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HOW DOES EXPOSURE TO SCREEN TIME—ESPECIALLY BEFORE BEDTIME—AFFECT SLEEP PATTERNS, SLEEP QUALITY, AND POTENTIAL MELATONIN-RELATED SYMPTOMS IN TEENAGERS?

Abdumutalov Doniyor Shavkat o'g'li
Abu Ali Ibn Sina Specialized school, student
email: abdumutalov3012@gmail.com tel:+998900411237
Madaminova Durdona Mo'minovna
Abu Ali Ibn Sina Specialized School, teacher
email: mdurdona1978@gmail.com tel:+998900868018

Abstract: The widespread use of digital devices has raised growing concerns about their potential impact on sleep, particularly among adolescents. Blue light emitted from screens is known to suppress melatonin, a hormone critical for regulating circadian rhythms, which may in turn reduce sleep quality. To explore this relationship, we conducted a survey-based study with 50 participants, asking whether they used screens within one hour before bedtime and how rested they felt upon waking. Responses showed that a majority of participants who used screens before bed reported lower sleep quality and feeling less rested in the morning. Conversely, those who avoided screen use in the hour before sleep were more likely to report waking up refreshed. Additional analysis revealed a clear negative association between screen exposure before bed and perceived sleep quality. While our study was limited by sample size and reliance on self-reported data, the findings align with prior research and highlight the importance of healthy bedtime habits. Future studies with larger and more diverse samples could provide further insights into how screen time impacts sleep across different populations. Overall, our results suggest that reducing screen use before bedtime may support better sleep quality and overall well-being.

Keywords: screen time, blue light, melatonin, sleep quality, circadian rhythm, adolescents, digital devices, bedtime habits

Introduction

In today's digital world, it's hard to imagine life without screens. Whether it's checking messages, doing homework online, watching videos, or playing games, most people—especially teenagers—spend hours a day on devices like smartphones, tablets, and computers. While technology brings many advantages, such as easier communication and access to information, more and more people are starting to worry about how this screen time might be affecting our health. One of the biggest concerns is its effect on sleep (1).

Getting enough good-quality sleep is extremely important, especially for young people whose brains and bodies are still developing. Sleep helps with memory, concentration, emotional regulation, and even immune function (2). One of the body's natural systems that controls sleep is called the circadian rhythm: it is a 24- hour internal clock that tells us when to feel awake and when to feel tired. This rhythm is controlled by a hormone called melatonin, which usually starts rising in the evening when it gets dark, signaling to the brain that it's time to sleep (3).

However, many studies have shown that blue light (the kind of light that screens give off) can suppress melatonin production if used at night—especially within the last hour before bed (4, 5). As a result, people may take longer to fall asleep, get lower quality sleep, and feel more tired the next day (6, 7). This is especially true for teenagers whose sleep cycles naturally shift later during puberty, making them even more sensitive to light at night (8, 9).

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Despite growing research on this topic, many young people still regularly use screens before sleeping, possibly without realizing the effects (10, 11). That's why we chose to explore this issue further through a simple, survey-based study. We wanted to understand whether screen use right before bed actually affects how well people sleep.

Based on prior research suggesting that blue light from screens can suppress melatonin and delay sleep onset, we hypothesized that participants who used screens within one hour before bed would be less likely to wake up feeling rested than those who did not (12–16). Our data showed a clear pattern: individuals who avoided screen use before sleep were more likely to report feeling well-rested in the morning, while those who used screens were less likely to feel refreshed. These results support our hypothesis and suggest that screen exposure before bedtime may negatively impact perceived sleep quality.

Results

We tested the potential relationship between screen exposure before bedtime and self-reported sleep quality in human participants. Previous studies suggest that blue light emitted from screens suppresses melatonin production, which may delay sleep onset and reduce sleep quality. To examine this pattern in a student population, we used a cross-sectional survey that asked about participants' screen use habits and how rested they felt upon waking.

A total of 73 participants completed the survey. Participants were asked whether they used screens (e.g., phones, tablets, or computers) within one hour before going to bed. They also answered whether they usually woke up feeling rested. Both questions were multiple choice with three options: Yes, Sometimes, or No.

We first examined the distribution of screen use habits among participants. Out of 73 responses, 53 participants (72.6%) reported using screens before bed, 17 (23.3%) answered "Sometimes," and only 3 (4.1%) reported not using screens before bed (Figure 1). These results suggest that screen use before bedtime is common among the surveyed group.

Then, we compared these responses to participants' answers to the question "Do you wake up feeling rested?" "Among participants who regularly used screens before bed (n=53), only 30.2% reported feeling rested in the morning, while the majority (69.8%) reported either sometimes or never feeling rested. Among participants who reported using screens **"sometimes"** within one hour before sleep (n = 17), **41.2%** reported waking up feeling rested, **47.1%** answered "Sometimes," and only **11.8%** reported not feeling rested. Compared to the group who regularly used screens before bed, this group showed a noticeably more positive sleep profile, suggesting a possible dose-response relationship between screen exposure and sleep quality. Due to the very small number of participants who did not use screens (n = 3), no strong conclusions can be drawn about that group. However, the data suggest a

trend where frequent screen use before sleep may be associated with lower perceived sleep quality. *Self-Rated Sleep Quality*

Participants also rated their overall sleep quality on a numerical scale. When grouped by screen usage habits, average sleep quality ratings showed a clear trend. Those who reported frequent screen use rated their sleep quality the lowest (mean ≈ 6.4), followed by occasional users (mean ≈ 7.6), and non-screen users reported the highest average (mean ≈ 8.7). This reinforces the earlier findings and suggests that increased screen exposure may be linked to poorer subjective sleep quality (Figure 3).

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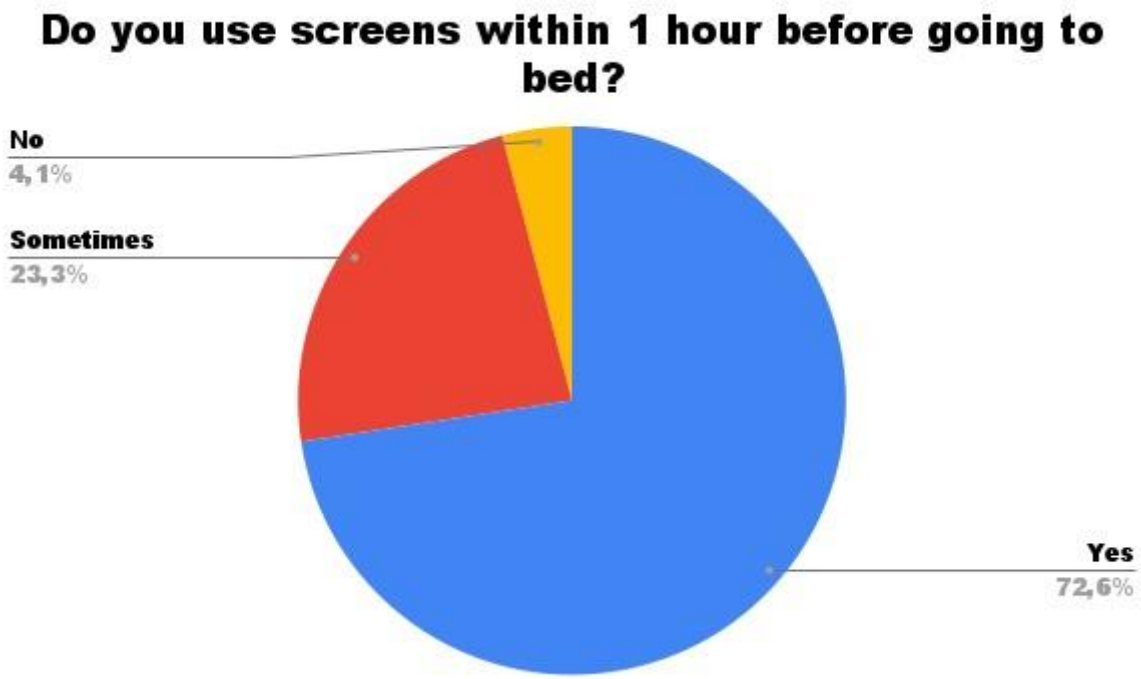

Figure 1. Frequency of screen use within 1 hour before bedtime among participants. Pie chart showing the distribution of responses to the question "Do you use screens within 1 hour before going to bed?" (n = 73). Participants selected from three options: "Yes" (n = 53), "Sometimes" (n = 17), and "No" (n = 3). The majority of respondents (72.6%) reported regular screen use before bedtime. Data was collected through a self-administered online survey and categorized based on screen usage frequency.

Discussion

The goal of this study was to examine whether using screens within one hour before bedtime affects how rested individuals feel and how they rate their sleep quality. Survey results indicated that participants who used screens regularly before sleep were less likely to report feeling well-rested and rated their sleep quality lower than those who used screens less frequently or not at all. These findings support our initial hypothesis that screen use before bed negatively impacts sleep experience. Participants who did not use screens within an hour before going to bed **(Figure 2)** reported the highest levels of feeling rested in the morning, with 1 out of 3 selecting "Yes." In contrast, among those who used screens regularly, only 16 out of 53 reported waking up feeling rested. Similarly, our bar graph comparing screen use with sleep quality **(Figure 3)** showed a clear trend: the average self-rated sleep quality was lowest for regular screen users (~6.4/10) and highest among those who avoided screens (~8.7/10). This consistent pattern suggests a possible relationship between nighttime screen exposure and reduced sleep satisfaction.These results are in line with existing literature that suggests blue light from screens can suppress melatonin production, delaying the onset of sleep and disrupting the circadian rhythm. Teenagers, who made up a large portion of our sample, are particularly vulnerable to such disruptions due to shifts in their biological clocks during adolescence. However, it is important to remember that while our findings indicate a strong association, they do not establish causation. Other factors — such as stress, caffeine consumption, or irregular schedules — could also contribute to poor sleep and were not measured in this study.

This research has several limitations. The data were self-reported, which introduces the possibility of inaccurate or biased responses. For example, participants might have misjudged how long they used screens or how well they slept. Additionally, our sample size was moderate

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(n = 73), and participants were not randomly selected or evenly distributed across all usage groups. The survey also did not control for external factors like device type, screen brightness, or individual sleep disorders, all of which might influence sleep quality. While human error is assumed, more detailed objective measurements — such as melatonin levels, sleep tracking devices, or sleep diaries — could strengthen future studies.

Despite these limitations, the results highlight a potentially important behavioral link between screen habits and sleep experience. Given the increasing reliance on digital devices, particularly among young people, these findings emphasize the need for more awareness about how screen time can impact sleep. Encouraging habits such as reducing screen exposure before bed or using blue-light filters could be simple strategies to improve sleep quality.

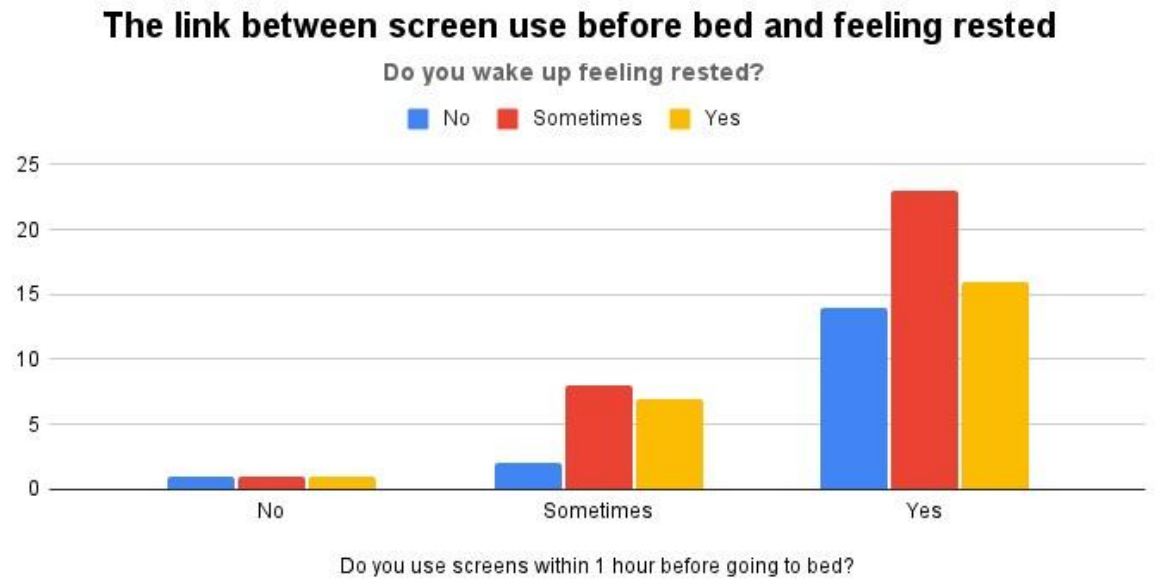

Figure 2. Relationship between screen use before bed and feeling rested upon waking. Bar chart displaying participants' self-reported restfulness levels grouped by frequency of screen use before sleep (n = 73). Each group was asked, "Do you wake up feeling rested?" and responded with "Yes," "Sometimes," or "No." Among regular screen users (n = 53), 30.2% answered "Yes," while 41.2% of occasional users (n = 17) and 33.3% of non-users (n = 3) reported feeling rested. The data indicate a potential association between lower screen exposure and increased restfulness.

Materials and methods

This study was conducted using a self-developed digital survey designed to collect anonymous data on screen usage habits and perceived sleep quality. The survey was created using Google Forms and consisted of a mix of multiple-choice and scaled questions. Participants were asked if they use screens within one hour before sleep, how often they wake up feeling rested, and how they would rate their overall sleep quality on a scale from 1 to 10. No personally identifiable information was collected.

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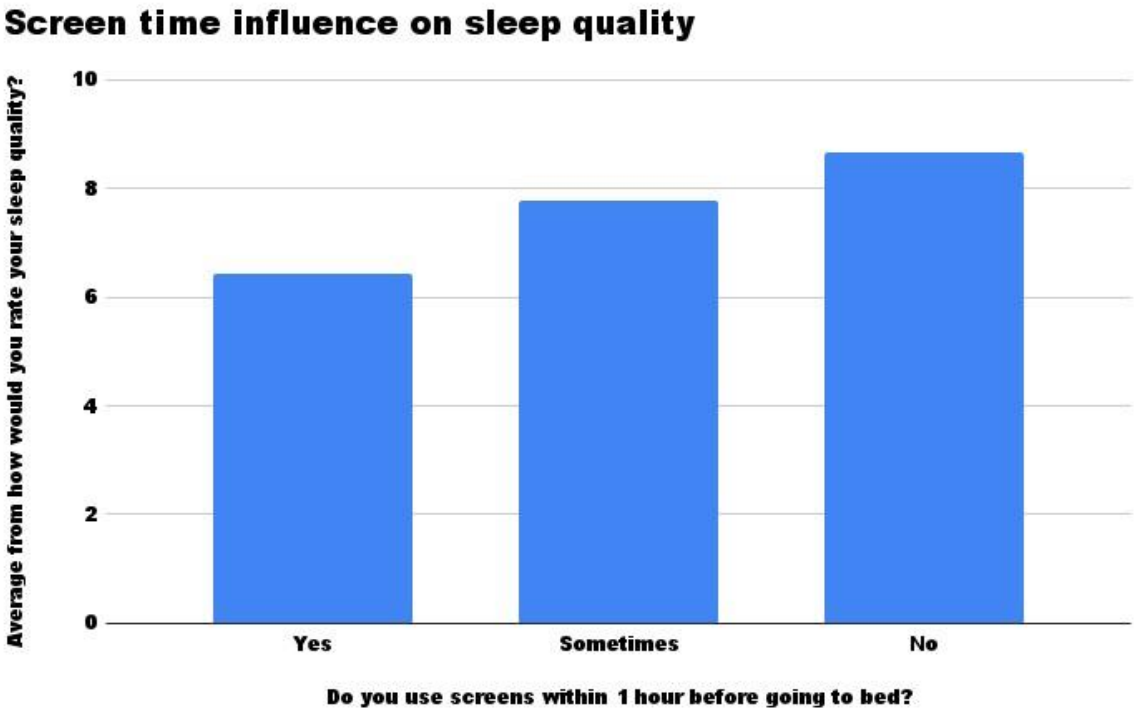

Figure 3. Average self-rated sleep quality based on bedtime screen use. Bar chart showing the average sleep quality rating (on a scale from 1 to 10) for each screen use group (n = 73). Participants rated their sleep and were grouped into "Yes" (frequent screen users), "Sometimes," and "No" (non-screen users) based on whether they used screens within one hour before bed. Mean sleep quality ratings were ~6.4 for frequent users, ~7.6 for occasional users, and ~8.7 for non-users. The trend suggests that higher screen exposure before sleep is associated with lower subjective sleep quality.

The survey was distributed through online messaging platforms, including WhatsApp and Telegram, between July 22 and August 3, 2025. Participation was voluntary, and respondents were informed that their answers would be used for an academic research project. In total, 73 responses were collected from students and young adults aged approximately 14–20 years. Since the focus was on screen use and sleep perception, no exclusion criteria were applied apart from incomplete responses, of which there were none.

All responses were automatically collected into a linked Google Sheets document. The data was categorized based on screen use habits ("Yes," "Sometimes," or "No") and then analyzed for patterns related to feeling rested and self-rated sleep quality. Visualizations were created in Google Sheets, including a pie chart for screen use frequency, a bar graph showing the distribution of restfulness levels, and a bar chart displaying average sleep quality scores per usage group. Basic arithmetic (mean calculations) was used for the sleep rating data; no advanced statistical software or significance testing was applied in this study, given its exploratory nature and limited sample size.

Conclusion

This study explored the relationship between screen use before bedtime and self reported sleep quality. Our results showed that participants who avoided screens within one hour before sleep were more likely to feel rested compared to those who used screens. These findings support previous research suggesting that evening screen exposure may disrupt sleep quality through its

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effects on circadian rhythms. While the survey sample was relatively small, the results highlight the importance of raising awareness about bedtime screen habits, particularly among young people. Future studies with larger and more diverse populations could provide stronger evidence and explore strategies to reduce the negative impact of screen time on sleep.

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