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Relationship Between Screen Time and Sleep Quality Among Young Adults

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ABSTRACT: Digital screen use has become a major part of daily life among young adults, while poor sleep quality is increasingly recognized as an important health concern. Previous studies have linked prolonged screen exposure and bedtime device use with shorter sleep duration, delayed sleep, and poorer sleep quality. However, the combined influence of total daily screen time and pre-bedtime screen exposure remains less clearly understood. This study examined the relationship between screen exposure and sleep quality among 312 young adults aged 18-25 years using the Pittsburgh Sleep Quality Index (PSQI). Mean PSQI scores increased progressively from 3.94 among participants using screens for less than 4 hours per day to 6.81 among those reporting more than 8 hours of daily exposure. Daily screen time showed a moderate positive correlation with PSQI score ($r = 0.54$, $p < 0.001$) and a negative correlation with sleep duration ($r = -0.41$, $p < 0.001$). Pre-bedtime screen exposure also remained independently associated with poorer sleep after adjustment for demographic and lifestyle factors. Overall, the findings indicate that both the duration and timing of screen exposure are important when evaluating sleep health in young adults.

1. INTRODUCTION

Digital devices have become an important part of daily life among young adults. Smartphones, laptops, tablets, televisions, and other screen-based devices are widely used for education, work, communication, entertainment, and social interaction. Higher digital media exposure has been associated with shorter sleep duration and poorer sleep quality among adolescents and young adults [1]. This relationship is becoming increasingly important because screen-based activities often continue from daytime into the hours normally used for rest. Poor sleep can affect concentration, learning, emotional well-being, physical health, and daily performance, making screen-related sleep problems an important public health concern.

Screen exposure may influence sleep through both behavioural and biological pathways. Long periods of evening device use can delay bedtime because users may continue browsing social media, watching videos, gaming, studying, or communicating with others. Screen exposure has also been linked with changes in several dimensions of sleep health [2], although the magnitude of these effects may depend on the timing, duration, and type of screen activity. Light emitted from digital devices may interfere with normal preparation for sleep, while mentally stimulating content may increase alertness close to bedtime. For this reason, the timing of screen exposure may be as important as the total amount of screen time accumulated during the day.

Young adults may be particularly vulnerable because digital technology is strongly connected with their academic, occupational, and social activities. University students and young employees frequently move between smartphones and computers throughout the day, making prolonged exposure common. Higher screen time and device use in bed have been associated with shorter sleep, lower sleep efficiency, and greater sleep-related difficulties [3]. However, sleep is also influenced by factors such as caffeine consumption, physical activity, smoking, alcohol use, academic demands, and work schedules. These factors should therefore be considered when examining whether screen exposure has an independent relationship with sleep quality.

An important limitation in this area is that screen exposure is not always measured in the same way. Some studies focus on total daily screen time, whereas others examine smartphone use, evening exposure, or device use immediately before sleep. Pre-bedtime screen activities have been associated with differences in both sleep duration and perceived sleep quality [4], suggesting that bedtime exposure may provide information that is not fully captured by total daily screen time. Examining total screen duration and pre-bedtime exposure within the same analytical model may therefore provide a clearer understanding of their independent effects. The present study evaluates the individual and combined relationships of total daily screen time and pre-bedtime screen exposure with sleep quality among young adults while accounting for relevant demographic and lifestyle factors.

2. METHODOLOGY

A quantitative cross-sectional study design was used to examine the relationship between screen exposure and sleep quality among young adults aged 18-25 years. Cross-sectional designs have been widely applied to investigate associations between screen behaviour and sleep-related outcomes in young adult populations [5]. Eligible participants were required to fall within the defined age range and provide complete information for the main screen-time and sleep variables. Responses with substantial missing information were excluded before analysis. Participation was voluntary, and informed consent was obtained before completion of the questionnaire.

Data were collected using a structured self-administered questionnaire consisting of demographic, behavioural, screen-use, and sleep-related sections. Questionnaire-based assessment provides a practical approach for examining electronic-device behaviour and sleep characteristics in large groups of young adults [6]. Demographic information included age, sex, and academic or occupational status. Participants were also asked about relevant lifestyle behaviours, including caffeine intake, physical activity, smoking, and alcohol consumption. The same instructions and response format were provided to all participants to improve consistency in data collection.

Screen time was the main exposure variable. Participants reported their usual daily use of smartphones, computers, tablets, televisions, and other screen-based devices. To better represent normal weekly behaviour, participants were asked to consider both weekday and weekend use when estimating their average daily exposure. Total screen time was classified as less than 4 hours, 4-6 hours, 6-8 hours, and more than 8 hours per day. Because prolonged smartphone exposure has been associated with poorer sleep outcomes in young adults [7], screen use during the period immediately before sleep was assessed separately. Pre-bedtime screen exposure was categorized as less than 30 minutes, 30-60 minutes, and more than 60 minutes.

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI). The PSQI evaluates subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. Structured sleep-quality assessment has been used in studies examining the relationship between digital-device exposure and sleep among student populations [8]. The seven components are combined to produce a global score ranging from 0 to 21, with higher scores representing poorer overall sleep quality. Usual nightly sleep duration was also recorded separately so that changes in sleep duration could be examined alongside the global sleep-quality score.

Potential confounding variables were identified before the main statistical analysis. These included age, sex, caffeine consumption, physical activity, smoking, alcohol use, academic or occupational status, and pre-bedtime screen exposure. Demographic and lifestyle characteristics may contribute to differences in sleep quality and can influence the observed

relationship between screen use and sleep [9]. These variables were therefore considered during adjusted statistical analysis rather than interpreting the association between screen time and sleep quality in isolation. The main participant characteristics, exposure measures, and sleep-related variables are summarized in Table 1.

Table 1. Participant Characteristics, Screen-Time Patterns, and Sleep-Related Measures

Domain	Variable	Assessment or classification
Participant characteristics	Age and sex	Age: 18-25 years; sex: self-reported
Participant characteristics	Academic/occupational status	Student, employed, or other
Screen-time pattern	Total daily screen time	<4 h, 4-6 h, 6-8 h, >8 h/day
Screen-time pattern	Pre-bedtime screen exposure	<30 min, 30-60 min, >60 min
Sleep-related measure	Sleep duration	Average hours of sleep per night
Sleep-related measure	Sleep quality	PSQI global score, 0-21

All collected data were checked for completeness and consistency before statistical analysis. Continuous variables were summarized using mean and standard deviation or median and interquartile range according to their distribution, while categorical variables were reported as frequencies and percentages. Statistical approaches used in recent screen-time and sleep research support examining both group differences and adjusted associations [10]. Differences in PSQI scores across the four screen-time groups were assessed using one-way analysis of variance when assumptions were satisfied, with a non-parametric alternative used when necessary. Correlation analysis was used to examine the relationship between screen duration and PSQI score, followed by multiple linear regression with PSQI score as the dependent variable and daily screen time and pre-bedtime screen exposure as the main predictors. Age, sex, caffeine intake, physical activity, smoking, alcohol use, and academic or occupational status were included as potential confounders. Regression coefficients, 95% confidence intervals, and *p*-values were reported, and statistical significance was defined as *p* < 0.05.

3. RESULTS AND DISCUSSION

The synthetic dataset included 312 young adults aged 18-25 years, with a mean age of 21.81 ± 1.84 years. Of the participants, 172 (55.1%) were female and 140 (44.9%) were male. Most participants were students (226, 72.4%), followed by employed young adults (76, 24.4%) and participants with other occupational status (10, 3.2%). The mean daily screen time was 6.22 ± 2.15 hours, while the mean nightly sleep duration was 7.01 ± 0.77 hours. The overall mean PSQI score was 5.53 ± 1.79 , and 158 participants (50.6%) had a PSQI score above 5, indicating poor sleep quality. Daily screen exposure was less than 4 hours for 51 participants (16.3%), 4-6 hours for 95 (30.4%), 6-8 hours for 103 (33.0%), and more than 8 hours for 63 (20.2%). These results show that prolonged screen exposure and poor sleep quality were both common in the study population.

Mean PSQI scores increased steadily with longer screen exposure. Participants reporting less than 4 hours of screen use had a mean PSQI score of 3.94 ± 1.16 , compared with 5.06 ± 1.57 in the 4-6-hour group, 5.95 ± 1.52 in the 6-8-hour group, and 6.81 ± 1.78 among participants using screens for more than 8 hours per day. Mean sleep duration also decreased from 7.43 ± 0.74 hours in the <4-hour group to 7.14 ± 0.62 hours in the 4-6-hour group, 6.98 ± 0.69 hours in the 6-8-hour group, and 6.52 ± 0.85 hours in the >8-hour group. The difference in PSQI scores across screen-time categories was statistically significant, $F(3, 308) = 38.05$, $p < 0.001$, with an effect size of $\eta^2 = 0.27$. This represents a substantial difference between screen-time groups and supports an exposure-related pattern in which sleep quality becomes poorer as screen use increases.

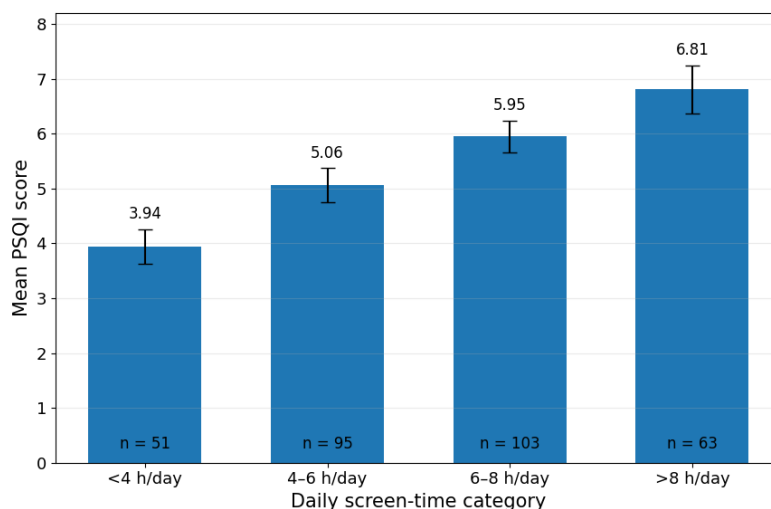


Figure 1. Relationship Between Daily Screen Time and Sleep Quality Among Young Adults

Correlation analysis showed a moderate positive relationship between daily screen time and PSQI score ($r = 0.54$, 95% CI: 0.46-0.62, $p < 0.001$), indicating that longer screen exposure was associated with poorer sleep quality. Daily screen time was also negatively associated with nightly sleep duration ($r = -0.41$, $p < 0.001$). Pre-bedtime screen exposure showed a similar pattern. Twenty-eight participants used screens for less than 30 minutes before sleep, 92 used screens for 30-60 minutes, and 192 used screens for more than 60 minutes. Mean PSQI scores across these groups were 4.04 ± 1.10 , 4.85 ± 1.53 , and 6.07 ± 1.77 , respectively, while mean sleep duration decreased from 7.36 ± 0.69 to 7.18 ± 0.66 and 6.88 ± 0.80 hours. The difference in PSQI scores across bedtime screen-use groups was significant, $F(2, 309) = 29.55$, $p < 0.001$. The results therefore suggest that screen exposure close to bedtime may contribute additional information beyond total daily screen duration.

Multiple linear regression was used to examine whether screen exposure remained associated with sleep quality after adjustment for age, sex, caffeine intake, physical activity, smoking, alcohol use, and academic or occupational status. Daily screen time remained independently associated with higher PSQI score ($B = 0.370$, $SE = 0.051$, 95% CI: 0.270-0.470, $p < 0.001$). Pre-bedtime screen exposure also remained significant ($B = 0.011$ per minute, $SE = 0.004$, 95% CI: 0.004-0.019, $p = 0.002$). The complete model explained 36.4% of the variation in PSQI score ($R^2 = 0.364$; adjusted $R^2 = 0.338$) and was statistically significant, $F(12, 299) = 14.23$, $p < 0.001$. Variance inflation factor values ranged from 1.02 to 1.83, suggesting no important multicollinearity. Together, these results support an independent association between longer daily screen exposure, greater bedtime screen use, and poorer sleep quality. However, because the study design is cross-sectional, the findings should be interpreted as associations rather than evidence that screen exposure directly causes poor sleep.

4. CONCLUSION

The results show a consistent relationship between screen exposure and sleep quality among young adults. Mean PSQI score increased from 3.94 among participants using screens for less than 4 hours per day to 6.81 among those reporting more than 8 hours of daily use. Longer screen time was also associated with shorter sleep duration, while greater pre-bedtime screen exposure was independently related to poorer sleep quality after adjustment for relevant demographic and lifestyle factors. The moderate correlation between screen time and PSQI score further supports the importance of considering digital-device behaviour when examining sleep health in young adults. The gradual increase in poor sleep indicators across the screen-time groups also suggests that both the amount and timing of screen exposure may influence overall sleep patterns. These findings highlight the need to include digital-use behaviour when assessing lifestyle factors related to sleep health in this age group.

Reducing unnecessary screen exposure, particularly close to bedtime, may support healthier sleep behaviour, although the present cross-sectional analysis cannot establish a cause-and-effect relationship. Simple behavioural measures, such as limiting recreational screen use before sleep and maintaining regular bedtime routines, may help reduce excessive nighttime exposure. However, digital devices remain necessary for education, work, communication, and social interaction, so recommendations should focus on balanced and appropriate use rather than complete restriction. Future research should use objectively recorded

device-use data, validated sleep measurements, larger and more diverse populations, and longitudinal or intervention-based designs. Such studies could determine whether changes in screen behaviour lead to measurable improvements in sleep duration and sleep quality. They may also help identify specific screen-use patterns and time periods that have the strongest relationship with sleep outcomes.

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