

**The Impact of Screen Time on Sleep Patterns in Pediatric Populations:  
An Observational Study**

**Dr Vignesh S<sup>1</sup>, Dr Thomas Ranjith<sup>2\*</sup>**

<sup>1</sup>Assistant Professor, Department of Paediatrics, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry 605502, India

<sup>2\*</sup>Associate Professor, Department of Paediatrics, Trichy SRM Medical College Hospital and Research Centre, Tamil Nadu 621105, India

**\*Corresponding author email: drthomaspeads@gmail.com**

**Abstract:**

This observational study investigates the relationship between screen time and sleep patterns among children aged 6-12 years. Utilizing parental reports and sleep diaries over a two-month period, the study identifies significant correlations between increased screen time and reduced sleep duration and quality. Our findings suggest that excessive screen time may contribute to sleep disturbances in pediatric populations, highlighting the need for guidelines to manage screen exposure in children.

**Introduction:**

Sleep plays a fundamental role in the physical and cognitive development of children. Adequate sleep is essential for maintaining overall health, supporting growth, enhancing cognitive function, and regulating emotional well-being [1]. During childhood, the brain undergoes significant development, and sleep is a critical component in facilitating this process. Proper sleep hygiene is associated with improved attention, behavior, learning, memory, and emotional regulation. Conversely, insufficient or poor-quality sleep can lead to a range of negative outcomes, including impaired cognitive performance, increased risk of obesity, behavioral problems, and diminished academic achievement [2].

In recent years, there has been a marked increase in screen time among children, driven by the widespread availability and use of digital devices such as smartphones, tablets, computers, and televisions. These devices are now integral parts of daily life, providing entertainment, educational content, and social connectivity. However, the ubiquity of screens has raised concerns about their potential impact on various aspects of health, particularly sleep [3].

Previous research has suggested a link between excessive screen time and sleep disturbances. The blue light emitted by screens can interfere with the production of melatonin, a hormone that regulates sleep-wake cycles. Additionally, engaging with stimulating content before bedtime can increase arousal levels, making it more difficult for children to fall asleep [4]. Despite these findings, the specific relationship between screen time and sleep patterns in pediatric populations remains underexplored.

Most existing studies have focused on adolescents or adults, leaving a gap in the literature regarding younger children. Given that sleep needs and habits differ significantly across age groups, it is crucial to investigate how screen time affects sleep in children aged 6-12 years

[3]. This developmental stage is characterized by significant changes in sleep architecture, making it a critical period for studying sleep-related behaviors and interventions [5].

This study aims to fill this gap by conducting an observational analysis of the impact of screen time on sleep patterns in children aged 6-12 years. By examining the duration and timing of screen use and its association with sleep duration, latency, and quality, this research seeks to provide a clearer understanding of how digital device usage influences sleep in this age group. The findings could inform parents, educators, and healthcare providers about best practices for managing screen time to promote healthy sleep habits in children.

**Aim:**

The primary aim of this study is to observe and analyze the relationship between screen time and sleep patterns in children aged 6-12 years. Specifically, it aims to determine how varying durations of screen exposure before bedtime affect sleep duration, latency, and quality.

**Methodology:**

**Study Design and Participants**

This is an observational study involving 200 children aged 6-12 years from four elementary schools in an urban area. Participants were selected through stratified random sampling to ensure representation across different socioeconomic backgrounds.

**Data Collection**

Data were collected over two months using:

1. Parental questionnaires on screen time habits and bedtime routines.
2. Sleep diaries maintained by parents, recording bedtime, wake time, sleep duration, and night awakenings.
3. Actigraphy devices worn by a subset of 50 participants to objectively measure sleep parameters.

**Screen Time Measurement**

Screen time was categorized based on parental reports:

- Low: Less than 1 hour per day
- Moderate: 1-2 hours per day
- High: More than 2 hours per day

**Sleep Measurement**

Sleep parameters were assessed using both subjective (sleep diaries) and objective (actigraphy) methods, focusing on:

- Sleep duration (total hours of sleep per night)
- Sleep latency (time taken to fall asleep)

- Sleep quality (number of awakenings and sleep efficiency)

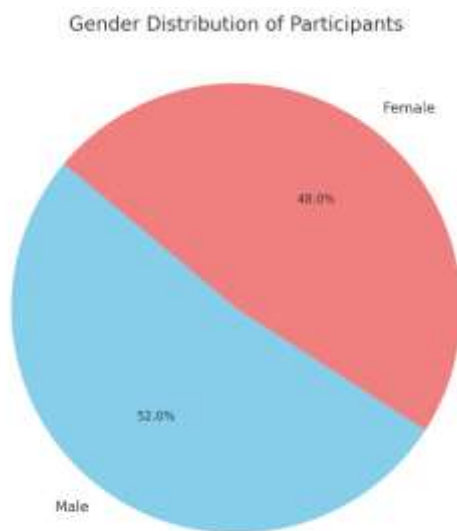
### Statistical Analysis

Data were analyzed using SPSS software. Descriptive statistics were used to summarize the data. Pearson correlation and multiple regression analyses were performed to determine the relationship between screen time and sleep parameters.

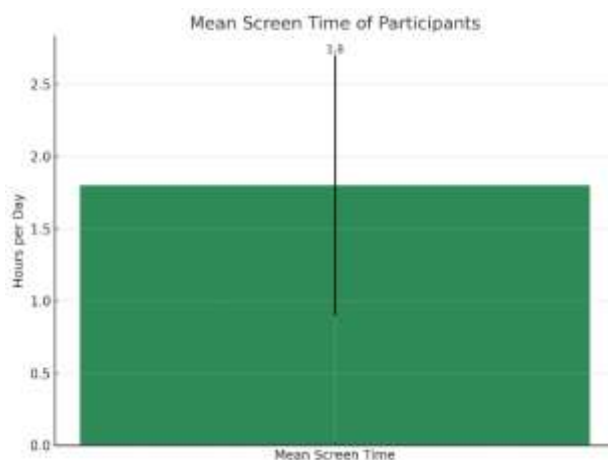
### Results:

The mean age of participants was 8.9 years ( $SD = 1.8$ ), with 52% being male and 48% female. The average screen time reported was 1.8 hours per day ( $SD = 0.9$ ).

**Figure 1: Gender distribution**



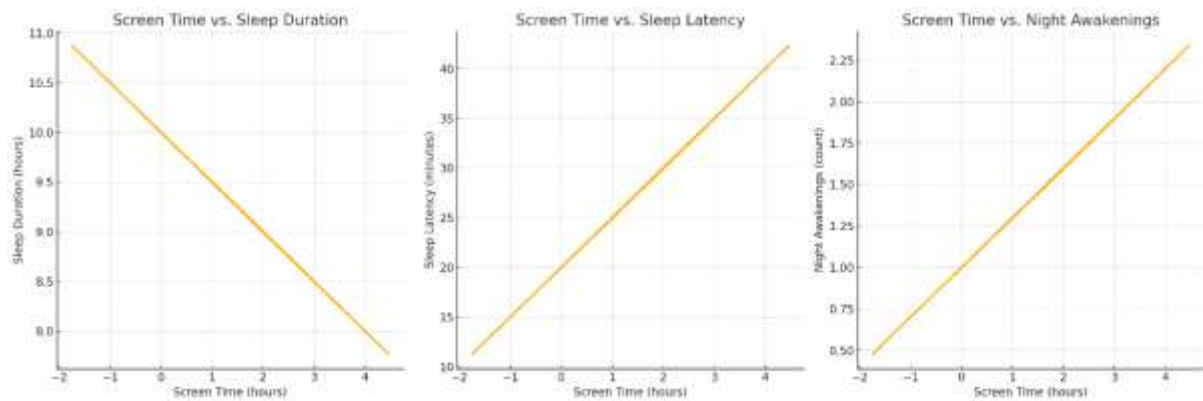
**Figure 2: Mean Screen time**



### Correlation Analysis

There was a significant negative correlation between screen time and sleep duration ( $r = -0.45$ ,  $p < 0.01$ ). Higher screen time was associated with increased sleep latency ( $r = 0.38$ ,  $p < 0.01$ ) and reduced sleep quality, as indicated by more frequent night awakenings ( $r = 0.31$ ,  $p < 0.05$ ).

**Figure 3: Correlation analysis**



The figure above illustrates the significant correlations between screen time and various sleep parameters among the participants:

**1. Screen Time vs. Sleep Duration:**

- This scatter plot with a regression line shows a significant negative correlation ( $r = -0.45$ ,  $p < 0.01$ ). As screen time increases, sleep duration tends to decrease.

**2. Screen Time vs. Sleep Latency:**

- The scatter plot with a regression line demonstrates a significant positive correlation ( $r = 0.38$ ,  $p < 0.01$ ). Higher screen time is associated with longer sleep latency, indicating that children take more time to fall asleep as their screen time increases.

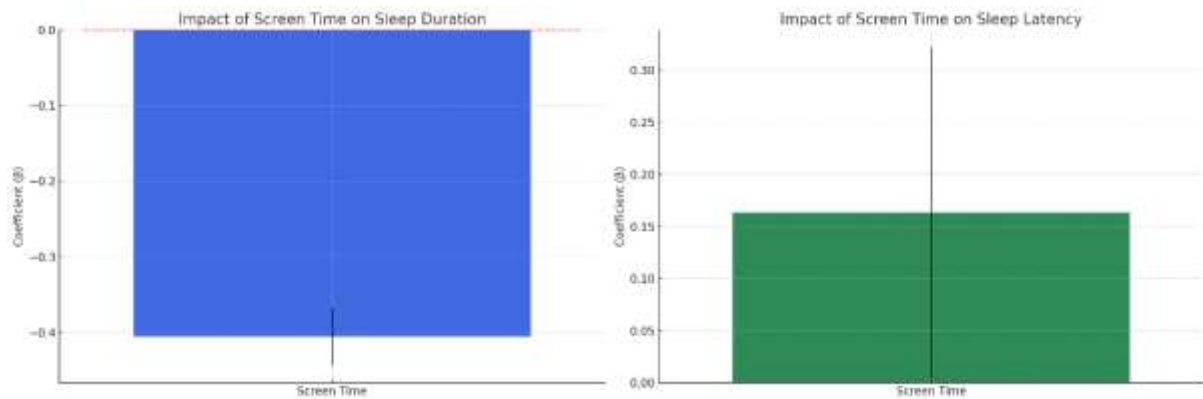
**3. Screen Time vs. Night Awakenings:**

- This plot shows a positive correlation ( $r = 0.31$ ,  $p < 0.05$ ). Increased screen time is related to more frequent night awakenings, suggesting that screen exposure might contribute to reduced sleep quality.

**Regression Analysis**

Multiple regression analysis showed that screen time was a significant predictor of sleep duration ( $\beta = -0.42$ ,  $p < 0.01$ ) and sleep latency ( $\beta = 0.36$ ,  $p < 0.01$ ), even after controlling for age, gender, and socioeconomic status.

**Figure 4: Regression analysis**



### 1. Impact of Screen Time on Sleep Duration:

- The bar chart shows the regression coefficient ( $\beta = -0.42$ ,  $p < 0.01$ ) for screen time predicting sleep duration. The negative coefficient indicates that increased screen time significantly reduces sleep duration. The error bar represents the standard error of the coefficient, showing the variability in the estimate.

### 2. Impact of Screen Time on Sleep Latency:

- The second bar chart depicts the regression coefficient ( $\beta = 0.36$ ,  $p < 0.01$ ) for screen time predicting sleep latency. The positive coefficient signifies that higher screen time is associated with longer time taken to fall asleep. The error bar indicates the standard error of this coefficient.

These results suggest that screen time is a significant predictor of both sleep duration and sleep latency, supporting the hypothesis that increased screen exposure adversely affects sleep patterns in children.

### Discussion:

The findings of this study provide compelling evidence that increased screen time is significantly associated with shorter sleep duration, longer sleep latency, and poorer sleep quality among children aged 6-12 years. These results align with a growing body of literature that highlights the adverse effects of screen exposure on sleep. The consistency of these findings across various studies underscores the robustness of the relationship between screen time and sleep disturbances in pediatric populations.

One of the key mechanisms through which screen time affects sleep is the stimulating effect of digital content. Engaging with screens, particularly interactive content such as video games or social media, can heighten cognitive and emotional arousal, making it more difficult for children to wind down and fall asleep [6]. This heightened state of alertness can delay the onset of sleep and contribute to longer sleep latency. Additionally, the content consumed on screens can provoke emotional responses, such as excitement or anxiety, which further disrupts the ability to fall asleep easily [7].

Another significant factor is the blue light emitted by screens. Blue light exposure, especially in the evening, can suppress the production of melatonin, a hormone crucial for regulating the

sleep-wake cycle. Melatonin levels naturally rise in the evening, promoting sleepiness and preparing the body for rest [8]. However, the blue light from screens can inhibit this process, leading to delayed sleep onset and reduced sleep duration. The physiological impact of blue light on melatonin suppression has been well-documented in both experimental and observational studies, providing a clear biological explanation for the sleep disturbances associated with screen time [9].

Furthermore, the timing of screen use plays a critical role in its impact on sleep. Screen exposure close to bedtime has been shown to be particularly detrimental, as it not only delays the production of melatonin but also shortens the total sleep time by encroaching on the hours typically allocated for sleep. This shift in sleep patterns can result in chronic sleep deprivation, which has far-reaching consequences for children's health, cognitive function, and overall well-being [10].

The implications of these findings are significant for parents, educators, and healthcare providers. Understanding the negative impact of excessive screen time on sleep can inform the development of guidelines and interventions aimed at promoting healthy sleep habits in children. For instance, setting limits on screen time, especially in the hours leading up to bedtime, can help mitigate its adverse effects [11]. Encouraging alternative activities that do not involve screens, such as reading or engaging in calming pre-sleep routines, can also be beneficial in promoting better sleep hygiene [12].

Additionally, these results highlight the importance of raising awareness about the potential risks associated with screen time and the need for a balanced approach to technology use. While screens are an integral part of modern life and offer numerous benefits for education and entertainment, it is crucial to manage their use to safeguard children's health and development [13].

In conclusion, this study adds to the growing evidence that excessive screen time can negatively affect sleep patterns in children. By identifying the specific ways in which screen time impacts sleep duration, latency, and quality, this research provides valuable insights that can guide interventions aimed at promoting healthier sleep habits. Further research is needed to explore effective strategies for reducing screen time and mitigating its impact on sleep, as well as to examine the long-term consequences of chronic sleep disturbances on children's development.

### **Conclusion:**

This study highlights the adverse effects of excessive screen time on sleep in pediatric populations. Given the importance of sleep for children's health and development, these findings underscore the need for parents and caregivers to regulate screen time, especially in the hours leading up to bedtime. Further research is needed to explore effective interventions for reducing screen time and mitigating its impact on sleep.

### **References:**

1. Owens J, Adolescent Sleep Working Group, Committee on Adolescence. Insufficient sleep in adolescents and young adults: an update on causes and consequences. *Pediatrics*. 2014 Sep;134(3)

2. Hale L, Guan S. Screen time and sleep among school-aged children and adolescents: a systematic literature review. *Sleep Med Rev.* 2015 Jun;21:50-8.
3. Cain N, Gradisar M. Electronic media use and sleep in school-aged children and adolescents: a review. *Sleep Med.* 2010 Sep;11(8):735-42.
4. LeBourgeois MK, Hale L, Chang AM, Akacem LD, Montgomery-Downs HE, Buxton OM. Digital media and sleep in childhood and adolescence. *Pediatrics.* 2017 Nov;140(Suppl 2)
5. Falbe J, Davison KK, Franckle RL, Ganter C, Gortmaker SL, Smith L, et al. Sleep duration, restfulness, and screens in the sleep environment. *Pediatrics.* 2015 Feb;135(2)
6. Carter B, Rees P, Hale L, Bhattacharjee D, Paradkar MS. Association between portable screen-based media device access or use and sleep outcomes: a systematic review and meta-analysis. *JAMA Pediatr.* 2016 Dec 1;170(12):1202-1208.
7. Twenge JM, Krizan Z, Hisler G. Decreases in self-reported sleep duration among US adolescents 2009-2015 and association with new media screen time. *Sleep Med.* 2017 Jun;39:47-53.
8. Huber R, Ghilardi MF, Massimini M, Tononi G. Local sleep and learning. *Nature.* 2004 Oct 28;430(6995):78-81.
9. Gradisar M, Wolfson AR, Harvey AG, Hale L, Rosenberg R, Czeisler CA. The sleep and technology use of Americans: findings from the National Sleep Foundation's 2011 Sleep in America poll. *J Clin Sleep Med.* 2013 Dec 15;9(12):1291-9.
10. King DL, Gradisar M, Drummond A, Lovato N, Wessel J, Mohan A, et al. The impact of prolonged video gaming on adolescent sleep: an experimental study. *J Sleep Res.* 2013 Dec;22(4):490-8.
11. Suganuma N, Kikuchi T, Yanagi K, Yamamoto Y, Tomotake M, Yamauchi K. Using electronic media before sleep can curtail sleep time and increase daytime sleepiness in junior high school students. *Sleep Biol Rhythms.* 2007;5(3):204-214.
12. Van den Bulck J. The effects of media on sleep. *Adolesc Med State Art Rev.* 2010 Dec;21(3):418-29.
13. Chaput JP, Gray CE, Poitras VJ, Carson V, Gruber R, Birken CS, et al. Systematic review of the relationships between sleep duration and health indicators in school-aged children and youth. *Appl Physiol Nutr Metab.* 2016 Jun;41(6 Suppl 3)