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Review Article

A review on the association between screen time and sleep quality among university students

Izaidah Najmiah Suhaimi [1], Eira Nur Syaheira Iramezi [1], Nurul Wajihah Che Nazari [1*]

1 Faculty of Pharmacy, Universiti Sultan Zainal Abidin, Besut, Terengganu, Malaysia

***Corresponding author:** wajihahnazari@gmail.com

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Abstract:

Students' academic achievement, emotional stability, and physical health all depend on getting enough sleep. Concerns have been raised regarding how university students' use of electronic devices may affect their sleep quality. Moreover, students' increased screen time has been greatly influenced by the prevalence of social media, online gaming, and regular use of digital devices in their daily routines, particularly when it comes to completing assignments and tasks. The purpose of this review of the literature was to identify whether university students' screen time and sleep quality were related in a variety of studies. A comprehensive search was carried out in a few databases to find peer-reviewed observational studies that examined the relationship between university students' screen time and sleep quality and were published between 2018 and 2025. Keywords associated with screen use, sleep disturbances, and university populations were combined in the search terms. Titles, abstracts, and complete texts of studies were reviewed using predetermined inclusion and exclusion criteria. Studies that met the eligibility requirements evaluated screen-based behaviors, reported quantitative results, and used validated instruments like the PSQI to measure sleep quality. The study design, analytical methods, the primary findings, mechanisms, implications, limitations, and suggested further research were among the data that were extracted. Since this review synthesized existing literature, no SPSS analysis was done. There viewed studies generally demonstrate that university students' poorer sleep quality has a significant association with their increased screen time.

Keywords: Students, Screen time Sleep quality, Electronic devices, PSQI, Sleep disturbances, Social media, Digital health, Academic performance.

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Introduction

The university students are juggling with the obligations of their coursework, strong pressure from their peers, and their newfound independence at an important time in their lives [1]. This transitional period is made more challenging by the extensive incorporation of technological advancements into the very basis of modern life. Due to the widespread use of smart phones, tablets, and laptops for leisure and educational purposes, average screen time (ST) has risen substantially [2]. Although certain cohorts report an average as high as 10.9 hours [7], numerous research studies on these subjects show that average daily of ST were within five to seven hours for each day [8,17,10],which have significantly increased due to the frequent usage of digital gadgets. Despite the fact that digital connectivity is often necessary, prolonged use of screens has grown into a major public health concern due to its adverse impacts on sleep quality.

Sleep is essential for mental and physical health and directly affects emotions, cognitive function, and all academic success [3]. The psychological and physiological effects of excessive digital engagement are becoming more closely related to sleep disturbance, which is already extremely prevalent among university students [9]. The most well-known theory is that, especially when LCD screens are viewed in the evening, the blue

light they emit inhibits the release of melatonin, which is a hormone essential for regulating the circadian rhythm. This suppression causes unproductive sleep, shortens the duration of total rest, and delays the onset of sleep, and is often made worse by the cognitive excitement which induced by engaging with stimulating internet-based content [4].

Researchers have consistently relied on standardized instruments to measure this intricate and complex event. The Pittsburgh Sleep Quality Index, also known as the PSQI, has gained broad acceptant Cesare cognized standard [5]. The PSQI isa self-rated questionnaire designed to assess subjective sleep problems and quality over a month.

The seven element evaluations it generates—disruptions to sleep, consumption of sleeping aids, a subjective sleep quality, latency, duration, and routine sleepingefficiency—aswellasdysfunctionduringtheday'seventsareadded to determine a global score [5].

Crucially, the scientific standard for" low "sleep quality is a global score greater than5, providing a consistent metric for assessment across different studies.

A rising number of data indicates that increased screen time is associated with higher PSQI scores, which indicate poorer subjective levels of sleep among college students globally [9, 8]. Understanding this relationship is crucial for public health measures because university students are in a vital growth and academic stage and depend heavily on screens. Its importance is further highlighted by the fact that too much screen time is associated with worse sleep, higher levels of mental distress, and worse academic results [15]. A thorough and systematic review is now required to expand the body of evidence available. Therefore, this review will meticulously look at approximately 35 peer-reviewed papers in order to fully evaluate the kind and extent of the correlation between screen time and sleep quality among university students worldwide. This review attempts to provide solid and useful basis for future research and focused interventions in public health by critically analyzing the methodological patterns, determining the most effective aspects of screen use, and outlining the root causes. This systematic review's main goal is to thoroughly summaries the most recent studies in order to determine the type and degree of there relationship between the screen time and sleep quality within under graduates. Their view will accomplish this by pursuing three specific goals: determining the particular aspects of screen use (such as total duration, timing around bedtime, and type of digital content) that have the greatest negative impact on sleep; evaluating the methods and approaches to statistics used in the literature, and determining the generalizability and reliability of the findings. The third goal is to measure the documented incidence of poor-quality sleep, as defined by a PSQI global evaluation greater than 5, across various student cohorts. The general hypothesis driving this review is that university students' subjective sleep quality (higher PSQI scores) is significantly and positively correlated with increased daily screen time, especially non-academic use within an hour of their regular bedtime, based on the published scientific research related to light-mediated suppression of melatonin and psychological arousal [4].

Methodology

To find specific studies analyzing the relationship between university students ‘screen time and sleep quality, a thorough literature search was carried out. In order to find articles published between 2018 and 2025, the databases PubMed, Scopus, Google Scholar, and Science Direct were accessed. The following search strings were used: (“screen time” OR “digital device use” OR “mobile phone use” OR “electronic device”) AND (“sleep quality” OR “sleep disturbance”) AND (“university students” OR“college students”).The search strategy was further limited to peer-reviewed publications in English. Firstly, the titles and abstracts of all articles identified were screened to determine their relevance and eligibility according to the inclusion and exclusion criteria. Then, in order to find any more relevant papers, the reference lists of the chosen studies were reviewed.

Inclusion criteria

Poor sleep quality is characterized as either a measured decrease in sleep quality using validated tools like the Pittsburgh Sleep Quality Index (PSQI) or comparable sleep assessment scales . Studies were considered eligible if they: (1) were observational studies, including cross-sectional, cohort, or case-control designs; (2) examined the association between screen time and sleep quality specifically; (3) assessed screen-based behaviors, such as mobile phone use, computer use, or television viewing; (4) reported sufficient statistical data, such as odds ratio (OR), 95% confidence interval (CI), standard error (SE), or p-values; and(5)included university or college students as participants; (6) only peer-reviewed empirical studies, published in English, were considered for inclusion in this review.

Exclusion criteria

Throughout the screening process of the title and abstract from this arch result, the studies were excluded if they: (1) were not peer-reviewed or not published in English; (2) Did not report quantitative outcomes related to screen time or sleep quality, or lacked sufficient data for statistical analysis; (3) included participants outside the university or college population, such as high school students or the general public.

Data extraction

The following study characteristics of the identified studies were extracted: the authors, year of publication, study design, analysis method, the finding or there results in terms of the association between screen time and sleep quality, the mechanism involved, the implications towards students and universities and the limitations and the future research of the study.

Findings and Discussion

Prevalence and Correlation of Screen Time with Sleep Quality

The reviewed studies consistently reported that higher screen time among university students is significantly associated with poorer sleep quality across various student groups, including engineering, medical, nursing, and dental students [7, 13, 16]. Poor sleep was commonly indicated by a Pittsburgh Sleep Quality Index (PSQI) score above 5, with prevalence rates reported as 73% [11], 65.7% [9], 61.7% [6], and 42.2% [7] across different cohorts. Significant positive correlations between total screen time and global PSQI scores further support this relationship, such as $r = 0.86$ (Sahu et al., 2024), $R = 0.356$ (Arshad et al., 2021), and $r = 0.82$ (Meghji et al., 2025) [7, 8, 9]. These findings demonstrate a robust and consistent association between excessive digital device usage and compromised sleep quality in the university student population.

Screen Use Types, Temporal Patterns, and Device-Specific Effects

The three types of screen use that were most strongly linked to poor sleep were social media, non-academic screen time, and using devices right before bed [7, 10, 15]. Sleep patterns were also impacted by the purpose of device use. While study-related screen use tended to shorten sleep duration, leisure screen time was linked to later bedtimes [26]. Additionally, recent onset of sleep issues was associated with both shorter and longer durations of digital media use, suggesting cumulative effects over time [14, 21, 22]. Device-specific variations

were also notable, with smartphones showing particularly significant negative associations with sleep quality [25]. Norwegian students' evening screen use was linked to a 65-minute sleep latency and lower efficiency in sleeping [33], while Chinese college students who used screens a lot were 31% more likely to have poor sleep [20]. Significantly, one study found that students who used digital media on the weekends for more than two hours had a 24.15-fold increased risk of having poor sleep quality [34].

Dose-Response Relationships and Synergistic Effects with Lifestyle

Frequent or excessive screen use showed dose-response relationships, with higher odds of poor sleep being associated with longer screen time such as spending more than two hours on weekends [34, 35]. Screen time and lifestyle factors are interconnected in affecting the quality of sleep. While students who engaged in both high screen time and low physical activity had 56% higher odds of poor sleep quality, those who engaged in both physical activity and screen time had 49% lower odds [20, 24]. A crucial variation in risk was identified where excessive screen time contributes to increasing the risk of poor sleep quality, but the risk was significantly higher when it was accompanied by low physical activity, resulting in an important synergistic effect between these two variables [20]. Lower sleep duration, higher sleep latency, decreased sleep efficiency, and more problems with the sleep cycle have all been linked to excessive screen time on weekdays or weekends [18, 19, 33]. Disrupted sleep schedules and tiredness during the day have also been strongly associated with internet addiction and excessive smartphone use [25, 26, 31, 36, 39].

Contradictory Findings and Nuanced Associations Across Studies

Although there is strong evidence supporting a negative correlation between screen time and sleep, considerable dispute exists over the specificity of this association. The impact on associated variables including academic achievement varied. Pradeep et al. (2023) found no convincing statistical association between screen time and academic performance, but Meghji et al. (2025) observed a significant correlation, pointing out that students with a GPA below 2.5 had significantly greater screen time [8]. A differentiation was observed between the quantity and quality of sleep. Sedaghat et al. (2025) confirmed Pradeep et al. (2023)'s finding that screen time was significantly linked to poor quality of sleep (PSQI score) but not the quantity of sleep (total hours) [10]. Findings also showed a significant inverse correlation between sleep duration and time spent in front of screens for school days ($p<0.05$), which means that higher screen time contributes to reducing sleep duration during the week. On the other hand, Baby et al. (2021) found a substantial negative correlation with sleep duration ($p = -0.61$) [13]. Engineering students reported significantly higher average screen time (8 hours) and higher prevalence of disturbed sleep (66%), in contrast with their medical student counterparts (5.25 hours and 43%, respectively) [13]. However, the total sleep quality ($p = 0.103$) among medical students reported by the German study was not significantly associated with overall screen time, indicating that the impact is nuanced and based on the particular type of use [23]. In Chahine et al., 2023, no significant correlation was found between the duration of sleep and screen time for weekdays [19]. Gender disparities were noted in certain samples, where female students exhibited worse sleep quality [36, 40], whereas other studies found no notable gender differences [35, 37]. These variations might indicate cultural differences, lifestyle elements, and measurement techniques, yet none opposed the primary conclusion that increased screen time negatively impacts sleep [30-41].

Physiological, Psychological, and Behavioral Mechanisms

Three main theories are put forth in the reviewed articles to explain how excessive screen time interferes with sleep quality among students. The most frequently mentioned physiological mechanism is that exposure to short-wavelength blue light from electronic

screens suppresses the pineal gland's ability to produce melatonin, an essential hormone that regulates circadian rhythms [9, 11, 14, 15, 18, 20, 30, 34, 37, 39]. This disruption delays circadian rhythms and complicates the initial moment of sleep, resulting in longer sleep latency and non-restorative sleep [11]. Similar studies by Meghji et al. found that sleep disorders such as insomnia and circadian rhythm abnormalities are due to physiological sleep-wake cycles caused by frequent contact with screens radiating blue light [9].

The psychological mechanism involves arousal, when consuming mentally and emotionally stimulating media such as games, videos, or social media before bed results in heightened mental, emotional, and physical arousal by triggering stress hormones, making it harder to fall asleep and increasing alertness [14, 15, 26]. Cognitive and emotional elements also play a role in this association as interactive or emotionally engaging content heightens arousal, concern, and rumination, whereas FoMO (fear of missing out) prompts night-time checking behaviors [38].

The behavioral mechanism involves unstructured screen time usage where screen use has no set start or stop time, detrimentally extending into the night and reducing total sleep time as it usurps time that should be spent sleeping [13, 14, 19, 23]. Screen use increased among students as they remain involved with messaging, gaming, videos, or social media into late hours [32, 34, 40]. Research has also shown that screen usage primarily contributes to increased levels of anxiety, depression, and stress [8, 15, 35], all of which are correlated with insomnia. These mechanisms operate together, explaining why screen time influences both the onset and overall quality of sleep.

Research Methodology, Instruments, and Study Design

Most of the reviewed studies employed cross-sectional, quantitative methodologies [7, 11, 12, 15, 17, 22, 23]. The Pittsburgh Sleep Quality Index (PSQI), which was employed almost consistently in all studies, served as the main instrument for evaluating sleep quality [7, 8, 9, 11, 12]. The PSQI comprises 19 self-rated items that cover seven components: sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications, daytime dysfunction, and overall sleep quality [20, 22, 24, 27]. When these factors are added together, a global PSQI score between 0 and 21 is obtained; a score of less than 5 indicates good sleep quality, while a score of more than 5 indicates poor sleep quality [20, 27].

The Epworth Sleepiness Scale (ESS) [6] and emotional wellness measures like the GAD-7, PHQ-9, and PSS-10 [8, 15] were among the other validated tools commonly used to evaluate related constructs. The majority of studies used self-reported questionnaires to measure screen time [11, 12, 15, 17], but certain studies used objective measures like smartphone tracking apps [9, 13] or wrist-worn accelerometers. Participant characteristics and variable distributions were summarized using descriptive statistics, such as means, standard deviations, frequencies, and percentages [18, 22, 23, 30-41]. Once examined, the reviewed studies consistently used quantitative cross-sectional designs with validated instruments that utilized recognized statistical techniques, confirming that the associations between screen time, sleep quality, and related lifestyle factors were adequately studied.

Clinical Implications and Public Health Interventions

Higher electronic device use, especially right before bed, is strongly linked to poorer sleep quality among college students. Poor sleep quality consistently linked with excessive screen time results in later bedtime and decreased sleep duration [18, 19, 20, 22, 23, 24, 25, 26, 27, 28], contributing to a range of mental health concerns such as increased risks of mental distress and general mental health problems. Furthermore, elevated stress, poorer quality of life, and worse academic performance are particularly linked with high screen time and smartphone use [19, 27]. This may be linked to a higher probability of overweight or obesity, changes in hormones, a drop in appetite hormonal plasma levels, and metabolic alterations of insulin and blood sugar that result in glucose intolerance [19]. Declarative, procedural,

and working memory impairments along with insufficient focus abilities have been linked to inadequate and poor-quality sleep, which may have an effect on academic achievement and emotional health [19, 31, 36, 39, 40].

The data emphasizes the importance of increased awareness and "digital hygiene" for students. This involves setting a "digital curfew" or preferably a buffer period of between 30 and 60 minutes before bed to reduce physiological and psychological effects, as well as self-monitoring screen time, especially for non-academic purposes [15]. Students should be introduced to secondary health effects of screen-induced sleep deprivation, such as headaches, exhaustion, and mood swings [11]. University students are personally encouraged to improve their sleep hygiene habits in order to reduce cumulative risk, such as limiting screen time to between one and two hours prior to bed, refraining from emotionally charged material at night, and keeping electronics physically away from their place of rest.

Importantly, the evidence gives academic institutions a strong call to action because they have a responsibility to promote digital wellness since academic requirements comprise a significant amount of students' screen time [15]. Universities must put in place multifaceted, preventive interventions that aim to reduce excessive screen time use and encourage physical activity at the same time [29]. This institutional dedication can be made through a variety of strategies, such as public relations campaigns, integrating sleep hygiene education into health and orientation programs, and making counselling and mental health treatment easily accessible [8, 17, 30-41]. In the end, these initiatives highlight how important it is that colleges give electronic wellness and sleep quality control top priority as crucial elements of overall student performance and health [18, 23, 24, 29].

Research Gaps, Limitations, and Future Recommendations

This review pointed out a number of important gaps in the existing literature. The main drawback is that most studies are cross-sectional, which makes it impossible to establish causal connections between variables [7, 11, 15, 12, 20, 23, 30-41]. It is possible that depression or sleep issues cause people to use screens more as a coping strategy, rather than the reverse. The use of self-reported assessments for both screen time and sleep quality evaluations is a second significant drawback, which is susceptible to recall errors and reporting bias [18, 30, 34, 37, 40, 41]. Due to uneven faculty representation and overrepresentation of certain groups, the use of quota sampling with convenience sampling introduces selection bias [9]. Non-response bias is possible as participants may differ from non-participants in characteristics such as availability or interest in the study. Numerous studies have focused on students from one university or particular departments, limiting generalizability [31, 36, 39, 40]. Certain studies' limitations involving smaller sample sizes may limit research findings and prevent the generalizability of results. The dynamic nature of each factor under investigation may not be fully provided by the study's brief span [22].

Future research recommended to enhance representativeness and robustness includes employment of probability sampling and larger multicenter samples in certain studies. Potential biases in data collection from public spaces may be reduced by assigning unique identifiers to participants to prevent duplicate responses [29]. Therefore, future studies should utilize longitudinal or experimental approaches, incorporate objective assessments of sleep and screen usage, explore particular screen activities, and analyze psychological processes like emotion regulation [30-41]. Longitudinal studies are strongly recommended to determine the true causal direction of this relationship and confirm causality [20]. There is also a need for intervention studies that test the effectiveness of lifestyle modification programs such as reducing screen time and increasing physical activity on objective measures of sleep, health, and well-being [20].

Additionally, research should use objective measurements for sleep (such as actigraphy, as utilized by Sedaghat et al., 2025) [10] and screen time (like tracking apps, as used by Arshad et al., 2021) [9]. A systematic review of sleep quality in African university students also suggests a high prevalence of poor sleep, indicating that more localized, in-depth research

on factors like screen time is needed in these regions [29]. Future research should include a greater range of confounding factors, such as diet, physical activity, and perceived academic workload, and more clearly distinguish between various types of screen usage (for instance, passive video watching versus interactive video games compared to educational reading) [12, 17]. Key confounders like caffeine consumption, mental health condition, and chronotype were not regularly evaluated, even though their impact on sleep is well-established [8, 10]. Table 1 shows the summary of study's characteristics.

Table1: Summary of Studies' Characteristics

Authors /Year/ Reference	Type of Study	Statistical Methods Used	Findings and Comments	Possible Mechanisms Underlying the Association	Implications for Students and Universities	Limitations
Sahuet al. (2024) [7]	Cross-sectional study (n= 192).- medical& nursing students	Pearson's correlation, Descriptive statistics (Median, IQR).	Strong positive correlation(r=0.86) between total ST and global PSQI score. Non-academic ST (r=0.812) was strongly correlated, academic ST was not. - 42.2%hadpoor sleep (PSQI >5). -Average ST was ~10.9h/day (305h/28days).	Increased screen use adversely affects sleep behavior (latency, efficiency).	- Intervention is required to reduce ST. - Need to stress a "healthy balance between digitalization and health."	- Cross-sectional (no causality) - self-reported substance use - confounders not included.
Alkaabb a et al. (2025) [15]	Cross-sectional study (n=102)- university students.	- Chi-square, Logistic - Regression (OR), - Pearson's correlation(r).	-40.2% had clinically significant anxiety; 30.4% moderate/severe depression. - >1 hour of pre-bedtime ST strongly linked to "trouble relaxing" ($p<0.001$) and depression (OR 2.1-2.3). - Social media use is linked to sleep initiation problems ($p=0.04$).	Blue light exposure suppresses melatonin. Psychological: Cognitive arousal from engaging digital content.	-Need for targeted "digital wellness interventions. " -Development of institutional policies and programs comprehensive e support.	- Cross-sectional (no causality) - convenience sampling - self-reported data - significant gender imbalance (79.4% male) - small sample size.

Watanab e et al. (2022) [14]	Retrospective cohort study comparing 2019 to 2020 data (n= 3,869) - students.	- Logistic - Regression (ORs), - Chi-square - ANOVA.	- 6.3% new incidence of sleep problems in 2020. - Students who *increased* ST (from ≤2h to >2h) - significant risk for new sleep problems (Adjusted OR:1.76).	Time spent on media replaces sleep time. Emotional stimulation. Blue light disrupting circadian rhythms.	- Highlights "appropriate digital media use" to maintain sleep quality, especially during abrupt lifestyle changes (pandemic).	- Single university - High dropout rate (selection bias) - sleep problems assessed by a single "yes/no" question (not a validated tool like PSQI).
Issac et al. (2021) [13]	Cross-sectional (comparative) (n=200) - medicalvs. engineering students. Objective ST measure(app).	- Pearson correlation(ρ) - -Mann-Whitney U-test.	Significant negative correlation (ρ=-0.61) between ST and sleep duration. Engineering students had higher median ST (8h/day) and more disturbed sleep (66%) than medical students (5.25h/day, 43%).	Time-consuming nature of media displaces sleep. Sedentary activity increases risk of insomnia.	- Need to sensitize students to harmful effects. -Recommend setting bed times and refraining from keeping gadgets in the bedroom.	- Cross-sectional design - limited sample (only medical and engineering students from two colleges).
Ma et al. (2020) [12]	Cross-sectional study (n= 5,233) - college freshmen	Multivariate Logistic Regression (aORs).	- High ST(>2h/day) was independently associated with poor sleep quality (aOR=1.20) and suboptimal health. Found *interactive* effect: low ST +high Physical Activity (PA) had the lowest risk.	ST displaces time for PA and sleep. Content may cause stress/anxiety.	- Reducing screen time and increasing physical activity should be the goals of health promotion initiatives.	- Cross-sectional - self-reported ST and PA (recall bias) - *types* of ST and PA *intensity* not assessed - potential confounders (caffeine)excluded.
Baria et al. (2023) [11]	Cross-sectional study (n=200) -medical students.	Chi-square test.	- High prevalence of poor sleep (73%) and increased ST (79%). - Significant association ($p<0.05$) between ST >4h/day and poor sleep quality (PSQI >5). Most common side effect: headache (57%).	Blue light suppresses melatonin. Acute alerting effects.	- Create awareness about good sleep quality. - Restrict electronic device usage, especially at bedtime. Encourage students to maintain their circadian cycle.	- Small sample size - limited to only medical students subjective self-report questionnaire (recall bias)

Nataraja n et al. (2020) [16]	Cross-sectional (observational) study (n= 275) - dental students.	- Chi-square test, - Pearson correlation.	- 49.8%hadpoor sleep. - The ST and PSQI scores showed a substantial positive correlation (r=0.374, p=0.000). - High ST(>2h) was highly prevalent (87.6%).	Blue light exposure reduces melatonin secretion, decreasing sleep onset, quality, and duration.	-Recommend s limiting screen time to <2 hours per day. - - Limiting ST will improve overall health and academic performance.	- Sample limited to only dental students - Sleep quality and screen time were both assessed via subjective - self-report questionnaires.
Sedagh et al. (2025) [10]	Brief Report / Cross-sectional (n= 29) - students Objective sleep measure (accelerometer)	- Independent samplet-tests - Cohen's D (Effect Size).	- Average ST ~7 hours/day; average STafter10PMwas 112 min. - Average bedtime was 2:26 AM. - Students who napped reported *less* daily ST (-92 min, p=0.04).	Time displacement (napping replaces ST). Blue light exposure. Emotionally stimulating content.	- Highlights that late bed times are common. Warrants further investigation into the relationship between napping and screentime in larger, more diverse samples.	- Very small sample size (n=29) - cross-sectional design - sample was homogenous (single major,>85% female), - limiting generalizability.
Arshad et al. (2021) [9]	Descriptive cohort study (n=242) - student sover 30 days Objective ST measure(app).	- Pearson's correlation (r) Simple Linear Regression.	- 65.7%hadpoor sleep (PSQI >5). - A strong positive correlation (R=0.356, p<0.001) Between the PSQI score and total ST. 12.7% of the variation in sleep quality was explained by ST.	Blue light (380-495nm) from screens suppresses melatonin production, disrupting the sleep-wake cycle.	-Suggests actions to reduce ST, particularly during the hours before bed. - Suggests using blue light effects on screens.	- Cross-sectional - did not account for ST from other devices (laptops, TV) did not assess confounders like stress/anxiety.
Deivendrane t al. (2025) [6]	Cross-sectional study (n=321) - medical/dental students.	- Pearson's correlation(r) - Regression analysis.	- 61.7%reported poor sleep. - High smartphone addiction (SAS-SV >40) strongly associated with poor sleep. - Moderate correlation(r=0.6) between addiction score and PSQI score.	Blue light exposure suppresses melatonin. Compulsive behaviors increase arousal.	- targeted interventions to address "smartphone addiction." Promote "digital hygiene," especially for high-risk groups.	- Cross-sectional design - ST was not measured directly but *inferred* from the Smartphone Addiction Scale (SAS-SV) score.

Meghji et al. (2025) [8]	Cross-sectional study (n=152) - students.	- Pearson's correlation (r) - Chi-square.	- Very strong positive correlation between ST and PSQI (r=0.82). - Very strong correlation between ST and mental distress (depression r=0.81, stress r=0.83). - Recreational ST and low GPA (<2.5) associated with higher ST.	Psychological distress from content and physiological arousal from blue light.	- Stresses the significance of balancing screen sage to safeguard both physical and mental health. - Implies a need to support academic success.	-Self-reported data on every variable (ST, PSQI, and DASS); - cross-sectional design; small sample size.
Usmani et al. (2021) [26]	Cross-sectional study n = 592	-Pittsburg Sleep Quality Index (PSQI) -chi-square tests -Non-parametric tests for comparison pairwise (like Kruskal-Wallis, Mann-Whitney U).	-Prevalence of Internet Addiction (IA) and its association with PSQI scores and Quality of Life (QoL). -Significant differences in PSQI score and QoL across normal, moderate, and severe internet addiction groups. -Increase in IA is associated with poorer sleep quality.	Not explicitly detailed in the study	Findings showed increasing risk of IA and negative effects on sleep and QoL are mostly among medical students.	-Data collected from a small study area -Study's result cannot be generalized for whole population
Huang et al. (2020) [25]	Preliminary study (Cross-sectional study) n = 439	Chi-square test (Implied by table structure comparing poor/normal sleepers).	-Mean PSQI score = 4.5 with 43 of the Students (9.8%) had poor sleep quality (PSQI>7) -Chi-square tests, Fisher's exact test and multivariable logistic analysis show poor sleepers significantly associated with male students. Poor sleep quality is associated with excessive smart phone usage among students.	Secretion of melatonin due to light exposure of smartphone screens and radiation from phone influence lead to sleep-wake rhythm disorders	Not clearly explained in the study.	-Significant relationship of poor sleep with poor PA and excessive smart phone use not strictly speaking, causal relationship due to cross-sectional study -Sample representativeness limitations -Inadequate control of other variables associated with poor sleep.

Ge et al. (2020) [21]	Cross-sectional (Implied)	-Self-administer red questionnaire -Independent t-test -Chi-squared test of Pearson -Logistic regression.	-Findings related to the relationship between screen time (ST), physical activity (PA), and perceived stress. -Higher tendency for females with high screen time (HST)to experience stress. -Combinations of ST and PA were also associated with higher stress in females.	Not explicitly detailed in the study.	The combination of ST and PA for stress prevention should be highlighted	Not explicitly detailed in the study.
Wu et al. (2015) [20]	Research Article n = 4915	-Self-administer red questionnaire -SPSS version 13.0 -chi-square and t-tests -logistic regression such as crude OR and adjusted OR with 95% CI	-Excessive screen time (ST) and lack of physical activity (PA) contribute to the risks of poor sleep quality and mental health problems result in poor sleep quality -Significant additive interaction between ST and PA ($p<0.05$) -Elevated PA and low ST lead to poor sleep quality (OR=0.50,95%CI: 0.30-0.82) -Time displacement explaining ST hypothesized to be the cause of insufficient and low-quality sleep.	Not clearly detailed in the study.	Study focus on promoting both PA and ST management in promoting student well-being	-Limited determination of causal relationship due to cross-sectional study -Needed for longitudinal studies -Cannotavoidrecall and reporting bias

Albalawi et al. (2023) [18]	Descriptive cross-sectional study n = 1593	Association/core relation analysis (self-administer red questionnaires)	-Significant sleep-cycle problems due to Screen time among Saudi Arabia's students. -Severe sleep-cycle difficulties mostly due to the use of screen time for 4 to 6 hours. -Average sleep-wake score is 34.2 ±8.8 with severe-wake issues (67.2%), moderate sleep-wake (11.6%) -Overall eye dryness score 7.2±5.9with41.7%mild to moderate symptoms and 46.2% with no symptoms -Average PSQI score 8.63	Disruption of circadian rhythm due to delay in melatonin generation	Raising awareness of excessive screen usage and its relation with dry eye and sleep cycle problems is recommended.	Not explicitly mentioned in the study.
Liebig et al. (2023) [23]	Online questionnaire based on Cross-sectional study	-Correlation coefficients -Linear regression -Involve analysis of mixed-model	-Students with leisure screen usage contributed with later bedtime (r=0.213, p<0.001) -Students with excessive screen usage used for study/work associated with shorter sleep (r=-0.108, p<0.015). -No significant association found between overall screen time and sleep quality with p=0.103	Delayed bedtime and reduce of sleep duration linked with excessive screen usage	-Focused on medical students, who may easily experience academic stress thus, have harmful health behaviors. =Educational interventions required to improve healthy sleep quality and limit screen time.	-No statements on causalities be made due to cross-sectional design -Inconsistency between objectives and subjective data regarding both sleep and screen time -PSQI total score could not be calculated -Data collected during temporary lockdown

Chahine et al. (2023) [19]	Cross-sectional descriptive observational study	-Mann-Whitney U when data not normally distributed -chi-square tests	-Examined the impact of screen usage and digital technology on sleep quality patterns among Lebanese students. -A significant inverted correlation between sleep duration and screen time ($p<0.05$). Poorer sleep quality associated with excessive screen time.	-Unstructured free time of screen usage detrimentally expanding sleep time -Light emission from screens suppressing melatonin hormone due to disruption of circadian rhythm	The need for intervention among the student population due to the negative impact of technology misuse on sleep and school performance.	Not clearly mentioned in the study.
Wang et al. (2023) [28]	Cross-sectional study	Involve the use of forums and WenJuanxing software for online questionnaire and social media respectively.	-Investigated the association between sleep quality, mental health, and screen usage among university students particularly during pandemic -Negatively correlated found between screen usage and sleep quality -Melatonin secretion due to excessive screen usage and mental arousal because of video games	String light emitted by electronic devices inhibit production of melatonin causing circadian rhythm disorders	Findings provide deep understanding into the relationship between factors mentioned as it is affected by pandemic.	-Causal inference weak and has the risk of causal reverse -Information and selectionist to online questionnaire survey -Unmeasured confounding factors lead to possibility of bias -Need for longitudinal studies for potential reverse causality
Meghji et al. (2023) [22]	Cross-sectional study design n=152	SPSS 22 version 22 used to determine the correlation, particularly Pearson's correlation coefficient between daily screen time, PSQI, and DASSscores based on p≤ - 0.05with95% CI	-Mean PSQI score =6.45 ±3.48. -Strong and significant positive correlation between increased daily ST and worsened sleep quality ($r=0.75$, $p<0.01$) Indicating higher ST linked with sleep quality behavior.	-Magnetic field from smartphones detrimentally influences serum melatonin levels, thus affecting sleep quality. -Exposure to blue light delay sleep on set.	- Highlights the pervasive influence of screen technology on sleep quality and mental health.	-Smaller sample size prevent the result's generalizability -Confounding variables (BMI, body image, self-esteem, familial environment, burnout) not considered -Extend duration of study to observe long-term effects and trends.

Feng et al. (2014) [24]	Cross-sectional Study n = 1106	Basic Analysis: Involve the use of t-test and chi-square test Primary Analysis: Multivariate logistic regression models used to estimate Odds Ratios (ORs) and 95% CIs.	-Lower risk of poor sleep quality contribute to lower screen usage with high Physical Activity (PA)(OR= 0.48 and 95% CI = 0.30-0.78) -High PA with low ST on poor sleep quality (OR=0.51, 95%CI=0.40-0.91) indicating subject had lower odds of poor sleep quality of 49%	-Physiological changes due to physical activity such as high sleep quality and lower sleep onset latency -Improving mental health such as decreased depression's symptoms leading to greater sleep quality	Improving student's mental well-being and sleep quality Supported by higher PA and lower ST	Inferring a causal direction between variables of PA, ST and sleep outcomes due to cross-sectional design
Kaewpra dit et al. (2025) [27]	Cross-sectional analytical study design n=13 668	-Self -administer red questionnaires -Pittsburgh sleep quality Index (PSQI) -Chi-square tests and rank sum tests -Involve logistic regression -Crude Odds Ratios (OR)	Excessive Digital Screen Time (DST) usage among half of Southern University Students are >8 hours per day and are associated with mental well-being, sleep quality, and academic performance.	Not clearly clarified in the study.	Studies focus on student's mental well-being, sleep quality, and academic performance.	Future research should employ longitudinal designs which state the possible sampling limitations
Nakie et al. (2024) [29]	Systematic Review and Meta-analysis	Standard meta-analysis techniques with 95% CI and I^2 for heterogeneity	-Poor sleep quality insignificancies among African university students. -Perceived stress, poor sleep hygiene, and electronic devices usage at bed time are factors that contributed to poor sleep quality. -The combined prevalence of poor sleep quality was 63.31% and 95% CI (56.91-65.71)	Blue light exposure due to electronic devices usage at bedtime.	Educational programs needed to promote better sleep quality. The interventions should target factors such as stress, sleep hygiene, and electronic device use at bedtime.	High heterogeneity was found among the included studies.

Pham et al.(2021) [30]	Cross-sectional survey	Descriptive, ANOVA, Pearson correlation, multiple regression	MeanPSQI≈5.7; 48.8%poor sleepers; 98.1% used devices 2 hours pre-bed; >30 min associated with worse PSQI	Blue-light melatonin suppression; cognitive/emotional arousal	-Negatively affect students' sleep, contributing to daytime tiredness and reduced concentration -Students reduce pre-bed Device use; universities add sleep-hygiene programs	Cross-sectional, self-report, amount of exposure was not measured
Mao et al.(2022) [31]	Cross-sectional	Descriptive, ANOVA, chi-square, multinomial/binary logistic regression, Sobel test	Pre-bed screentime>60minlinked to poor sleep (adjusted odds ratio of 1.87 (95% CI: 1.27–2.74, p = 0.001) and worse academics; sleep mediates effect	Circadian disruption, sleep loss; impaired memory	Students limit night SM (using reminders after10p.m.); universities create educational programs and promote healthier screen habits	Self-report. single-site, cross-sectional, data on certain substances that could affect sleep, such as taurine or medications, were not collected
Mohd Kamaru zihan & Soe (2023) [32]	Comparative cross-sectional	descriptive, chi-square	University students' PSQI worse than children; extreme users had high dysfunction	Arousa,; blue-light; sleep displacement	Students avoid in-bed device use	Self-report, online survey
Hjetland et al. (2021) [33]	Cross-sectional	Linear & logistic regression	Students used screen sat bed time, with checking social media being the most common activity for both males and females. Evening screen time→ sleep on latency 65min, low sleep efficiency (83%), insomnia 36%andU-shaped addiction effect	Screen time negatively affects sleep outcomes, including longer sleep onset, lower sleep efficiency, and higher insomnia	Reduce evening screen time, social media addiction may contribute to higher evening screen use addressing social media addiction	Cross-sectional, sleep and screen use were assessed via self-report (may be inaccurate) and measuring addiction with only one item may not fully capture addictive social media behavior.

Muhammad & Hussain (2021) [34]	Cross-sectional	Chi-square, univariable logistic regression, the HELENA questionnaire used to measure screen time	71%poorsleepers according to PSQI, students spent >2 hours on screens per day had higher odds of poor sleep on weekends (OR: 24.15, 95% CI: 11.19–52.11) compared to weekdays (OR: 4.23, 95% CI: 2.66–6.72).	Prolonged screen exposure may displace time otherwise available for sleep, resulting in shorter total sleep duration. Mental stimulation delayed sleep onset	Excessive screen time can lead to increased daytime sleepiness, delayed onset of sleep, and reduced total amount of sleep duration students need to be aware of their screen usage patterns and consider self-monitoring. Universities could implement educational programsthat raise awareness	Cross-sectional design prevents establishing a causal relationship between screen time and sleep outcome. Self-report (led to under- or over-reporting of screen time and sleep behaviors) and limited generalizability
Zhai et al. (2020) [35]	Cross-sectional	t-tests, ANOVA, chi-square, logistic regression	Heavy users OR≈2.71 for poor sleep; low PA + heavy use highest risk, heavy smartphone use had171.4%higher odds of reporting poor sleep quality (OR = 2.714; 95% CI = 2.115–3.484)	Linked to problematic behavior or dependency, increased perceived stress	Limiting screen time, especially before bedtime, turn off notification sat night, setting screen-time limits, or engaging in alternative may help improve sleep	Self-report are subject to measurement errors, recall bias, and social desirability effects, limited generalizability
Kolhar et al. (2021) [36]	Cross-sectional , female-only	descriptive, chi-square, Fisher's exact, ANOVA	97% use social media, 68% delayed bedtime, negative academic impact, bedtime patterns were delayed due to social media use (p= 0.028)	Distraction, pre-sleep arousal, blue-light (affects circadian rhythms)	Distract students, affect academic performance, social interactions, and sleep duration, lead sedentary lifestyle and physical inactivity. students limit SM, universities	Female-only; limited scope

					promote offline interaction	
Jniene et al. (2019) [38]	Cross-sectional	t-test, Mann-Whitney, chi-square	97.3% bedtime use, 59% message checking during sleep,75.2%had poor sleep quality (PSQI >5, p <0.005), scores of subjective sleep quality, sleep duration, and day time dysfunction were significantly higher in this group (p = 0.01, p = 0.01, And p=0.005, respectively)	Melatonin suppression, hyperarousal	Perceiving sleep disturbances is not sufficient to improve sleep habits, students adopt structured bedtime routines	Self-report, no objective measure, influential factors such as caffeine or energy drink in take, napping, circadian type, lifestyle habits, and psychological conditions (anxiety, depression) were not assessed.
Almeida et al. (2023) [37]	Cross-sectional	Pearson correlations, hierarchical regression	Night screentime predicted poor sleep (r =0.220, p<0.001) independent of FOMO/rumination	Cognitive arousal, FoMO, bedtime delay, Emotional mechanisms (seeking social validation or avoiding negative emotions)	Emotion-regulation training reduce night screen time	Cross-sectional and non-experimental, female-skewed, self-report
Elsheikh et al. (2024) [39]	Cross-sectional	chi-square, logistic regression	96% bedtime use; poor sleep→ worse concentration & grades, smartphone users before bed had higher risk of poor sleep quality (OR = 3.6) ,1.39 times experienced poor sleep.	Blue light inhibits melatonin production, stimulating cognitive functions and brain alertness; arousal and bedtime displacement	Negatively affected students' concentration, decision-making, memory, and learning abilities, Students limit bedtime use, universities run awareness	Self-report, cross-sectional, introduced recording bias

Alsulami et al. (2018) [40]	Cross-sectional	chi-square, t-tests, ANOVA	67.1% poor sleepers, social media correlated with long sleep latency, basic-year students had poorer sleep quality compared to clinical-year students (73.58% vs. 63.6%, p = 0.007), negative correlation between sleep duration and electronic device usage ($p < 0.05$), positive correlation between sleep latency and duration of social media use before sleep ($r=0.246$, $n= 675$, $p < 0.05$)	Cognitive stimulation from device use, prolonged exposure to light-emitting screens (potentially disrupting melatonin production), and time displacement delayed bedtime	Negatively impact learning, memory consolidation and academic performance. Students reduce night screen time,	Self-report, introduce reporting bias, PSQI as subjective measure
Qanash et al. (2021) [41]	Cross-sectional	MIformissing data, chi-square, logistic regression	-62%poorsleepers; SAS-SV correlated with PSQI -- High device addiction; correlated with poor sleep; minimal GPA effect.	Melatonin suppression, addictive patterns	Students reduce addiction behaviors, universities support interventions	Self-report; no objective usage logs

Conclusion

The overall reviewed studies consistently show that higher screen time is linked with poorer sleep quality particularly among university students. A high rate of sleep problems across different groups including medical, dental, engineering, and general university students referred to students scored above the PSQI cut-off (>. Excessive screen use particularly at night, for social media, or more than 2 hours before bedtime was strongly associated with later bed times, reduced sleep duration, and higher PSQI scores. This happens primarily because of blue light exposures which secrete the melatonin hormone, stimulating content increases mental arousal, and screen use takes up time meant for sleep. Some studies showed extreme risks for pro long exposure to screen including students with more than two hours of screen time experiencing higher odds of poor sleep quality.The associations are also modified by several life style factors such as low physical activity, smartphone addiction, and internet dependence which lead to worse sleep outcomes. Although there was consensus regarding the negative impact of screen time, there were differences in the strength of correlations (e.g., r =0.86vs. mildr≈0.35) and in the impacts on related outcomes such as sleep duration or academic performance. Inconsistencies were also contributed by type of device, gender, cultural context, and the aim of screen time, although no study contradicted the general finding that increased screen time impairs sleep.

Excessive screen use particularly at night, for social media, or more than 2 hours before bedtime was strongly associated with later bedtimes, reduced sleep duration, and higher PSQI scores .This happen primarily beca use of blue light exposures which secrete the melatonin hormones, stimulating content increases mental arousal, and screen use takes up time meant for sleep. Some studies also found that students with elevated physical activity and low screen time had much better sleep quality, while those with low physical activity and high screen usage had the worst outcomes. The findings hold important implications for both students and universities, focusing on the need for digital hygiene practices such as limiting screen use between 30 to 60 minutes before bedtime, avoiding emotionally stimulating content at night, and promoting physical activity. Poor sleep contributed to heavy screen use resulting in impaired memory, poor concentration, less academic performance, mood disturbances, metabolic changes, and over all reduced well-being. Therefore, institutions play an important role in promoting digital wellness, sleep-hygiene education, and mental health support. Current studies is limited by cross-sectional designs, self-reported measures, selection bias, and small or single-site samples, reducing the ability to prove the causation and generalize findings. Future research should incorporate longitudinal or experimental designs, objective measures such as actigraphy or screen-tracking apps, larger multicenter samples, and better control of confounders including diet, caffeine, mental health, and chronotype in order to better understanding the relationships of the variables used. Besides, the study should also include different populations as well as use objective tools for instance, tracking applications or actigraphy to better understand this relationship.

Conflict of interest

The authors declare no conflict of interest

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