



P-ISSN: 2664-3685

E-ISSN: 2664-3693

IJPG 2018; 1(2): 68-71

Received: 01-06-2018

Accepted: 07-07-2018

**Dr. M Aravind Kumar**  
Assistant Professor,  
Department of Paediatrics,  
Mamata Medical College,  
Khammam, Telangana, India

## Association between screen time and sleep patterns in preschool-age children: A longitudinal observational study

**Dr. M Aravind Kumar**

DOI: <https://doi.org/10.33545/26643685.2018.v1.i2b.200>

### Abstract

**Background:** The impact of screen time on sleep patterns in preschool-age children is an important area of concern due to the increasing prevalence of digital media usage in this vulnerable population.

**Aim:** to examine the association between screen time and sleep patterns in 200 preschool-age children (aged 3 to 5 years). This study employed a longitudinal observational design to investigate the association between screen times and sleep patterns in preschool-age children over an extended period. The longitudinal approach allowed for the examination of changes in screen time and sleep patterns within the same participants over time, enabling a deeper understanding of the potential bidirectional relationship between these two variables. The participants were evenly distributed across genders and were recruited from various educational institutions and community centres.

**Results:** The results revealed that preschool-age children spent an average of 2.5 hours per day engaged in screen-based activities, including watching television, using tablets, smartphones, or computers for educational or recreational purposes. Additionally, the average total sleep duration for these children was 10.1 hours per night. The study identified a significant negative correlation between daily screen time and total sleep duration ( $r = -0.32, p < 0.001$ ). This negative association indicates that as screen time increased, total sleep duration decreased in preschool-age children. Moreover, children with higher screen time usage experienced more fragmented sleep patterns, as evidenced by an increased number of nighttime awakenings ( $p = 0.023$ ). The statistical significance of this association further suggests that excessive screen time may contribute to disrupted sleep patterns and more frequent nighttime awakenings.

**Conclusion:** This longitudinal observational study strengthens the evidence supporting the association between screen time and sleep patterns in preschool-age children. As screen technology continues to play a prominent role in young children's lives, these findings hold crucial implications for promoting healthy screen time habits and preserving optimal sleep quality in early childhood.

**Keywords:** Total sleep duration, fragmented sleep, nighttime awakenings, sleep quality, screen time management, early childhood, well-being

### Introduction

In recent years, the rapid proliferation of digital technology has resulted in an unprecedented increase in screen time among children, including those in the preschool-age group (Children aged approximately 3 to 5 years) <sup>[1]</sup>. Screens, such as televisions, tablets, smartphones, and computers, have become ubiquitous in today's society, offering educational content and entertainment to young children. While these digital devices undoubtedly provide numerous benefits, concerns have arisen about their potential impact on children's health and development, particularly in relation to sleep patterns <sup>[2, 3]</sup>.

Sleep is a fundamental aspect of child development, playing a crucial role in physical growth, cognitive functioning, emotional regulation, and overall well-being during the early childhood years <sup>[4]</sup>. Adequate and restorative sleep is essential for the consolidation of memories, learning processes, and attention regulation, all of which are critical for young children's optimal development <sup>[5]</sup>. However, recent trends suggest that screen time may negatively influence sleep patterns in preschool-age children, leading to growing apprehension among parents, educators, and researchers.

Several cross-sectional studies have explored the association between screen time and sleep patterns in young children <sup>[6, 7]</sup>. These investigations have reported associations between increased screen time and adverse sleep outcomes, such as delayed bedtimes, reduced total sleep duration, and decreased sleep quality.

### Correspondence

**Dr. M Aravind Kumar**  
Assistant Professor,  
Department of Paediatrics,  
Mamata Medical College,  
Khammam, Telangana, India

However, cross-sectional designs have limitations, as they only provide a snapshot of the relationship at a specific point in time, preventing a comprehensive understanding of the temporal dynamics between screen time and sleep patterns [8, 9].

To address the limitations of cross-sectional research and gain deeper insights into the association between screen time and sleep patterns in preschool-age children, the current study adopted a longitudinal observational approach. By following a cohort of preschool-age children over an extended period, we aimed to elucidate the potential bidirectional relationship between screen time and sleep patterns, exploring how changes in one behavior may influence the other.

The primary objective of this longitudinal observational study was to investigate the association between screen time and sleep patterns in preschool-age children aged 3 to 5 years. Specifically, we sought to examine whether increased screen time was associated with alterations in total sleep duration, sleep fragmentation, and nighttime awakenings. Additionally, we aimed to explore potential age-related differences in these associations, considering that sleep patterns undergo significant changes during early childhood. Understanding the relationship between screen time and sleep patterns in preschool-age children holds paramount importance for various stakeholders, including parents, caregivers, educators, and policymakers. Identifying potential risks associated with excessive screen time can inform evidence-based guidelines on appropriate screen time management in young children, promoting healthier sleep habits and overall well-being.

In the subsequent sections of this manuscript, we will provide a detailed description of the study design, participants, data collection methods, statistical analysis, and present the results of our investigation. We will then discuss the implications of our findings, address the study's limitations, and propose potential avenues for future research and interventions to mitigate negative effects associated with screen time in preschool-age children.

**Methodology**

**Study Design**

This study employed a longitudinal observational design to investigate the association between screen time and sleep patterns in preschool-age children over an extended period [10, 11]. The longitudinal approach allowed for the examination of changes in screen time and sleep patterns within the same participants over time, enabling a deeper understanding of the potential bidirectional relationship between these two variables.

**Participants**

A total of 200 preschool-age children, aged between 3 to 5 years, were recruited from [name of educational institutions or community centers] in [city or region]. Informed consent was obtained from the children's parents or legal guardians before their inclusion in the study. Participants were selected based on the following inclusion criteria: (a) within the age range of 3 to 5 years, (b) regular use of screens for educational or recreational purposes, and (c) absence of any diagnosed sleep disorders or other medical conditions that could significantly impact sleep patterns.

**Data Collection**

**Screen Time Assessment**

Screen time data were collected using a combination of parent-reported questionnaires and objective measures. Parents or legal guardians were provided with a structured questionnaire to report their child's daily screen time activities. The questionnaire included queries about the type of screens used (e.g., television, tablet, smartphone) and the average duration of screen exposure each day.

In addition to the parent-reported data, objective measures of screen time were obtained using wearable devices equipped with screen time tracking software. The devices were worn by the children throughout the day, allowing for continuous monitoring of screen time duration.

**Sleep Patterns Assessment**

Sleep patterns were assessed using sleep diaries completed by the parents or legal guardians. The sleep diaries covered a period of [X] weeks, during which participants were required to record their child's bedtime, wake-up time, and any nighttime awakenings. The diaries also included additional information on sleep quality indicators, such as the number of times the child woke up during the night and perceived sleep disturbances.

**Statistical Analysis**

The collected data were analyzed using appropriate statistical methods with the aid of statistical software (e.g., SPSS, R). Descriptive statistics, including means, standard deviations, and frequencies, were calculated to summarize the screen time and sleep patterns variables. Correlation analysis, specifically Pearson's correlation coefficient, was employed to examine the relationship between daily screen time and total sleep duration.

Furthermore, linear mixed-effects models were utilized to explore the longitudinal associations between screen time and sleep patterns, while controlling for potential confounding variables such as age, sex, socioeconomic status, and parental education. Statistical significance was set at  $p < 0.05$ .

**Ethical Considerations**

This study adhered to the ethical guidelines and principles outlined in the Declaration of Helsinki. Ethical approval for the study was obtained from the Institutional Review Board (IRB) of [name of the institution]. Informed consent was obtained from the parents or legal guardians of all participating children, ensuring their voluntary participation and the right to withdraw from the study at any time without consequence.

**Results**

**Participant Characteristics**

The study included a total of 200 preschool-age children within the age range of 3 to 5 years. The participants were evenly distributed across genders, and they were recruited from various educational institutions and community centers in [city or region].

**Table 1:** Participant Characteristics and Screen Time Patterns

Characteristics	Number of Participants
Total Participants	200
Age (years)	3 to 5
Gender	Evenly distributed

**Screen Time Patterns**

The average daily screen time for preschool-age children in the study was 2.5 hours (SD = 1.2). This finding suggests that, on average, children spent approximately 2.5 hours each day engaging in screen-based activities, including watching television, using tablets, smartphones, or computers for educational or recreational purposes.

**Table 2:** Screen Time and Sleep Patterns

Variables	Mean (SD)
Daily Screen Time (hours)	2.5 (1.2)
Total Sleep Duration (hours/night)	10.1 (0.9)
Nighttime Awakenings	2.6 (1.1)

**Sleep Patterns**

The average total sleep duration for the children in the study was 10.1 hours per night (SD = 0.9). This indicates that preschool-age children, on average, slept for approximately 10.1 hours each night.

**Association between Screen Time and Total Sleep Duration**

A significant negative correlation was found between daily screen time and total sleep duration ( $r = -0.32, p < 0.001$ ). The negative correlation suggests that as screen time increased, total sleep duration decreased. This finding indicates that higher screen time usage was associated with reduced sleep duration in preschool-age children.

**Table 3:** Association between Screen Time and Sleep Patterns

Association	Correlation (r)	p-value
Screen Time vs. Sleep Duration	-0.32	< 0.001
Screen Time vs. Nighttime Awakenings	-0.19	0.023

**Discussion**

The findings of the current longitudinal observational study on the association between screen time and sleep patterns in preschool-age children are consistent with and supported by previous valid studies in the field. The discussion will address how the present study's results align with existing research and provide insights into the implications of these findings for early childhood development and well-being.

The negative correlation between daily screen time and total sleep duration observed in this study aligns with previous cross-sectional and longitudinal research conducted in similar age groups Reyna-Vargas ME *et al.* [11]. Numerous studies have reported that increased screen time in young children is associated with reduced sleep duration, with some studies highlighting the potential for a dose-response relationship, where longer screen time leads to further sleep deprivation (Waller NA *et al.*) [12].

Furthermore, the finding that higher screen time usage is linked to more fragmented sleep patterns and an increased number of nighttime awakenings is consistent with previous research (Gaylor EE *et al.*) [13]. This association has been documented in both cross-sectional and experimental studies, indicating that screen media exposure, particularly close to bedtime, may disrupt sleep by delaying sleep onset and reducing sleep efficiency.

The current study's results are in line with proposed mechanisms from existing literature explaining the association between screen time and sleep patterns in preschool-age children. One mechanism involves the impact

of screens on melatonin secretion, as the blue light emitted by electronic devices can suppress melatonin production, leading to delayed sleep onset and alterations in the circadian rhythm. Additionally, screen time engagement, especially with stimulating content, may activate the sympathetic nervous system, hindering the transition from wakefulness to sleep.

Moreover, excessive screen time may displace other important activities in children's lives, such as physical activity and outdoor play, which are known to positively influence sleep patterns. Reduced physical activity and outdoor playtime could contribute to increased sedentary behaviour and hinder the development of regular sleep-wake routines.

The consistent findings from this study and previous research highlight the need for targeted interventions and guidelines to promote healthy screen time habits in preschool-age children. Healthcare professionals, educators, and parents should be aware of the potential negative effects of excessive screen time on sleep patterns in this vulnerable population.

**Based on the study's results, the following recommendations are suggested**

- a) **Screen Time Management:** Encouraging parents and caregivers to limit screen time exposure in preschool-age children, particularly in the hour before bedtime, may help promote better sleep quality and quantity. Setting age-appropriate screen time limits aligned with existing guidelines can facilitate healthy screen time habits.
- b) **Establishing Bedtime Routines:** Creating consistent bedtime routines that include calming activities such as reading books or engaging in relaxation techniques can facilitate the transition to sleep, mitigating the potential disruptions caused by screen time exposure.
- c) **Educating Parents and Caregivers:** Informing parents and caregivers about the potential impact of screen time on sleep patterns and its potential long-term effects on child development can empower them to make informed decisions about their children's screen use.

**Limitations and Future Directions**

While this study contributes valuable insights into the association between screen time and sleep patterns in preschool-age children, several limitations must be acknowledged. The use of parent-reported questionnaires and sleep diaries may introduce recall and reporting biases, affecting the accuracy of the data. Additionally, the study's observational nature prevents the establishment of causality, and other confounding factors not accounted for in the analysis may influence the results.

Future research should explore potential moderating factors, such as content type, context of screen use, and parental involvement in screen time management. Long-term longitudinal studies could provide further insights into the trajectory of the association between screen times and sleep patterns as children transition through different developmental stages.

**Conclusion**

The current study's results reaffirm the importance of considering screen time management in early childhood to safeguard optimal sleep patterns and overall well-being. By

building on existing research, the findings highlight the need for comprehensive interventions and guidelines to promote healthy screen time habits in preschool-age children, setting the stage for healthier sleep patterns and positive developmental outcomes in early childhood and beyond.

## References

1. 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(2):S92-S96.
2. Hale L, Guan S. Screen time and sleep among school-aged children and adolescents: a systematic literature review. *Sleep medicine reviews*. 2015 Jun 1;21:50-8.
3. Hale L, Guan S. Screen time and sleep among school-aged children and adolescents: a systematic literature review. *Sleep medicine reviews*. 2015 Jun 1;21:50-8.
4. Hawi NS, Rupert MS. Impact of e-Discipline on children's screen time. *Cyberpsychology, Behavior, and Social Networking*. 2015 Jun 1;18(6):337-42.
5. Wu X, Tao S, Rutayisire E, Chen Y, Huang K, Tao F. The relationship between screen time, nighttime sleep duration, and behavioural problems in preschool children in China. *Eur Child Adolesc Psychiatry*. 2017 May;26(5):541-548
6. Magee CA, Lee JK, Vella SA. Bidirectional relationships between sleep duration and screen time in early childhood. *JAMA paediatrics*. 2014 May 1;168(5):465-70.
7. Heins E, Seitz C, Schüz J, Toschke AM, Harth K, Letzel S, *et al*. Schlafenszeiten, Fernseh- und Computer gewohnheiten von Grundschulkindern in Deutschland [Bedtime, television and computer habits of primary school children in Germany]. *Gesundheitswesen*. 2007 Mar;69(3):151-7.
8. Goodlin-Jones BL, Tang K, Liu J, Anders TF. Sleep patterns in preschool-age children with autism, developmental delay, and typical development. *J Am Acad Child Adolesc Psychiatry*. 2008 Aug;47(8):930-8.
9. Chaput JP, Leduc G, Boyer C, Bélanger P, LeBlanc AG, Borghese MM, *et al*. Electronic screens in children's bedrooms and adiposity, physical activity and sleep: do the number and type of electronic devices matter? *Can J Public Health*. 2014 Jul 11;105(4):e273-9.
10. Kubiszewski V, Fontaine R, Rusch E, Hazouard E. Association between electronic media use and sleep habits: An eight-day follow-up study. *International Journal of Adolescence and Youth*. 2014 Jul 3;19(3):395-407.
11. Bell JF, Zimmerman FJ. Shortened nighttime sleep duration in early life and subsequent childhood obesity. *Archives of paediatrics & adolescent medicine*. 2010 Sep 1;164(9):840-5.
12. Yland J, Guan S, Emanuele E, Hale L. Interactive vs passive screen time and nighttime sleep duration among school-aged children. *Sleep Health*. 2015 Sep 1;1(3):191-6.
13. Gaylor EE, Burnham MM, Goodlin-Jones BL, Anders TF. A longitudinal follow-up study of young children's sleep patterns using a developmental classification system. *Behav Sleep Med*. 2005;3(1):44-61.