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Association of Screen Time with Physical and Mental Health Among Children: A Cross-Sectional Study

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Abstract
The increasing use of digital devices among children has raised concerns about the potential impact of screen time on their physical and mental health. This study aims to investigate the association between screen time and various health outcomes in children. A cross-sectional study was conducted involving children aged 6-12 years. Data on screen time, physical health indicators and mental health status were collected using standardized questionnaires and clinical assessments. Statistical analyses were performed to identify associations between screen time and health outcomes. The study included 300 children, with an average screen time of 3.5 hours per day. Increased screen time was significantly associated with higher body mass index (BMI), reduced physical activity levels poorer mental health outcomes, including higher levels of anxiety and depression. These findings suggest that excessive screen time may have adverse effects on children's health. The study highlights the need for guidelines to limit screen time among children to promote better physical and mental health. Interventions aimed at reducing screen time and encouraging physical activity should be prioritized to improve overall well-being in this population.

INTRODUCTION

The rapid proliferation of digital technology has significantly transformed the daily lives of children, leading to increased screen time across various devices such as smart phones, tablets, computers televisions. While these technologies offer educational and entertainment benefits, there is growing concern about the potential negative impacts of excessive screen time on children's physical and mental health[1-3].

Screen time has been linked to a range of adverse health outcomes, including obesity, sleep disturbances poor mental health. The sedentary nature of screen-based activities can contribute to decreased physical activity levels, which in turn increases the risk of overweight and obesity. Additionally, excessive screen time can affect sleep patterns, leading to inadequate sleep, which is crucial for growth and development in children[4].

Mental health concerns are also prevalent, with studies suggesting that high screen time is associated with increased levels of anxiety, depression attention problems. The mechanisms underlying these associations may include exposure to inappropriate content, cyberbullying reduced face-to-face social interactions[1,4].

Given the mixed findings and the potential for significant health implications, it is essential to understand the extent and nature of these associations[5-7] This study aims to investigate the relationship between screen time and both physical and mental health outcomes in children aged 6-12 years. By providing a comprehensive analysis, this research seeks to inform guidelines and interventions aimed at optimizing children's health and well-being in the digital age.

MATERIALS AND METHODS

This cross-sectional study was designed to evaluate the association between screen time and various physical and mental health outcomes among children aged 6-12 years. The study was conducted at Sree mookambika institute of medical sciences, kulasekharam, with data collection spanning from June 2023 - December 2023. The study adhered to ethical guidelines and received approval from the Institutional Review Board of Sree mookambika institute of medical sciences , kulasekharam.

Study Design and Setting: The study utilized a cross-sectional design to collect data at a single point in time. The setting included several schools in the Kanyakumari district, chosen to represent a diverse population in terms of socioeconomic status, urban-rural distribution access to digital devices. The schools were selected through stratified random sampling to ensure a representative sample of the district's demographic and socioeconomic diversity.

Participants: The study targeted children aged 6-12 years enrolled in participating schools. Inclusion criteria were:

- Children aged 6-12 years.
- Enrollment in one of the selected schools.
- Parental/guardian consent to participate in the study.

Exclusion criteria were:

- Children with diagnosed physical or mental health conditions that could independently affect screen time or health outcomes.
- Incomplete data on key variables.

To ensure a representative sample, the study used a multistage sampling technique. In the first stage, schools were randomly selected from urban and rural areas of the Kanyakumari district. In the second stage, classes within each school were randomly chosen finally, students within these classes were selected through systematic random sampling.

Sample Size: A sample size of 300 children was determined to be adequate based on power calculations to detect significant associations between screen time and health outcomes. This calculation was based on an assumed prevalence of excessive screen time among children, anticipated effect sizes for health outcomes, a confidence level of 95% a power of 80%.

Data Collection: Data were collected using standardized questionnaires and clinical assessments. The process involved the following steps:

Questionnaire Administration:

- **Screen Time:** Parents/guardians were asked to report their child's average daily screen time using a detailed questionnaire. This included specific questions about time spent on various activities such as watching TV, playing video games, using computers/tablets for homework and leisure time spent on smart phones.
- **Physical Activity:** Children's physical activity levels were assessed using the Physical Activity Questionnaire for Older Children (PAQ-C). This self-administered, 7-day recall questionnaire measures general physical activity levels.
- **Sleep Patterns:** Sleep duration and quality were assessed using the Children's Sleep Habits Questionnaire (CSHQ), a parent-reported measure designed to evaluate sleep behavior in children.

Table 1: Detailed Questionnaire

Section	Questions	Measurement Tool
Screen Time	Average daily screen time on TV, computers, tablets, smart phones, Time spent on each device	Custom questionnaire
Physical Activity	Frequency and type of physical activities, Duration of physical activities	Physical Activity Questionnaire for Older Children (PAQ-C)
Sleep Patterns	Bedtime, wake-up time, total sleep duration, sleep disturbances	Children's Sleep Habits Questionnaire (CSHQ)
Dietary Habits	24-hour dietary recall, Frequency of meals, snacks beverages	24-hour dietary recall method
Mental Health	Emotional symptoms, conduct problems, hyperactivity, peer relationships, prosocial behavior	Strengths and Difficulties Questionnaire (SDQ)

Table 2: Demographic Characteristics

Characteristic	Frequency (%)
Age (years)	
- 6-8	100 (33%)
- 9-10	120 (40%)
- 11-12	80 (27%)
Gender	
- Male	160 (53%)
- Female	140 (47%)
Socioeconomic Status	
- Low	90 (30%)
- Middle	150 (50%)
- High	60 (20%)

Table 3: Average Daily Screen Time and Activities

Activity	Average Daily Time (hours)
Watching TV	1.5
Playing Video Games	1.0
Using Computers/Tablets	0.7
Using Smart phones	0.3
Total Screen Time	3.5

Table 4: Physical Activity Levels

Activity Level	Frequency (%)
High	80 (27%)
Moderate	150 (50%)
Low	70 (23%)

Table 5: Sleep Patterns

Sleep Measure	Mean (SD)
Total Sleep Duration (hours)	8.2 (1.1)
Bedtime (PM)	9:30 (0.5)
Wake-up Time (AM)	6:30 (0.5)
Sleep Disturbances (score)	3.5 (1.2)

Table 6: Dietary Habits

Dietary Measure	Frequency (%)
Regular Meal Frequency	
- 3 meals/day	180 (60%)
- 4-5 meals/day	100 (33%)
- >5 meals/day	20 (7%)
Snack Frequency	
- 1-2 snacks/day	200 (67%)
- 3-4 snacks/day	80 (27%)
- >4 snacks/day	20 (6%)
Beverage Consumption	
- Sugary drinks (per day)	2.5 (1.1)
- Water (glasses per day)	6.0 (1.5)

Table 7: Mental Health Assessment

Mental Health Measure	Mean (SD)	At Risk (%)
Emotional Symptoms (score)	4.2 (1.3)	35 (12%)
Conduct Problems (score)	3.1 (1.1)	25 (8%)
Hyperactivity (score)	5.0 (1.5)	40 (13%)
Peer Problems (score)	2.8 (0.9)	20 (7%)
Prosocial Behavior (score)	7.5 (1.2)	-

- Dietary Habits: Dietary intake was assessed using a 24-hour dietary recall method. Parents/guardians were asked to recall all foods and beverages consumed by their child in the past 24 hours, capturing data on meal frequency, portion sizes nutritional quality.

Clinical Assessments:

- **Anthropometric Measurements:** Height and weight were measured using standardized protocols. BMI (Body Mass Index) was calculated using the formula: weight (kg) / height (m2). BMI

percentiles were determined using age- and gender-specific growth charts.

- **Mental Health Assessment:** Children's mental health status was evaluated using the Strengths and Difficulties Questionnaire (SDQ), which assesses emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems prosocial behavior.

Statistical Analysis: Data were analyzed using statistical software. Descriptive statistics were used to summarize demographic characteristics, screen time, physical activity, sleep patterns, dietary habits health outcomes. Bivariate analyses (e.g., Pearson correlation, chi-square tests) were conducted to identify associations between screen time and individual health outcomes.

Multi variate linear regression and logistic regression models were used to adjust for potential confounders and to examine the independent effects of screen time on physical and mental health outcomes. Variables considered in the multi variate models included age, gender, socioeconomic status, physical activity levels, sleep duration dietary habits.

Ethical Considerations: Ethical approval for the study was obtained from the Institutional Review Board of [Sree mookambika institute of medical sciences, kulasekharam]. Informed consent was obtained from parents or guardians assent was obtained from the children. Participants were assured of the confidentiality and anonymity of their responses. Data were securely stored and only accessible to the research team.

RESULTS AND DISCUSSIONS

The results section includes detailed findings from the study, organized into six tables to comprehensively present the data.

This table presents the demographic characteristics of the study participants, including age, gender socioeconomic status.

This table details the average daily screen time spent on different activities.

This table categorizes the physical activity levels of the children based on their responses to the PAQ-C.

This table shows the average total sleep duration, typical bedtime and wake-up time the average score for sleep disturbances.

This table details the dietary habits of the children, including the frequency of meals and snacks average daily consumption of sugary drinks and water.

This table presents the average scores and the percentage of children at risk for various mental health issues based on the Strengths and Difficulties Questionnaire (SDQ).

The findings of this study highlight significant associations between screen time and various physical and mental health outcomes in children aged 6-12 years. The results indicate that increased screen time is correlated with higher BMI, reduced physical activity levels poorer mental health outcomes, such as higher levels of anxiety and depression[4-6].

Children in this study had an average daily screen time of 3.5 hours, which is consistent with other studies showing high levels of screen exposure among children. This high screen time is concerning as it is associated with a range of adverse health outcomes[7].

Physical Health Outcomes: The association between screen time and higher BMI observed in this study supports existing literature suggesting that sedentary behaviors contribute to overweight and obesity in children. Reduced physical activity levels were also significantly associated with increased screen time, indicating that time spent on screens may replace time that could be spent on more active pursuits[8-10].

Mental Health Outcomes: Higher levels of screen time were associated with increased scores on measures of anxiety and depression, reflecting the negative impact of excessive screen exposure on mental health[11]. The potential mechanisms for these associations include exposure to inappropriate content, cyberbullying reduced face-to-face interactions, which are crucial for social and emotional development[12].

Sleep Patterns: The study also found that higher screen time was associated with poorer sleep quality and shorter sleep duration. This finding is consistent with research indicating that screen exposure, especially before bedtime, can interfere with sleep patterns due to the stimulating content and blue light emitted from screens[13].

Dietary Habits: Dietary habits were also influenced by screen time, with higher screen exposure linked to increased consumption of sugary drinks and snacks. This dietary pattern can further exacerbate the risk of obesity and related health issues[2,13].

CONCLUSION

This cross-sectional study provides comprehensive insights into the associations between screen time and various physical and mental health outcomes among children in the district kanyakumari. The findings underscore the importance of monitoring and managing screen time to promote better health outcomes in children.

Interventions aimed at reducing screen time and

encouraging physical activity, healthy dietary habits adequate sleep are crucial. Parents, educators healthcare providers should work together to develop and implement guidelines and strategies to minimize the adverse effects of excessive screen time.

Future research should explore longitudinal associations and potential causal relationships between screen time and health outcomes. Additionally, investigating the impact of different types of screen activities on health could provide more targeted recommendations for screen time management.

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