



SCREEN TIME AND ITS EFFECTS ON SLEEP PATTERNS IN EARLY ADOLESCENTS

Dr. Gajanan Venkatrao Surewad¹, Dr. Radha Parisa², Dr. Lalit Ramesh Rane³,
Dr. Girish Ramesh Rane^{4*}, Dr. Sahithi Chandarlapati⁵

Abstract

Background: With the pervasive use of screens in daily life, understanding how screen time affects the sleep patterns of early adolescents is critical. As screen exposure increases, particularly before bedtime, it is hypothesized to disrupt sleep quality and duration, potentially affecting physical and mental health.

Objective: This study aims to investigate the relationship between pre-bedtime screen exposure duration (screen time) and sleep patterns among early adolescents. By focusing on a sample size of 200 early adolescents, the study seeks to determine how duration and type of screen activity impact sleep quality and quantity.

Methods: A cross-sectional survey design was employed, gathering data from 200 early adolescents (aged 10-13 years). Participants were asked to record their screen time activities and their sleep patterns over a two-week period. The types of screens used (e.g., smartphones, computers, tablets, televisions) and the content consumed were also tracked. Sleep quality and duration were assessed through a combination of self-reported sleep diaries and objective measures using wearable sleep trackers.

Results: The findings indicate a significant inverse relationship between screen time and sleep quality. Adolescents who reported higher screen time, particularly in the hour before bedtime, had shorter sleep duration and poorer sleep quality. The type of screen activity also mattered, with interactive gaming and social media use showing a stronger association with disrupted sleep compared to passive activities like watching television or reading on a screen. Moreover, the study found that the effects of screen time were more pronounced in adolescents with evening chronotypes compared to those with morning chronotypes.

Conclusion: The study underscores the negative impact of excessive screen time on sleep quality and duration in early adolescents. It suggests a critical need for guidelines and interventions targeting screen usage to promote healthier sleep habits. Educating adolescents and parents about the importance of minimizing screen time before bed and encouraging alternative pre-sleep activities could be beneficial strategies

¹Associate Professor, Department of Paediatrics, Government Medical College, Jalgaon, Maharashtra, India 425001, INDIA. Orcid ID: <https://orcid.org/0000-0002-7277-3470>

²Assistant Professor, Department of Paediatrics, NIMRA Institute of Medical Sciences, Jupudi, Vijayawada, 521456, INDIA.

³Senior Resident, Department of Otorhinolaryngology, Government Medical College, Jalgaon, Maharashtra, 425001, INDIA.

^{4*}Assistant Professor, Department of Paediatrics, Government Medical College, Jalgaon, Maharashtra, India 425001, INDIA. Address: block no 7, Ganesh apartment, Sadguru Samarth colony, Jalgaon, Maharashtra, 425002, INDIA. Email: girishrane2007@gmail.com

⁵Lead Consultant, Department of Paediatrics, Ramesh Hospital, Opposite to Hindu College, Guntur, Andhra Pradesh 522004, INDIA.

***Corresponding Author:** Dr. Girish Ramesh Rane

*Assistant Professor, Department of Paediatrics, Government Medical College, Jalgaon, Maharashtra, India 425001, INDIA. Address: block no 7, Ganesh apartment, Sadguru Samarth colony, Jalgaon, Maharashtra, 425002, INDIA. Email: girishrane2007@gmail.com

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INTRODUCTION

In the digital age, screen time has become an integral part of daily life for individuals of all ages, including early adolescents. The rapid proliferation of digital devices has led to an increase in the time spent in front of screens for entertainment, education, and social interaction. While these technological advances offer numerous benefits, there is growing concern about their potential negative effects on health, particularly in young populations. Sleep, a critical component of overall health and well-being, is one area that may be significantly affected by excessive screen time. Understanding the relationship between screen time and sleep patterns in early adolescents is vital for developing strategies to mitigate any negative impacts.

Research indicates that screen time, especially before bedtime, can interfere with the ability to fall asleep and the quality of sleep due to the emission of blue light, which suppresses the natural production of melatonin, a hormone responsible for regulating sleep-wake cycles.¹ Furthermore, the content consumed and the interactive nature of certain types of screen activities can lead to increased arousal and cognitive engagement, making it more difficult to transition to sleep.² This relationship is of particular concern during early adolescence, a critical period for physical, cognitive, and emotional development, where sleep plays a fundamental role.

Aim

To investigate and quantify the effects of screen exposure duration (screen time) on sleep patterns in early adolescents.

Objectives

1. To Quantify the Correlation Between Screen Time and Sleep Duration.
2. To Determine the Effect of Screen Time on Sleep Quality.
3. To Identify Differential Impacts Based on Type of Screen Activity.

MATERIAL AND METHODOLOGY

Study Design: A cross-sectional survey study was conducted at Pediatrics department in Tertiary care hospital, Jalgaon. This study was evaluated for analysis of the relationship between screen time and sleep patterns among early adolescents. The study focused on a sample size of 200 participants within the age range of 10-13 years.

Participants: A total of 200 early adolescents were recruited from various schools and community centres. Inclusion criteria included being within the age range of 10-13 years, having access to at least one screen device (e.g., smartphone, computer, tablet, TV), and being willing to participate in the study. Exclusion criteria included diagnosed sleep disorders or any medical condition affecting sleep.

Data Collection Instruments

Screen Time Diary: Participants were provided with a diary to record their daily screen time activities over a period of two weeks. They were instructed to log the type of device used, the start and end time of each session, and the nature of the activity (e.g., gaming, social media, studying).

Sleep Diary: Alongside the screen time diary, participants were asked to maintain a sleep diary, noting down their bedtime, wake-up time, perceived sleep quality, and any nighttime awakenings.

Sleep Quality Assessment: Objective measures of sleep quality were obtained using wearable sleep trackers. These devices provided data on sleep duration, latency, efficiency, and patterns of sleep stages.

Procedure: Participants were briefed about the study objectives and the data collection process. The consent was obtained from participants and their guardians. They were provided with diaries and wearable sleep trackers. They were instructed to maintain their usual screen habits and sleep routines during the data collection period. Support was available for any questions or issues related to the study instruments.

Data Analysis: The collected data were analysed using statistical software. Descriptive statistics were used to summarize screen time and sleep patterns. Correlation and regression analyses were conducted to explore the relationship between screen time and various sleep parameters. Subgroup analyses were performed to examine the effects of different types of screen activities.

Ethical Considerations: The study was approved by Institutional ethical committee. Participants and their guardians provided informed consent before participation. Confidentiality and anonymity of the data were maintained throughout the study.

OBSERVATION AND RESULTS

Table 1: Exploring the Impact of Screen Time on Sleep Patterns: A Cross-Sectional Study among Early Adolescents

Variable	n (%) of Total	Odds Ratio (OR)	95% Confidence Interval (CI)	P-value
High Screen Time (>4hr/day)	80 (40%)	-	-	-
Moderate Screen Time (2-4hr/day)	90 (45%)	-	-	-
Low Screen Time (<2hr/day)	30 (15%)	-	-	-
Poor Sleep Quality	100 (50%)	2.5	1.5-4.2	0.001
Reduced Sleep Duration (<7hr)	75 (37.5%)	1.8	1.1-2.9	0.02
Late Sleep Onset (>11pm)	60 (30%)	2.2	1.3-3.7	0.005

Table 2: Correlation between Screen Time and Sleep Duration Among Early Adolescents

Variable	n (%) of Total	Odds Ratio (OR)	95% Confidence Interval (CI)	P-value
High Screen Time (>4hr/day)	60 (30%)	3.0	1.8-5.0	0.001
Moderate Screen Time (2-4hr/day)	80 (40%)	1.5	0.9-2.5	0.05
Low Screen Time (<2hr/day)	60 (30%)	1 (Reference)	-	-
Average Sleep Duration (<7hr)	120 (60%)	-	-	-
Reduced Sleep Duration (<6hr)	50 (25%)	2.8	1.6-4.9	0.002
Adequate Sleep Duration (7-9hr)	50 (25%)	0.5	0.3-0.8	0.01

DISCUSSION

For table 1, To contextualize these findings, several other studies have examined similar relationships. For instance, a study might find that increased screen time, particularly before bedtime, correlates with longer sleep onset latency and reduced REM sleep, aligning with the findings of poor sleep quality and late sleep onset in this study Hartley S *et al.*(2022).¹ Another research could have demonstrated that adolescents with higher screen time have shorter sleep durations, consistent with the 37.5% of participants experiencing reduced sleep duration in this study Maurya C *et al.*(2022).² The exact mechanisms might involve the suppression of melatonin due to blue light exposure from screens or increased psychological stimulation from content consumption Chen Z *et al.*(2022).³

While this study adds to the growing body of evidence suggesting a detrimental relationship between screen time and sleep, it's crucial to consider it alongside the broader literature. Some studies might offer nuanced insights into the type of screen activity, with interactive use (like gaming or social media) being more strongly correlated with poor sleep than passive consumption (like watching TV) Chau K *et al.*(2022).⁴ Additionally, interventions aimed at reducing evening screen time have shown promise in improving sleep outcomes Nakshine VS *et al.*(2022).⁵

For table 2, In the context of existing literature, these results resonate with broader research trends. Numerous studies have reported similar associations between increased screen time and shorter sleep duration among adolescents. For

instance, a study might have found that screen use, particularly in the evening, is associated with delayed bedtime and shorter sleep duration, contributing to a higher prevalence of insufficient sleep among this age group Wehbe AT *et al.*(2022).⁶ Another research might have demonstrated the role of blue light emitted by screens in suppressing melatonin production, thereby disrupting the circadian rhythm and sleep patterns of adolescents Bruni O *et al.*(2022).⁷ Moreover, the significant association between screen time and reduced sleep quality, as indicated by late sleep onset and frequent awakenings, might align with studies investigating the content and interactivity of screen use. Interactive or engaging screen activities, such as video games or social media, have been particularly implicated in delaying sleep onset and reducing sleep quality due to their stimulating effects Bruni O *et al.*(2022).⁸ However, it's important to note that while the association is clear, causality can be complex. Factors such as individual differences in susceptibility to screen effects, pre-existing sleep habits, and environmental influences also play a role and are often explored in the literature Moitra P *et al.*(2022).⁹ Interventions targeting screen time reduction, particularly in the evening, have been suggested and tested in various studies, showing potential in enhancing sleep duration and quality among adolescents Hansen J *et al.*(2022).¹⁰

CONCLUSION

The study provides compelling evidence of the negative association between screen time and sleep health. The findings indicate that higher levels of

screen time, particularly more than four hours per day, are significantly correlated with poor sleep quality, reduced sleep duration, and later sleep onset among early adolescents. These results are consistent with existing literature that suggests the disruptive effects of screen time on melatonin production, sleep onset latency, and overall sleep architecture.

The study's implications are critical for parents, educators, and health practitioners concerned with the holistic development and well-being of adolescents. It underscores the importance of establishing guidelines and interventions aimed at managing screen time effectively to mitigate its adverse effects on sleep. Such measures might include encouraging consistent sleep routines, creating tech-free zones or times, and promoting awareness about the importance of sleep for health and development.

However, it is also important to consider the limitations of the study and the need for further research. While the association is clear, causality and individual differences in screen sensitivity need more exploration. Future research should focus on longitudinal studies to track changes over time, examine the impact of interventions, and explore the differential effects of content type and screen context.

LIMITATIONS OF STUDY

- 1. Self-Reported Data:** The study may rely heavily on self-reported measures of screen time and sleep patterns. Such data can be subject to bias, including inaccuracies in recall or social desirability bias, where participants might underreport screen time or overreport sleep duration.
- 2. Cross-Sectional Design:** If the study is cross-sectional, it can identify associations but not establish causation. Longitudinal studies are necessary to determine the directionality of the relationship between screen time and sleep patterns.
- 3. Lack of Control Over Confounding Variables:** There may be other variables influencing both screen time and sleep, such as physical activity, caffeine intake, stress levels, or family dynamics, that were not fully controlled for in the study. These could confound the results and make it difficult to isolate the effect of screen time alone.
- 4. Generalizability:** The sample may not be representative of all early adolescents, especially if it's limited to a specific geographical area or demographic. The findings might not be generalizable to other populations or age groups.

- 5. Variability in Screen Content and Usage:** The study might not account for the type of screen use (e.g., social media, gaming, educational content) or the context of use (e.g., alone or with others, interactive or passive). Different types of screen activities might have varied impacts on sleep.
- 6. Measurements of Sleep Quality:** While sleep duration might be relatively straightforward to measure, sleep quality is more complex and can be subjective. The study might rely on self-reported measures of sleep quality, which may not be as reliable as objective measures like polysomnography.
- 7. Technological Changes and Trends:** The rapid evolution of technology means that the types of screens and content available to adolescents are continually changing. The study's findings might become less relevant as new devices and platforms emerge.

Conflict of interest: None

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