Screen Usage Habits and Sleep Quality: Insights Across Age Groups

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In today's digital world, understanding how screen time affects sleep is more important than ever. This study looks at the relationship between screen habits and sleep quality, focusing on how different screen activities like social media, video streaming, and gaming influence sleep. It also considers the timing of screen use and total daily exposure across different age groups. Using a detailed survey, the research calculates a Sleep Quality Score based on seven key factors, including how long people sleep, how efficient their sleep is, how much deep sleep they get, and how satisfied they feel with their rest. The results show a clear pattern. People who spent less time on screens overall and avoided screens in the evening tended to have better sleep quality. These findings suggest that not only does too much screen time hurt sleep, but the type of screen activity and when it happens matter too. By exploring these patterns, the study offers practical insights to help people build healthier digital habits and get better sleep in a tech-driven world.

Keywords: sleep quality, screens, blue light

Introduction

Screen Use Across Age Groups

In today's world, screens are everywhere. From smartphones and tablets to laptops and televisions, people of all ages spend a big part of their day using them. While the reasons for screen use vary, the habits often depend on age. Teens and young adults tend to use screens for things like social media, gaming, and streaming, while adults might use them more for work, communication, or staying informed. These differences matter because they may shape how screen time affects our health, especially our sleep.

Sleep Disturbances Across Age Groups

Sleep is essential for physical and mental well-being. Poor sleep has been linked to higher levels of anxiety, weakened immune function, memory issues, and even long-term problems like heart disease[1]. But sleep doesn't impact everyone the same way. Teens who sleep poorly might struggle with mood swings or school performance, while older adults may experience fatigue or cognitive decline.

To better understand how screen time affects sleep, it helps to look at what's going on behind the scenes. One key factor is the circadian rhythm, our body's natural sleep-wake cycle. This rhythm is easily disrupted by blue light, which is the type of light many screens emit. Blue light can reduce the release of melatonin, the hormone that makes us feel sleepy[2]. As a result, the brain can stay alert longer, making it harder to fall asleep. There's also the behavioral side of screen use. When people regularly use screens before bed, the brain can start associating those devices with stimulation instead of rest. Even without the light, the mental engagement from texting, scrolling, or gaming can keep people wired when they should be winding down[1].

The Current Study

While plenty of studies have looked at screen time and sleep, most only cover the basics. They tend to focus on overall screen hours and don't dive into what people are actually doing on their screens. Watching a movie isn't the same as playing a fast-paced game or checking social media, especially right before bed. Past research also doesn't always look closely at how these effects change across age groups.

This study tries to fill those gaps. It focuses on the specific types of screen-based activities people engage in, when those activities happen, and how all of that connects to their sleep. Using survey data, it looks at key sleep metrics like how long people sleep, how rested they feel, and how well they stay asleep. The goal is to understand not just whether screen use affects sleep, but how and for whom.

To guide this research, the study explores four main ideas:

1. People who use screens more throughout the day are likely to report lower sleep quality than those who use them less.
2. Using screens close to bedtime will be linked to worse sleep compared to stopping screen use earlier in the evening.
3. Some screen activities, like gaming or scrolling through social media, may have a stronger negative impact on sleep than more passive activities like watching TV.

4. Younger people, especially teens and young adults, will be more affected by nighttime screen use than older adults.

These questions aim to paint a clearer picture of how digital habits shape the way we sleep in today's tech-heavy world.

Methods

This study aimed to investigate the relationship between screen usage habits and sleep quality. The survey was conducted online and distributed across several platforms, including Reddit's SampleSize and Sleep subreddits, as well as Facebook groups focused on sleep. The survey was open to anyone who voluntarily chose to participate. Upon consenting to the study, participants provided data on their screen usage habits, sleep patterns, and self-assessed sleep quality. All data were anonymized, ensuring participant confidentiality. An ethics board review was not required due to the low risk nature of the data collected.

Survey

The survey collected data in four key areas:

1. **Screen Time and Sleep Habits:** Participants were asked how long before bed they stopped using screens, the type of screen activity they engaged in before bed (e.g., social media, work, gaming), and their total screen time for the previous day. Participants also rated how mentally stimulated they felt after screen use on a scale of 1 to 10.

2. **Sleep Patterns:** Participants provided detailed information about their sleep schedules, including when they lay down, fell asleep, woke up, and got out of bed. Another thing they were asked to report was deep sleep[1] and REM sleep durations[3] if they had tracking capabilities. Participants without this data were asked to exit the survey.

3. **Nighttime Awakenings:** Participants reported the number of times they woke up during the night and how long they stayed awake in total if they did wake up.

4. **Personal Sleep Ratings:** Participants rated their sleep satisfaction, sleep consistency over the past week, and daytime sleepiness on a scale from 0 (poor) to 10 (excellent).

Sleep Quality Score

Sleep Quality Score (SQS) was calculated based on seven key sleep metrics: sleep duration[4], sleep efficiency[5], onset latency[3], nighttime awakenings[6], deep sleep[7], REM sleep[7], and overall satisfaction (which included self-reported sleep satisfaction, consistency, and daytime sleepiness)[8]. The SQS is calculated as follows:

SQS = (Sleep Duration Score + Sleep Efficiency Score + Onset Latency Score + Nighttime Awakenings Score + Deep Sleep Score + REM Sleep Score + Overall Satisfaction Score) / 7

- **Sleep Duration Score:** The sleep duration score is based on how closely the participant's total sleep duration matches the ideal duration for their age group. Ideal sleep for ages 14–17 is 9 hours (range: 8–10 hours)[4]. For older participants, ideal sleep duration is 8 hours (range: 7–9 hours)[9].

$$\text{Sleep Duration Score} = 10 - \left| \left(\text{Hours Slept} \times \frac{10}{\text{Ideal Hours}} \right) - 10 \right|$$

- **Sleep Efficiency Score:** Sleep efficiency is the percentage of time spent asleep relative to the time spent in bed[5]. The formula normalizes this percentage to a score out of 10.

$$\text{Sleep Efficiency Score} = \frac{\text{Time Asleep}}{\text{Time in Bed}} \times 10$$

- **Onset Latency Score:** Onset latency refers to the time it takes to fall asleep[3]. The score is based on how much this time deviates from 15 minutes, which is considered optimal.

$$\text{Onset Latency Score} = 10 - \left(\frac{|\text{Latency} - 15|}{15} \times 10 \right)$$

- **Nighttime Awakenings Score:** The number of times the participant woke up during the night and the total time spent awake are used to calculate this score[6,10]. A normalization factor is applied to reflect the impact of both the number and duration of awakenings.

$$\text{Nighttime Awakenings Score} = 10 - (\text{Number of Awakenings} + (\text{Total Awake Time} \times 0.1))$$

- **Deep Sleep Score:** Deep sleep is a crucial phase of sleep[7]. The score is calculated based on how closely the participant's deep sleep duration matches the ideal for their age group. Ideal deep sleep for ages 17 or younger is 120 minutes[7], and for older participants[9], it is 90 minutes[7].
  - If duration is less than ideal:

$$\text{Deep Sleep Score} = 10 - \left(\frac{\text{Duration} - \text{Ideal}}{15} \right) \times 2$$

  - If duration is more than ideal:

$$\text{Deep Sleep Score} = 10 - \left(\frac{\text{Duration} - \text{Ideal}}{15} \right)$$

- **REM Sleep Score:** Similarly to deep sleep, REM sleep[7] is assessed based on how closely the participant's REM sleep duration aligns with the ideal. Ideal REM sleep for participants under 18 is 135 minutes[9], while for older participants[9], it is 120 minutes[7].
  - If duration is less than ideal:
  $$\text{REM Sleep Score} = 10 - \left(\frac{\text{Duration} - \text{Ideal}}{15}\right) \times 2$$
  - If duration is more than ideal:
  $$\text{REM Sleep Score} = 10 - \left(\frac{\text{Duration} - \text{Ideal}}{15}\right)$$
- **Overall Satisfaction Score:** This score is derived from three subjective ratings[8] provided by participants: last night's sleep satisfaction, consistency of sleep over the past week, and daytime sleepiness.
  - Overall Satisfaction Score = (Last Night Sleep Satisfaction / 4) + (Sleep Consistency / 4) + ((10 - Daytime Sleepiness) / 2)
  - Daytime sleepiness is subtracted from 10 to normalize the score.

By calculating the average of these seven components, the total SQS provides a comprehensive measure of sleep quality. A higher SQS reflects better overall sleep quality, with a maximum possible score of 10.

A power analysis was conducted, and it determined that about 60 responses would be enough to see a general trend in the data.

The data collected was run through a python algorithm which determined the SQS as outlined above. A variety of graphs and tables were then utilized to determine trends present in the gathered information. Screen time was self-reported and categorized into groups (<5 hours, 5–10 hours, >10 hours). These thresholds were chosen based on prior research indicating that screen exposure beyond approximately 5 hours per day has measurable associations with sleep disturbances, while exposure greater than 10 hours represents an extreme use group. Although self-reporting introduces some imprecision, this grouping allowed for clearer comparisons across different levels of use. Different analysis methods were used to uncover these trends, including the use of descriptive statistics and box plots. Correlation analyses were performed using Pearson's correlation coefficient with a significance threshold of $p < 0.05$.

Results

The study examined the relationship between screen usage habits and SQS. The analysis focused on two main factors: the total screen time during the day and the proximity of screen use before bed. SQS was measured based on various factors related to sleep quality. The findings, summarized in the tables and graphs attached, reveal clear trends in how screen exposure affects sleep quality.

Groups:	**$<$ 5 hours**	**5–10 hours**	**$>$ 10 hours**
Sample size	17	32	11
Minimum:	−1.04	2.17	1.35
Q1:	5.845	4.545	3.615
Median:	7.18	5.39	4.79
Q3:	8.325	7.15	7.385
Maximum:	9.45	9.44	8.2
IQR	2.48	2.605	3.77
Mean:	6.6406	5.7788	5.1655

Table 1 Effect of total daily screen time on sleep quality

Table 1 examines the effect of total daily screen time on sleep quality. Participants were divided into three groups: less than 5 hours, 5–10 hours, and more than 10 hours of total screen exposure.

Participants with less than 5 hours of total screen exposure had the highest median SQS (7.18), while those with more than 10 hours reported the lowest median SQS (4.79). Individuals with 5 to 10 hours of screen time demonstrated relatively consistent yet poor SQS. The variability in sleep quality was highest in participants with more than 10 hours of screen time, with an IQR of 3.77, suggesting inconsistent sleep quality among heavy screen users. As further seen in Figure 1, participants with less screen time during the day held much higher SQSs. They also had consistent sleep as seen by the interquartile range demonstrated in the box plot.

Figure 1 portrays the information in Table 1 as a box plot. It exhibits the noticeable change between different screen times visually. The box shows the interquartile range (IQR) and the line through the box is the median score.

Total Exposure	**Median SQS**	**25th to 75th Percentile**
$<$ 5 hours	7.2	5.8 – 8.3
5–10 hours	5.4	4.5 – 7.2
$>$ 10 hours	4.8	3.6 – 7.4

Table 2 Main conclusions from Table 1

Table 2 further proves that median SQS declines as total screen exposure increases. Participants with less than 5 hours of screen time reported better sleep, while those exposed to screens for over 10 hours had poorer sleep quality.

Table 3 categorizes participants based on how soon before bed they stopped using screens: less than 30 minutes, 30–59 minutes, 1–2 hours, and more than 2 hours before bed.

Groups:	< 30 minutes	30–59 minutes	1–2 hours	> 2 hours
Sample size	36	10	9	8
Minimum:	2.17	−1.04	6.45	4.48
Q1:	4.185	4.32	6.93	6.19
Median:	5.02	6.45	7.72	8.33
Q3:	6.425	8.43	8.305	9.18
Maximum:	8.86	8.76	9.45	9.57
IQR	2.24	4.11	1.375	2.99
Mean:	5.285	5.618	7.7011	7.6813

Table 3 Participants categorized by time before bed that screens were stopped

Table 3 determined that participants who used screens less than 30 minutes before bed had a median SQS of 5.02, the lowest among all groups. Those who stopped using screens more than 2 hours before bed reported the highest median SQS of 8.33.

The group that stopped using screens 30–59 minutes before bed had a wider spread in SQSs, as reflected by an interquartile range (IQR) of 4.11, while those who stopped 1–2 hours before bed possessed a more consistent sleep quality (IQR = 1.375). The mean SQS values also reflected this trend, with participants who avoided screens for more than 2 hours before bed having an average SQS of 7.681, while those who used screens within 30 minutes of sleep averaged a significantly lower SQS of 5.285. This highlights the negative effect of screen use immediately before sleep.

As seen in Figure 2, the median line shifts further to the right when screen exposure is limited before bed. Something noted was the increased consistency (lower IQR) between less than 1 hour and more than 1 hour.

Figure 2 displays the information in Table 3 in a boxplot.

Last Exposure before bed	Median SQS	25th to 75th Percentile
< 30 min	5.02	4.2 – 6.4
30–59 min	6.45	4.3 – 8.4
1–2 hours	7.72	6.9 – 8.3
> 2 hours	8.33	6.2 – 9.2

Table 4 Relationship between timing of screen use before bed and SQS

Table 4 shows the relationship between the timing of screen use before bed and SQS. Participants who stopped using screens more than 2 hours before bed had the highest median SQS (8.33), while those who used screens within 30 minutes before bed had the lowest median SQS (5.02). This suggests a strong negative impact of using screens immediately before sleep.

The IQR was wider for participants who stopped using screens 30–59 minutes before bed, indicating greater variability in their sleep quality. In contrast, those who stopped 1–2 hours before bed experienced more consistent sleep outcomes. The comparison of mean and median Sleep Quality Scores across groups indicates some skewness in the data distribution. For example, the group with more than 10 hours of screen exposure shows a lower mean than median, suggesting a left-skewed distribution. Additionally, the broad interquartile range observed in groups such as those stopping screen use 30–59 minutes before bed reflects substantial variability in sleep quality within similar exposure categories. These variations could be influenced by individual differences in sleep sensitivity, lifestyle factors, or differences in the types and contexts of screen usage, but further research is needed to explore these possibilities.

A Pearson correlation analysis showed a statistically significant moderate negative relationship between total screen time and Sleep Quality Score ($r = -0.34$, $p = 0.02$). This indicates that higher screen exposure is moderately associated with poorer sleep quality. However, other factors, such as how close screen use occurs to bedtime, also appear to influence sleep outcomes.

Activity	Median SQS	25% to 75%
Social Media	5.6	4 – 7.8
Watching Movies or TV Shows	6.1	3.5 – 8
Work or Study	7.3	5.5 – 8.8
Video Games	6.8	4.6 – 8.1
Web Surfing	6.1	4.5 – 8.9

Table 5 Data in terms of the activity technology is being used for before bed

Table 5 reveals significant variations in SQS depending on how participants spent their time on a screen before sleep. Social media usage was associated with the lowest median SQS of 5.62, with a wide range from the 25th percentile (4.02) to the 75th percentile (7.81). This suggests that engaging in social media before sleep tends to result in poorer sleep quality for most individuals, although some outliers may experience better rest. Streaming movies or TV shows yielded a slightly higher median SQS of 6.08, with a similar spread between the 25th and 75th percentiles, indicating that this activity may also negatively impact sleep quality, though to a lesser extent than social media.

Work or study-related activities, including reading and watching educational videos, demonstrated a notably higher median SQS of 7.32, with scores ranging from 5.53 to 8.76. This suggests that these activities, particularly those with an educational or intellectual focus, are more conducive to better sleep quality. Video games had a moderate median SQS of 6.78, with the range extending from 4.62 to 8.14, indicating that this activity can result in both good and poor sleep outcomes depending on individual habits. Web surfing and streaming (including internet usage on laptops) exhibited a median SQS of 6.08, comparable to streaming entertainment, suggesting that passive online activities may not contribute to optimal sleep quality, though they do not have as severe an impact as social media.

Discussion

The findings of this study underscore the significant relationship between screen usage habits and sleep quality, highlighting the detrimental effects of excessive screen time and late-night exposure. Participants with less than 5 hours of daily screen time reported the highest median SQS, whereas those exceeding 10 hours exhibited the lowest median SQS. This aligns with existing literature indicating that prolonged screen exposure negatively impacts sleep duration[4], efficiency[5], and overall satisfaction[8]. The results support the hypothesis that reduced screen time can enhance sleep quality, emphasizing the need for public health initiatives aimed at decreasing screen usage, particularly among vulnerable demographics[2].

Importantly, the timing of screen use before bedtime plays a crucial role in sleep quality. Participants who ceased screen activities more than 2 hours prior to sleep exhibited significantly higher median SQS compared to those who stopped within 30 minutes. This finding highlights the necessity of establishing healthy pre-sleep routines that minimize screen exposure, given that the blue light emitted by devices can disrupt melatonin production and impair circadian rhythms[11]. Individuals should be encouraged to limit screen use in the hour or two leading up to bedtime to foster better sleep hygiene.

Additionally, the variability in sleep quality among participants who stopped using screens 30 to 59 minutes before bed suggests a potential divide in the impact of different screen activities. Certain types of content consumed prior to sleep, such as social media versus video games, may have differential effects on cognitive arousal and emotional stimulation. Future research should explore these nuances to clarify which screen activities are most disruptive to sleep and how they might be mitigated.

The results also highlight the influence of various activities on sleep quality, attributed to differing levels of cognitive and emotional arousal before bedtime. Social media usage, associated with the lowest median SQS, may evoke heightened emotional responses or cognitive stress, increasing sympathetic nervous system activation. This can delay sleep onset and disrupt sleep architecture[1], particularly the transition to deep sleep stages[9]. Conversely, work or study-related activities, especially reading or educational videos, engage slower cognitive processes and promote relaxation, leading to higher SQS values. These findings align with the role of pre-sleep cognitive arousal in sleep latency and quality; high-arousal activities can prolong sleep onset and reduce sleep efficiency[5]. Furthermore, passive activities like streaming or web surfing, which yielded moderate SQS outcomes, may induce lower arousal levels than social media but still disrupt melatonin secretion. This supports the hypothesis that not all screen-related activities equally impact sleep quality, with the type of content consumed playing a critical role in its effects on circadian rhythms[11] and sleep patterns.

Although the correlation between screen time and sleep quality was statistically significant, the effect size ($r = -0.34$) suggests only a modest relationship. This indicates that while higher screen time is associated with lower sleep quality, screen time alone does not fully account for variations in sleep outcomes. Other factors such as stress, physical activity, and baseline health habits likely contribute to sleep quality as well. Therefore, these findings should be interpreted with caution, and future research should further explore the interaction of multiple lifestyle variables with sleep.

The findings in Table 5 suggest that the type of screen activity may influence sleep quality in different ways. Social media use was linked to the lowest median SQS, which may be due to the interactive and emotionally stimulating nature of these platforms, often combined with extended engagement late at night. In contrast, activities such as work or study were associated with higher sleep quality scores. One possible explanation is that these tasks, though cognitively demanding, may encourage more structured use and earlier disengagement compared to the prolonged, unstructured patterns common with social media or streaming. Passive activities like watching movies, TV shows, or web surfing fell in between, indicating that while they are less interactive, their extended duration and blue light exposure may still contribute to sleep disruption. These differences highlight the importance of considering not just the amount of screen exposure but also the nature of the activity, which may represent an important direction for future research.

This study reinforces the notion that screen time significantly impacts sleep quality, with both the duration and timing of use playing pivotal roles. These findings have important implications for individuals seeking to improve their sleep hygiene in an increasingly digital world. By raising awareness of the negative effects of late-night screen exposure and advocating for screen-free bedtime routines, stakeholders can help mitigate the adverse consequences of excessive screen usage on sleep quality. Continued exploration of this relationship will be critical in developing targeted interventions addressing the complexities of modern screen habits and their effects on health and well-being.

It is important to note that individuals may vary in their sensitivity to screen exposure and light, and the effects of screen use on sleep quality are unlikely to be uniform. While the study categorized participants by total screen time and activity type, this approach assumes homogeneity within each group. Some individuals may tolerate prolonged screen exposure with minimal disruption, whereas others may be highly sensitive to blue light or cognitive stimulation from screen activities. Future research should explore individual differences, possibly incorporating objective measures such as circadian phase assessments or light sensitivity, to better understand how personal traits interact with screen use to affect sleep quality.

Limitations

While this study offers valuable insights into the relationship between screen use and sleep quality, several limitations should be considered. First, all data was self-reported, which introduces the possibility of bias or inaccuracies in how participants recall and report their screen time or sleep habits. Future research would benefit from using objective sleep-tracking tools, such as wearable devices or sleep apps, to supplement self-assessments and provide more accurate data.

A particular limitation lies in the Sleep Quality Score (SQS) itself. While it was used in this study to bring together various dimensions of sleep into a single interpretable score, it is based entirely on subjective reporting. Key measures like sleep duration, latency, and satisfaction are reliant on personal perception, which can differ from physiological data. Although the SQS includes components such as deep and REM sleep durations, these depend on access to consumer-grade sleep tracking, which may vary in accuracy and consistency across participants. Furthermore, the internal structure of the SQS is not yet empirically validated. The specific influence of each component, for example, whether sleep satisfaction affects the score more than REM duration, is unclear. This lack of standardization means that while the SQS is helpful for identifying broad trends, it does not yet offer the same reliability as clinical tools like actigraphy or polysomnography. Future studies should explore how each component contributes to the overall score and validate the SQS against objective benchmarks.

Second, the cross-sectional nature of the study means it captures a single moment in time. As a result, it cannot determine whether screen use causes changes in sleep quality or simply occurs alongside them. Longitudinal studies are needed to explore how changes in screen habits over time affect sleep patterns.

This study also did not include a control group, which means we cannot definitively say that screen time causes changes in sleep quality. Without a control group to compare against, it is difficult to rule out other factors that might be influencing sleep, such as levels of physical activity, stress, or existing health conditions. These variables could also affect sleep patterns independently of screen use, so future research should consider including control groups or more comprehensive data collection to better isolate the effects of screen time.

This study focused on correlation analyses to explore relationships between variables. Regression modeling was not included due to the exploratory design and sample size limitations. Future research should incorporate regression or multivariate analyses to control for potential confounders and better understand predictive factors.

It should be noted that screen time was self-reported and grouped into broad categories. While this allowed for meaningful comparisons, it does not capture more nuanced effects such as timing of use (e.g., late-night exposure) or type of screen activity. Future work should employ objective measures and finer-grained groupings to better characterize how different patterns of screen use affect sleep quality.

Lastly, participants were recruited through voluntary online platforms like Reddit and Facebook. While these sources provided quick access to a wide range of users, they may have attracted individuals who are already interested in sleep or screen-related issues. This self-selection could lead to a sample that does not fully represent the general population. The study also did not collect data on participants' socioeconomic status, geographic location, or other potentially important background information. Without this context, it is difficult to know how well the findings apply to different groups or settings.

Conclusion

The study found that participants with less daily screen time and those who stopped using screens 1–2 hours before bed had better sleep quality, with those limiting screen time to under five hours reporting the highest SQS. Conversely, using screens within 30 minutes of bedtime was linked to significantly lower SQS. However, the small sample size limits the findings' generalizability, and reliance on self-reported data may introduce bias. Additionally, other potential influences like lifestyle, health, and environmental factors were not controlled, and the online nature of the survey may have skewed results toward individuals with higher screen usage. The findings suggest the need for public health campaigns that raise awareness of the negative impact of screen use, particularly before bedtime, on sleep quality.

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