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Relationship between Screen Time and Academic Performance in Adolescents

Meena Patel [1], Saurabh Kumar Patel [1], Sneha Suresh [2], Kshama Vishwakarma [3], Sandeep Singh [4*]

1. Department of Pediatrics, Shyam Shah Medical College Rewa (MP), India.
2. Shyam Shah Medical College Rewa (MP) India.
3. Department of Obstetrics & Gynaecology, Shyam Shah Medical College Rewa M.P. India.
4. Department of Community Medicine, Shyam Shah Medical College, Rewa, M.P. India.

* **Corresponding Author:** Dr. Sandeep Singh (MD);
Address: Shyam Shah Medical College Rewa M.P. India.
Tel.: +91 9893137639 **E-mail:** drsandeepsingh@live.in

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ABSTRACT

Background and Objective: Youth is a sensitive time, and the habits acquired during this period last a lifetime. Today's generation wastes their time with smartphones and other electronic media, which prevents them from focusing on academic and other healthy activities. The aim of the present study was to investigate the problem of screen time and academic performance.

Methods: This was a community-based descriptive cross-sectional study conducted among 301 adolescents aged 10-18 years between January 2020 and December 2021. A pilot-tested semi-structured questionnaire was used to elicit responses using the interview method, focusing on basic demographic information and screen time. This pilot study was conducted on healthy adolescents attending the pediatric clinic of the Department of Pediatrics at GMH in Rewa, and the same questionnaires were then used in the sampled schools in Rewa County (M.P.).

Findings: In the present study, 106 children (35%) belonged to the early adolescent age group, 174 (58%) to the middle adolescent age group, and 21(7%) to the late adolescent age group. The average percentage of the participants' grades was 74.6%. It was found that the average percentage of grades obtained decreased with increasing screen time. Sixty-three (20.9%) children with screen time of > 3 hours per day achieved an average grade of 62.1%, while those who did not use screen media achieved an average grade of 88.4%. This is statistically significant with a p-value of <0.001.

Conclusion: Adolescents spending 3 hours per day in front of a computer screen may decrease their academic performance.

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Introduction

Adolescents around the world spend a significant amount of their free time using mobile devices with screens and other visual aids. This has increased exponentially since the advent of the Internet and social media [1]. Smartphone ownership and access among youth has rapidly increased to 95% in 2018 [2]. In addition, India has the second highest percentage of cell phone users in the world after China, as these two countries have the largest populations. Mobile gaming, video streaming, social media such as Weibo, Tik-Tok, Facebook, Instagram, Whatsapp, and Twitter are the main leisure activities enabled by mobile screens [3].

Adolescence is a period in which the foundations of adult behaviour and health are laid, as it is a period of rapid physical, neuro-behavioral and hormonal changes. It has been said that the future development of a country depends on the health and behaviour of its adolescent population [1]. Early academic success and career development are significantly influenced by academic performance. Nowadays, adolescents are growing up surrounded by digital media, which can have both positive and negative effects on healthy development. Increased screen use has also been associated with poorer academic performance [4]. Time spent in front of screens each day -on a phone, TV, computer, tablet, or other visual device- is referred to as screen time. Increased screen use in children has been linked to a range of negative physical, psychological, and social outcomes, as well as poor academic performance [4].

The American Academy of Pediatrics, the World Health Organization (WHO), the Canadian Pediatric Society (CPS), the Royal College of Pediatrics and Child Health (RCPCH), and the Australian government have issued guidelines on children's screen use [5-9]. These recommendations prohibit media use by children under two years of age, while older children should limit their media consumption to no more than two hours per day. With the exception of video conferencing, the Indian Association of Pediatrics (IAP) discourages excessive media use and recommends limiting screen time to no more than 2 hours per day of high quality content.

Concern has grown among parents, educators, and others about the increasing screen use by children [10]. To be healthy, screen time must be carefully selected and used in the right quantity, quality, and at the right time. This is similar to eating a balanced diet. While watching inappropriate shows (TV), accessing illicit websites, or playing violent video games are just a few examples of negative or unhealthy screen time, it is considered positive or healthy when used for educational or prosocial activities such as schoolwork, interaction with friends and family, artistic or musical creation, or relaxation. Many positive and negative health effects have been associated with the amount of time spent in front of a screen and the quality of information displayed there. These include problems issues related to weight, sleep, neck pain, eyestrain, eating habits, communication with others and exposure to harmful information [10].

Recently, increasing attention has been paid to adolescents' screen use and academic performance [11]. However, very few studies have been conducted in India assessing the effects of screen use on adolescents, and there is no generally accepted evidence on the extent to which screen use affects academic performance. One hypothesis [12] states that screen time can decrease academic achievement, while others [12] claim that screen time can promote achievement. Adolescents are an important age group to focus on, as habits are formed during this time that are most likely to be maintained later in life [10]. Adolescence is not only the peak of many people's school activities, but also adolescence serves as the starting point for a range of future health and behavioural problems. All actions taken during this time have a significant impact on and alter future health [10]. The relationship between screen time and academic performance identified in this study can be used as a guide to improve this performance and help establish better guidelines for appropriate screen use among adolescents.

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Methods

Design and participants

This community-based descriptive cross-sectional study was conducted in the Department of Pediatrics at Shyam Shah Medical College and Gandhi Memorial Hospital in Rewa district of Madhya Pradesh, India. The study involved 301 adolescent school children. The identified study population was adolescent students aged 10 to 18 years during the study period, which spanned 12 months from January 2021 to December 2021. Inclusion criteria included students whose parents were willing to have them participate in the study and gave consent. Exclusion criteria for the study were children with developmental delays, intellectual disabilities, learning disabilities, behavioural problems, visual or hearing impairments, or chronic or acute medical conditions listed in the medical record. After obtaining informed consent from students along with their parents, a pilot-tested semistructured questionnaire was used to elicit interview responses, focusing on basic demographic information and screen time.

Sampling

A two-stage random sampling procedure was used. First, a list of all schools in Rewa district was requested from the district educational officer after informing him of the objectives, methods, and significance of the study. Five schools (two government, two private, and one) run by the central government were selected from the list according to our convenient location. The principals of these schools were contacted and their consent to the study was obtained. In the second phase, students were selected using the convenience sampling method.

Data collection

Parents provided information on screen use, i.e., total time spent daily looking at screens (including those on phones, TV, computers, tablets, or any other visual aids), and teachers provided information on students' academic performance on monthly assessments. The length of screen time on an average school day and an average holiday was compiled, and based on the average screen time per day, the average screen time during a week was calculated. Based on the students' combined academic performance on the three previous tests, teachers were asked to classify students as low, average, or good academic performance. This test was used to calculate overall academic performance.

Statistical analysis

Data were analyzed using IBM SPSS 23.0.

Results

Of the total 400 study participants from different schools to whom a survey form was distributed, 305 children completed and returned the form. Of these, two children exceeded the age limit and were therefore excluded from the study, and two proformas were only partially completed and therefore excluded, so the final analysis was calculated for 301 children, of whom 106 were categorized as early adolescents (10-13 years), 174 as middle adolescents (14-17 years), and 21 as late adolescents (18-19 years). Of these, 5.3% (n=16) cases did not use screen media. Of participants who used screen media, 32% (n=96) used devices up to 1 hour per day, 23% (n=70) >1 hour but <2 hours per day, 18% (n=56) >2 but <3 hours and the reminder (n=63, 21%) >3 hours per day. The average screen time recorded was 2.28 hours. The majority of study participants belonged to nuclear families (72%). Among children from nuclear families, the proportion who spent > 2 to 3 hours (20%) and > 3 hours (24%) in front of the screen was higher than among children from joint families (29% who spent > 2 hours in front of the screen). It was found that according to the modified Kuppuswamy scale for socioeconomic status, upper-class children had the highest percentage of screen time >3 hours (36%), but this was not statistically significant for the different socioeconomic classes (Table 1).

Of 301 participants, 49% (n=148) were female and 50.8% (n=153) were male. A statistically significant difference was found in screen time with respect to gender (p=0.0005). A statistically higher percentage of boys (27.5%) reported screen time of > 3 hours than girls (14%). It was also found that a

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higher percentage of girls did not use screen media at all (8%) compared to boys (3%). The average screen time was also much higher in males (2.68 ± 1.71 hours/ day) than in females (1.87 ± 1.42 hours/ day) (Table 2). In the present study, 106 (35%) children belonged to early adolescence (10-13 years), 174 (58%) children belonged to middle adolescence (14-17 years) and 21 (7%) belonged to late adolescence (18 years). No statistically significant difference in the screen time was found between these age groups (Table 3).

Of 301 children who participated in the study, 33% (n=100) had their own smartphone. This group also included the number of children who used screen media for longer periods of time. Moreover, 27% (n=27) of those who owned a smartphone had screen time of >2 to 3 hours, while 39% (n=39) had screen time of > 3 hours. This difference was found to be highly significant. It was also found that study participants consumed an average of 3.93 GB of mobile data per month (Table 4). The average percentage of marks of the participants was 75%. It was found that the average percentage of marks earned decreased as screen time increased. Those who had the screen time of > 3 hours achieved an average score of 62%, while those who did not use screen media achieved an average score of 88%. Of total participants, 8% (n=25) of parents felt that students' academic performance was greatly affected by screen media use, while 52% (n=157) found no difference. The majority of those whose parents felt that their academic performance was affected were in the group that reported screen time of >3 hours. Most of those whose academic performance was not affected (48%) had screen time of > 1 hour (Table 5).

Table 1. Demographic profile and Screen time of the study population

No.	Characteristics		N	%	Avg. Screening time (Hours per day)	SD	P value
1	Sex	Male	153	51	2.68	1.71	0.0005
		Female	148	49	1.87	1.42	
2	Age group	Early adolescent	106	35	2.09	1.32	0.136
		Middle adolescent	174	58	2.33	1.81	
		Late adolescent	21	7	2.83	1.26	
3	Socio economic status	Lower	6	2	3.25	3.09	0.218
		Upper lower	87	29	2.04	1.51	
		Lower middle	97	32	2.23	1.55	
		Upper middle	100	33	2.43	1.65	
		Upper	11	4	2.73	1.81	
4	Type of family	Nuclear	217	72	2.34	1.63	0.287
		Joint	84	23	2.12	1.61	
5	Type of school	State government	150	50	2.30	1.79	0.873
		Central government	45	15	2.17	1.16	
		Private	106	35	2.31	1.54	

Table 2. Screen time and gender

No.	Screening time	Female		Male		P value
		N	%	N	%	
1	Nil	12	8	4	3	0.001
2	Upto 1 hr	59	40	37	24	
3	>1 - 2 hrs	34	23	36	23.5	
4	> 2 - 3 hrs	22	15	34	22	
5	> 3 hrs	21	14	42	27.5	
6	Total	148 (49%)		153 (51%)		

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Table 3. Screen time and age group

No.	Screening time	Early adolescent		Middle adolescent		Late adolescent		P value
		N	%	N	%	N	%	
1	Nil	4	4	11	6	1	5	0.207
2	Upto 1 hr	36	34	58	33	2	9.5	
3	>1 - 2 hrs	28	26	38	22	4	19	
4	> 2 - 3 hrs	19	18	29	17	8	38	
5	> 3 hrs	19	18	38	22	6	28.5	
6	Total	106 (35%)		174 (58%)		21 (6.9%)		

Table 4. Screen time and possession of smartphone

No.	Screening time	Children who own smartphone		Children who don't own smartphone		P value
		N	%	N	%	
1	Nil	0	0.0	16	8.0	0.0005
2	Upto 1 hr	15	15.0	81	40.3	
3	>1 - 2 hrs	19	19.0	51	25.4	
4	> 2 - 3 hrs	27	27.0	29	14.4	
5	> 3 hrs	39	39.0	24	11.9	
6	Total	100 (33.22)		201 (66.78)		

Table 5. Screen time and average percentage of marks

Screen time	N	Average Percentage of Marks	SD	P value
Nil	16	88	10.7	0.0005
Upto 1 hr	96	83	11.1	
>1-2 hrs	70	76	13.1	
> 2-3 hrs	56	70	12.4	
> 3 hrs	63	62	13.0	
Total	301	75	14.7	

Discussion

Longer screen time is due to poor performance in adolescents, and we found similar results in our study for those who spend more than 3 hours per day on screens. Several studies have been conducted to examine the impact of screen time on various domains of learning and academic performance in children [4]. However, the present study specifically investigated the association between screen time and academic achievement among adolescents in Rewa district of Madhya Pradesh, India, as no study has been conducted in this region to assess the association between screen time and academic performance among adolescents.

In the current study, it was revealed that screen time of more than three hours per day is associated with poor academic performance. Similar findings have also been reported worldwide, e.g., by Peiro´-Velert et al., [13] who stated that overall screen media use among Spanish adolescents was higher in boys (total time 5.5 hours) than in girls although the exact duration in girls was not reported. A meta-analysis by Kaur et al [14] also found that boys under the age of five had higher overall screen time than girls. In their study among adolescents in Singapore, Toh et al. [15] observed no significant gender differences in screen time, but found that smartphone ownership was higher among adolescent girls, while adolescent boys owned more game consoles and desktop computers. Adolescent screen time in Singapore (mean = 4.4 hours, SD= 4 hours) was also much higher overall than that in the present study.

McManus et al. [16] found no significant relationship between screen time and gender in their study on the influence of gender on screen time among adolescents in the United States. The average screen time observed by Syväoja et al. [17] in Finnish children was 3.6 hours compared to 2.8 hours in the ongoing study. Unlike the present study, no significant difference was found between the two genders. In the present study, no significant

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difference in screen time was found between the different age groups. Fulton et al. [18] revealed a positive correlation between age and screen time in their study of screen time of American children: 29% of the age group 2-5 years, 32% of the age group 6-11 years, and 35% of the age group 12-15 years exceeded the recommended screen time of 2 hours per day. In the present study, the percentage of children spending more than 2 hours per day in front of a screen was 57%, 60%, and 86% in early, middle, and late adolescence, respectively. Although the earlier study is not exactly comparable to the current study, it was used for comparison because it included the adolescent age group. These percentages are very high compared to Fulton's study, which may indicate that the proportion of screen use in the adolescent population is increasing and is much higher than in younger children. Comparable screen time was found in Cheng S et al.'s [19] study on Japanese children aged 18-30 months, where 55% of male children over 18 months had screen time of >3 hours per day and 45% of female children of the same age had screen time of >3 hours. In the same study, boys' and girls' screen time was found to be 45% and 40%, respectively, at 30 months of age. Pagani et al., [20] in their study on screen time in early childhood, found significant differences in screen time at 29 months and 59 months of age (1.26 and 1.85 hours, respectively). Average screen time in the present study was higher than that in the study by Pagani et al., [20] suggesting higher screen time among adolescents. With the exception of male predominance in screen media use, the other findings in the ongoing study were comparable to those in the existing literature.

Kaur et al. [14] found a negative correlation between screen time and socioeconomic status. They also reported a negative relationship between effective parent-child interactions and screen time, which was not examined in the present study. Cheng et al. [19] demonstrated that children from lower-income families had higher screen time. However, in the present study, it was found that among participants who had screen time of >3 hours, more participants belonged to the upper socioeconomic class although this was not statistically significant. Cha, Seo et al. [21] suggested no significant relationship between smartphone use and gender, age group and socioeconomic status in Korean children. Bernard et al. [22] indicated a significant negative correlation between screen time in children under 3 years of age and maternal socioeconomic status and education in Singaporean children. This could be due to the fact that in more developed countries there is greater awareness of the negative effects of screen media on children, whereas in India the correlation may be blurred due to the imbalance between education, awareness, and access to screen media. In the present study, family structure was also taken into account, and no significant relationship was observed between screen time and family structure, i.e., whether it was nuclear or joint family.

Smartphone ownership was another parameter considered in the present study, and it was found that about 1 in 3 adolescents (n=100, out of 301) at schools in Rewa owned a smartphone. As expected, screen time was also significantly higher among these children, with 39% of them reporting screen time >3 hours. In the present study, it was found that an increase in screen time led to a decrease in the percentage of grades obtained in the exams administered by the respective schools. A higher negative relationship was found between screen media use and academic performance in adolescent boys (r=-0.580) than in girls (r=-0.541). It was also revealed that there was a higher negative relationship between screen time and school performance with increasing age. These findings are supported by Choi and Park [23] in a study on Korean children, who also showed a significant negative relationship between screen time and academic performance. However, the r-values in the present study were much higher than those of Choi and Park (r=-0.15). Moreover, Pagani et al. [20] support our findings of relationship between preschool children's screen time and their academic performance. From the questionnaire completed by teachers, classroom engagement and math skills were found to be negatively affected by screen time, while no significant relationship was found between screen time and reading skills. Students who spent more screen time also reported a decrease in sleep

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duration. In addition, 80% of students with sleep disorders had screen time of >2 hours (p>0.05). This could also affect academic performance, as it can lead to increased daytime sleepiness and inattention. In contrast to the results of the present study, McManus et al. [16] did not find a significant association between sleep disorders and screen time in their study in the United States. Aguilar et al. [24] in their study in Chile found that academic performance was affected by both screen time and cardio-respiratory fitness, with the former indicating a negative and the latter a positive relationship with screen time. The present study also found that 12% of participants (n = 36) preferred mobile play to outdoor play, which may also affect physical activity and cardiorespiratory fitness. A study conducted by Sharif and Sargent [25] found similar results to our study: screen time on school days correlated negatively with academic performance, whereas restrictive parenting and parental monitoring of child screen activity correlated positively with it. However, screen use on non-school days was not found to significantly affect academic performance. Peiro´-Velert et al [13] also found a negative correlation of 0.37 to 0.56 between different types of screen media use and academic achievement, which is comparable to the r-values obtained in the present study.

Limitations of the study

We are aware of the limitations and shortcomings of the study. Responses may have been affected by a lack of understanding of concepts and vocabulary, and we could have used a more reliable sampling method. Participants, instructors, and parents may not have accurately recalled actions related to screen use. There is a possibility that parents underreported their children's screen time because the calculation of screen time was dependent on parent responses. The study sample was limited, and media content was not examined. The study was conducted in only one area of India and therefore may not be representative of the situation across the country.

Conclusion

We can safely assume that a high percentage of adolescents in Rewa district, India, spend more than the recommended screen time on smartphones and a significant proportion of them appear to have negative academic outcomes. A statistically higher percentage of boys reported screen time of > 3 hours than girls, although no difference in screen time was found between different age groups of adolescents. It was found that the academic performance of adolescents decreases when they spend 3 hours per day in front of a screen, and the average percentage of grades achieved also decreases with increasing screen time. Because parents are their children's first teachers, they need to assess the impact of electronic devices on academic performance and family interaction and encourage positive use while reducing negative effects. The study; therefore, suggests that parents and teachers should strive to limit their children's screen time to ensure that academic performance is not affected.

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Ethical Considerations

Prior approval was obtained from the Ethics Committee of Shyam Shah Medical College Rewa M.P. (S.No./IEC/SS/MC/2020/4255 rewa dated 28/02/2020).

Conflict of interest

There was no conflict of interest.

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