

Beyond Screen Time: Analyzing the Role of Timing, Purpose and Night Time Digital Habits in the Sleep Routine of College Students.

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Abstract - Digital devices have become a common part of college student's everyday life. Students use smartphones, laptops, and tablets for online classes, assignments, coding, research, communication, social media, and entertainment. Since these devices are used for both useful and distracting activities, looking only at total screen time may not give a complete picture of students' sleep habits. This study focuses on when students use screens, what they use them for, and how much they use them before going to sleep. To understand this better, the study introduces a measure called Bedtime Screen Delay (BSD). It refers to the time gap between a student's normal bedtime and the actual time they stop using a digital device and go to sleep. The study divides screen use into four categories: academic, social, entertainment, and communication. Earlier studies have found a possible connection between high screen use, smartphone dependency, and sleep problems. However, the results are not always the same, and many studies are based on one-time surveys. Therefore, this study does not assume that screen time directly causes poor sleep. Instead, it provides a simple framework that can be tested using real data from college students. The proposed study can be useful for an MCA research project, college presentation, and future research publication.

Keywords: Screen Time, Sleep Routine, Bedtime Screen Delay, Digital Habits, College Students, Smartphone Use, Digital Well-being

1. INTRODUCTION

College students now spend a large part of their daily lives using digital devices. Smartphones, laptops, and tablets are used for many activities such as attending online lectures, finding study materials, completing assignments, programming, research, communication, social media, and entertainment. For MCA students, digital devices are especially important because they are regularly used for coding, software development, documentation, and online teamwork.

Because screens are used for different purposes, simply asking students how many hours they spend on screens may not provide a complete understanding of their habits. For example, five hours spent on coding and online classes

is different from five hours spent mainly on social media or entertainment. Similarly, two students may have the same total screen time but different sleep patterns depending on when they stop using their devices. Therefore, screen use should be studied based on how long, why, and when students use digital devices.

Sleep is also more than just the total number of hours slept. Factors such as bedtime, wake-up time, regularity of sleep, sleep quality, difficulty falling asleep, and tiredness during the day can provide a better understanding of students' sleep routines. A study that measures only sleep duration may therefore miss other important changes in sleeping behaviour.

Recent research supports the need for a more detailed approach. A 2026 systematic review and meta analysis involving 72 studies and 71,633 university students found that higher screen time was associated with poorer sleep quality, although the evidence for sleep duration was less consistent. Another 2026 meta-analysis using within-person data found a small association between increased daily screen use and later sleep onset, while most other sleep measures did not show significant associations.

These findings suggest that screen use should not be treated as a single measure. Instead, timing, purpose, and bedtime-related screen use should also be considered when studying students' sleep routines.

1.1 Problem Statement

College students increasingly depend on digital devices, but many research projects reduce digital exposure to a single number: total hours per day. This can make it difficult to distinguish productive screen use from night-time distraction and may hide the role of bedtime habits. There is a need for a simple, practical framework that can be implemented through a college questionnaire and still capture meaningful differences in digital behaviour.

1.2 Research Gap

The proposed gap is not that screen time and sleep have never been studied. They have been studied extensively.

The gap addressed here is the student-friendly integration of total duration, purpose, timing, bedtime delay and routine regularity in one simple model. The model can be used to examine whether timing and purpose provide useful information beyond total screen hours.

1.3 Significance of the study

The study can be useful to students, teachers and colleges because it converts a general awareness topic into measurable daily behaviours. It can also provide an MCA student with an opportunity to demonstrate questionnaire design, data analysis, visualization and evidence-based interpretation.

1.4 Objectives

- 1) To measure daily digital-screen exposure among college students.
- 2) To separate screen use into academic, social-media, entertainment and communication categories.
- 3) To examine screen use during the hour before bedtime.
- 4) To measure bedtime, wake-up time and sleep duration on weekdays and weekends.
- 5) To introduce and calculate Bedtime Screen Delay (BSD).
- 6) To examine associations between digital-use patterns and reported sleep outcomes.
- 7) To develop practical recommendations based on the collected evidence.

1.5 Research Questions

- RQ1.** Is total daily screen time associated with students' reported sleep routine?
- RQ2.** Does the purpose of screen use provide additional information beyond total screen hours?
- RQ3.** Is frequent screen use shortly before bedtime associated with later sleep onset or greater bedtime delay?
- RQ4.** Is Bedtime Screen Delay associated with morning tiredness or self-reported sleep difficulty?
- RQ5.** Do weekday and weekend digital habits show different patterns?
- RQ6.** How do students describe the role of academic workload and late-night study in their screen and sleep habits?

1.6 Proposed Hypotheses

- H1: Higher total daily screen time will be associated with poorer self-reported sleep outcomes.
- H2: Greater pre-sleep screen use will be associated with later actual sleep time.
- H3: Greater Bedtime Screen Delay will be associated with higher reported morning tiredness.

H4: Non-academic night-time screen use will show a different relationship with sleep outcomes than academic screen use.

2. REVIEW OF LITERATURE

2.1 Screen Time and University Students

Zeng et al. (2026) conducted a systematic review and meta-analysis of screen time among university students. The review included 72 studies with 71,633 students and examined physical, mental-health, sleep and academic outcomes. The authors reported that screen time was associated with sleep-quality deterioration, but the pooled association with sleep duration was not significant. [1] This finding is important for the present study because it suggests that sleep quality and sleep duration should not be combined into a single variable.

2.2 Within-Person Evidence and Sleep Onset

A 2026 systematic review and within-person meta-analysis examined screen use and sleep in young people aged 3–25 years. It found a small but statistically significant association between daily screen use and later sleep onset, while several other sleep outcomes did not show significant associations. [2] For college research, this supports including bedtime and actual sleep-onset timing rather than relying only on total sleep duration.

2.3 Problematic Smartphone Use

A 2023 systematic review of problematic smartphone use among university students included 11 studies and found associations with mental-health outcomes, sleep quality and academic outcomes. However, most included studies were cross-sectional, limiting conclusions about causality. [3] The present study therefore uses the language of association and does not claim that screen use alone causes sleep problems.

2.4 Evidence Among Medical and College Students

A 2023 systematic review and meta-analysis of medical students included 16 studies and 9,466 participants. The pooled evidence reported a relationship between smartphone-addiction measures and poorer sleep quality, as well as an association with sleep duration. [4] Indian studies have also examined smartphone screen time and sleep among medical students, demonstrating the relevance of studying digital habits within the Indian college context. [5][6]

2.5 What the Literature Suggests for This Study

The literature supports three design decisions. First, measure screen time but do not stop there. Second, capture pre-sleep use because timing may matter. Third,

keep causal claims limited because many student studies are observational or cross-sectional. These decisions form the basis of the proposed Beyond Screen Time model.

3. METHODOLOGY

3.1 Research Design

The recommended design is a cross-sectional quantitative survey with a small qualitative component. The quantitative part measures screen exposure and sleep indicators. The optional qualitative question asks students to describe why they use screens at night and what makes it difficult to stop. This mixed approach can provide both numerical patterns and student explanations.

3.2 Target Population

The target population is college students, with an MCA-focused sample being especially suitable for the proposed project. A practical student project may begin with 80–150 respondents depending on access and institutional requirements. The final sample size should be reported exactly and not rounded or invented.

3.3 Sampling

Convenience or purposive sampling may be used for a college-level project when access is limited. If feasible, stratified sampling across academic years can improve representation. The method used should be stated transparently in the final paper.

3.4 Data Collection Instrument

A structured questionnaire can be distributed through Google Forms or an equivalent platform. Participation should be voluntary. The survey should avoid collecting unnecessary identifying information. Questions should use clear time ranges and simple language to reduce recall difficulty.

3.5 Variables

Variables	Type	Example measurement
Total screen time	Independent	Hours/day
Academic screen time	Independent	Hours/day
Non-academic screen time	Independent	Hours/day
Pre-sleep screen use	Independent	None / <15 / 15–30 / 31–60 / >60 min
Bedtime Screen Delay	Derived	Actual sleep time – usual/planned bedtime

Sleep duration	Outcome	Hours/night
Sleep difficulty	Outcome	Never to very often
Morning tiredness	Outcome	Never to very often
Routine regularity	Outcome	Difference/variation in bedtime

4. THE PROPOSED BEDTIME SCREEN DELAY (BSD) INDICATOR

To make the study distinctive, this paper proposes a simple derived measure: **Bedtime Screen Delay (BSD)**. It is intended as a descriptive indicator, not a clinically validated scale.

$$\text{BSD} = \text{Actual Sleep Time} - \text{Usual/Planned Bedtime}$$

Example: If a student normally plans to sleep at 10:30 p.m. but actually goes to sleep at 12:30 a.m., the BSD is 2 hours. If the student does not have a planned bedtime, the questionnaire can use their typical weekday bedtime as the reference.

BSD can be grouped for analysis, for example: 0–30 minutes, 31–60 minutes, 61–120 minutes and more than 120 minutes. The exact categories should be decided before analyzing the final dataset. The measure should not be described as a diagnosis or proof that screens caused the delay.

4.1 Why BSD Adds Value

Total screen time tells researchers how much exposure occurred across the day. BSD focuses on the specific period where digital behaviour may overlap with intended sleep. It therefore provides a simple bridge between a technology-use variable and a sleep-routine variable.

5. DATA ANALYSIS PLAN

Analysis	Method	Purpose
Descriptive statistics	Frequency, percentage, mean, median	Describe student digital and sleep patterns.
Screen-purpose comparison	Compare academic and nonacademic hours	Check whether purpose adds information beyond total time.
Pre-sleep comparison	Compare users vs non-users before bed	Examine timing of screen exposure.
BSD analysis	Mean/median and categories	Describe bedtime delay patterns.
Association testing	Spearman/Pearson as appropriate	Test relationships between

		continuous/ordinal measures.
Group comparison	t-test/Mann-Whitney ANOVA/Kruskal-Wallis as appropriate	Compare sleep outcomes across screen-use groups.

6. RESULTS SECTION

Indicator	Result	Interpretation
Number of respondents	n = 50	Final sample size.
Mean total screen time	6.10 hours/day	Overall exposure.
Mean academic screen time	2.50 hours/day	Academic exposure.
Mean non-academic screen time	3.6 hours/day	Social/entertainment exposure.
Pre-sleep screen users	83.14 %	Night-time screen-use prevalence.
Mean sleep duration	6.46 hours	Reported sleep duration.
Sleep difficulty	57.65 %	Students reporting difficulty falling asleep.
Morning tiredness	67 %	Reported daytime tiredness.

Figure 1: Analysis of Average Daily Screen Time

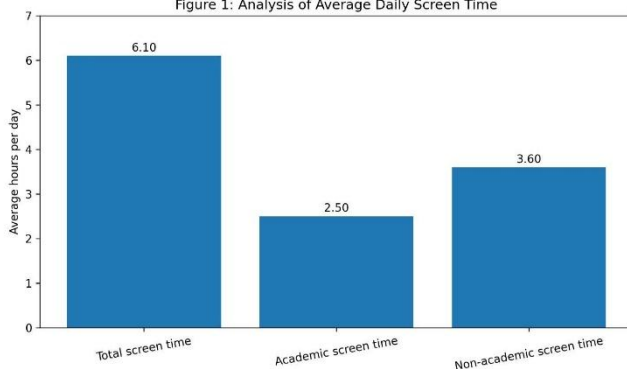
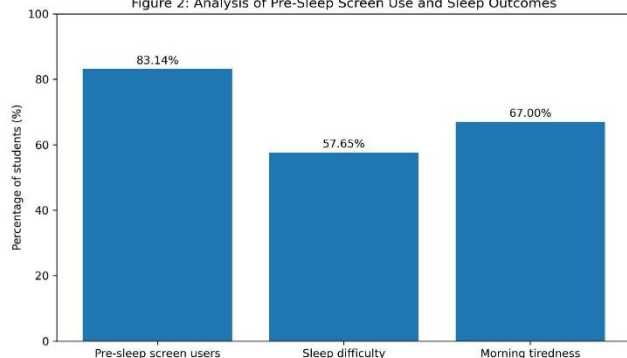


Figure 2: Analysis of Pre-Sleep Screen Use and Sleep Outcomes



7. DISCUSSION FRAMEWORK

The study shows that students spend 6.10 hours/day on screens, with more time on non-academic activities. 83.14% use screens before sleep. Average sleep duration is 6.46 hours, while 57.65% face sleep difficulties and 67% feel tired in the morning.

Overall: High and late-night screen use appears to be associated with poor sleep and daytime tiredness among students.

8. PRACTICAL RECOMMENDATIONS

8.1 For Students

- Track total and night-time screen use for one week.
- Separate necessary academic use from optional entertainment or social use.
- Set a realistic screen cut-off time before the intended bedtime.
- Keep the phone away from immediate reach during sleep when practical.
- Avoid turning a short break into prolonged scrolling after completing academic work.
- Maintain a reasonably consistent bedtime and wake-up time, including weekends.
- During examinations, plan digital study sessions earlier where possible and protect a basic sleep routine.

8.2 For Colleges

Colleges can include digital-well-being education in student orientation and wellness programs. Rather than telling students to “stop using phones,” awareness sessions can teach students how to distinguish necessary academic use from unplanned night-time use, how to review screen-time reports and how to build realistic bedtime routines.

8.3 For Researchers

Future studies should combine self-reported questionnaires with device-generated screen-time logs when ethically and practically possible. Repeated measurements across several weeks would be stronger than a single cross-sectional survey.

9. LIMITATIONS

First, the proposed college study is likely to be cross-sectional, so it cannot establish temporal or causal relationships. Second, self-reported screen time and sleep may contain recall or reporting errors. Third, a convenience sample may not represent all college

students. Fourth, the meaning of “screen time” varies by activity and device. Fifth, sleep is influenced by factors beyond digital behaviour, including academic workload, physical activity, caffeine, environment, stress and individual differences. Finally, the proposed Bedtime Screen Delay is a research indicator introduced for this study and should not be treated as a clinically validated measure until it is formally validated.

10. ETHICAL CONSIDERATIONS

Participation should be voluntary and based on informed consent. The questionnaire should collect only information necessary for the research objective. Names, phone numbers, passwords, private messages and other unnecessary personal data should not be collected. Results should be reported in aggregate form. Participants should be informed that they may stop participation according to the study's consent procedure.

11. FUTURE SCOPE

A future version of the project can develop a lightweight mobile or web application that combines voluntary screen-time data with a short daily sleep diary. A dashboard could calculate screen-purpose patterns, night-time use, Bedtime Screen Delay and routine regularity. Machine-learning models could later be explored to identify behavioural patterns, but any predictive model would require a substantially larger and carefully collected dataset.

12. CONCLUSION

The relationship between digital devices and sleep is more complex than a simple comparison of screen hours and sleep hours. College students use screens for different purposes and at different times. A fivehour academic workload and five hours of late-night entertainment are not equivalent behaviours, and two students with identical daily screen time may have very different bedtime routines.

This paper therefore proposes a Beyond Screen Time framework that combines total screen time, purpose, pre-sleep use, bedtime, routine regularity and a new descriptive indicator called Bedtime Screen Delay. The framework is designed to be simple enough for a college survey while providing richer information than a basic screen-time question. Its findings should be based on real data and interpreted as associations rather than automatic proof of causation. With transparent methodology, appropriate statistics and a clear Indian college context, the project can serve as a strong foundation for a presentation and a future student research publication.

15. REFERENCES

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