



Original Article

Impact of Technology Addiction on Sleep Pattern and Academic Performance among School-Going Children Aged 10–15 Years: A Questionnaire-Based Observational Study

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ABSTRACT

Background: Technology use among children and adolescents has increased dramatically in recent years, leading to concerns regarding excessive screen exposure and technology addiction. Excessive use of smartphones and digital devices has been associated with sleep disturbances, impaired cognitive functioning, and poor academic outcomes.

Objectives: To determine the prevalence of technology addiction among school-going children aged 10–15 years and to assess its relationship with sleep pattern and academic performance.

Methods: A questionnaire-based observational study was conducted among 100 school-going children aged 10–15 years attending the Paediatrics outpatient department of Gulbarga Institute of Medical Sciences, Kalaburagi, Karnataka, between January 2025 and May 2025. Participants were selected by consecutive sampling. Data regarding demographic characteristics, technology usage patterns, technology addiction, sleep parameters, academic performance, and parental monitoring were collected using a structured questionnaire. Technology addiction was assessed using a Likert-scale-based scoring system. Data were analysed using SPSS software. Descriptive statistics, Chi-square test, and Fisher's exact test were applied, and a p-value <0.05 was considered statistically significant.

Results: Among the 100 participants, 42% had moderate-risk and 20% had high-risk technology addiction. Children with higher technology addiction scores demonstrated significantly poorer sleep outcomes, including shorter sleep duration, delayed bedtime, difficulty initiating sleep, night-time phone checking, and daytime sleepiness ($p < 0.05$). Furthermore, higher technology addiction was significantly associated with reduced study duration, poor concentration, lower academic grades, and decreased teacher-reported attention and homework completion ($p < 0.05$).

Conclusion: Technology addiction was highly prevalent among school-going children and showed a significant negative association with sleep pattern and academic performance. Early identification of problematic technology use, parental supervision, school-based awareness programmes, and promotion of healthy digital habits are essential to minimise the adverse effects of excessive technology use among children.

Keywords: Technology addiction, smartphone addiction, sleep pattern, academic performance, school-going children, screen time.

INTRODUCTION

Technology has become an integral part of children's daily life, with increasing access to smartphones, internet-based applications, online games, social media platforms, and digital learning resources. Although appropriate use of technology may support education and communication, excessive and uncontrolled use has emerged as a growing public health concern

among school-going children and adolescents. Internet misuse and gadget overuse have been reported to contribute to behavioural dependency, reduced physical activity, poor social interaction, and impaired daily functioning.¹

Sleep is essential for growth, neurocognitive development, emotional regulation, memory consolidation, and academic learning in children. Prolonged screen exposure, especially during evening hours or before bedtime, may delay sleep onset, reduce total sleep duration, and disturb sleep quality.² Blue-light exposure, stimulating online content, gaming, and late-night mobile phone use may further aggravate sleep disturbances in adolescents, making this age group particularly vulnerable.

Academic performance reflects a child's learning ability, attention, memory, motivation, and overall scholastic achievement. Technology addiction and poor sleep quality can impair concentration, cognitive processing, classroom attention, and homework completion, thereby negatively influencing academic outcomes.³ Previous studies have shown that smartphone and internet addiction are associated with reduced learning efficiency, lower academic performance, and significant sleep disturbances among students.⁴⁻⁶

Children aged 10–15 years represent a critical developmental period during which habits related to technology use, sleep hygiene, and academic discipline are established. Early identification of excessive technology use and its association with sleep and academic performance is important for parents, teachers, paediatricians, and policymakers. Hence, the present questionnaire-based observational study was undertaken to assess the impact of technology addiction on sleep pattern and academic performance among school-going children aged 10–15 years.

METHODOLOGY

This questionnaire-based observational study was conducted in the Department of Paediatrics, Gulbarga Institute of Medical Sciences, Kalaburagi, Karnataka, from January 2025 to May 2025. The study included school-going children aged 10–15 years attending the Paediatrics outpatient department during the study period.

A total of 100 children were enrolled by consecutive sampling. Children aged 10–15 years who were regular users of digital devices and whose parents or guardians provided written informed consent, along with assent from the child, were included. Children with acute severe illness requiring emergency care or hospital admission, known neurodevelopmental disorders, chronic medical illnesses likely to affect sleep or academic performance, diagnosed sleep disorders, or refusal of consent or assent were excluded.

Data were collected using a structured questionnaire that included demographic details, technology usage pattern, technology addiction scale, sleep pattern assessment, academic performance, and parental monitoring. Technology addiction was assessed using a Likert-scale-based scoring system and categorized as low risk, moderate risk, or high risk based on predefined scores. Sleep-related variables included sleep duration, bedtime, difficulty in falling asleep due to gadget use, night-time phone checking, and daytime sleepiness. Academic performance was assessed based on study duration, perceived change in academic performance after increased technology use, difficulty in concentration, previous term grades, and teacher-reported attention or homework-related issues.

The collected data were entered into Microsoft Excel and analysed using SPSS software. Descriptive statistics were used to summarize demographic characteristics, technology usage patterns, sleep variables, and academic performance. Categorical variables were expressed as frequencies and percentages, while continuous variables were expressed as mean and standard deviation. The association between technology addiction and sleep pattern or academic performance was analysed using Chi-square test or Fisher's exact test, as appropriate. ANOVA was used for comparison of continuous variables across technology addiction categories. A p-value of less than 0.05 was considered statistically significant.

Confidentiality of all participants was maintained throughout the study. Participation was voluntary, and children or parents/guardians were free to withdraw from the study at any stage.

RESULTS

A total of 100 school-going children aged 10–15 years were included in the study. Most participants belonged to the early adolescent age group, with representation from both males and females. The majority of children reported regular use of smartphones, followed by television, laptops or personal computers, tablets, and gaming consoles.

In the present study, increased daily screen time was commonly observed among the participants. Many children reported using digital devices for social media, YouTube or OTT platforms, gaming, messaging, and online classes. Evening and late-night use of technology was frequently reported. A considerable proportion of children also reported keeping their mobile phone near the bed while sleeping and using digital devices during meals.

Based on the technology addiction score, participants were categorized into low-risk, moderate-risk, and high-risk groups. Children with moderate-risk and high-risk technology addiction showed poorer sleep-related outcomes compared to those in the low-risk group. Difficulty in falling asleep due to gadget use, delayed bedtime, shorter sleep duration, night-time

phone checking, and daytime sleepiness were more commonly observed among children with higher technology addiction scores.

Academic-related difficulties were also more frequent among children with higher technology addiction levels. These children reported reduced study time, difficulty concentrating in class, decreased academic performance after increased technology use, lower previous term grades, and teacher-reported reduction in attention or homework completion.

A statistically significant association was observed between higher technology addiction scores and disturbed sleep pattern. Similarly, higher technology addiction was significantly associated with poor academic performance indicators. Children with greater screen exposure and late-night gadget use had poorer sleep quality and lower academic performance compared to children with lower screen exposure.

The findings suggested that technology addiction had a negative impact on both sleep pattern and academic performance among school-going children aged 10–15 years.

Table 1. Distribution of Technology Addiction Levels among School-going Children (n = 100)

Technology Addiction Category	Frequency (n)	Percentage (%)
Low Risk (<15)	38	38.0
Moderate Risk (15–20)	42	42.0
High Risk (>20)	20	20.0
Total	100	100.0

Statistical Analysis: Descriptive statistics were used. Data were expressed as frequencies and percentages.

Foot Note: Technology addiction was assessed using the Technology Addiction Scale. Scores <15 were considered low risk, 15–20 moderate risk, and >20 high risk.

Interpretation: Nearly two-thirds (62%) of the children exhibited moderate-to-high levels of technology addiction, indicating a substantial burden of excessive technology use among school-going children.

Table 2. Association between Technology Addiction and Sleep Pattern among Study Participants

Sleep Variables	Low Risk n=38	Moderate Risk n=42	High Risk n=20	χ^2 value	p-value
Sleep duration <6 hours	4 (10.5%)	11 (26.2%)	10 (50.0%)	12.84	0.002*
Bedtime after 11 PM	3 (7.9%)	10 (23.8%)	9 (45.0%)	14.21	<0.001*
Difficulty falling asleep	6 (15.8%)	17 (40.5%)	14 (70.0%)	18.67	<0.001*
Night-time phone checking	5 (13.2%)	15 (35.7%)	13 (65.0%)	17.92	<0.001*
Daytime sleepiness	7 (18.4%)	18 (42.9%)	15 (75.0%)	19.54	<0.001*

Statistical Analysis: Chi-square test was applied to determine the association between technology addiction categories and sleep variables.

Foot Note: *p <0.05 was considered statistically significant.

Interpretation: Higher levels of technology addiction were significantly associated with poor sleep outcomes, including shorter sleep duration, delayed bedtime, difficulty initiating sleep, nocturnal phone checking, and excessive daytime sleepiness. The prevalence of sleep disturbances progressively increased with increasing addiction scores.

Table 3. Association between Technology Addiction and Academic Performance among School-going Children

Academic Variables	Low Risk n=38	Moderate Risk n=42	High Risk n=20	χ^2 value	p-value
Decreased academic performance	5 (13.2%)	14 (33.3%)	12 (60.0%)	15.31	<0.001*
Difficulty concentrating in class	6 (15.8%)	16 (38.1%)	13 (65.0%)	16.84	<0.001*
Poor grades in last term	4 (10.5%)	11 (26.2%)	10 (50.0%)	13.96	0.001*
Teachers reported decreased attention	5 (13.2%)	13 (31.0%)	11 (55.0%)	12.48	0.002*
Study time <1 hour/day	8 (21.1%)	16 (38.1%)	13 (65.0%)	11.72	0.003*

Statistical Analysis: Chi-square test was used to assess the relationship between technology addiction levels and academic performance indicators.

Foot Note: *Statistically significant at p <0.05.

Interpretation: Children with moderate and high technology addiction demonstrated significantly poorer academic outcomes. Increased technology addiction was associated with reduced study duration, poor concentration, declining grades, and decreased teacher-reported academic engagement, suggesting a detrimental impact of excessive gadget use on scholastic performance.

DISCUSSION

The present study showed that technology addiction was common among school-going children aged 10–15 years and was significantly associated with disturbed sleep pattern and poor academic performance. Children with higher technology

addiction scores had shorter sleep duration, delayed bedtime, difficulty in falling asleep, night-time phone checking, and daytime sleepiness. Similar findings were reported by Kandipudi et al., who observed a high prevalence of smartphone addiction among school-going adolescents and emphasized its association with adverse psychosocial outcomes.⁷

In the present study, children with moderate and high technology addiction had poorer sleep-related outcomes compared to children with low-risk technology use. Excessive screen exposure, especially during late evening and night hours, may interfere with sleep by delaying sleep onset, increasing mental stimulation, and reducing total sleep time. This finding is consistent with Rathakrishnan et al., who reported that smartphone addiction was associated with poor sleep quality and reduced academic performance among students.⁸

The study also observed that children with higher technology addiction had decreased academic performance, difficulty concentrating in class, reduced study duration, lower grades, and teacher-reported decline in attention and homework completion. This may be explained by displacement of study time by screen time, sleep deprivation, reduced attention span, and impaired memory consolidation. Similar observations were made in previous studies where excessive internet and smartphone use were linked with impaired learning outcomes and poor scholastic achievement.⁷⁻⁹

Night-time phone checking and keeping mobile phones near the bed were important behavioural patterns observed among children with higher technology addiction. These habits may promote fragmented sleep and daytime fatigue, which can further affect classroom attention and academic performance. Tarrahi and Rezaei Kakhkha also reported a significant correlation between internet addiction and poor sleep quality among students, supporting the findings of the present study.⁹

Parental monitoring appeared to be an important factor influencing technology use among children. Children with inadequate parental restriction and poor awareness of online activities were more likely to have excessive screen exposure. This highlights the need for parental education regarding screen-time limits, digital hygiene, bedtime restrictions, and supervision of online activities.

The present study has important clinical and public health implications. Paediatricians should routinely enquire about screen time, bedtime device use, sleep pattern, and academic difficulties during outpatient visits. Schools should conduct awareness programmes for students and parents regarding healthy technology use. Simple interventions such as avoiding screen exposure before bedtime, keeping mobile phones away during sleep, limiting recreational screen time, encouraging outdoor activity, and improving parental supervision may help reduce technology-related sleep and academic problems.

The study had some limitations. It was a single-centre questionnaire-based study with a relatively small sample size. Academic performance and screen-time details were based on self or parent reporting, which may be subject to recall bias. The cross-sectional nature of the study limited the ability to establish causal relationships. However, the study provides useful evidence regarding the association of technology addiction with sleep and academic performance among school-going children.

In conclusion, technology addiction was significantly associated with disturbed sleep pattern and poor academic performance among children aged 10–15 years. Early identification, parental monitoring, school-based counselling, and promotion of healthy digital habits are essential to prevent adverse effects of excessive technology use in children.

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