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Effects of electronic gadgets on the physical health of high school students

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Abstract
Background: Adolescents increasingly rely on electronic devices, which are integral to daily life. Device usage among school pupils has surged, offering convenience, but posing risks to well-being. This study explores electronic gadget impact on physical health in high school students.
Methodology: A cross-sectional study of 100 high school students used non-probability purposive sampling. Data were collected via a semi-structured questionnaire and analyzed using descriptive and inferential statistics.
Results: Over 29% of participants used devices for 5-6 hours daily, equating to a quarter of their time. Additionally, 23% spent 3-4 hours, 19% spent 7-8 hours, and 14% spent 1-2 hours daily on devices. 4% used devices for over 10 hours. High dependency was seen in 4%, moderate in 44%, and slight in 52%. Students using devices for more than 8 hours daily had more sleep disturbances (80%), headaches, and neck pain (60%), compared to fewer issues among 1-4-hour users. Heavy users also experienced more vision problems (53%), back pain (40%), hearing issues, obesity, and migraines. A significant positive correlation exists between gadget use duration and physical complaints (p<0.001).
Conclusion: The study concluded that setting realistic screen time limits encourages adolescents to engage in physical activity and in-person social contact. To address technology addiction among schoolchildren, parents, educators, and legislators must collaborate to provide positive role models and support. The study also found that longer gadget usage is directly associated with more physical health problems in students.

Keywords: Electronic gadgets, physical health, high school students

Introduction
Regardless of age, every individual uses electronic devices in their daily lives. They simplify our lives on the one hand but using them excessively is harmful. Both mental and physical health are affected by these devices. Screen time has increased due to the increasing use of computers, cell phones, tablets, and other digital devices. Although technology can enhance education, adolescents may become diverted from learning and critical thinking if they use it excessively or without the right guidance [1].

Today's students rely extensively on their electronic devices. The sum of time children spends with different devices, including their phones, tablets, computers, TVs, iPods, and games, has been the subject of numerous studies. Students utilize electronic devices for a range of purposes, such as researching, playing games, watching videos, listening to music, chatting with friends, and browsing other websites. They spend most of their time doing these activities, ignoring things that could harm their eyesight and general health, such as body position when using the computer, screen brightness, and screen distance from their eyes [2].

A study including 200 participants 77 men and 123 women with age ranges of students ranging from 15 to 25 years old was carried out in Hyderabad. The majority of those surveyed own two or more electronic devices. The issues surrounding the overuse of technological gadgets have informed the design of the questionnaire. The study looked at things, including how long the volunteers used the gadgets, where they used them, and what health risks (such as stress, headaches, anxiety, sadness, and withdrawal symptoms) they faced from using them excessively. The individuals who used the device for more than six to eight hours also displayed disruptions in their logical thinking and memory levels [3].

The cross-sectional study included 885 schoolchildren in north India, ages 13 to 18. Analyses were using logistic regression and descriptive data. 30.3% (95% Confidence Interval = 27.2%-33.3%) of the subjects satisfied the requirements for dependency. The odds ratio for students who were more likely to be addicted to technology were 2.82, 95% CI = 1.43, 5.59; male students were also more likely to have a personal mobile phone (2.98, 1.52-5.83), use a smartphone (2.77, 1.46-5.26), use one more gadget (2.12, 1.14-3.94), and be depressed (3.64, 2.04-6.49). The researcher concluded that depression and poor performance in school may be influenced by technological addiction [4].

A cross-sectional study of 1803 Bangladeshi secondary school students found that 67.11% used phones daily. Due to COVID-19, 24.48% attended online classes, increasing gadget use significantly ($p< .05$) from 2019 to 2020. Over half spent less than an hour outdoors daily. Gadget use is correlated with health issues like headaches, backaches, vision disturbances, and insomnia [5].

A descriptive study surveyed 240 pupils aged 12 to 16 from a government high school in Mangalore, Karnataka, examining the impact of electronic gadgets on behavior, academics, and health. Results indicated that 69% spent time with electronic gadgets before bedtime, with 59% facing morning headaches and vision issues. 53% stated focus troubles in class and while studying. While not the sole cause, electronic use significantly contributed to various health conditions like obesity, sleep disorders, eye problems, and aggressive behavior, showing its role in equally mental and physical health problems [6].

Earlier research mainly focused on ICT and electronic devices' impacts on youth, neglecting children aged four to twelve in classroom settings. This article investigates these effects on young children for educational purposes. During interviews and literature review, a conceptual model shapes motivation, usability, acceptability, and simplicity of use. Findings suggest significant impacts on physical and mental well-being, urging educators and institutions to consider ICT and electronic gadget use in their strategies [7].

The research examines the correlation between obesity and factors like electronic device usage, sleep patterns, stress, and physical exercise among 150 overweight high school students. Findings indicate gadget use positively impacts physical activity, which in turn affects obesity. Gadget use also correlates with sleep patterns and stress levels. There is a direct correlation between gadget addiction and stress, physical activity, sleep patterns, and obesity, as well as an indirect correlation [8].

This study examined the impact of electronic devices on family connections, health, study habits, and academic achievement among 378 randomly selected Grade 8 female students. It found no significant difference in the effects of device use on family connections and study habits when considering age, sex, and grade level. However, health impacts varied by grade level. Additionally, there was no correlation between academic achievement and the influence of device use on family relationships, health, and study habits [9].

An online poll explored lockdown effects on schoolchildren's sleep and screen time. Social jet lag and insomnia diminished remarkably during lockdown, but inertia grew. Significant screen time differences were found between pre-lockdown weekdays and lockdown weekends. Three distinct clusters based on screen time and sleep behavior were identified. Cluster 2 indicated elevated screen time and increased sleep durations simultaneously. These findings offer insights for crafting strategies to reduce screen time among schoolchildren [10].

A cross-sectional study was conducted involving 130 children aged 12 to 15, attending schools in the urban region of Thiruvananthapuram district. The aim was to ascertain the prevalence of excessive screen usage among school-going adolescents and identify associated factors. The study found that 87.7% of pupils reported high screen time, with mobile phones being the most used device. Furthermore, high screen time was associated with male gender (odds ratio [OR] = 8.3, 95% confidence interval [CI] = 1.7-40.3), shorter sleep duration (OR = 0.34, 95% CI = 0.15-23.12), and lower socioeconomic status (OR = 0.21, 95% CI = 0.21-0.96). These findings indicate a correlation between excessive screen time and male gender, as well as shorter sleep duration [11].

531 kids between the ages of 3 and 14 participated in the study, which looked at the effects of prolonged use of electronic devices on kids' oral health, overall health, and quality of life. The study's findings demonstrated that children's oral hygiene, overall wellness, and general quality of life were all adversely impacted when they used electronic devices for more than five hours a day. In conclusion, the future of our nation rests on the shoulders of its children. As a result, it's critical to protect kids from the possible dangers linked to prolonged usage of electronic devices with the help of parents, teachers, and societal support [12]. A cross-sectional study aimed to establish screen time recommendations and assess its effects on the mental and physical health of children aged 2 to 18. Parents completed a structured questionnaire, and psychologists and pediatricians evaluated outcomes. 155 children participated. On weekdays, average screen time for 2-5, 5-10, and 10-18-year-olds was 4, 5.83, and 6.29 hours, respectively. Weekends saw increases to 5.64, 5.76, and 7.69 hours. Nearly 70% suffered malnutrition, and only 18% knew about screen-free days. Screen time correlated significantly with negative behavior (P=0.001) and health (P=0.0001). Average screen time tripled from pre-COVID to COVID-19 eras. This emphasizes the need to understand screen time effects, particularly in underdeveloped countries without regulations, amidst the pandemic [13].

It's widely recognized that excessive electronic device usage can have adverse effects on health, manifesting in issues like headaches, nausea, eye strain, and psychological impacts. [18] Adolescents' utilization of mobile phones has witnessed a notable surge, primarily attributable to the heightened relevance of these devices during this developmental phase compared to other life stages. Hence, the objective of the current study was to assess the impact of high school students' electronic device usage on their physical health.

Materials and Methods

Study design and setting

A descriptive cross-sectional survey was undertaken to evaluate how electronic devices affect the physical health of 100 high school students in Bangalore. The study was conducted between January 3, 2023, and April 28, 2023.

Study participants and sampling

A purposive sampling method was followed to collect

information from 100 high school students. The age range varies from 14 to 16 years. The study included students who were eager to take part in study, available for data collection, and proficient in reading and writing English.

Data collection tools and technique

A semi-structured questionnaire was used to collect the data. It consists of four sections.

- **Section A:** Demographic variables.
- **Section B:** A complete set of questions about using the devices is included in the questionnaire. When asked how long they had spent using each device, the respondents gave answers such as 1-2 hours, 3-4 hours, 5-6 hours, 7-8 hours, 9-10 hours, and more than 10 hours for each device. The respondents' percentage was calculated based on how much time they spend using their devices. According to the respondents in this survey, using electronics for longer than ten hours is considered addictive.
- **Section C:** Use a Likert scale to assess respondents' dependence on digital devices and services. Where 1 denotes strongly disagree and 5 indicates strongly agree. A score of 16-20 is considered high, a score of 11-15 is considered moderate, and a score of 5-10 indicates a slight dependency. Dependency is a determining factor in addictive behavior, meaning that the more dependent the response, the more addicted they will be.
- **Section D:** Asks about specific health issues and your current state of physical health based on the duration of gadget usage.

Statistical analysis

The data were analyzed using Statistical Package for Social Science (SPSS) version 22. Appropriate statistical tests were used for data analysis based on the findings.

Ethical consideration

Each participant was well-informed about the study's purpose, procedures, and benefits of the study, and each student signed a voluntary consent form.

Results

The descriptive data were analyzed using frequency and percentage.

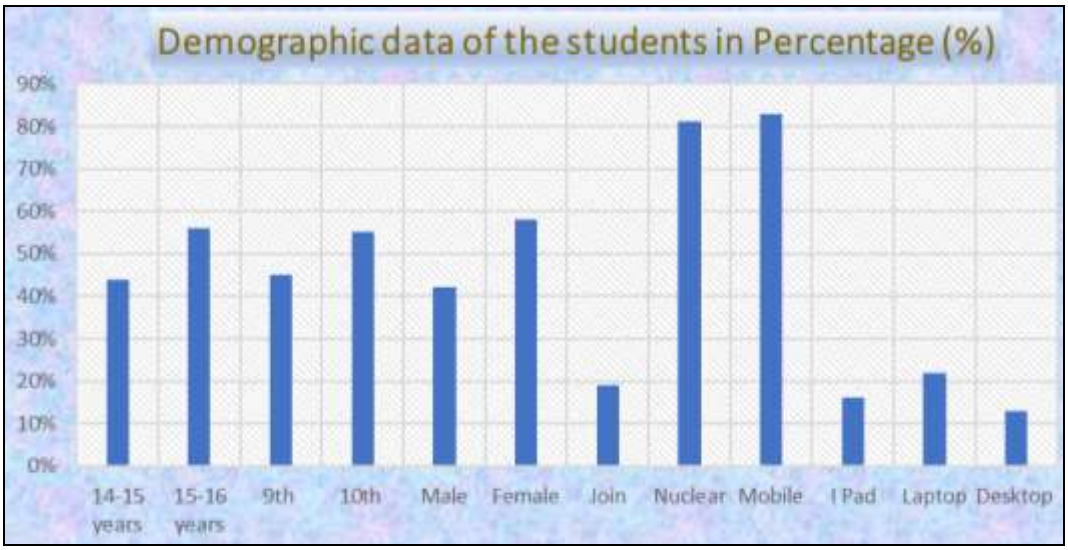

Fig 1: Frequency and percentage distribution of students according to their demographic variables N= 100

Figure. 1 shows the percentage of high school students based on demographic variables. 56 percent of students are between the ages of 15-16 years and 44% are between 14-15 years. 42% of them were Male and 58% female students. 45% of them study in the 9th class, and 55% in the 10th class. Most of them are from (81%) nuclear families. Most of the students (83%) owned mobile phones, 16% had iPads, 22% Laptops and 13% of them had desktops.

Table 1: Time Spent with Gadgets: N=100

Sl. No.	Time spent with gadgets in hours	Frequency	%
1.	1-2	14	14%
2.	3-4	23	23%
3.	5-6	29	29%
4.	7-8	19	19%
5.	9-10	11	11%
6.	>10	4	4%

Table 1 denotes how much time the respondents devote to the gadgets they use. The majority, 29% of the participants, used their devices for 5-6 hours. This also means ¼th of their time is spent with their gadgets and services. 23% of the total respondents spend more than 3-4 hours per day with their technological devices. Where 19% of participants are using the gadgets for 7-8 hours per day and 14% of them are using these for 1-2 hours. The number of participants who spend more than 10 hours per day with their gadgets is much less i.e. only 4%.

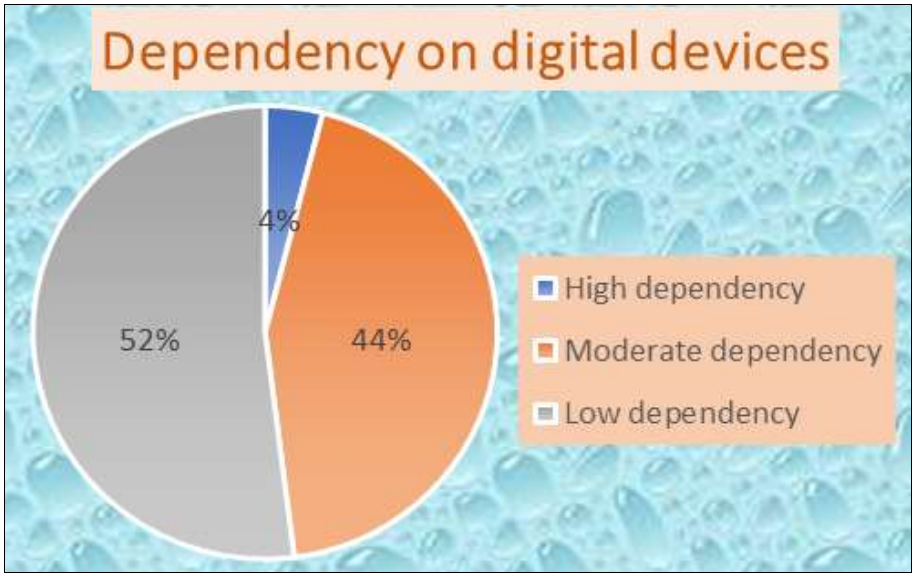

Fig 2: Dependency on digital devices: N=100

Figure 2 illustrates a score of 16-20 is considered a high dependency is very few 4%, a score of 11-15 is considered a moderate dependency is 44%, and a score of 5-10 indicates a slight dependency of around 52% of the students.

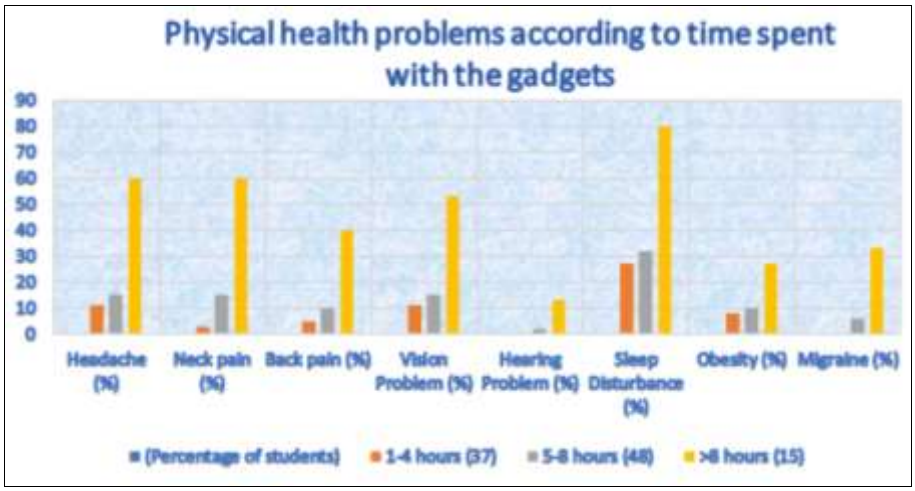

Fig 3: Identified Physical Health Problems according to time spent with the Gadgets by the Respondents: N=100

Figure 3 reveals a correlation between the amount of time high school students spend on smartphones and various physical health issues. Students using smartphones for more than 8 hours a day are more likely to experience sleep disturbances (80%), headaches and neck pain (60%), vision problems (53%), and back pain (40%), with 13-33% also suffering from hearing problems, obesity, and migraines. Those who use smartphones for 5-8 hours daily have increased levels of sleep disturbances (32%), headaches and neck pain, vision problems (15%), back pain, and obesity (10%), with 2-6% experiencing hearing problems and migraines. Students using smartphones for 1-4 hours a day are also prone to higher levels of sleep disturbances (27%), headaches and vision problems (11%), neck pain, back pain, and obesity (13-8%), but there are no reported cases of hearing problems or migraines in this group.

Discussion

The current study findings revealed that the majority, 29% of the participants, used their devices for 5-6 hours daily, equating to spending a quarter of their time on gadgets and services. Additionally, 23% of the respondents spent 3-4 hours per day on their devices. Meanwhile, 19% of participants used their gadgets for 7-8 hours daily, and 14% for 1-2 hours. 4% of participants spent more than 10 hours per day on their devices. These statistics indicate the extensive use of devices among young respondents, with 6 hours or more being a significant amount of time for anyone, especially students at a young age.

This study result is proved by a study on the effects of students' excessive use of electronic gadgets during COVID-19 are still being felt, schools are still shuttered, and students are forced to do their coursework online. Consequently, it is now necessary to use this modern equipment. However, students use these gadgets for a variety of other leisure-related activities in addition to attending their online classes. Thus, there has been a noticeable increase in the amount of time that kids spend using these gadgets, which is having a big impact on their physical and mental health. The majority of kids, according to the report, have issues with their eyes and have trouble focusing [15].

The current study showed that only a few students (4%) have a high dependency on their devices. Moderate

dependency is seen in 44% of the students. The majority, 52%, show slight dependency. This result is similar to a cross-sectional study that was carried out to determine the requirements for screen time recommendations and to investigate the effects of screen time on children's mental and physical health, among 155 kids ages 2 to 18. On weekdays, the mean child hours for children ages 2-5 years, 5-10 years, and 10-18 years were 4 hours, 5.83 hours, and 6.29 hours, while on weekends, 5.64 hours, 5.76 hours, and 7.69 hours. The age at which they started using screens was less than two years old for over one-third of the kids. Malnutrition affects almost 70% of youngsters. The concept of screen-free days was unfamiliar to only 18% of parents. Screen time negatively impacted children's conduct (P=0.001) and health (P=0.0001). The mean rise in screen time from the pre-COVID era to the COVID-19 era was over three times [17].

The findings of the current recent study revealed that students who use smartphones for more than 8 hours a day are more likely to experience sleep disturbances (80%), compared to 32% among those using them for 5-8 hours and 27% among those using them for 1-4 hours. They also face headaches and neck pain (60%), whereas this issue is only reported by 11% of 1-4-hour users. Vision problems (53%) and back pain (40%) are prevalent among those using devices for more than 8 hours, while these issues are reported by fewer than 10% of users in other groups. Additionally, 13-33% of these heavy users suffer from hearing problems, obesity, and migraines, which are not evidenced in the 1-4-hour user group. Finally, this study reveals that the duration of gadget usage is directly associated with students' physical health status. The duration of gadget use, there is a significant positive correlation with the level of physical complaints (p<0.001). This indicates that users who long duration use the gadgets experience a higher level of physical health problems.

This study's findings align with research on electronic gadgets. From 2017 to 2023, mobile phone ownership rose from 42% to 95.7%. A recent psychological study found electronic device addiction as harmful as alcohol addiction, affecting many youths and children. Symptoms include excessive gaming and social media use. While gadgets ease tasks, overuse harms eyes, backbone, and brain [16].

Significance of the Study

Research in this field targets developed nations. However, studies in developing countries, especially in smaller cities like Bangalore, are rare. This research aims to bridge that gap, offering insights for new researchers into technology addiction and its management, and highlighting its impact on school students.

Limitations and Future Directions

The limited sample size may affect generalizability. Future research should include more participants and a control group to compare technology users and non-users. Time constraints limited this study to consumers. Unforeseen factors might have influenced social, physical, and mental health outcomes.

Conclusion

Across the globe, there's mounting concern regarding school students' reliance on electronic devices, particularly smartphones. This study's results suggest that excessive electronic device usage can indeed have adverse effects on physical health. These effects may include sleep disturbances, headaches, vision and hearing problems, obesity back and neck pain, and migraines. It's essential to recognize and address these potential consequences, particularly as electronic devices become increasingly integrated into daily life for many students. The situation has been exacerbated by the widespread COVID-19 lockdowns. [16] The overarching observation is that young individuals are becoming increasingly reliant on technology due to the proliferation of available gadgets. While there may be some advantages to device usage, excessive screen time can yield negative outcomes, particularly among young children. Hence, it is imperative, with the guidance of caregivers, to take proactive measures to curb excessive electronic device usage among school students.

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Conflict of Interest

There are no conflicts of interest in this work.

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