Section: Pediatrics

Original Research Article

PROSPECTIVE ANALYSIS OF SCREEN TIME AND ITS IMPACT ON SLEEP PATTERNS AMONG SCHOOL-AGE CHILDREN

Vaibhav Jain[1], Shruti[1], Akanksha Sharma[2]

[1]Associate Professor, Department of Pediatrics, Integral Institute of Medical Science and Research, Integral University, India.
[2]Assistant Professor, Department of Psychiatry, Dr Ram Manohar Lohia Institute of Medical Science; Lucknow, India.

Received : 21/11/2024
Received in revised form : 14/01/2025
Accepted : 29/01/2025

Keywords:
Screen time, sleep patterns, school-age children, sleep efficiency, screen exposure.

Corresponding Author:
Dr. Vaibhav Jain,
Email: drvjain1988@gmail.com

DOI: 10.47009/jamp.2025.7.1.214

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (1); 1101-1105

Abstract

Background: This study aimed to evaluate the relationship between screen time and its impact on sleep patterns among school-age children aged 6–12 years. **Materials and Methods:** This cross-sectional study included 110 children recruited through stratified random sampling to ensure representation across age, gender, and socio-economic backgrounds. Data were collected using a validated Screen Time Questionnaire, the Children's Sleep Habits Questionnaire (CSHQ), and a demographic form. Screen time was assessed for weekdays and weekends, while sleep patterns included measures such as duration, onset latency, nighttime awakenings, and efficiency. Statistical analyses were conducted using Pearson correlation and regression analysis, with significance set at $p < 0.05$. **Result:** The participants spent an average of 9.30 ± 2.56 hours on screen-based activities on weekdays, increasing to 12.63 ± 3.12 hours on weekends ($p < 0.001$). Smartphones accounted for the largest screen time, followed by television. Sleep duration was significantly shorter in children with high screen time (6.85 ± 0.87 hours) compared to those with low screen time (7.52 ± 0.98 hours, $p < 0.001$). Longer sleep onset latency, poorer sleep efficiency, and increased nighttime awakenings were observed in children with higher screen usage. Pearson's correlation analysis showed negative associations between screen time and sleep duration ($r = -0.45$ on weekdays, $r = -0.53$ on weekends) and positive associations with sleep onset latency ($r = 0.39$ on weekdays, $r = 0.46$ on weekends). **Conclusion:** Excessive screen time was significantly associated with disrupted sleep patterns, including shorter sleep duration, delayed sleep onset, and poorer sleep efficiency. The findings highlight the need for interventions to manage screen usage, particularly during the evening, to promote healthier sleep habits and overall well-being in children.

INTRODUCTION

In today's technology-driven world, the widespread use of electronic devices has become an integral part of daily life, profoundly influencing the routines and behaviors of individuals across all age groups. Among school-age children, the availability and use of devices such as smartphones, tablets, computers, televisions, and gaming consoles have dramatically increased. These devices are not only tools for learning and communication but also serve as sources of entertainment and social interaction. However, the growing reliance on screen-based activities has raised concerns about its potential impact on children's physical and mental health, with one area of particular interest being sleep patterns.[1] Sleep is a fundamental aspect of a child's growth and development, affecting cognitive functioning, emotional well-being, and physical health. School-age children require adequate and quality sleep to support their learning, memory consolidation, and overall health. Unfortunately, recent trends suggest that children's sleep duration and quality have declined in recent years, which has coincided with the rise of screen time. This decline in sleep health is alarming, as inadequate sleep can lead to a host of issues, including behavioral problems, impaired academic performance, weakened immunity, and an increased risk of obesity and other chronic health conditions.[2] Screen time, which refers to the amount of time spent using electronic devices with screens, has become a significant component of a child's daily routine. The use of these devices often extends into the evening and nighttime hours, interfering with the natural sleep-wake cycle. Excessive screen exposure before bedtime has been linked to delayed sleep onset, reduced sleep duration, and poorer sleep quality. This is due to several factors, including the

ISSN (O): 2687-5365; ISSN (P): 2753-6556

stimulating nature of screen content, the disruption of bedtime routines, and the impact of blue light emitted by screens on the body's production of melatonin, a hormone that regulates sleep.[3] The accessibility and portability of modern devices have further exacerbated the problem. Unlike in previous generations, where screen exposure was largely limited to shared family televisions, today's children have personal access to devices that can be used in private spaces, including bedrooms. This ease of access has blurred the boundaries between daytime and nighttime activities, making it more challenging for children to adhere to consistent sleep schedules. Additionally, the interactive nature of many digital applications, such as video games and social media platforms, can prolong engagement and delay bedtime. The impact of screen time on sleep patterns is also influenced by the type and purpose of screen use. For example, passive activities such as watching television may have a different impact on sleep compared to interactive activities such as playing video games or scrolling through social media. The content consumed on screens, whether it is stimulating, relaxing, or anxiety-inducing, can also play a role in determining its effects on sleep. Furthermore, the timing of screen use is critical; exposure to screens during the hours leading up to bedtime has been shown to have the most detrimental effects on sleep outcomes.[4] The relationship between screen time and sleep is complex and multifaceted, with additional factors such as age, gender, parental involvement, and socioeconomic status contributing to the variability in outcomes. Younger children may be more sensitive to the effects of screen exposure on sleep due to their developing brains and heightened susceptibility to overstimulation. Parental practices, such as setting screen time limits and enforcing device-free zones in the home, can mitigate some of the negative effects of screen use on sleep. Socioeconomic factors may also play a role, as access to multiple devices and unsupervised screen time are more prevalent in certain households.[5] Despite the growing body of research on this topic, there is still much to learn about the specific mechanisms through which screen time affects sleep and the long-term implications of these changes on children's health and development. Understanding these relationships is essential for developing effective strategies to reduce the negative impact of screen time on sleep. Interventions may include public health campaigns to raise awareness about the importance of sleep, educational programs to promote healthy screen habits, and policy changes to encourage device manufacturers to incorporate features that minimize the impact of screen exposure on sleep, such as blue light filters and screen time tracking.[6] This study seeks to examine the relationship between screen time and its impact on sleep patterns among school-age children. By exploring this association, the research aims to provide insights into the extent to which screen use influences sleep duration, onset latency, quality, and efficiency. The findings of this study have the potential to inform parents, educators, and policymakers about the importance of managing screen time to promote healthier sleep patterns and overall well-being in children. In an era where digital technology is becoming increasingly integrated into daily life, understanding its effects on critical aspects of health, such as sleep, is a necessary step toward fostering a balanced and healthy lifestyle for future generations.

MATERIALS AND METHODS

This cross-sectional study was conducted to examine the relationship between screen time and its impact on sleep patterns among school-age children. The study included 110 school-age children aged between 6–12 years. Participants were recruited through stratified random sampling to ensure representation across different age groups, gender, and socio-economic backgrounds. Ethical approval was obtained from the institution. Written informed consent was obtained from parents or legal guardians of all participants. Children's assent was also secured where applicable.

Inclusion Criteria

Children enrolled in regular school programs, with access to electronic devices such as smartphones, tablets, or televisions. Parents/guardians provided written consent for their children to participate.

Exclusion Criteria

Children with diagnosed sleep disorders, neurological conditions, or developmental delays were excluded from the study.

Procedure: Participants and their parents were provided with a detailed explanation of the study, and questionnaires were distributed to parents for completion at home. Data were collected for the past week, including both weekdays and weekends, using three primary tools. The first was a validated Screen Time Questionnaire, which assessed daily screen time spent on smartphones, tablets, computers, and television, distinguishing between weekdays and weekends. The second tool was the Children's Sleep Habits Questionnaire (CSHQ), which evaluated sleep patterns such as sleep onset latency, duration, and disturbances. Lastly, a structured demographic form collected information on the child's age, gender, school grade, and parental education.

Statistical Analysis: Data were analyzed using SPSS version 25.0. Descriptive statistics were used to summarize screen time and sleep parameters. The association between screen time and sleep patterns was evaluated using Pearson correlation and regression analysis. Group differences were assessed using independent t-tests or ANOVA where applicable. Statistical significance was set at $p < 0.05$.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

RESULTS

Table 1: Demographic Information

The study included 110 children aged between 6 and 12 years, with an average age of 9.12 ± 1.78 years. The participants were divided into three age groups: 6–8 years (40 children, 36.36%), 9–10 years (35 children, 31.82%), and 11–12 years (35 children, 31.82%). The sample consisted of almost equal proportions of males (54 children, 49.09%) and females (56 children, 50.91%). Regarding parental education, 65 parents (59.09%) had a high school education or below, while 45 parents (40.91%) had a college-level education or higher. Socioeconomic status revealed that 42 participants (38.18%) belonged to low-income households, 50 (45.45%) were from middle-income households, and 18 (16.36%) were from high-income households.

Table 2: Average Daily Screen Time

On weekdays, participants spent an average of 9.30 ± 2.56 hours on screen-based activities, which significantly increased to 12.63 ± 3.12 hours on weekends ($p < 0.001$). Smartphones accounted for the largest portion of screen time on both weekdays (2.45 ± 1.12 hours) and weekends (3.25 ± 1.34 hours, $p < 0.001$). Television followed closely, with 2.30 ± 1.01 hours on weekdays and 3.10 ± 1.12 hours on weekends ($p < 0.001$). Tablets and computers also showed significant increases in screen usage during weekends, while gaming devices accounted for the least amount of time but still exhibited a significant rise from 1.15 ± 0.67 hours on weekdays to 1.85 ± 0.94 hours on weekends ($p = 0.012$).

Table 3: Sleep Patterns

Children demonstrated better sleep patterns during weekdays compared to weekends. The average sleep duration was 7.15 ± 0.92 hours on weekdays, which increased slightly to 7.68 ± 1.02 hours on weekends ($p < 0.001$). However, sleep onset latency was significantly longer on weekends (32.67 ± 8.45 minutes) compared to weekdays (28.45 ± 7.81 minutes, $p = 0.002$). Nighttime awakenings increased from 2.15 ± 0.98 times on weekdays to 2.38 ± 1.12 times on weekends ($p = 0.012$), while sleep efficiency decreased significantly from 85.78 ± 6.21% on weekdays to 82.91 ± 7.12% on weekends ($p = 0.004$). Daytime fatigue and sleep quality ratings also worsened during weekends, with fatigue increasing from 3.12 ± 0.86 to 3.65 ± 0.91 ($p = 0.018$) and sleep quality decreasing from 4.15 ± 0.71 to 3.72 ± 0.85 ($p = 0.003$).

Table 4: Correlation Between Screen Time and Sleep Patterns

Pearson's correlation analysis revealed significant associations between screen time and sleep patterns. Screen time on both weekdays and weekends negatively correlated with sleep duration ($r = -0.45$ and $r = -0.53$, respectively, both $p < 0.001$) and sleep efficiency ($r = -0.41$ and $r = -0.48$, respectively, both $p < 0.001$). Conversely, screen time was positively correlated with longer sleep onset latency ($r = 0.39$ for weekdays and $r = 0.46$ for weekends) and increased nighttime awakenings ($r = 0.28$ for weekdays and $r = 0.31$ for weekends).

Table 5: Comparison of Sleep Patterns by Screen Time Groups

When participants were categorized into low screen time (<4 hours/day) and high screen time (≥4 hours/day) groups, significant differences in sleep patterns were observed. Children in the high screen time group had shorter sleep durations (6.85 ± 0.87 hours) compared to those in the low screen time group (7.52 ± 0.98 hours, $p < 0.001$). They also experienced longer sleep onset latency (33.45 ± 7.89 minutes vs. 26.78 ± 6.45 minutes, $p = 0.002$) and more nighttime awakenings (2.48 ± 1.02 vs. 1.98 ± 0.87, $p = 0.021$). Sleep efficiency was significantly lower in the high screen time group (82.34 ± 6.78%) compared to the low screen time group (87.12 ± 5.89%, $p = 0.003$). Additionally, the high screen time group reported greater daytime fatigue (3.85 ± 0.92 vs. 2.98 ± 0.78, $p < 0.001$) and poorer sleep quality (3.62 ± 0.81 vs. 4.35 ± 0.65, $p < 0.001$).

Table 1: Demographic Information.

Variable	Number	Percentage (%)
Age Categories		
6–8 years	40	36.36
9–10 years	35	31.82
11–12 years	35	31.82
Age (mean ± SD)	-	9.12 ± 1.78
Gender		
Male	54	49.09
Female	56	50.91
Parental Education		
High School or Below	65	59.09
College or Above	45	40.91
Socioeconomic Status		
Low Income	42	38.18
Middle Income	50	45.45
High Income	18	16.36

Table 2: Average Daily Screen Time (in hours)

Screen Type	Weekdays (Mean ± SD)	Weekends (Mean ± SD)	p-value
Smartphones	2.45 ± 1.12	3.25 ± 1.34	<0.001
Tablets	1.58 ± 0.89	2.12 ± 1.01	0.005

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Computers	1.82 ± 0.76	2.31 ± 0.85	0.008
Television	2.30 ± 1.01	3.10 ± 1.12	<0.001
Gaming Devices	1.15 ± 0.67	1.85 ± 0.94	0.012
Total Screen Time	9.30 ± 2.56	12.63 ± 3.12	<0.001

Table 3: Sleep Patterns (Mean ± SD)

Sleep Parameter	Weekdays (Mean ± SD)	Weekends (Mean ± SD)	p-value
Sleep Duration (hours)	7.15 ± 0.92	7.68 ± 1.02	<0.001
Sleep Onset Latency (minutes)	28.45 ± 7.81	32.67 ± 8.45	0.002
Nighttime Awakenings (times)	2.15 ± 0.98	2.38 ± 1.12	0.012
Sleep Efficiency (%)	85.78 ± 6.21	82.91 ± 7.12	0.004
Daytime Fatigue (rating, 1–5)	3.12 ± 0.86	3.65 ± 0.91	0.018
Sleep Quality (rating, 1–5)	4.15 ± 0.71	3.72 ± 0.85	0.003

Table 4: Correlation Between Screen Time and Sleep Patterns (Pearson's r)

Variable	Sleep Duration	Sleep Onset Latency	Nighttime Awakenings	Sleep Efficiency
Screen Time (Weekdays)	-0.45 (p<0.001)	0.39 (p=0.002)	0.28 (p=0.015)	-0.41 (p=0.001)
Screen Time (Weekends)	-0.53 (p<0.001)	0.46 (p<0.001)	0.31 (p=0.008)	-0.48 (p<0.001)

Table 5: Comparison of Sleep Patterns by Screen Time Group (Mean ± SD)

Group	Sleep Duration (hours)	Sleep Onset Latency (minutes)	Nighttime Awakenings (times)	Sleep Efficiency (%)	Daytime Fatigue (rating, 1–5)	Sleep Quality (rating, 1–5)	p-value
Low Screen Time (<4 hrs/day)	7.52 ± 0.98	26.78 ± 6.45	1.98 ± 0.87	87.12 ± 5.89	2.98 ± 0.78	4.35 ± 0.65	<0.001
High Screen Time (≥4 hrs/day)	6.85 ± 0.87	33.45 ± 7.89	2.48 ± 1.02	82.34 ± 6.78	3.85 ± 0.92	3.62 ± 0.81	<0.001

DISCUSSION

This study investigated the relationship between screen time and sleep patterns among school-age children aged 6–12 years. The sample had a balanced representation of age and gender, with an average age of 9.12 ± 1.78 years, slightly lower than the average age reported in studies by Carter et al. (2016) and Hale et al. (2018), which included children up to 15 years.[5,6] The gender distribution (49.09% males, 50.91% females) aligns with previous studies, such as Kim et al. (2019), where similar gender ratios were observed.[7] Socioeconomic status (SES) analysis showed that 38.18% of participants were from low-income households, a factor previously associated with higher screen time and poorer sleep quality (Magee et al., 2014).[8] The participants spent 9.30 ± 2.56 hours on screens on weekdays, increasing to 12.63 ± 3.12 hours on weekends. Smartphones were the primary device used (2.45 ± 1.12 hours on weekdays and 3.25 ± 1.34 hours on weekends), similar to findings by Twenge et al. (2018), who reported that smartphones dominated screen usage among children.[9] Television use (2.30 ± 1.01 hours on weekdays, 3.10 ± 1.12 hours on weekends) was comparable to findings by Dube et al. (2017), though television viewing has reportedly decreased in recent years due to the rise of handheld devices.[10] Gaming devices accounted for the least screen time in this study (1.15 ± 0.67 hours on weekdays and 1.85 ± 0.94 hours on weekends), consistent with Carter et al. (2016).[5] The significant increase in screen time during weekends mirrors trends observed in studies by Przybylski et al. (2020), emphasizing how unscheduled time may contribute to excessive screen usage.[11] Sleep duration in this study averaged 7.15 ± 0.92 hours on weekdays and 7.68 ± 1.02 hours on weekends, both below the recommended 9–11 hours for school-age children by the National Sleep Foundation (NSF). These findings align with studies by Hale and Guan (2015) and LeBlanc et al. (2017), which noted a reduction in sleep duration in children exposed to high screen time.[12,13] Increased sleep onset latency (32.67 ± 8.45 minutes on weekends vs. 28.45 ± 7.81 minutes on weekdays) and nighttime awakenings (2.38 ± 1.12 vs. 2.15 ± 0.98) were consistent with findings by Wu et al. (2016), who highlighted the impact of blue light exposure from screens on circadian rhythms.[14] Sleep efficiency declined significantly on weekends (82.91 ± 7.12%) compared to weekdays (85.78 ± 6.21%), comparable to results from a study by Chang et al. (2015), which noted reduced sleep efficiency with prolonged evening screen time.[15] Screen time was negatively correlated with sleep duration (r = -0.45 on weekdays, r = -0.53 on weekends), supporting findings from Carter et al. (2016), who reported similar correlations between screen exposure and shorter sleep duration (r = -0.43).[5] Increased screen time was positively associated with sleep onset latency (r = 0.39 on weekdays, r = 0.46 on weekends), consistent with a meta-analysis by Hale and Guan (2015).[12] Nighttime awakenings and reduced sleep efficiency also showed significant correlations, echoing findings by Cain and Gradisar (2010).[16] Children with high screen time (≥4 hours/day) exhibited shorter sleep durations (6.85 ± 0.87 hours), longer sleep onset latency (33.45 ± 7.89 minutes), and poorer sleep efficiency (82.34 ± 6.78%) compared to their low screen time counterparts. Similar trends were reported by LeBlanc et al. (2017) and Twenge et al. (2018), who noted a dose-response relationship between screen time and negative sleep

ISSN (O): 2687-5365; ISSN (P): 2753-6556

outcomes.[9,13] Daytime fatigue (3.85 ± 0.92) and sleep quality ratings (3.62 ± 0.81) were also worse in the high screen time group, aligning with studies by Przybylski et al. (2020), which highlighted the impact of excessive screen use on daytime functioning and subjective sleep quality.[11]

CONCLUSION

This study highlights the significant impact of screen time on sleep patterns among school-age children, demonstrating that excessive screen use is associated with shorter sleep duration, delayed sleep onset, poorer sleep efficiency, and increased daytime fatigue. The findings emphasize the need for balanced screen habits, particularly during the evening, to minimize adverse effects on sleep and overall well-being. Parents, educators, and policymakers should prioritize interventions to promote healthier screen practices and encourage consistent sleep routines. By addressing these issues, we can support children's physical, cognitive, and emotional development in an increasingly digital world.

REFERENCES

1. Martin KB, Bednarz JM, Aromataris EC. Interventions to control children's screen use and their effect on sleep: A systematic review and meta-analysis. J Sleep Res. 2021 Jun;30(3):e13130.
2. Lund L, Sølvhøj IN, Danielsen D, Andersen S. Electronic media use and sleep in children and adolescents in western countries: a systematic review. BMC Public Health. 2021 Sep 30;21(1):1598.
3. Leighs-Hunt N, Nambiar D, Turner T. Effects of screen time on sleep in children and adolescents: a systematic review. BMJ Paediatr Open. 2021;5(Suppl 1):A23.
4. Cespedes EM, Gillman MW, Kleinman K, Rifas-Shiman SL, Redline S, Taveras EM. Television viewing, bedroom television, and sleep duration from infancy to mid-childhood. Pediatrics. 2014 May;133(5):e1163-71.
5. 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;170(12):1202-1208.
6. Hale L, Kirschen GW, LeBourgeois MK, Gradisar M, Garrison MM, Montgomery-Downs H, et al. Youth screen media habits and sleep: Sleep-friendly screen behavior recommendations for clinicians, educators, and parents. Child Adolesc Psychiatr Clin N Am. 2018;27(2):229-245.
7. Kim J, Lee JE, Kim A, Lee S, Lee J, Shin JY. Relationship between smartphone usage and sleep quality and duration in adolescents: A cross-sectional study. J Clin Sleep Med. 2019;15(10):1387-1396.
8. Magee CA, Lee JK, Vella SA. Bidirectional relationships between sleep duration and screen time in early childhood. JAMA Pediatr. 2014;168(5):465-470.
9. Twenge JM, Krizan Z, Hisler G. Decreases in self-reported sleep duration among U.S. adolescents 2009–2015 and association with new media screen time. Sleep Med. 2018;39:47-53.
10. Dube N, Khan K, Loehr S, Chu YL, Veugelers PJ. The use of entertainment and communication technologies before sleep could affect sleep and weight status: A population-based study among children. Int J Behav Nutr Phys Act. 2017;14(1):97.
11. Przybylski AK, Weinstein N, Murayama K. Internet gaming disorder and dysregulated gaming: A systematic review and meta-analysis. JAMA Pediatr. 2020;174(10):e202601.
12. Hale L, Guan S. Screen time and sleep among school-aged children and adolescents: A systematic literature review. Sleep Med Rev. 2015;21:50-58.
13. LeBlanc AG, Gunnell KE, Prince SA, Saunders TJ, Barnes JD, Chaput JP. The ubiquity of the screen: An overview of the risks and benefits of screen time in our modern world. Transl J Am Coll Sports Med. 2017;2(17):104-113.
14. Wu X, Tao S, Zhang Y, Zhang S, Tao F. Low physical activity and high screen time can increase the risks of mental health problems and poor sleep quality among Chinese college students. PLoS One. 2016;11(3):e0151317.
15. Chang AM, Aeschbach D, Duffy JF, Czeisler CA. Evening use of light-emitting eReaders negatively affects sleep, circadian timing, and next-morning alertness. Proc Natl Acad Sci U S A. 2015;112(4):1232-1237.
16. Cain N, Gradisar M. Electronic media use and sleep in school-aged children and adolescents: A review. Sleep Med. 2010;11(8):735-742.

ISSN (O): 2687-5365; ISSN (P): 2753-6556