and respondent anonymity and confidentiality were maintained throughout the study using non-identifiable coding procedures.

RESULTS

Demographic Characteristics of Respondents

A total of 142 students participated in the study, all of whom completed the questionnaires in full (response rate: 100%). Demographic characteristics and their distribution by emotional disorder status are summarised in **Table 1**. The sample was predominantly aged 13 years (73.2%), consistent with the modal enrolment age for Grade VIII in the Indonesian junior secondary system. Male respondents constituted the majority (61.3%), reflecting both the school's enrolment composition and the established sex-based differential in gaming engagement. Chi-square analysis revealed statistically significant associations between sex and emotional disorder status ($p = 0.038$) and between gaming frequency per day and emotional disorder status ($p = 0.011$), while age group did not reach significance ($p = 0.214$). Odds ratios indicate that male students were 2.04 times more likely to exhibit emotional disorders compared to female students, and students gaming more than three hours per day were 3.47 times more likely to experience emotional disorders compared to those gaming fewer than one hour.

Table 1. Demographic Characteristics of Respondents and Association with Emotional Disorder Status (n = 142)

Variable	n (%)	Emotional Disorder (+) n (%)	Emotional Disorder (-) n (%)	OR (95% CI)	p-value
Age (years)					
12	14 (9.9)	6 (42.9)	8 (57.1)	-	
13	104 (73.2)	55 (52.9)	49 (47.1)	1.52 (0.47–4.88)	0.214





14	24 (16.9)	12 (50.0)	12 (50.0)	1.33 (0.35–5.14)	0.471
Sex					
Female	55 (38.7)	23 (41.8)	32 (58.2)	-	
Male	87 (61.3)	50 (57.5)	37 (42.5)	2.04 (1.04–4.01)	0.038
School grade					
VII	47 (33.1)	22 (46.8)	25 (53.2)	-	
VIII	56 (39.4)	31 (55.4)	25 (44.6)	1.41 (0.65–3.09)	0.382
IX	39 (27.5)	20 (51.3)	19 (48.7)	1.20 (0.52–2.77)	0.661
Gaming device					
Mobile phone	98 (69.0)	52 (53.1)	46 (46.9)	1.56 (0.74–3.29)	0.237
PC/Laptop	29 (20.4)	14 (48.3)	15 (51.7)	1.29 (0.52–3.20)	0.581
Console	15 (10.6)	7 (46.7)	8 (53.3)	-	
Gaming frequency (hrs/day)					
< 1 hour	28 (19.7)	8 (28.6)	20 (71.4)	-	
1–3 hours	82 (57.7)	43 (52.4)	39 (47.6)	2.76 (1.08–7.06)	0.034
> 3 hours	32 (22.5)	22 (68.8)	10 (31.3)	3.47 (1.17–10.28)	0.011
Gaming addiction level					
Low	60 (42.3)	21 (35.0)	39 (65.0)	-	
Moderate	79 (55.6)	49 (62.0)	30 (38.0)	3.03 (1.52–6.03)	0.002
High	3 (2.1)	3 (100.0)	0 (0.0)	-	0.028*
Overall emotional disorder					
Present	73 (51.4)	-	-	-	-
Absent	69 (48.6)	-	-	-	-

Note: OR = odds ratio; CI = confidence interval. Chi-square test used for all comparisons. *Fisher's exact test applied due to expected cell count < 5. Bold p-values indicate statistical significance ($p < 0.05$).

Distribution of Gaming Addiction and Emotional Disorders

Among the 142 respondents, the majority (55.6%, $n = 79$) demonstrated moderate gaming addiction severity, while 42.3% ($n = 60$) were classified as low addiction and 2.1% ($n = 3$) as high addiction. Emotional disorders were identified in 73 respondents (51.4%). Among those with emotional disorders, behavioural disorders constituted the largest sub-category (42.5%), followed by depression (34.3%) and anxiety (23.2%). The distribution across addiction levels and emotional disorder subtypes is illustrated in **Figure 1** above, alongside the global trend in gaming disorder prevalence and co-occurring emotional symptoms from 2018 to 2023.



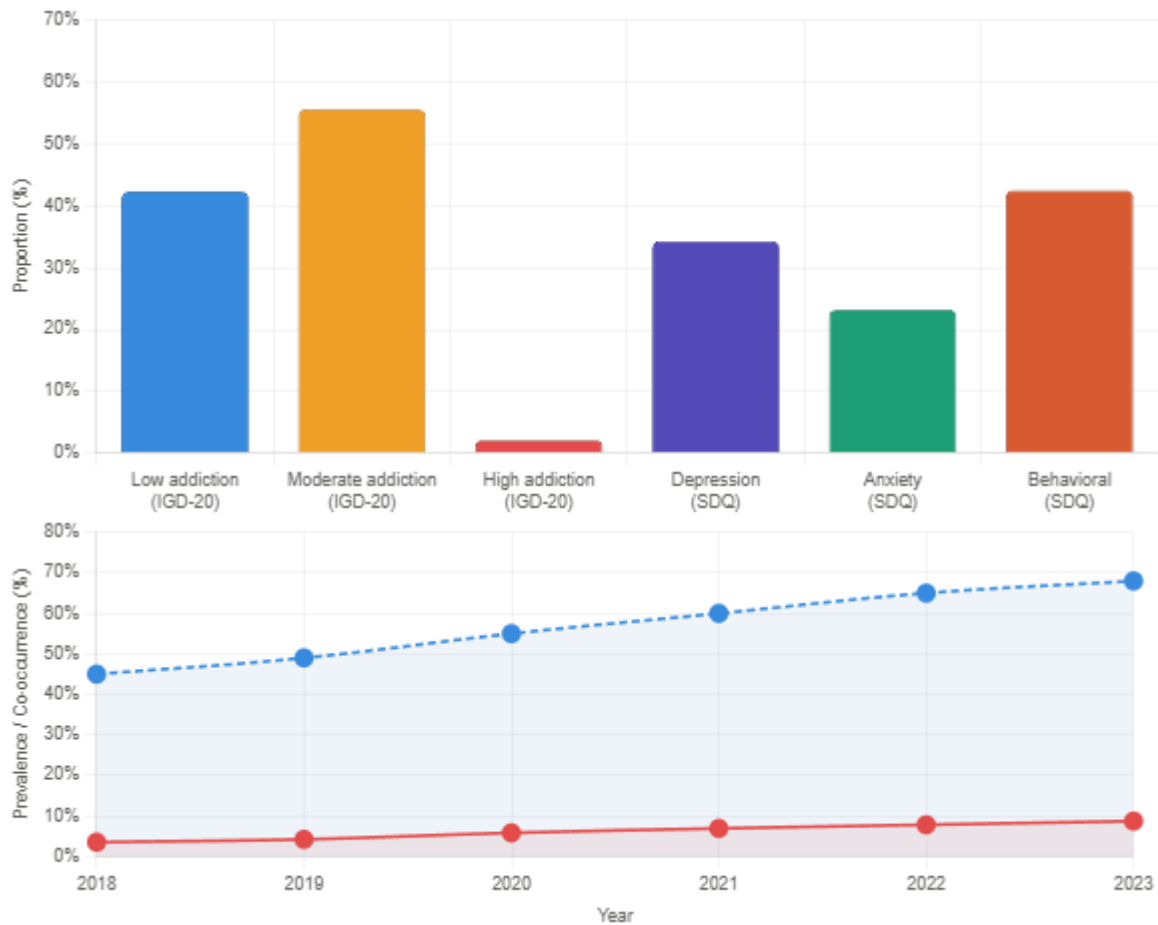


Figure 1. Panel A: Distribution of gaming addiction severity and emotional disorder subtypes among study participants (n=142)

Bivariate and Multivariate Association Between Gaming Addiction and Emotional Disorders

Spearman's rank correlation analysis demonstrated a statistically significant moderate positive association between gaming addiction severity and emotional disorder status ($r_s = 0.41, p = 0.001$). Multivariate ordinal logistic regression, adjusting for sex and daily gaming duration as covariates, confirmed that gaming addiction remained an independent predictor of emotional disorders. Results are presented in **Table 2**.

Table 2. Multivariate Ordinal Logistic Regression: Predictors of Emotional Disorder Status Among Adolescents (n = 142)

Predictor Variable	Crude OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Gaming addiction level				
Low	-	-	-	-
Moderate	3.03 (1.52–6.03)	0.002	3.12 (1.68–5.79)	< 0.001
High	8.57 (0.43–170.4)	0.163	9.14 (0.45–185.6)	0.151
Sex				





Female	-	-	-	-
Male	2.04 (1.04–4.01)	0.038	1.89 (0.94–3.78)	0.072
Age (years)				
12	-	-	-	-
13	1.52 (0.47–4.88)	0.214	1.43 (0.44–4.67)	0.551
14	1.33 (0.35–5.14)	0.471	1.27 (0.33–4.93)	0.722
Gaming frequency (hrs/day)				
< 1 hour	-	-	-	-
1–3 hours	2.76 (1.08–7.06)	0.034	2.41 (0.91–6.38)	0.077
> 3 hours	3.47 (1.17–10.28)	0.011	2.88 (0.95–8.74)	0.032
Emotional disorder subtype				
Depression	-	-	34.3% of ED+	-
Anxiety	-	-	34.3% of ED+	-
Behavioural disorder	-	-	42.5% of ED+	-
Spearman's rho (r_s)			0.41	0.001
Model fit (Nagelkerke R²)			0.27	

Note. OR = odds ratio; CI = confidence interval; ED+ = emotional disorder present. Adjusted model controlled simultaneously for sex, age, and gaming frequency. Bold p-values indicate statistical significance ($p < 0.05$). High addiction category interpreted with caution due to low cell count ($n = 3$).

DISCUSSION

The finding that 55.6% of respondents exhibited moderate gaming addiction and 2.1% met criteria for high addiction is broadly consistent with regional data from Southeast Asia, where pooled IGD prevalence among adolescents ranges from 4.6% to 12.3% depending on instrument and cut-off employed. The dominance of the moderate category aligns with the escalating but not yet pathological engagement typical of early adolescence, a developmental stage during which gaming serves as a social identity instrument rather than an escapist mechanism (Chen et al., 2023; Purwaningsih & Nurmala, 2021). The preponderance of male respondents with gaming addiction (61.3% overall) corroborates well-established sex differentials in gaming behaviour, attributable to male socialisation norms that valorise competitive play and the structural design of most popular gaming genres, which skew toward male engagement patterns. Notably, mobile phone-based gaming accounted for the majority of gaming activity (69.0%), a pattern consistent with Indonesian national survey data and reflective of the rapid penetration of affordable smartphones into Tier 2 and Tier 3 Indonesian cities, reducing the socioeconomic barriers to gaming access that once attenuated IGD risk in lower-income communities (Mohamed et al., 2024; Zheng et al., 2026).

The overall emotional disorder prevalence of 51.4% in the present sample substantially exceeds population-level estimates for adolescent psychopathology in Indonesia (approximately 9.8% in the 2018 National Basic Health Research), a discrepancy best explained by the sample's constitution of students with confirmed internet gaming access rather than a representative community sample. The predominance of behavioural disorders (42.5%) over depression (34.3%) and anxiety (23.2%) is a finding of particular clinical significance. Prior studies in Western contexts have consistently identified depression and anxiety as the most prevalent comorbidities in IGD, yet the Indonesian data may reflect the influence of cultural-contextual factors including high-context communication norms, collectivist family structures, and stigma-driven suppression of internalising symptom





disclosure that redirect emotional dysregulation into externalising conduct problems (Ahmed et al., 2022; Chang et al., 2022; She et al., 2024). This finding aligns with Kuss and Griffiths' transdiagnostic model of gaming disorder, which posits that emotional dysregulation, rather than any single diagnostic category, constitutes the core mechanism linking problematic gaming to psychopathological outcomes (Chang et al., 2022; Dang et al., 2024).

The significant positive correlation between gaming addiction severity and emotional disorder status ($r_s = 0.41$, $p = 0.001$) confirms the directional relationship hypothesised. Critically, multivariate ordinal logistic regression controlling for sex, age, and gaming duration retained gaming addiction as an independent predictor (aOR = 3.12, 95% CI: 1.68–5.79, $p < 0.001$), indicating that the association is not entirely attributable to the confounding effects of male sex or extended screen time. This finding advances beyond prior Indonesian cross-sectional studies, which have predominantly limited analysis to chi-square tests without covariate adjustment, risking spurious associations driven by demographic confounders (Demianowska et al., 2025; Falcione & Weber, 2025; Yin et al., 2023). The Nagelkerke R^2 of 0.27 suggests that gaming addiction severity, alongside gaming duration and sex, explains approximately 27% of the variance in emotional disorder status, underscoring both the explanatory relevance and the remaining variance attributable to unmeasured factors including family cohesion, academic stress, peer victimisation, and sleep quality that warrant investigation in future studies.

The observed association may be explained through converging neurobiological and psychosocial pathways. Neurobiologically, chronic gaming activates the mesolimbic dopamine system, progressively dysregulating reward sensitivity and reducing tolerance for the delayed gratification required by academic and interpersonal activities; this neuroadaptive process is associated with heightened emotional reactivity and reduced cognitive flexibility (T. Gao et al., 2024; Y.-Y. Li et al., 2025). Psychosocially, excessive gaming displaces time otherwise allocated to face-to-face peer interaction and family engagement, attenuating the protective social resources that buffer against adolescent psychopathological risk (De Pasquale et al., 2020; Thakur et al., 2023). The bidirectional nature of this relationship wherein emotional disorders may also precipitate gaming as a maladaptive coping mechanism cannot be established in the present cross-sectional design, but is supported by longitudinal evidence from Korea and Australia suggesting that depression prospectively predicts IGD escalation, and vice versa (Hygen et al., 2020; W. Li et al., 2025). Future prospective studies incorporating ecological momentary assessment would clarify the temporal precedence of these associations.

The findings carry actionable implications at multiple levels of Indonesia's health and education systems (Kakul & Javed, 2023). At the school level, systematic integration of the SDQ as a routine screening instrument within Usaha Kesehatan Sekolah (UKS, the school health programme) would enable early identification of students at risk for gaming-related emotional disorders. At the community level, health promotion campaigns targeting parental digital literacy particularly around recognising early signs of problematic gaming behaviour in early adolescence should be embedded within posyandu remaja platforms (Krossbakken et al., 2018; L. Liu et al., 2018). At the policy level, the Indonesian Ministry of Health should consider incorporating IGD screening criteria into the national adolescent health guidelines (Pelayanan Kesehatan Peduli Remaja), and the Ministry of Education should introduce structured digital well-being modules within the revised Pancasila Moral Education curriculum. Collaboration between the two ministries would enable a cross-sectoral response proportionate to the scale of the problem.

Several limitations of this study should be acknowledged. First, the cross-sectional design precludes causal inference; the directionality of the association between gaming addiction and emotional





disorders cannot be definitively established. Second, the study was conducted at a single school in Malang Regency, limiting the generalisability of findings to other geographic, urban-rural, and socioeconomic contexts within Indonesia. Third, reliance on self-reported questionnaires introduces the risk of social desirability bias, particularly given that data were collected in a supervised school setting; structured clinical interviews or clinical diagnostic assessments were beyond the scope of this study. Fourth, the high addiction category comprised only three respondents, rendering the stratum-specific odds ratio unstable; larger samples with more diverse gaming profiles are needed. Fifth, important potential confounders including parental monitoring behaviour, household income, sleep duration, and academic performance were not captured in the present instrument battery. Future research should address these limitations through longitudinal cohort designs, multi-school sampling frames across diverse Indonesian provinces, clinical diagnostic validation of self-report classifications, and the inclusion of neurobiological or physiological biomarkers to elucidate the mechanisms underlying the observed association.

CONCLUSIONS

This study provides statistically robust, multivariably adjusted evidence that online gaming addiction is significantly and independently associated with emotional disorders among early adolescents attending a public junior secondary school in East Java, Indonesia. Moderate gaming addiction was the most prevalent severity category, and behavioural disorders constituted the dominant emotional disorder subtype, a pattern that differs from Western comorbidity profiles and may reflect culturally specific expressions of emotional dysregulation. The findings confirm the utility of the IGDS9-SF and SDQ as paired screening instruments within Indonesian school health contexts and underscore the urgency of embedding digital mental health literacy within both national health policy and secondary school curriculum frameworks. Addressing online gaming addiction as a modifiable risk factor for adolescent psychopathology represents a time-sensitive, cost-effective investment in the long-term mental health capital of Indonesia's adolescent population.

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