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Impact of screen time on sleep quality and duration among medical and healthcare students: A narrative review

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ABSTRACT

Sleep quality (SQ) is an essential factor for both physical and mental health. Among university populations, especially those in medical and healthcare fields, poor SQ is frequently noted at alarmingly high rates. This narrative review summarises recent findings on the relationship between screen time (ST), with a focus on device use before bedtime and problematic patterns of use, and overall SQ and sleep duration in this group. Studies show that both excessive and bedtime-specific ST adversely affect sleep latency, duration, and efficiency as well as overall well-being. These outcomes are mainly due to physiological mechanisms, including melatonin suppression and disruption of the circadian rhythm from exposure to short-wavelength light. The literature consistently shows that bedtime device use is associated with poorer SQ. At the same time, the impact regarding total daily ST is ambiguous and depends on things like why the device is used (for study or leisure), the type of device, and other variables. Excessive ST correlates positively with adverse mental health outcomes and physical issues, especially in the musculoskeletal system. Additionally, it is also associated with reduced academic performance, mainly due to memory problems and exacerbated daytime sleepiness. Studies indicate that fixing and improving SQ and sleep duration is possible by restricting device use near bedtime. Main research limitations include a lack of longitudinal studies, dependence on self-reported SQ and ST data, and insufficient use of objective measures. This review points out the importance of reducing bedtime ST and encourages healthy sleep practices among students.

Keywords: sleep quality, screen time, medical students, circadian rhythm, electronic device

1. INTRODUCTION

Sleep quality (SQ) is a key factor affecting mental health and quality of life (QOL) (Scott et al., 2021). However, several factors with different impact strengths determine SQ. This review analyses associations between SQ and screen time (ST),

which has been identified as a primary concern in student-reported sleep priorities (Holmen et al., 2021). Among medical students, a 52.7% pooled prevalence of poor sleep ($P < 0.001$) was reported, which is much higher than in other disciplines (Rao et al., 2020). It justifies the focus of this review on the healthcare population and the need to determine lifestyle factors contributing to poor SQ, including the influence of device use.

The consensus statement of the American Academy of Sleep Medicine and Sleep Research Society, in line with the National Sleep Foundation guidelines, advises young adults to get at least 7 hours of sleep per night to preserve good health (Hirshkowitz et al., 2015; Watson et al., 2015). In addition to duration, other important recommendations include sleep quality, regularity, appropriate timing, and the absence of sleep disturbances.

Electronic media use is well-established as correlated with reduced SQ, while problematic use is further associated with intensified sleep problems (Han et al., 2024). Moreover, poor SQ resulting from excessive ST directly affects students' mental and physical health, memory, and academic performance.

We intentionally excluded studies based on data collected during the COVID-19 pandemic. During this period, strict restrictions requiring individuals to remain at home, combined with heightened stress levels, resulted in a significant rise in overall ST. For instance, daily internet use increased by approximately 20 minutes in 2020 and 2021 (We Are Social, Meltwater, 2025), which is around 5%, and total daily ST increased by nearly an hour among adults (Trott et al., 2022).

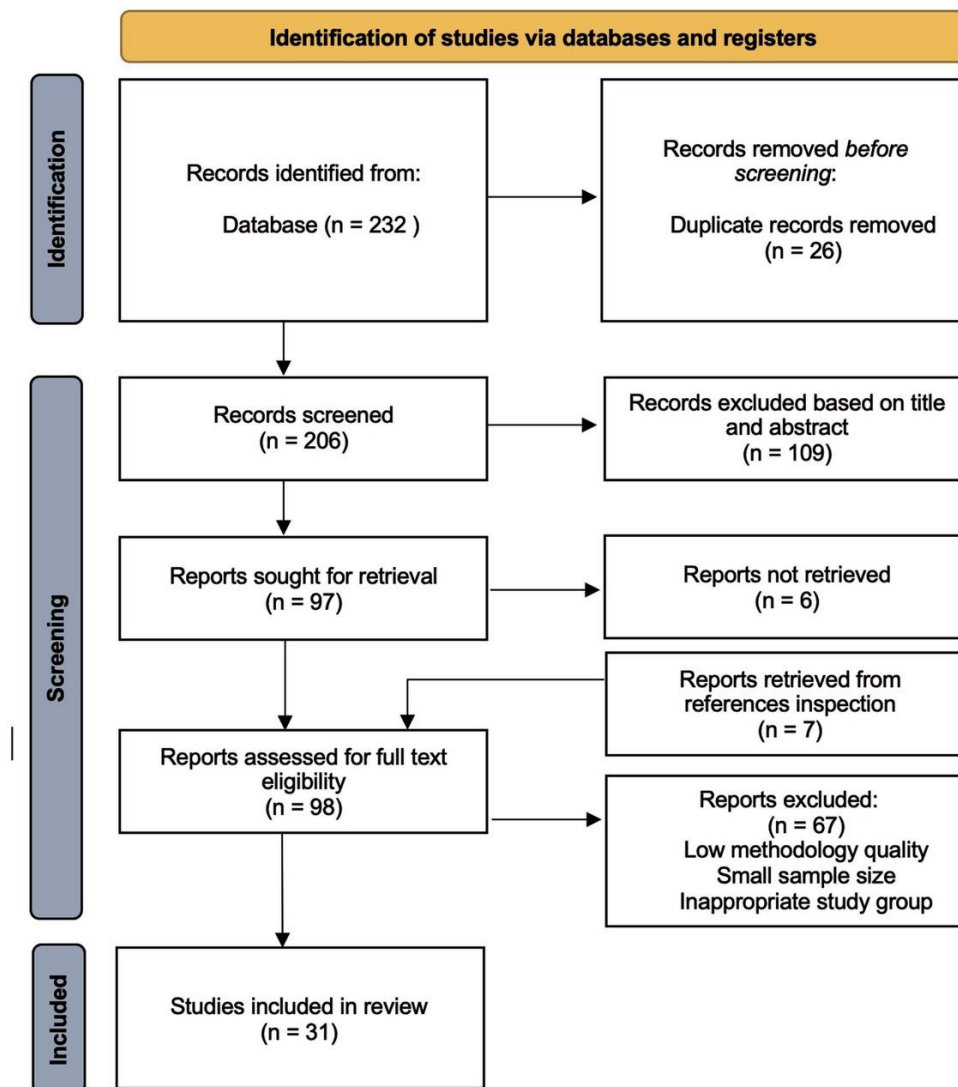


Figure 1. PRISMA flow diagram of the study selection. Records identified from databases (n=232), final records included (n=31).

2. REVIEW METHODS

We identified the studies for this review through a comprehensive search of the PubMed database. We screened the abstracts to check their compliance with our inclusion criteria, and then we performed a full-text review. Inspecting references helped us identify additional relevant articles to cover the topic precisely. The search utilized MeSH terms and Boolean operators, for example, “(sleep) AND (screen time) AND ((medical) OR (healthcare)) AND (students)”, along with related combinations. We present the selection process in the PRISMA flow diagram (Figure 1).

3. RESULTS

Physiology of Sleep

Evening sleepiness is mainly induced by melatonin release, which prepares the body for rest. Latest reports state that this process can be suppressed by exposure to short-wavelength light. This light, commonly referred to as “blue”, can disrupt the suprachiasmatic nucleus (SCN), the central regulator of humans’ circadian rhythm. The SCN remains in constant communication with the pituitary gland to modulate not only melatonin secretion but also the distal-proximal temperature gradient (DPG) and cortisol levels. A fast rise of DPG is considered the strongest physiological predictor of quick sleep onset. However, exposure to short-wavelength light can interfere with the SCN function and has been shown to delay the rise of DPG for up to 2 hours. Furthermore, exposure to such light delays the onset of slow-wave sleep by approximately 30 minutes and reduces delta-wave power for 60 to 105 minutes after sleep initiation (Schmid et al., 2021).

Screening Instruments

The Pittsburgh Sleep Quality Index (PSQI) is the most commonly used tool for assessing SQ. This questionnaire is frequently employed in both clinical and research settings. It includes items on sleep duration, latency, bed and wake times, sleep disturbances, subjective SQ, medication use, and daytime drowsiness (Buysse et al., 1989). The Epworth Sleepiness Scale (ESS) can also be utilised as a complementary measure for further evaluation (Johns, 1991).

Screen Time and Internet Addiction

Research investigating the impact of overall ST on SQ has produced heterogeneous findings. Nevertheless, it is certain that impaired sleep is connected to being addicted to the internet or using media devices at bedtime. A study performed by Alimoradi et al., (2019) shows that individuals with internet addiction (IA) suffer more from sleep problems and have reduced sleep time. Other research claims that approximately 30% of medical and healthcare students are addicted to the internet (Salpynov et al., 2024; Zhang et al., 2018). This raises serious concerns about the health and well-being of future physicians. Even though some part of ST goes to academic or informational purposes, a substantial amount is used for entertainment, communication, gaming, social media, shopping, and sometimes gambling or sexually explicit content (Sánchez-Fernández & Borda-Mas, 2023). At the time, medical guidelines do not recognise IA as a formal diagnosis, except for gaming disorder. It is classified in the ICD-11 (World Health Organization, 2022) and mentioned in the DSM-5 (American Psychiatric Association, 2022) as a condition requiring further study.

Bedtime Electronic Device Use and Sleep Outcomes

Smartphone ownership is almost universal nowadays, so it is important that we promote responsible use in the sake of society’s better health and SQ. According to Elsheikh et al., (2024), 96.5% of Al-Azhar University medical students in Cairo reported using their phones prior to bedtime, and nearly half of them for more than 2 hours. A student spent an average of 4.7 hours each day on the phone. Majority, precisely two-thirds, of bedtime users presented poor SQ. It was two times more than non-users. Furthermore, those who used smartphones before sleep had a higher median PSQI score. These individuals also experienced prolonged sleep latency, more frequent sleep disturbances, and shorter total sleep duration.

In a similar study, participants were split into three groups based on their pre-sleep device use: under 1 hour, 1 to 2 hours, and above 2 hours. Although they found no notable differences in subjective SQ, substantial disparities emerged in sleep latency, duration, efficiency, and PSQI outcomes. All of these parameters favoured individuals with more restrictive use (Krishnan et al., 2020).

Another research was conducted across three universities in Jeddah, Saudi Arabia. Night device use was screened among undergraduate healthcare students of various specialities with the Smartphone Addiction Scale-short version (SAS-SV) (Kwon et al., 2019). Addiction was a potential predictor for poor SQ, alongside bedtime device use. According to the study, 93.1% of the cohort

reported using electronic devices before sleep either always or regularly, while 32% met the criteria for smartphone addiction. Smartphone addiction was strongly correlated with high PSQI scores, which indicates poor SQ (Qanash et al., 2021).

General Screen Use and Sleep Outcomes

The evidence regarding total ST and SQ is considerably more ambiguous. Although some data points out an association, the reliability of these results is questionable. For example, Arshad et al., (2021) reported an association of greater ST and worse sleep, but this was the only factor considered. They overlooked other device-related variables. Liebig et al., (2023), on the other hand, found no meaningful correlation between total ST and SQ. They suggest that patterns of use are more important. Leisure ST was associated with later sleep onset, while device use for study or work was linked to earlier wake times and shorter sleep duration. Additionally, participants living alone presented longer total ST, and sex differences were found in the form of higher leisure ST for males but greater ST for study or work for females.

AlKhenazi et al., (2025) reported comparable results, showing no significant relation between total ST and SQ. However, students with lower recreational ST scored better on the Brief Mood Introspection Scale, particularly in the pleasant-unpleasant, positive-tired, and negative-relaxed ranges. These outcomes matched the group reporting high-quality sleep.

Deivendran et al., (2025) also applied SAS-SV to a group of university students who engaged in more than 3 hours of ST per day. They were split into three groups representing low, moderate, and high screen use. The results showed a clear trend: as ST increased, students scored lower all over the board. They had higher PSQI scores, worse ESS results, and more pronounced daytime sleepiness.

Mental Health

University students who sleep less than 6 hours per night present poorer mental health, in the form of decreased self-perceived QOL, increased anxiety and depressive symptoms, and greater stress levels. More research performed by Caamaño-Navarrete et al., (2024) shows that going above 4 hours of ST per day deteriorates mental health, increases depressive symptoms and anxiety, and reduces life satisfaction. However, a meta-analysis demonstrated that better sleep parameters result in significant improvements in mental health, including lower incidence of depression, anxiety, and rumination, as well as substantial reduction in stress and psychotic symptoms (Scott et al., 2021).

Physical Health

Excessive use of electronic devices adversely affects physical health and fitness. Students frequently report musculoskeletal discomfort, most often in the neck, wrists, thumbs, lower back, hips, thighs, and elbows. The prevalence of such pain was associated with the smartphone size, predominant purpose of use, and body position during use (Walankar et al., 2021). Those physical issues also correlated positively with the occurrence of IA in the study by Nochian et al., (2024). A notable relationship has been observed between prolonged ST and a higher chance of being overweight or obese in adolescents (Haghjoo et al., 2022). These findings match research showing reduced grip strength, shorter long jumps, and lower flexibility as a consequence of excessive smartphone use (Li et al., 2022).

Memory and Academic Performance

Since there is consistent evidence of insufficient SQ among students, it is essential to understand how this affects declarative memory and academic performance. Effective learning is crucial to educational success. Sleep deprivation impairs memory across all stages (encoding, consolidation, and retrieval) to varying degrees. The most pronounced defects are in encoding, with both complete and partial sleep restriction resulting in substantial learning difficulties. Cousins and Fernández (2019), observed a 26% reduction in the capacity to acquire factual knowledge after 4 nights of only 5 hours of sleep. Additionally, picture encoding declined by 9% following 5 nights of such sleep opportunity. In contrast, memory consolidation and retrieval are more resilient to both total and partial sleep deprivation.

Recent meta-analytic evidence supports this, showing that sleeping less than 6.5 hours per night impairs memory formation, particularly during encoding. Thereby, it diminishes learning capacity the following day. Furthermore, insufficient sleep or complete sleep deprivation after an encoding session similarly compromises memory formation (Crowley et al., 2024).

Even though ST indirectly affects memory mechanisms due to the use of electronic devices, total ST alone is inconsistent for predicting poor academic results. Negative educational outcomes present a weak correlation with overall smartphone use times. Nonetheless, a stronger connection appears for specific activities, such as excessive conversation and chatting, sending text messages,

using social media, and playing games or watching videos. Furthermore, other factors like smartphone addiction, dependence, frequent use, and multitasking in class are clearly tied to worse academic results (Hsieh, 2025).

Additionally, poor SQ can harm advanced thinking skills, such as problem solving, decision-making, and clinical reasoning - competencies essential to healthcare education and future medical practice. All the mentioned health outcomes of excessive ST, methods used to evaluate the correlation or basis on which the connection is established, the direction of the association, and supporting studies are listed in Table 1.

Table 1. Health outcomes associated with excessive screen time

Outcome	Evaluation method	Direction of association	Supporting studies
Poor sleep quality	Higher PSQI scores, worse sleep parameters (e.g. duration, latency)	Positive	Alimoradi et al., 2019; Elsheikh et al., 2024; Han et al., 2024; Krishnan et al., 2020; Arshad et al., 2021; Deivendran et al., 2025
Daytime sleepiness	Increased ESS scores	Positive	Deivendran et al., 2025
Sleep problems	Internet addiction (SAS-SV)	Positive	Alimoradi et al., 2019; Han et al., 2024; Qanash et al., 2021
Mental health problems	Signs of anxiety, depression, stress, lower QOL; worse results in Brief Mood Introspection Scale	Positive	AlKhezaizi et al. 2025; Caamaño-Navarrete et al., 2024
Physical health issues	Musculoskeletal disorders; physical fitness decline; overweight or obesity risk	Positive	Walankar et al., 2021; Nochian et al., 2024; Li et al., 2022; Haghjoo et al., 2022
Academic performance / cognitive function	Memory formation	Negative impact	Cousins & Fernández, 2019; Crowley et al., 2024; Hsieh, 2025

4. DISCUSSION

Although medical students focus on health, many are unaware or ignore the evidence that uncontrolled electronic device use significantly affects SQ and produces other adverse health consequences. Smartphones are highly addictive because of access to the internet and social media and that is why students often find it difficult to restrict their ST. According to research, bedtime specific device use is strongly tied to poorer SQ because of delayed sleep onset, prolonged latency, and reduced sleep duration. However, overall ST has a negligible influence on SQ. Social media platforms capture attention, keep users engaged for long hours, and create a sense of urgency to stay online. This reduces melatonin secretion and postpones the natural drive to sleep.

These effects are based on physiological mechanisms, such as delayed DPG changes, altered melatonin release, and circadian rhythm disruption. They result from exposure to short-wavelength light. There is an association of excessive ST and mental health problems, including heightened anxiety, depressive syndromes, and increased stress. Also, physical consequences occur, such as musculoskeletal pain and decreased fitness. Not getting enough sleep also harms encoding and academic performance. Across studies, total daily ST does not always correlate with poor SQ. However, using devices at bedtime and problematic use are the most significant predictors of impaired sleep and poor academic performance among medical and healthcare students. Physiological disruption, such as suppressed melatonin release and delayed DPG from short-wavelength light, is not the only reason why device use postpones falling asleep. Emotional and mental factors also matter. Social interactions, exciting content, news, and late-night studying can all cause mental stimulation and excitement. This can interact with circadian rhythms, making it even harder to fall asleep and get good quality sleep. Academic deadlines and schedules also make students more vulnerable. Studying on phones, tablets, or laptops in the evening keeps students awake longer than they should, which, combined with waking up early, reduces their sleep opportunity. We need to be aware of all these different reasons to plan better interventions that will address both screen use and the reasons for it.

Since so many students fall into these wrong patterns, those interventions need to be thoughtfully designed and performed. Promoting knowledge about responsible device use and healthy sleep habits can help reduce risks and improve well-being and

academic performance. However, most studies rely on self-reported ST and sleep measures, which are susceptible to recall and social desirability bias. Only a few employ objective tracking methods such as actigraphy or digital usage logs, making it hard to establish cause and effect. In future research, we should utilise these objective techniques, use a longitudinal design, and include more diverse populations beyond medical and healthcare students. To get a better outlook on the correlations, we need to examine mediating factors such as stress, natural sleep rhythms, and academic workload. Support from universities and medical schools is necessary for implementing effective interventions and ensuring that behavioural recommendations lead to lasting changes in students' lifestyles. Intervention studies are also warranted.

5. CONCLUSION

Excessive and bedtime-specific electronic device use negatively impacts SQ, as well as the physical and mental health, and academic performance of medical and healthcare students.

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Authors' Contributions

MK: conceptualisation and design of the study, review, editing, methodology, original draft preparation; ZC, FG: selection of the inclusion and exclusion criteria, literature search; JG: screening and selection of eligible studies; TK: data extraction and organisation; JM: analysis and interpretation of reviewed literature; MM: development of discussion and interpretation of findings; AO: writing - review and editing; FO: supervision, language editing, formal analysis; MŚ: supervision, formal analysis, reference checking. All authors read and approved the final version of the manuscript.

Informed consent

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Ethical approval

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Data and materials availability

All data associated with this study will be available based on the reasonable request to corresponding author.

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