

Night-time Internet Use and Mental Health in Adolescents

Uso de Internet nocturno y salud mental en adolescentes

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Abstract

The timing of Internet use may provide information about adolescent digital risks beyond total screen time. This study examined the association between Internet use after midnight, problematic Internet use (PIU), and various psychological indicators. A cross-sectional, observational, analytical study was conducted with 597 adolescents aged 12 to 19 years ($M = 15.20$, $SD = 1.56$; 53.1% boys). Measures included Internet use duration and timing, PIU, Internet use in response to negative emotional states, gaming-related problems, anxiety, depression, ADHD symptoms, and difficulties in emotion regulation. Group comparisons, correlation analyses, and regression models adjusted for age, sex, and daily Internet use duration were performed. Overall, 19.3% of participants reported using the Internet after midnight almost every day. The prevalence of positive PIU screening increased from 23.1% to 49.6%, and the prevalence of at least moderate depressive symptoms increased from 26.0% to 47.0%, when comparing adolescents who never used the Internet after midnight with those who did so almost daily. In the adjusted models, nighttime Internet use was associated with higher PIU ($\beta = .232$, $p < .001$) and greater depressive symptomatology ($\beta = .177$, $p < .001$), even after excluding the sleep-related item from the PHQ-9. Associations with anxiety, emotion regulation, and emotional Internet use were no longer significant after adjustment. Internet use after midnight appears to be a contextual marker of risk rather than a diagnostic criterion. Assessing the timing of Internet use may complement measures of total screen time and help guide prevention strategies focused on healthy sleep, self-regulation, and the early identification of depressive symptoms.

Key Words

Adolescence; problematic Internet use; night-time Internet use; depression; mental health; digital technologies.

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Resumen

El horario de conexión puede aportar información sobre los riesgos digitales adolescentes más allá del tiempo total de uso. Se analizó la asociación entre el uso de Internet después de medianoche, el uso problemático de Internet (UPI) y distintos indicadores psicológicos. Se llevó a cabo un estudio observacional, transversal y analítico con 597 adolescentes de 12 a 19 años ($M = 15,20$; $DT = 1,56$; 53,1% chicos). Se evaluaron el tiempo y horario de conexión, el UPI, el uso de Internet ante estados emocionales negativos, los problemas relacionados con videojuegos, la ansiedad, la depresión, los síntomas compatibles con TDAH y las dificultades de regulación emocional. Se realizaron comparaciones entre grupos, correlaciones y regresiones ajustadas por edad, sexo y tiempo diario de conexión. El 19,3% utilizaba Internet después de medianoche casi diariamente. El cribado positivo de UPI aumentó del 23,1% al 49,6%, y la depresión moderada o superior, del 26,0% al 47,0%, entre quienes no se conectaban y quienes lo hacían casi todos los días. En los modelos ajustados, el uso nocturno se asoció con mayor UPI ($\beta = ,232$; $p < ,001$) y sintomatología depresiva ($\beta = ,177$; $p < ,001$), incluso al excluir el ítem de sueño del PHQ-9. Las asociaciones con ansiedad, regulación emocional y uso emocional de Internet no se mantuvieron tras el ajuste. La conexión después de medianoche constituye un marcador contextual de riesgo, no un criterio diagnóstico. Su evaluación puede complementar el tiempo total de uso y orientar la prevención hacia el descanso, la autorregulación y la detección temprana del malestar depresivo.

Palabras clave

Adolescencia; uso problemático de Internet; uso nocturno de Internet; depresión; salud mental; tecnologías digitales.

INTRODUCTION

Internet and digital technologies are part of adolescents' everyday lives and serve communicative, social, educational, and self-exploratory functions (Crone & Konijn, 2018; Hollis et al., 2020; Nesi et al., 2018). However, a high frequency of Internet use does not in itself imply loss of control or psychopathology (Fineberg et al., 2018; Kardefelt-Winther et al., 2017). Indeed, the association between overall digital-use time and well-being is generally small, heterogeneous, and sensitive to methodological decisions. Orben and Przybylski (2019) estimated that digital technology use explained, at most, 0.4% of the variance in well-being, whereas Odgers and Jensen (2020) concluded that the evidence does not support a simple and necessarily causal relationship with mental health problems. It is therefore necessary to consider not only

how much the Internet is used, but also how, why, and when it is used.

Within this framework, the timing of Internet use may provide particularly relevant information. The same amount of daily use may involve very different activities, motivations, and consequences, whereas extending use into time intended for rest may delay bedtime or make it more difficult to disengage. This issue is especially important in adolescence, a developmental period characterized by circadian and homeostatic changes that favor later sleep schedules and increase vulnerability to insufficient or mistimed sleep (Crowley et al., 2018; Tarokh et al., 2016). Consistent with this, access to or use of digital devices in the sleep environment has been associated with shorter sleep duration, poorer sleep quality, and greater daytime sleepiness (Carter et al., 2016).



Nevertheless, not all forms of digital exposure appear to be equivalent. Brosnan et al. (2024) observed that screen use during the two hours before bedtime was not associated with most sleep indicators, whereas use once in bed, particularly interactive activities, was associated with later sleep onset and shorter sleep duration. Similarly, Bourke et al. (2026) found that young people tended to fall asleep slightly later on days with greater screen use, without overall associations with sleep duration, efficiency, or quality; however, use after bedtime was associated with poorer subjective sleep quality. These findings suggest that the timing and context of use may be more informative than total use time considered in isolation.

To explain these associations, LeBourgeois et al. (2017) proposed three potentially concurrent mechanisms: displacement of time allocated to sleep, cognitive or emotional arousal generated by certain content, and exposure to light emitted by screens. The latter mechanism is supported by experimental evidence, as nighttime exposure to light-emitting devices can delay circadian timing and make sleep onset more difficult (Chang et al., 2015). In any case, nighttime Internet use should not be considered pathological in itself. Its relevance depends on its frequency, duration, function, and degree of interference with sleep and everyday functioning (Fineberg et al., 2018; Kardefelt-Winther et al., 2017).

Available evidence suggests that nighttime use of digital technologies may be related to sleep and emotional adjustment, although these associations depend on the type of activity and study design. Lemola et al. (2015) found that nighttime electronic media use was associated with shorter sleep duration, greater sleep difficulties, and higher depressive symptomatology. When analyses focus specifically on social

media, associations have also been reported with poorer sleep quality, greater anxiety and depression, and lower self-esteem (Woods & Scott, 2016). Longitudinal evidence provides clues about possible mechanisms: Vernon et al. (2018) found that changes in sleep habits mediated the relationship between initial increases in nighttime mobile phone use and subsequent increases in depressed mood and externalizing problems, as well as decreases in self-esteem and coping.

Internet use specifically after midnight has received less attention. Lederer-Hutsteiner et al. (2024) found that this pattern was associated with greater insomnia and statistically mediated part of the relationship between Internet-related addictive behaviors and insomnia symptoms. Complementarily, Szapary et al. (2024) found that a combined pattern of morning and nighttime use, Internet use for more than six hours per day, and urgency to respond were independently associated with problematic Internet use (PIU). Although the latter study did not isolate after-midnight use, both studies support the relevance of considering the temporal distribution of Internet use in addition to its duration.

This distinction is important because PIU is not simply equivalent to spending many hours online, nor does it constitute a unitary clinical diagnosis. It is an umbrella term encompassing repetitive Internet-related behaviors when they involve difficulties with control, negative consequences, or functional impairment (Fineberg et al., 2018; Spada, 2014; Starcevic & Aboujaoude, 2017). Accordingly, frequency or intensity of use is insufficient to characterize a behavioral addiction in the absence of significant and persistent harm (Kardefelt-Winther et al., 2017). From this perspective, repeated Internet use after midnight could act as an in-



indicator of difficulty stopping an activity, but its meaning will depend on whether it displaces sleep, produces daytime consequences, or forms part of a broader pattern of loss of control.

The relationship between PIU and emotional distress is also complex and potentially bidirectional. Gámez-Guadix (2014) found that baseline depressive symptoms predicted subsequent increases in preference for online relationships, use of the Internet to regulate mood, and negative consequences; in the reverse direction, only baseline negative consequences predicted greater subsequent depressive symptomatology. Morita et al. (2022) identified bidirectional relationships between PIU and both depression and hyperactivity/inattention. More broadly, Villanueva-Blasco et al. (2026a) observed a predominantly bidirectional pattern between PIU and several emotional-distress variables, although with substantial conceptual, measurement, and outcome heterogeneity.

Much of the literature has focused on total use time, pre-bedtime use, or specific platforms, whereas studies of Internet use after midnight are less common. It also remains unclear whether timing provides additional information once daily duration is controlled for and whether it is broadly related to psychological distress or more specifically to PIU and depression.

The aim of this study was to analyze the association between Internet use after midnight, PIU, and several psychological indicators in adolescents, and to determine whether nighttime timing provided additional information beyond age, sex, and daily Internet-use time. We hypothesized that a higher frequency of nighttime use would be associated with greater PIU and depressive symptomatology.

METHOD

Design

An observational, cross-sectional, analytical study was conducted to examine the association between Internet use after midnight, problematic Internet use, and several indicators of mental health and psychological adjustment in adolescents.

Participants

The sample comprised 597 adolescents aged 12 to 19 years ($M = 15.20$; $SD = 1.56$). There were 317 boys (53.1%) and 280 girls (46.9%). Most were enrolled in compulsory secondary education ($n = 379$; 63.5%), followed by vocational education and training ($n = 125$; 20.9%), upper secondary education/Baccalaureate ($n = 90$; 15.1%), and other educational pathways ($n = 3$; 0.5%). A total of 67 participants (11.2%) reported a previous ADHD diagnosis made by the healthcare system.

Measures

Sociodemographic and clinical variables

Data were collected on sex, age, educational stage, school attended, and the existence of a previous ADHD diagnosis reported by the participant. This latter variable was considered only as self-reported clinical information and not as a diagnosis established by the research team.

Indicators of digital engagement

Frequency and timing of Internet use.

Daily Internet-use time during the previous 30 days was assessed using an ad hoc item with



six response categories: less than one hour, between one and two hours, between two and three hours, between three and five hours, more than five hours, and throughout the day. Frequency of Internet use was also assessed across four time periods: 08:00–14:00, 14:00–21:00, 21:00–midnight, and after midnight. Each time period had three response options: none, sometimes, and almost every day.

Problematic Internet use. The Problematic Internet Use Scale for Adolescents (EUPI-a; Rial et al., 2015) was used. It comprises 11 items referring to the previous 30 days. Items are rated on a five-point Likert scale and yield a total score ranging from 0 to 44; higher scores indicate greater problems. A cutoff of ≥ 16 was used to identify a positive screen, without interpreting it as a clinical diagnosis. Internal consistency was adequate in the present sample ($\alpha = .868$).

Internet use in response to negative emotional states. The Internet Use Scale for Emotional Distress Avoidance in Adolescents (IU-EDA; Villanueva-Blasco et al., 2026b) was used to assess the tendency to turn to the Internet to alleviate or avoid states such as anxiety, sadness, irritability, frustration, emptiness, or hopelessness. The total score was used, with higher values reflecting greater emotionally motivated Internet use. Internal consistency was excellent ($\alpha = .936$).

Gaming-related problems. The brief seven-item version of the Game Addiction Scale for Adolescents (GASA; Lemmens et al., 2009), validated in Spanish adolescents by Lloret Irles et al. (2018), was administered. The items assess manifestations during the previous six months such as preoccupation, loss of control, tolerance, distress, conflict, and giving up other activities. Higher scores indicate a

greater presence of gaming-related problems. Internal consistency was high ($\alpha = .887$).

Indicators of mental health and psychological adjustment

Anxiety symptoms. Anxiety was assessed using the Generalized Anxiety Disorder-7 (GAD-7; Spitzer et al., 2006), validated in Spanish adolescents by Casares et al. (2024). Its seven items assess symptom frequency during the previous two weeks and yield a score from 0 to 21. A score ≥ 10 was considered indicative of clinically relevant anxiety symptoms. Internal consistency was high ($\alpha = .888$).

Depressive symptoms. The Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001), validated in Spanish adolescents by Fonseca-Pedrero et al. (2023), was used. It assesses the frequency of nine depressive symptoms during the previous two weeks and yields a total score from 0 to 27. Severity was classified as minimal (0–4), mild (5–9), moderate (10–14), moderately severe (15–19), or severe (20–27). For categorical analyses, symptomatology was classified as below moderate versus moderate or higher. As a sensitivity analysis, an alternative score excluding the sleep item was calculated to reduce potential overlap between the depression measure and Internet use after midnight. Internal consistency of the PHQ-9 was high ($\alpha = .880$).

Symptoms consistent with ADHD. Inattention and hyperactivity-impulsivity symptoms were assessed using the Adult ADHD Self-Report Screening Scale for DSM-5 (ASRS-5; Ustun et al., 2017), a brief six-item self-report measure. Although originally developed for adults, Somma et al. (2021) pro-



vided evidence of a unidimensional structure, reliability, convergent validity, and discriminative ability in male Italian adolescents. In this study, it was used as an exploratory dimensional indicator of symptoms consistent with ADHD, not as a diagnostic tool. Internal consistency was acceptable ($\alpha = .730$).

Emotion regulation difficulties. The Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) was administered in its Spanish adaptation (Hervás & Jódar, 2008), for which specific psychometric evidence is available in Spanish adolescents (Gómez-Simón et al., 2014). It comprises 36 items distributed across six dimensions: impulse control, access to regulation strategies, emotional acceptance, goal-directed behavior, emotional awareness, and emotional clarity. The total score was used; higher values indicate greater emotion regulation difficulties. Internal consistency was excellent ($\alpha = .923$).

Procedure

Data were collected during the 2025–2026 academic year. Schools first received an information letter explaining the study objectives and procedure and requesting consent from legal guardians. The information emphasized the voluntary nature of participation and data confidentiality. Once authorizations had been verified, the study was presented to students and their cooperation was requested. The questionnaire battery was administered collectively in the classroom during school hours under the supervision of a member of the research team. Completion took approximately 20 to 30 minutes. Data were handled confidentially and in accordance with ethical privacy standards. The study was approved by the

Ethics Committee of the International University of Valencia (code CEID2024_17).

Data analysis

Analyses were conducted using IBM SPSS Statistics, version 31. Frequencies and percentages were calculated for categorical variables, and means, standard deviations, and observed ranges for continuous variables. Internal consistency of the measures was estimated using Cronbach's alpha.

Frequency of Internet use after midnight was treated primarily as a three-level ordinal variable (none, sometimes, and almost every day), and daily Internet-use time as a six-category ordinal variable.

Differences in PIU, anxiety, depression, depression excluding the sleep item, emotion regulation difficulties, Internet use in response to negative emotional states, and gaming-related problems according to frequency of after-midnight Internet use were examined using one-way ANOVA. Welch and Kruskal–Wallis tests were used as robustness analyses in the event of possible violations of homogeneity of variance or distributional assumptions. η^2 was reported as a measure of effect size.

Associations between nighttime use and positive screens for PIU, clinically relevant anxiety, and moderate-or-higher depression were analyzed using contingency tables and χ^2 tests, with Cramer's V reported. Odds ratios (ORs) and 95% confidence intervals were also calculated comparing almost-daily Internet use after midnight with all other frequencies.

Bivariate associations between nighttime use and psychological variables were estimated using Spearman correlations. Partial corre-



lations were then calculated controlling for age, sex, and daily Internet-use time category. Symptoms consistent with ADHD were analyzed only with bivariate correlations and were considered exploratory.

The specific contribution of Internet use after midnight was examined using hierarchical linear regressions. Age, sex, and daily Internet-use time were entered in the first block, followed by frequency of nighttime use in the second block. Separate models were estimated for PIU, anxiety, depression, depression excluding the sleep item, emotion regulation difficulties, and Internet use in response to negative emotional states. B , standard error, β , 95% confidence intervals, R^2 , and ΔR^2 were reported. Positive screens for PIU, anxiety, and depression were analyzed using logistic regressions adjusted for the same covariates, with adjusted ORs and 95% confidence intervals reported.

As a sensitivity analysis, the main models were repeated after dichotomizing nighttime use as almost daily versus all other frequencies. ANCOVAs were also conducted treating nighttime frequency as a three-level categorical factor to test the results without assuming linearity across categories. Moderation by sex was examined using interaction terms for PIU, anxiety, and depression.

Statistical significance was set at $p < .05$.

RESULTS

Patterns of Internet use

Overall, 30.3% reported high Internet use (more than five hours per day or throughout the day). Almost-daily Internet use was most frequent between 14:00 and 21:00

(72.5%) and between 21:00 and midnight (45.1%). After midnight, 19.3% used the Internet almost every day, 35.0% sometimes, and 45.7% did not use it (Table 1).

Psychological indicators and prevalence of positive screens

Overall, 30.8% of the sample had a positive screen for PIU. A total of 38.4% met the GAD-7 cutoff for clinically relevant anxiety symptoms. On the PHQ-9, 37.9% had minimal, 27.6% mild, 17.3% moderate, 11.1% moderately severe, and 6.2% severe symptoms; overall, 34.5% fell within the moderate-or-higher depression range. Descriptive statistics and internal consistency are shown in Table 2 and Figure 1.

Differences according to Internet use after midnight

PIU scores increased stepwise with the frequency of Internet use after midnight, from $M = 10.01$ ($SD = 7.55$) among adolescents who did not use the Internet during this period to $M = 17.16$ ($SD = 10.56$) among those who did so almost every day, $F(2, 594) = 32.60$, $p < .001$, $\eta^2 = .099$. The Welch test confirmed the difference, $F(2, 275.10) = 22.03$, $p < .001$. A gradient was also observed for depression, $F(2, 594) = 14.07$, $p < .001$, $\eta^2 = .045$, and remained when the PHQ-9 sleep item was excluded, $F(2, 594) = 11.01$, $p < .001$, $\eta^2 = .036$. Differences in emotion regulation, Internet use in response to emotional distress, and gaming-related problems were significant but small. For anxiety, the ANOVA was not significant, $F(2, 594) = 2.63$, $p = .073$, $\eta^2 = .009$, although the Kruskal-Wallis test showed a small difference, $H = 6.68$, $p = .035$. Nonparametric analyses corroborated the overall pattern (Table 3).


Table 1. Daily Internet-use time and frequency of use by time period

Indicator	Category	n	%
Daily use time in the previous 30 days	Less than 1 hour	32	5.4
	Between 1 and 2 hours	101	16.9
	Between 2 and 3 hours	123	20.6
	Between 3 and 5 hours	160	26.8
	More than 5 hours	125	20.9
	Throughout the day	56	9.4
High Internet use	More than 5 hours or throughout the day	181	30.3
08:00-14:00	None	193	32.3
	Sometimes	283	47.4
	Almost every day	121	20.3
14:00-21:00	None	24	4.0
	Sometimes	140	23.5
	Almost every day	433	72.5
21:00-midnight	None	72	12.1
	Sometimes	256	42.9
	Almost every day	269	45.1
After midnight	None	273	45.7
	Sometimes	209	35.0
	Almost every day	115	19.3

Note. High use was defined as Internet use for more than five hours per day or throughout the day.

Table 2. Descriptive statistics and internal consistency of psychological variables

Variable	M	SD	α
Problematic Internet use (PIU)	12.02	8.39	.868
Anxiety (GAD-7)	8.29	5.39	.888
Depression (PHQ-9)	7.94	6.42	.880
Depression excluding the sleep item	6.83	5.69	—
Emotion regulation difficulties (DERS)	87.56	18.58	.923
Internet use in response to emotional distress (IU-EDA)	13.78	7.61	.936
Gaming-related problems (GASA)	12.93	6.11	.887
Symptoms consistent with ADHD (ASRS-5)	8.45	4.15	.730

Note. ADHD = attention-deficit/hyperactivity disorder. No independent reliability coefficient was estimated for the PHQ-9 score excluding the sleep item.

Figure 1. Prevalence of positive screening for problematic Internet use, clinically relevant anxiety, and levels of depressive symptomatology in adolescents

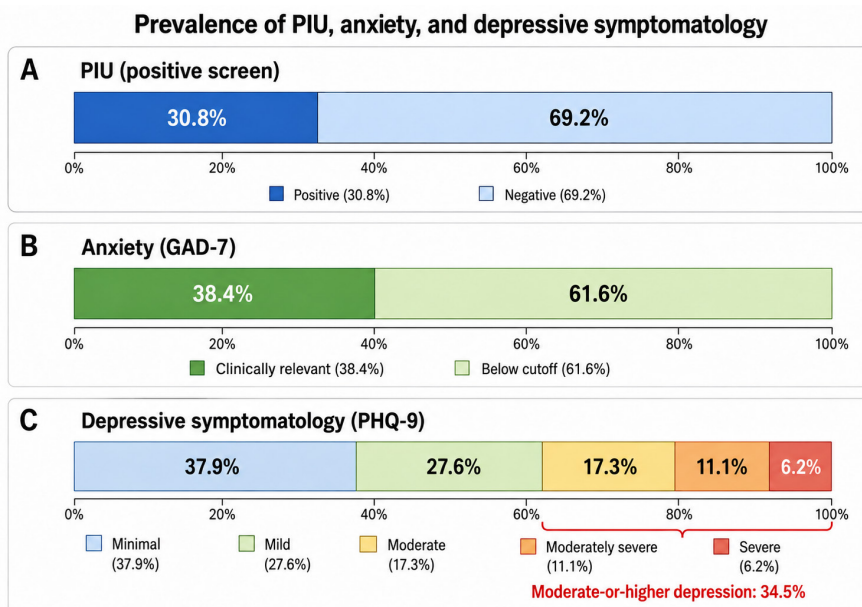


Table 3. Psychological variables according to frequency of Internet use after midnight

Variable	None M (SD)	Sometimes M (SD)	Almost daily M (SD)	F (p)	η^2	H (K-W) (p)
Problematic Internet use	10.01 (7.55)	11.83 (6.79)	17.16 (10.56)	32.60 (< .001)	.099	49.18 (< .001)
Anxiety	7.76 (5.55)	8.59 (5.00)	8.98 (5.59)	2.63 (.073)	.009	6.68 (.035)
Depression	6.62 (6.17)	8.45 (5.89)	10.18 (7.21)	14.07 (< .001)	.045	29.71 (< .001)
Depression excluding the sleep item	5.78 (5.48)	7.25 (5.27)	8.57 (6.40)	11.01 (< .001)	.036	24.00 (< .001)
Emotion regulation difficulties	86.44 (18.99)	86.34 (16.83)	92.41 (19.99)	4.92 (.008)	.016	9.03 (.011)
Internet use in response to emotional distress	13.05 (7.43)	13.82 (7.40)	15.44 (8.18)	4.05 (.018)	.013	6.63 (.036)
Gaming-related problems	11.99 (5.21)	12.90 (5.63)	15.21 (8.10)	11.62 (< .001)	.038	13.46 (.001)

Note. F values correspond to one-way ANOVAs; robust and nonparametric tests were conducted as sensitivity analyses.



Nighttime use and positive screens

The rate of positive PIU screening increased from 23.1% among adolescents who did not use the Internet after midnight to 49.6% among those who did so almost every day, $\chi^2(2) = 26.63$, $p < .001$, $V = .211$. Almost-daily use was associated with 2.75-fold higher odds, $OR = 2.75$, 95% CI [1.81, 4.17]. Moderate-or-higher depression increased from 26.0% to 47.0%, $\chi^2(2) = 18.28$, $p < .001$, $V = .175$, with 1.92-fold higher odds, $OR = 1.92$, 95% CI [1.27, 2.91]. The association with anxiety was not significant (Table 4, Figure 2).

Bivariate and partial correlations

Internet use after midnight was correlated with daily Internet-use time ($\rho = .446$, $p < .001$) and with use between 21:00 and midnight ($\rho = .611$, $p < .001$). In bivariate analyses, it was positively associated with PIU, depression, gaming-related problems, anxiety,

emotion regulation difficulties, Internet use in response to emotional distress, and symptoms consistent with ADHD. After controlling for age, sex, and daily use time, only the associations with PIU, depression, depression excluding the sleep item, and gaming-related problems remained significant (Table 5).

Multivariable associations with problematic Internet use

Age, sex, and daily Internet-use time explained 9.0% of the variance in PIU, $R^2 = .090$, $F(3, 593) = 19.50$, $p < .001$. After Internet use after midnight was added, explained variance increased to 13.2%, $R^2 = .132$, adjusted $R^2 = .126$, $F(4, 592) = 22.52$, $p < .001$; $\Delta R^2 = .042$, $F_change = 28.85$, $p < .001$. Each one-category increase in nighttime use was associated with a 2.55-point increase in PIU, $B = 2.55$, $SE = 0.48$, $\beta = .232$, $p < .001$. Daily Internet-use time also showed an independent association; age was inversely associated, and sex was not significant.

Table 4. Positive screens according to Internet use after midnight

Screening variable	None (%)	Sometimes (%)	Almost daily (%)	$\chi^2(df)$	p	V	OR almost daily vs. other [95% CI]
Problematic Internet use	23.1	30.6	49.6	26.63 (2)	< .001	.211	2.75 [1.81, 4.17]
Clinically relevant anxiety	33.3	43.1	41.7	5.43 (2)	.066	.095	1.19 [0.79, 1.80]
Moderate-or-higher depression	26.0	38.8	47.0	18.28 (2)	< .001	.175	1.92 [1.27, 2.91]

Note. The OR compares participants who used the Internet after midnight almost every day with all other participants. OR = odds ratio; CI = confidence interval.

Figure 2. Prevalence of positive screens according to frequency of Internet use after midnight.

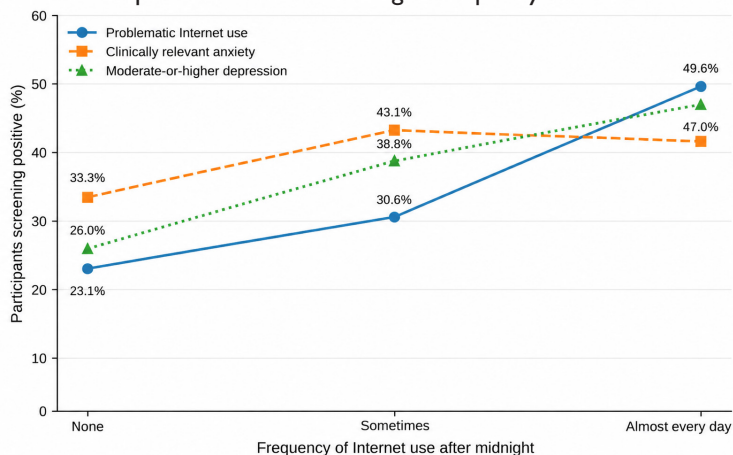


Table 5. Correlations between Internet use after midnight and psychological variables

Variable	Spearman ρ	p	r partial	p partial
Problematic Internet use	.279	< .001	.216	< .001
Anxiety	.102	.013	.062	.131
Depression	.223	< .001	.164	< .001
Depression excluding the sleep item	.200	< .001	.141	.001
Emotion regulation difficulties	.092	.024	.031	.453
Internet use in response to emotional distress	.104	.011	.057	.162
Gaming-related problems	.145	< .001	.152	< .001
Symptoms consistent with ADHD	.205	< .001		

Note. Partial correlations control for age, sex, and daily Internet-use time. Partial correlations were not estimated for symptoms consistent with ADHD.

Table 6. Hierarchical linear regression for PIU

Predictor	B	EE	β	IC 95% for B	p
Age	-0.66	0.21	-.123	[-1.08, -0.25]	.002
Female sex	0.10	0.65	.006	[-1.17, 1.38]	.872
Daily Internet use	1.26	0.27	.204	[0.73, 1.78]	< .001
After-midnight Internet use	2.55	0.48	.232	[1.62, 3.49]	< .001

Note. Final model: $N = 597$; $R^2 = .132$; adjusted $R^2 = .126$; $F(4, 592) = 22.52$, $p < .001$. The increase relative to the model including age, sex, and daily Internet-use time was $\Delta R^2 = .042$, $F_{\text{change}} = 28.85$, $p < .001$. Female sex was coded as 1 = female, 0 = male.



The logistic model showed an equivalent pattern (Table 7, Figure 3). After adjustment, each one-category increase in Internet use after midnight was associated with a 51% increase in the odds of a positive PIU screen, OR = 1.51, 95% CI [1.16, 1.97], $p = .002$.

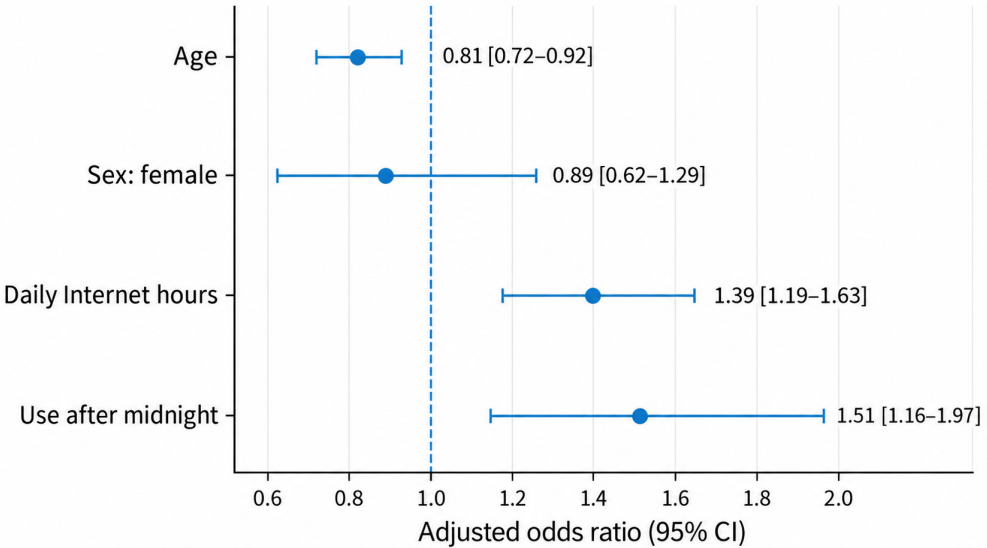
In the dichotomous analysis, participants who used the Internet after midnight almost every day had approximately twice the odds of a positive screen compared with the rest, OR = 2.11, 95% CI [1.33, 3.37], $p = .002$.

Table 7. Logistic regression for positive problematic Internet use screening

Predictor	B	SE	OR	95% CI OR	p
Age	-0,21	0,06	0,81	[0,72, 0,92]	,001
Female sex	-0,11	0,19	0,89	[0,62, 1,29]	,543
Daily Internet use	0,33	0,08	1,39	[1,19, 1,63]	< ,001
After-midnight Internet use	0,41	0,14	1,51	[1,16, 1,97]	,002

Note. Model adjusted for age, sex, and total daily Internet-use time. Pseudo- $R^2 = .069$. OR = odds ratio; PIU = problematic Internet use.

Figure 3. Adjusted odds ratios for positive problematic Internet use screening



Multivariable associations with mental health

In adjusted linear models, Internet use after midnight was associated with greater depressive symptomatology, $B = 1.50$, $SE = 0.37$, $\beta = .177$, $p < .001$, and explained an additional 2.5% of the variance. The association remained after excluding the sleep item, $B = 1.14$, $SE = 0.33$, $\beta = .152$, $p = .001$, $\Delta R^2 = .018$. No independent associations were observed with anxiety, emotion regulation difficulties, or Internet use in response to negative emotional states (Table 8). In logistic regressions, nighttime use was associated with moderate-or-higher depression, $OR = 1.63$, 95% $CI [1.25, 2.11]$, $p < .001$, but not with anxiety, $OR = 1.21$, 95% $CI [0.94, 1.55]$, $p = .147$.

Sensitivity analyses and moderation by sex

ANCOVAs confirmed the adjusted associations of Internet use after midnight with PIU,

$F(2, 587) = 15.17$, $p < .001$, $\eta p^2 = .049$; depression, $F(2, 587) = 6.64$, $p = .001$, $\eta p^2 = .022$; and depression excluding the sleep item, $F(2, 587) = 4.63$, $p = .010$, $\eta p^2 = .016$. No adjusted effects were observed for anxiety, $F(2, 587) = 0.94$, $p = .390$. No significant interactions between sex and Internet use after midnight were identified for PIU, $F(2, 585) = 0.94$, $p = .393$; depression, $F(2, 585) = 2.05$, $p = .130$; or anxiety, $F(2, 585) = 0.95$, $p = .387$.

DISCUSSION

This study examined the association between Internet use after midnight, PIU, and several psychological indicators in adolescents. Almost one in five participants used the Internet during this nighttime period almost every day. This pattern showed a graded and consistent association with PIU, even after controlling for age, sex, and daily Internet-use time, and was also associated with greater depressive symptomatology. In contrast, associations with anxiety, emotion regulation

Table 8. Adjusted linear models for mental health indicators

Dependent variable	R ²	ΔR^2 for nighttime use	B nighttime use	β	p
Anxiety	.085	.004	0.47	.067	.132
Depression	.109	.025	1.50	.177	< .001
Depression excluding the sleep item	.095	.018	1.14	.152	.001
Emotion regulation difficulties	.048	.001	0.83	.034	.454
Internet use in response to emotional distress	.070	.003	0.62	.062	.164

Note. All models control for age, sex, and daily Internet-use time. B and β correspond to Internet use after midnight, treated as an ordinal variable.



difficulties, and Internet use in response to negative emotional states were weaker and were no longer significant after adjustment.

The strongest relationship was observed with PIU. The rate of positive screening increased from 23.1% among those who did not use the Internet after midnight to 49.6% among those who did so almost every day. In addition, nighttime timing explained an additional 4.2% of the variance beyond age, sex, and daily Internet-use time, although the full model explained only 13.2%.

Internet use after midnight does not in itself constitute a manifestation of PIU, but it may coincide with difficulty stopping use, displacement of routines, or prolongation of digital activity despite obligations the following day. The results partially converge with Szapary et al. (2024), who found that a combined pattern of morning and nighttime use, Internet use for more than six hours, and urgency to respond were independently associated with PIU. Lederer-Hutsteiner et al. (2024) specifically found that device use after midnight was associated with insomnia and statistically mediated part of the relationship between Internet-related addictive behaviors and insomnia symptoms.

The relevance of temporal context is consistent with the findings of Brosnan et al. (2024), who reported that screen use during the two hours before bedtime was not associated with most sleep indicators, whereas use once in bed was associated with later and shorter sleep, especially when it involved gaming or multitasking. Bourke et al. (2026) found a small association between greater daily screen use and later sleep onset, but no overall relationships with sleep duration, efficiency, or quality. Thus, digital use may delay sleep under certain circumstances, although

it does not appear to affect all sleep dimensions uniformly. In the present study, it is unknown where participants used the Internet, how long the activity lasted, or whether it actually displaced sleep.

The second central finding was the association with depression. The proportion of adolescents with moderate-or-higher symptoms increased from 26.0% to 47.0% across the extremes of nighttime-use frequency. Timing explained an additional 2.5% of the variance in depression, a smaller contribution than that observed for PIU but consistent across analyses. This pattern is consistent with cross-sectional research linking nighttime electronic media use with sleep difficulties and depressive symptoms (Lemola et al., 2015), and nighttime social media use with poorer sleep, anxiety, depression, and lower self-esteem (Woods & Scott, 2016). Vernon et al. (2018) found that changes in sleep habits mediated the relationship between initial increases in nighttime mobile phone use and subsequent changes in depressed mood, externalizing problems, self-esteem, and coping. Likewise, Alonzo et al. (2021) found associations among frequent social media use, sleep problems, and mental health.

A reciprocal relationship between distress and digital use is also plausible. Gámez-Guadix (2014) found that baseline depressive symptoms predicted subsequent increases in preference for online relationships, mood regulation through Internet use, and negative consequences. In the reverse direction, only baseline negative consequences predicted an increase in depression, so reciprocity was not observed for all components of PIU.

Morita et al. (2022), in turn, identified bidirectional relationships between PIU and both depression and hyperactivity/inatten-



tion. Villanueva-Blasco et al. (2026a) found a predominantly bidirectional pattern between PIU and several emotional-distress variables, alongside unidirectional relationships and substantial heterogeneity. This evidence does not demonstrate reciprocity between depression and Internet use after midnight, but it provides a plausible framework for interpreting their coexistence.

In the present study, no association was observed between anxiety and nighttime Internet use. This contrasts with the findings of Woods and Scott (2016), who reported associations between nighttime social media use and anxiety. One possible explanation is that a general measure of Internet use combines very different activities. Some interpersonal processes specific to social media may be more relevant to anxiety than the timing of Internet use.

Emotion regulation difficulties and Internet use in response to negative emotional states were higher among adolescents who used the Internet after midnight almost every day, but these associations disappeared after controlling for age, sex, and total Internet-use time. This may indicate that they are related to greater overall digital engagement rather than specifically to timing of use.

Gaming-related problems retained a partial association with Internet use after midnight. This result is consistent with Brosnan et al. (2024), who linked gaming once in bed with shorter sleep duration. However, the activities participants engaged in at night were not recorded, and no specific multivariable model for gaming was estimated; therefore, it cannot be concluded that gaming explains the relationship with PIU or depression.

The association with symptoms consistent with ADHD was only bivariate and should

be considered exploratory. Morita et al. (2022) reported longitudinal relationships between PIU and hyperactivity/inattention, whereas Ra et al. (2018) found a modest prospective association between frequency of digital media use and the subsequent emergence of ADHD symptoms. However, neither study specifically assessed Internet use after midnight.

No moderation by sex was detected in the associations with PIU, depression, or anxiety. This indicates an absence of statistically significant differences between boys and girls, but it does not demonstrate equivalence or identical mechanisms. Activities, motivations, and interpersonal contexts may differ.

Applied implications

Assessment of digital risks should not be limited to daily use time, but should also include the frequency and duration of nighttime use, device use in bed, activities performed, difficulty stopping them, and daytime consequences. Asking about Internet use after midnight may serve as an initial signal prompting further assessment, but not as a diagnostic criterion. Almost-daily use during this period would justify jointly exploring sleep habits, fatigue, academic or family interference, degree of control, and depressive symptomatology.

Preventive interventions should protect sleep and promote self-regulation by reducing digital use in bed, managing notifications, anticipating the end of activities that are difficult to stop, and establishing routines through negotiation. When Internet use serves an emotional coping function, technology restriction alone may be insufficient without alternatives for managing psychological distress.



Limitations and future research directions

The cross-sectional design precludes establishing temporality or causality. In addition, midnight is a practical cutoff, but it may not coincide with the usual sleep period and may vary by age, as may bedtime on school days versus non-school days. Future studies should measure frequency quantitatively and distinguish brief connections from prolonged use.

Analyses of anxiety, emotion regulation, Internet use in response to psychological distress, gaming, ADHD, and moderation by sex were exploratory and involved multiple comparisons. For ADHD, the absence of an adjusted model limits interpretation. Longitudinal designs are needed that also examine the temporality and function of different digital activities.

CONCLUSIONS

Internet use after midnight was consistently associated with PIU and depressive symptomatology, independently of age, sex, and daily Internet-use time, whereas relationships with anxiety, emotion regulation difficulties, and Internet use in response to negative emotional states did not remain after adjustment. These results do not allow nighttime Internet use to be considered a cause, consequence, or sufficient criterion for the presence of a problem, but they support its usefulness as a contextual indicator that may complement assessment of total use time, the function of use, and the potential interference of digital use in adolescents' lives.

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CONFLICT OF INTEREST

VJVB and MIF declare that they are members of the Scientific Advisory Board of *Revista Española de Drogodependencias*. Neither participated in the selection of reviewers, the editorial evaluation, the decision-making process, or any other aspect of the editorial management of this article. Full editorial responsibility for this manuscript was delegated to an independent editor, in accordance with the journal's policy.

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