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Association between pre-sleep screen exposure, internet addiction, life satisfaction and sleep quality among high school students

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Abstract

Introduction: Evening exposure to blue light from digital devices has been associated with sleep disruption, reduced life satisfaction, and problematic internet use in adolescents, yet few studies have investigated these factors together in a single population.

Aim: To examine the relationships between pre-sleep screen exposure, sleep quality, life satisfaction, and internet use behaviors, and to explore factors associated with poor sleep quality among high school students.

Material and methods: A cross-sectional study was conducted in May 2025 with 364 students (grades preparatory to 11) from a private high school in Istanbul. Data were collected via an online survey including the Pittsburgh Sleep Quality Index (PSQI), Young Internet Addiction Test-Short Form (YIAT-SF), and the Satisfaction with Life Scale (SWLS). Descriptive statistics, Spearman correlations, and binary logistic regression were performed.

Results and discussion: Poor sleep quality was observed in 83.0% of participants, and 48.1% demonstrated borderline or risky internet use. PSQI was positively correlated with YIAT-SF ($r = 0.401$, $p < 0.001$) and negatively with SWLS ($r = -0.254$, $p < 0.01$). Logistic regression analysis indicated that higher YIAT-SF scores (OR = 1.067, $p = 0.010$) and screen exposure in the last hour before sleep (OR = 5.487, $p < 0.001$) were significantly associated with poor sleep quality.

Conclusions: Problematic internet use and evening screen exposure are significantly associated with poor sleep quality. School-based initiatives promoting digital hygiene and sleep education may contribute to mitigating the adverse effects of technology on adolescent well-being.

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1. INTRODUCTION

The sharp rise in the use of smartphones, tablets, and LED screens has led adolescents to substantial evening exposure to short-wavelength ("blue") light. CDC data from 2021–2023 indicate that 50.4% of those aged 12–17 spend at least four hours per weekday in front of a screen.[1] The situation is similar in Türkiye: according to the Turkish Statistical Institute's 2024 survey on "Information Technologies Use in Children," 95.9% of 11–15-year-olds use a smartphone regularly.[2] Blue light affects sleep because it reduces melatonin, the hormone that helps us fall asleep. For example, Chang et al.[3] demonstrated that reading on an LED-backlit e-reader continuously suppressed melatonin release and delayed the circadian phase by approximately three hours. These physiological effects manifest in practice as delayed bedtimes, reduced total sleep duration, and increased daytime sleepiness among adolescents. In a systematic review of 67 studies, Hale and Guan[4] found that 90% of the studies reported greater screen time was associated with shorter sleep. Similarly, the WHO guidelines on physical activity and sedentary behavior emphasize the importance of adequate sleep for children and adolescents.[5]

Sleep loss entails not only physiological but also psychosocial consequences. In a study including 380,000 adolescents from 37 European and North American countries, life-satisfaction scores decreased significantly as screen time increased.[6] In Türkiye, research among university students likewise reported a negative correlation between smartphone addiction and life satisfaction.[7] In high-school samples, smartphone addiction has been shown to explain roughly 25% of the variance in insomnia, with mindfulness partially buffering this association.[8] The Interaction of Person–Affect–Cognition–Execution (I-PACE) model conceptualizes sleep deprivation as a critical intermediate variable that intensifies online addictive behaviors.[9] Consistently, a 2024 fMRI systematic review reported that internet/smartphone addiction in adolescents is linked to connectivity anomalies within reward valuation and cognitive control networks.[10]

Although blue-light–related sleep disruption and internet addiction have often been examined separately, quantitative studies that consider sleep quality, life satisfaction, and internet addiction holistically within the same adolescent sample remain scarce. The aim of this study was to examine the associations between pre-sleep screen exposure, sleep quality, life satisfaction, and internet use behaviors among high school students, to provide an empirical basis for evidence-informed school health interventions.

2. AIM

To examine the relationships between pre-sleep screen exposure, sleep quality, life satisfaction, and internet use behaviors; as well as to explore factors associated with poor sleep quality among high school students.

3. MATERIAL AND METHODS

3.1. Study design and sample

This cross-sectional study was planned with a total of 519 students enrolled from the preparatory year through 11th grade at a private high school in Istanbul (Table 1). Twelfth-grade students were excluded because they were in the national examination year. The study hypothesis was formulated as: H1: Pre-sleep screen exposure is associated with sleep quality, life satisfaction, and internet use behaviors.

Because the annual student intake at the (German) high school is stable, the sampling frame was defined accordingly. A priori power analysis (Cohen's d = 0.30, 95% confidence, $\alpha = 0.05$, power = 80%) indicated a minimum required sample of 351. Anticipating missing questionnaires, a 4% surplus was added.

Sampling proceeded in two stages: (1) stratification by grade level, followed by (2) simple random sampling within each stratum. The minimum number of students to be recruited per grade is presented in Table 1.

Table 1. Minimum number of students to be recruited from each grade.

Grade level	Total students	Target sample
Preparatory	150	105
9th grade	130	91
10th grade	118	83
11th grade	121	85
Total	519	364

The gender distribution in the sample reflects the predominantly male student population of the school.

Dependent variable: Sleep quality (PSQI).

Independent variables:

- **Screen exposure before sleep:** pre-sleep screen viewing, primary device type used before sleep, blue-light filter use;
- **Internet addiction:** YIAT-SF total score;
- **Life satisfaction:** SWLS score;
- **Demographics:** gender, grade level, daily internet-use duration (minutes);
- **Sleep-related functional indicators:** morning fatigue and concentration difficulties.

3.2. Data collection instruments

Data were collected using a structured questionnaire comprising four parts:

1) **Demographic Information Form:**
   Items covered age, sex, grade level, daily electronic device use (minutes), most frequently used device types, and typical times of use.
2) **Pittsburgh Sleep Quality Index (PSQI):**
   Developed by Buysse et al. (Cronbach's alpha 0.83), with Turkish validity/reliability demonstrated by Ağargün et al.

(alpha 0.80).[11,12] The PSQI was used to assess sleep quality during the past month. The instrument includes 19 items and seven components (subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction). Higher total scores indicate poorer sleep quality; a total score ≥5 denotes poor sleep quality.

3) **Young's Internet Addiction Test-Short Form (YIAT-SF):** Originally developed by Young and shortened by Pawlikowski et al.[13,14] Internal consistency was reported as 0.85. The Turkish validity and reliability study by Kutlu et al. reported Cronbach's alpha = 0.86 for adolescents.[15] The YIAT-SF consists of 12 items rated on a 5-point Likert scale (1 = never to 5 = very often), with no reverse-coded items. Higher scores reflect greater internet addiction.
4) **Satisfaction with Life Scale (SWLS):** This scale was developed by Diener et al. and considered appropriate for individuals aged 15 years and older.[16] The Turkish adaptation by Durak et al. reported Cronbach's alpha = 0.81.[17] The SWLS comprises five items in a single dimension, scored on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree); item 4 is reverse-coded. Total scores range from 5 to 25, with the following interpretation: 5–9 low, 10–14 moderate, 15–19 good, and 20–25 very high life satisfaction.

In this study, blue-light exposure was approximated through self-reported pre-sleep screen exposure, device type, and blue-light filter use. Objective photometric measurements (e.g., wavelength or illuminance) were not conducted.

3.3. Data collection procedure

Written consent was obtained from both parents and students prior to participation. Data were collected via an online survey coordinated by the school administration; the student researchers visited each class in person to facilitate participation. Completion of the questionnaire took approximately 20–25 minutes.

3.4. Ethics

Permission to conduct the study was obtained from the school administration, followed by approval from the Ministry of Health and the Istanbul Faculty of Medicine Clinical Research Ethics Committee (date: 08/09/2025; approval no: 3571221). Written informed consent was obtained from both students and their parents prior to participation. The study was conducted in accordance with the principles of the Declaration of Helsinki.

3.5. Statistical Analysis

Statistical analyses were performed using SPSS (Statistical Package for the Social Sciences), version 30.0. Descriptive statistics were presented as frequencies and percentages for categorical variables, and as mean ± standard deviation or median (25^{th}–75^{th} percentile) for continuous variables depending on distributional characteristics. The normality of the data was assessed using the Kolmogorov–Smirnov and Shapiro–Wilk tests. For non-normally distributed variables, the Mann–Whitney U and Kruskal–Wallis tests were used as appropriate. Associations between categorical variables were analyzed using the Chi-square test (χ^2) or Fisher's Exact test when necessary. The relationships between pre-sleep screen exposure duration and the scores of the Pittsburgh Sleep Quality Index (PSQI), Young Internet Addiction Test-Short Form (YIAT-SF), and the Satisfaction with Life Scale (SWLS) were examined using Spearman correlation analyses, depending on data distribution.

To further identify the predictors of poor sleep quality, a binary logistic regression analysis was conducted. In this model, sleep quality was defined as a binary outcome (PSQI ≥ 5 = poor sleep quality, PSQI < 5 = good sleep quality). Independent variables included gender, grade level, daily internet usage duration (minutes), internet addiction level (YIAT-SF total score), life satisfaction (SWLS score), morning fatigue, attention difficulties, pre-sleep screen exposure (screen use in the last hour before sleep), and use of blue light filters. Multicollinearity was checked using variance inflation factor (VIF) values. Model fit was assessed with the Hosmer–Lemeshow test, and explanatory power was reported using Nagelkerke R^2. The classification accuracy of the model was also calculated. A p-value <0.05 was considered statistically significant.

4. RESULTS

The study included 364 high school students with a mean age of 16.2 ± 1.1 years, of whom 30.5% were female and 69.5% male. Most participants lived with their families (93.1%). The most common leisure activities were internet browsing (86.8%), meeting friends (84.1%), and listening to music (75.5%). More than half of the students reported difficulty waking up in the morning (55.5%), frequent daytime fatigue (61.0%), and attention problems related to tiredness (56.0%). In addition, 38.2% of the participants reported that their sleep pattern negatively affected their academic performance (Table 2).

The median daily internet usage time of the participants was 240 minutes (20–1000 min), while the median screen time before sleep was 30 minutes (3–300 min). The internet was mostly used for entertainment (97.8%) and communication (89.8%); the most frequently preferred platform was Instagram (79.7%). A total of 85.1% of the participants reported screen use before sleep, and 82.7% preferred the phone. The rate of those who did not use a blue light filter was 56.3%. According to the scale scores, 83.0% of students were found to have poor sleep quality, 48.1% were borderline/risky internet users, and 50.3% had high life satisfaction (Table 3).

The distribution of sleep quality (PSQI), internet addiction (YIAT-SF), and life satisfaction (SWLS) scale scores according to variables is presented in Table 4. Significant differences were found in PSQI and YIAT-SF scores in terms

Table 2. Sociodemographic characteristics, leisure activities, and sleep-related findings of the participants (n = 364).

	Number	%
Gender		
Female	111	30.5
Male	253	69.5
Grade		
Preparatory	132	36.3
9th	93	25.5
10th	76	20.9
11th	63	17.3
Living arrangement		
With family	339	93.1
Alone at home	10	2.7
In dormitory	10	2.7
Other[1]	5	1.4
Preferred leisure activities[2]		
Internet browsing	316	86.8
Meeting friends	306	84.1
Listening to music	275	75.5
Watching TV/series/movies on other platforms	261	71.7
Doing sports	235	64.3
Playing online games	214	58.8
Sleeping	192	52.7
Reading books	117	32.1
Other[3]	11	3.0
Difficulty waking up in the morning		
Yes	202	55.5
No	162	44.5
Feeling after waking up		
Tired	327	89.8
Energetic	37	10.2
Impact of sleep pattern on academic performance		
Affects negatively	139	38.2
No effect	225	61.8
Feeling frequently tired at school		
Yes	222	61.0
No	142	39.0
Concentration difficulties due to fatigue		
Yes	204	56.0
No	160	44.0

[1] Uncle, cousin, grandmother, aunt, friends.
[2] Multiple options marked.
[3] Handicrafts, playing an instrument, daydreaming, playing with pets, spending time with family, making music, designing card games, drawing, sewing.

Table 3. Internet usage characteristics, pre-sleep screen exposure, and scale score distributions (n = 364).

Characteristics	Number	%
Purpose of internet use[1]		
Entertainment	356	97.8
Communication	327	89.8
Research for supporting courses	234	64.3
Following the news	169	46.4
Shopping	132	36.3
Other[2]	5	1.4
Most frequently used platform[1]		
Instagram	290	79.7
Whatsapp	226	62.1
Snapchat	112	30.8
Tiktok	112	30.8
Twitter (X)	53	14.6
YouTube	34	9.3
Reddit	6	1.6
Facebook	3	0.8
Pinterest	3	0.8
Other[3]	6	1.6
Screen use in the last hour before sleep		
Yes	310	85.1
No	54	14.9
Most used device before sleep		
Computer	29	8.0
Phone	301	82.7
Tablet	30	8.2
TV	3	0.8
All devices	1	0.3
Blue light filter usage		
Not using	205	56.3
Using	159	43.7
PSQI		
Good sleep quality	62	17.0
Poor sleep quality	302	83.0
YIAT-SF		
Normal use	172	47.3
Borderline/risky use	175	48.1
Problematic use	17	4.7
SWLS		
Very low	11	3.0
Low	84	23.1
Moderate/neutral	33	9.1
High	183	50.3
Very high	53	14.6

[1] Multiple answers were marked.
[2] Watching informative videos, reading books, drawing, finding notes and chords of songs, exercising, investing.
[3] Binance, Brawl Stars, Discord, SLACK, and Steam.

Table 4. Distribution of sleep quality (PSQI), internet addiction (YIAT-SF), and life satisfaction (SWLS) scale scores according to variables.

	PSQI	YIAT-SF	SWLS
Gender			
Female	9.0 (7.0–12.0)	32.0 (25.0–37.0)	16.0 (15.0–19.0)
Male	8.0 (6.0–10.0)	27.0 (22.0–33.5)	17.0 (14.0–20.0)
P[1]	**<0.001**	**<0.001**	0.525
Grade			
Preparatory	7.0 (6.0–10.0)	29.0 (22.0–34.0)	17.0 (15.0–19.0)
9th	8.0 (6.0–11.0)	29.0 (25.0–36.0)	16.0 (14.0–18.5)
10th	8.0 (6.0–11.0)	26.5 (22.3–34.0)	17.0 (14.0–20.0)
11th	9.0 (7.0–11.0)	28.0 (23.0–34.0)	17.0 (15.0–20.0)
P[2]	0.131	0.295	0.415
Living arrangement			
With family	8.0 (6.0–11.0)	28.0 (23.0–34.0)	17.0 (15.0–19.0)
Alone at home	8.5 (6.5–11.5)	29.0 (22.5–43.0)	18.5 (12.3–21.3)
In dormitory	8.0 (6.8–14.0)	32.5 (27.5–37.5)	13.5 (12.0–15.5)
Other	6.0 (5.5–11.5)	28.0 (25.5–38.5)	17.0 (14.0–18.5)
P[2]	0.816	0.452	0.111
Difficulty waking up in the morning			
Yes	7.0 (6.0–9.0)	27.0 (22.0–31.0)	17.0 (15.0–20.0)
No	10.0 (7.0–13.0)	32.0 (26.0–36.0)	16.0 (14.0–19.0)
P[1]	**<0.001**	**<0.001**	0.064
Feeling after waking up[3]			
Tired	10.0 (7.0–13.0)	30.0 (24.0–36.0)	16.0 (13.0–18.3)
Energetic	7.0 (6.0–10.0)	27.0 (23.0–34.0)	17.0 (15.0–20.0)
P[1]	**<0.05**	**<0.001**	**<0.001**
Impact of sleep pattern on academic performance[4]			
Affects negatively	11.0 (8.0–13.0)	32.0 (26.0–37.0)	16.0 (14.0–18.0)
No effect	7.0 (5.5–8.0)	27.0 (22.0–32.0)	17.0 (15.0–20.0)
P[1]	**<0.001**	**<0.001**	**<0.001**
Feeling frequently tired at school			
Yes	9.0 (7.0–12.0)	30.0 (25.0–36.0)	16.0 (14.0–19.0)
No	7.0 (5.0–8.0)	26.0 (21.0–31.0)	17.0 (15.0–20.0)
P[1]	**<0.001**	**<0.001**	**<0.001**
Concentration difficulties due to fatigue			
Yes	10.0 (7.0–12.0)	30.5 (25.3–37.0)	16.0 (14.0–19.0)
No	7.0 (5.0–8.0)	26.0 (21.0–31.0)	17.0 (15.0–20.0)
P[1]	**<0.001**	**<0.001**	0.062

[1] Mann–Whitney U test.
[2] Kruskal–Wallis test.
[3] Self-reported feeling after waking up.
[4] Self-reported impact of sleep pattern on academic performance.

of gender ($p < 0.001$ for both), while no difference was observed in SWLS scores ($p = 0.525$). Significant differences were also observed between all scales and difficulty waking up in the morning, morning fatigue, and the perceived impact of current sleep patterns on academic performance ($p < 0.05$). Students who felt very tired in the morning had higher PSQI and YIAT-SF scores, while their SWLS scores were lower.

Table 5. Binary logistic regression analysis Predicting Sleep Quality (PSQI).

Variable	B	S.E.	Wald	p	OR (Exp(B))	95% CI for OR (Lower–Upper)
Use of blue-light glasses (Yes = 1 vs. No = 0)	–0.253	0.319	0.628	0.428	0.777	0.416–1.451
Internet addiction (YIAT-SF, continuous)	0.065	0.025	6.682	**0.010**	1.067	1.016–1.121
Life satisfaction (SWLS, continuous)	–0.045	0.043	1.123	0.289	0.956	0.879–1.039
Gender (Female = 1 vs. Male = 0)	0.457	0.403	1.286	0.257	1.580	0.717–3.481
Grade level (continuous)	0.014	0.032	0.203	0.652	1.014	0.953–1.079
Daily internet use (minutes, continuous)	0.000	0.001	0.061	0.805	1.000	0.997–1.002
Morning fatigue (Very tired = 1 vs. Not tired = 0)	–0.387	0.325	1.415	0.234	0.679	0.359–1.285
Screen exposure in the last hour before sleep (Yes = 1 vs. No = 0)	1.702	0.361	22.191	**<0.001**	5.487	2.702–11.142
Constant	0.686	1.560	0.193	0.660	1.986	–

Model Statistics: Omnibus Test: $\chi^2(9) = 57.478, p < 0.001$ (model significant), Hosmer–Lemeshow Test: $\chi^2(8) = 9.891, p = 0.273$ (good fit), Nagelkerke R^2: 0.244 (model explains 24.4% of the variance), Classification accuracy: 83.5% (good sleepers correctly classified: 98.7%, poor sleepers: 9.7%).

In this study, the relationships between participants' Sleep Quality (PSQI), Internet Addiction (YIAT-SF), and Life Satisfaction (SWLS) scale scores were examined. The findings revealed statistically significant correlations between PSQI and YIAT-SF ($r = 0.401$; $p < 0.001$) and between PSQI and SWLS ($r = –0.254$; $p < 0.01$). Additionally, a significant negative correlation was observed between YIAT-SF and SWLS ($r = –0.269$; $p < 0.001$).

Binary logistic regression analysis showed that the model was statistically significant ($\chi^2(9) = 57.478$, $p < 0.001$) and explained approximately 24.4% of the variance in sleep quality (Nagelkerke $R^2 = 0.244$) (Table 5). The model demonstrated good fit according to the Hosmer–Lemeshow test ($\chi^2(8) = 9.891, p = 0.273$). Classification accuracy was 83.5%, with high precision in identifying good sleepers (98.7%) but relatively poor sensitivity for poor sleepers (9.7%). Among the independent variables, higher internet addiction scores (YIAT-SF) were significantly associated with poorer sleep quality (OR = 1.067, 95% CI: 1.016–1.121, $p = 0.010$). Screen exposure in the last hour before sleep increased the odds of poor sleep quality more than fivefold (OR = 5.487, 95% CI: 2.702–11.142, $p < 0.001$). Other variables, including use of blue-light glasses, life satisfaction, gender, grade level, daily internet use, and morning fatigue, did not emerge as significant factors ($p > 0.05$).

5. DISCUSSION

The present study examined the associations between presleep screen exposure, internet addiction, life satisfaction, and sleep quality among high school students. Using binary logistic regression, the study further explored factors associated with poor sleep quality. The analysis showed that higher internet addiction scores and screen exposure during the last hour before sleep were most significantly associated with poor sleep quality, whereas other variables – including gender, daily internet use, life satisfaction, grade level, morning fatigue, and the use of blue-light glasses – did not emerge as significant factors. Furthermore, recent evidence from this journal suggests that improper smartphone use patterns in students can lead to a broad spectrum of physiological disturbances, ranging from postural issues to cognitive control network alterations.[18] These findings suggest that problematic digital behaviors and evening screen-use patterns may play an important role in adolescent sleep health. Internet addiction was significantly associated with poor sleep quality, with each incremental increase in YIAT-SF score corresponding to approximately a 6.7% increase in the odds of poor sleep.

This finding suggests that it may not be the overall duration of internet use, but rather the compulsive and problematic nature of engagement that is more significantly related to sleep disturbances. Previous studies have similarly reported that compulsive online behaviors – such as late-night social media use, online gaming, and difficulty disengaging from the internet – are more closely associated with insomnia symptoms and delayed sleep onset than total screen time alone.[19–21] Neurobiological research further supports this relationship, indicating that adolescents with problematic internet use show altered connectivity in reward processing and cognitive control networks, which may contribute to difficulties in both sleep regulation and psychological functioning.[22] These observations are consistent with the Interaction of Person–Affect–Cognition–Execution (I-PACE) model, which conceptualizes problematic internet use as a dynamic behavioral process influenced by emotional, cognitive, and neurobiological factors.[23]

Another significant association was observed for screen exposure in the last hour before sleep, which was linked to more than fivefold higher odds of poor sleep quality. This

result aligns with experimental studies demonstrating that evening exposure to light-emitting screens suppresses melatonin secretion and delays circadian rhythms, resulting in later bedtimes and reduced sleep duration.[3,4,24] Interestingly, the use of blue-light–filtering glasses did not significantly mitigate poor sleep outcomes. This may reflect inconsistent use of these devices or the limited effectiveness of filters in real-world conditions. These findings suggest that sleep-health interventions should focus not only on protective tools such as filters but also on reducing overall evening screen exposure. Although the regression model demonstrated high overall classification accuracy, its sensitivity for identifying poor sleepers was relatively low. This may partly reflect the imbalance between poor and good sleepers in the dataset and indicates that the predictive performance of the model should be interpreted with caution. Contrary to expectations, life satisfaction did not independently predict sleep quality in the regression model, although correlational analyses showed significant negative associations. This may indicate that life satisfaction influences sleep indirectly through other behavioral or psychosocial pathways, such as problematic internet use or fatigue, rather than acting as a direct factor. Similarly, gender differences observed in bivariate analyses did not remain significant in the regression model, likely due to overlapping influences of digital behaviors. More broadly, several variables that were significant in bivariate analyses lost significance in the multivariate model, which may reflect shared variance between predictors or potential mediation effects, particularly between internet addiction and screen exposure behaviors. Previous studies have frequently reported poorer sleep quality among adolescent girls compared to boys, often attributed to psychosocial stressors, emotional reactivity, and social interaction patterns.[25] Adolescence itself has been described as a developmental period characterized by a "perfect storm" of biological circadian shifts, academic pressures, and social demands, which increase vulnerability to sleep deficits.[26] Large-scale international surveys have also demonstrated that longer screen time is associated with lower life satisfaction among adolescents.[27] In the present study, variables such as grade level, daily internet use, and morning fatigue did not emerge as independent factors in the regression model, suggesting that qualitative aspects of digital engagement may play a more prominent role than demographic or lifestyle characteristics in explaining sleep health. An additional insight from this study is that impaired daytime functioning may represent a more visible outcome of poor sleep than subjective complaints alone. Adolescents experiencing sleep difficulties frequently report reduced sustained attention, impaired executive functioning, and increased academic challenges.[28] Consistent with these findings, students in our sample who reported frequent fatigue and concentration problems also had significantly higher PSQI scores, suggesting that functional impairments may serve as important indicators of poor sleep health. These findings have important implications for school health programs and public health policy. First, interventions addressing sleep problems should prioritize reducing problematic internet use through digital literacy education, parental involvement, and cognitive-behavioral strategies rather than focusing solely on limiting total screen time.[19] Second, the significant association between pre-sleep screen exposure and poor sleep highlights the need for structured school-based initiatives promoting sleep hygiene and responsible evening technology use. Finally, aligning school schedules more closely with adolescent circadian rhythms – as recommended in prior public health literature – may help mitigate the negative effects of insufficient sleep on academic performance and well-being.[29]

5.1. Limitations

This study contributes to the literature by simultaneously examining sleep quality, internet addiction, and life satisfaction in a relatively large adolescent sample using validated measurement scales. However, several limitations should be acknowledged. First, the cross-sectional design prevents the establishment of causal relationships between screen exposure, internet addiction, and sleep quality. Second, reliance on self-reported data may introduce recall or social desirability bias. Third, a significant limitation concerns the measurement of blue-light exposure; the study relied on behavioral indicators such as pre-sleep screen use rather than objective photometric measurements of wavelength or light intensity. Therefore, findings should be interpreted as reflecting behavioral screen exposure rather than direct physiological light exposure. Finally, as the sample was drawn from a single private high school in Istanbul with a predominantly male student population, the findings may not be fully representative of all Turkish adolescents or students in different socioeconomic settings. Despite these limitations, the study provides valuable insights into the significant association between digital habits and sleep health in a specific adolescent population.

6. CONCLUSION

This study shows that problematic internet use and pre-sleep screen exposure are significantly associated with poor sleep quality among adolescents. These findings highlight the importance of school-based initiatives that promote digital hygiene, encourage screen-free periods before bedtime, and increase awareness among students and parents regarding the potential health consequences of excessive evening screen exposure. Integrating sleep education into school health curricula and promoting healthier bedtime routines may contribute to improved academic performance, psychological well-being, and long-term health outcomes in adolescents. Future research should employ longitudinal designs and include more diverse school settings to further clarify these associations and guide targeted public health interventions.

Ethics approval

Approved by the Istanbul Faculty of Medicine Clinical Research Ethics Committee (08/09/2025; approval no: 3571221).

Conflict of interest
None declared.

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Author Contributions
Study design: SC
Statistical analysis: SC
Data interpretation: DMC, DK
Manuscript preparation: SC
Literature search: DMC, DK, SC

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