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Research Article

Association of screen time with academic performance and behaviour among primary school children of Kandy district Sri Lanka

Abstract

Background: Screen time in children is a growing problem all over the world. Screen time of Sri Lankan school children has not been published before. The objective of this study is to determine the impact of screen time on the academic performances and the behaviour of children in primary classes in Kandy district, Sri Lanka.

Methods: This descriptive cross-sectional study was carried out in 1200 school children from grade 3 to 5, representing 40 schools in the Kandy district, Sri Lanka. Data collection was done using pretested validated questionnaires and general education test papers. Parents and class teachers answered questions related to children's screen time and the children sat for the general education test.

Results: Response rate was 65.6% (n=787). Mean age of study group is 8.6 years (SD=1). The mean (95% CI) screen time= 36.8 (32.5 to 41.0) min/day during week days & 56.8 (50.5 to 63.0) min/day during weekends. 6% of children during weekdays and 12% of children during weekend have television time more than 2 hours/day. Screen time of students is associated with the TV time of parents during weekdays and weekends (p=0.01). Time spent on studies during weekdays is associated with marks obtained in the assessment (p=0.023), but no evidence for association with screen time (p=0.19, p=0.14).

Marks obtained in the assessment is associated with reduction of study time at home due to screens (p<0.01). Violent scenes in screen time is proportionally associated to Total screen time score (p<0.01) and inversely proportionate to marks obtained in the assessment (p=0.01). Change in behaviour following screen time exposure is clearly associated with total screen time score (p<0.01)

Conclusions: Mean screen time of primary school children in Kandy district is within accepted limits, but considerable percentage of children are having screen time of more than 2 hours. Reduction of study time due to screens is associated with poor academic performances. Screen time is associated with behavioural changes in children. We recommend that National screen time guidelines should be produced to create awareness on the harmful effects of screen time.

Abbreviations

GET: General Education Test; TV: Television; AAP: American Academy of Paediatrics; DVD: Digital Video Disc; NEREC: National Education Research and Evaluation Centre

Introduction

Screen time is defined as the time spent on using TV/video, computer, electronic games, and other visual devices [1]. Screen viewing is considered as one of the most common sedentary activities in which children participate in [2]. Researchers have found that British adolescents spend 6.1 hours and American children spend 7.5 hours on screens per day [3-5].

It is believed that screen time in children has significant adverse effects on their wellbeing as well as the academic performances. A British study revealed that children who spent more than two hour a day watching television or using computers were at an increased risk of psychological difficulties [6]. In younger children exposure to excessive screen time is associated with problems in later childhood, including lower school achievement, reduced physical activity and victimization by classmates [7]. Social media is considered as the growing monster among teenagers. More than half of teenagers log on to social media sites more than once a day and 22% log on to their favourite social media site more than 10 times per day [8]. Therefore, all these findings suggest that screen time has a remarkable impact on children.

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In 2013, the American Academy of Paediatrics (AAP) produced guidelines on screen time allowance for children [9]. It emphasized limiting screen time to less than two hours per day. In 2016, AAP updated their screen time guidelines with age specific recommendations and parent guided media use suggestions [10].

In par with rest of the world, usage of media devices among Sri Lankan children is gradually becoming a major issue. In a recent hospital-based survey undertaken at Lady Ridgeway Hospital for Children among 109 children, more than 70% of children exceeded the daily recommended level of media use of two hours [11]. This small-scale survey is just the tip of the iceberg.

Despite growing concerns in Sri Lanka, the literature search used in this research did not show any major studies on the impact of screen time on Sri Lankan children. With the current trend globally, it was felt that it was pertinent to investigate this issue and its impact in Sri Lanka.

Objective

The objective of our study is to estimate the screen time of the children of primary classes in Kandy District, Sri Lanka and to determine the association of screen time on their academic performances and the behaviour.

Materials and Methods

Study design, setting and population

This is a descriptive analytical cross-sectional study which was conducted in 1200 children from 40 schools of Kandy district. 1200 children in the sample were allocated to 40 clusters with the cluster size of 30 children in each cluster. The cluster size of 30 was determined with consideration of average number of students in a class. Data was collected from March' 2016 to February' 2017. Study population included children from grade 3 to grade 5 from state sector and semi-government schools in the Kandy district. Although primary classes include children from grade 1 to grade 5, study population was limited to children of grade 3 to grade 5 as it would be difficult to assess the academic performance and behaviour of children of grade 1 and 2.

Sample size

Sample size was calculated based on a cross sectional study done in Iran [12]. The sample size was calculated to estimate screen time more than 2 hours among 50% of participants with the margin of error of 4% on either side with 95% confidence level with the use of following equation [13]:

$$n = \frac{Z^2 p(100 - P)}{d^2}$$

Equation 1: Sample size calculation to estimate a proportion

(n-sample size, Z- standard normal deviate of the confidence level, p-proportion of the outcome of interest, d-margin of error on either side of the point estimate)

Thousand two hundred children in the sample were allocated to 40 clusters. The list of schools was obtained from the data base of the Ministry of Education and the schools were randomly allocated using sampling proportionate to population as described by Magnani (1997) [14].

Data collection technique

Permission for data collection in the schools was obtained from the Zonal education Office Kandy and from the Principals of the relevant schools. Four MBBS qualified, trained pre-intern doctors collected data using pretested questionnaires and examination papers. `Questionnaires were prepared based on a group discussion involving randomly selected 25 parents and teachers. Then the questionnaires were pretested in a pilot study and was validated.

For each study participant two questionnaires were provided.

Questionnaire I – This Questionnaire was for parents of the participants. It comprised questions related to demographic details, screen time and its association with study time and behavioural changes.

Questionnaire II – This Questionnaire was for the class teachers of the participants. It comprised questions related to school performance and behaviour of the children in the school.

Selected schools were visited by the data collectors and the selected students were given a parent information sheet and a consent form. The parents who had given consent, answered the questionnaire and their children sat for the examination paper on a later date. The examination paper based on a GET consisting of two 30-minute sections were administered: a first language test and a math test. These tests were adapted from the National Education Research and Evaluation Centre (NEREC) and were pretested and validated. Papers were corrected by the trained data collectors using a validated marking scheme as per the standards of NEREC. The class teachers completed the questionnaire II for the students who were recruited in to the study.

The study obtained parent reported measures of the following predictor variables: availability of screen device at home (Television, DVD/VCD, Computers, Video-games, Tablets/smart phones) and screen time during weekdays and weekends. The outcome measures were average study time during weekdays and weekends, reduction of study time due to screen time, marks obtained in the GET, change of behaviour following screen time and amount of exposure to violence scenes during screen time.

Data entry and analysis

Data entry was done by a trained technical officer using EpiData software. For data analysis SPSS and STATA statistical software packages were used. Missing data components in the questionnaires were not included in the analysis.

Ethical issues

The Ethical clearance was obtained from Ethical review committee, Faculty of Medicine, University of Peradeniya.

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Public involvement

Public were not involved in the designing of the study concept. Questionnaires were prepared based on a group discussion involving randomly selected parents and teachers, that was the first contact with the public in the study process. We will be sharing a plain language summary of the results with the participating schools and the children.

Results

Demographic details

One thousand two hundred children and their parents were invited for the study, among them 787(65.6%) completed the study. Of these 787 children, 51% were girls, 32% of the participants were from grade 3, 33% were from grade 4 and the remaining were from grade 5. The mean age of the study group was 8.6 years (SD=1) (Table 1).

Table 1: Demographic details.

Epidemiological features	Category	Frequency	Percentage
Sex	Girls	401	51%
	Boys	386	49%
Grade	3	253	32%
	4	260	33%
	5	274	35%

General results on screen time

The mean (95% CI) screen time for all devices was 36.8(32.5 to 41.0) min/day during week days and 56.8(50.5 to 63.0) min/day during weekends. During weekdays 38% of the study participants reported a total screen time of less than 30 minutes, 5% reported 30minutes to 60 minutes, 5% reported 1 to 2hours, 2% reported 2 to 3 hours and 2% reported more than 3 hours of screen time per day. During weekends 36% reported screen time of less than 30 minutes, 4% reported 30minutes to 60 minutes, 6%reported 1 to 2hours, 2% reported 2 to 3 hours and 5%reported more than 3 hours of screen time per day. The most popular media device was TV (46.6%, n=367). Six percent of children during weekdays and 12% children during weekends watch TV more than 2 hours/day.

The distribution of total screen time score is associated with category of mother tongue (p<.001), ethnicity (p=.001), availability of DVD player (p=.004), availability of computer (p<.001), availability of smart phone (p<.001), how much time spent on TV during weekdays and weekends (p<.001), violence in programs seen by the child (p<.001), does the child admire violence shown on screens (p=.003). Screen time score was not associated with sex (p=.427), categories of grade (p=.058), mothers age (p=.594) and average time spent on studying at home during weekdays (p=.198), during weekends (p=.140) respectively (Figure 1A).

Impact on the school performance

The distribution of the marks obtained in the assessment test is associated with categories of school (p<.001) and categories of ethnicity (p=.015). The distribution of the marks obtained in the assessment test was not associated with categories of grade (p=.544), categories of mother tongue (p=.830), categories of sex (p=.970) and categories of availability of TV at home (p=.205) (Figure 1B).

Time spent on studies during weekdays is proportionately associated with marks obtained in the assessment (p=0.023)

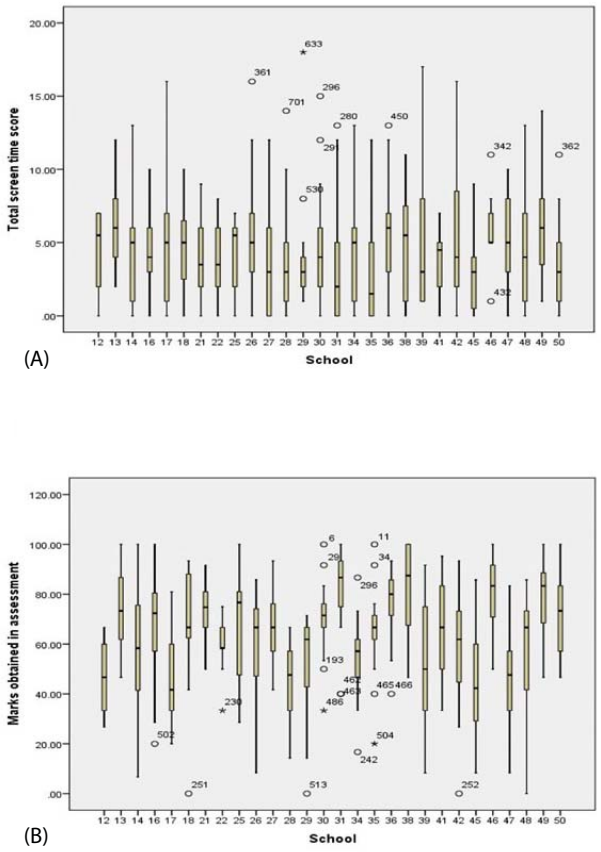

Figure 1: Distribution of total screen time score among the schools (A) and distribution of the marks in the assessment test among the schools (B).

but does not show evidence for association with screen time during both weekdays and weekends respectively (p=0.19, p=0.14). Marks obtained in the assessment is associated with reduction of study time at home due to screens (p<0.001). (Table 2, Figures 2 A-C).

Impact on behaviour and psychological status

Violent scenes in screen time is proportionally associated to Total screen time score (p<0.01) and inversely proportionate to marks obtained in the assessment (p<0.01). Change in behaviour following screen time exposure is clearly associated with total screen time score (p<0.01) (Table 3, Figure 3 A-C).

Discussion

The study invited 1200 children and their parents to partake, however only 66 % of children completed the study due to parents not giving consent and not completing the questionnaires. Some schools showed less interest in the study

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citing reasons that it would disturb the academic activities of the school. Interestingly, in a recent UK study on screen time and risk markers of diabetes mellitus, the response rate was only 68% [15].

The mean screen time reported by parents during weekdays and weekends was less than an hour. This is below the 2 hour/day cut off recommended in the AAP guidelines [16] and contrary to the finding in a recent hospital-based study at Lady Ridgeway Hospital for Children, which is situated in the capital of the country, where more than 70% of children exceeded the daily recommended level of media use of two hours [11].

Table 2: Screen time variables associated to school performance.

Variable	Category	Number	Rank sum	P-value
Marks by time spent on studies during weekdays	Nil	20	3400.50	P=0.023
	1-31 min	28	5140.50	
	31-60 min	108	25597.50	
	1-2 hours	186	43464.50	
	2-3 hours	80	20770.00	
	>3 hours	49	12783.00	
Marks by reduction of reduction time spent on studies due to screens	Not reduced	229	61063.50	P<0.001
	Slightly reduced	225	51985.50	
	Moderately reduced	33	5779.00	
Screen time by reduction in study time due to screen time	Not reduced	229	45348.50	P<0.001
	Slightly reduced	225	64977.50	
	Moderately reduced	33	8502.00	

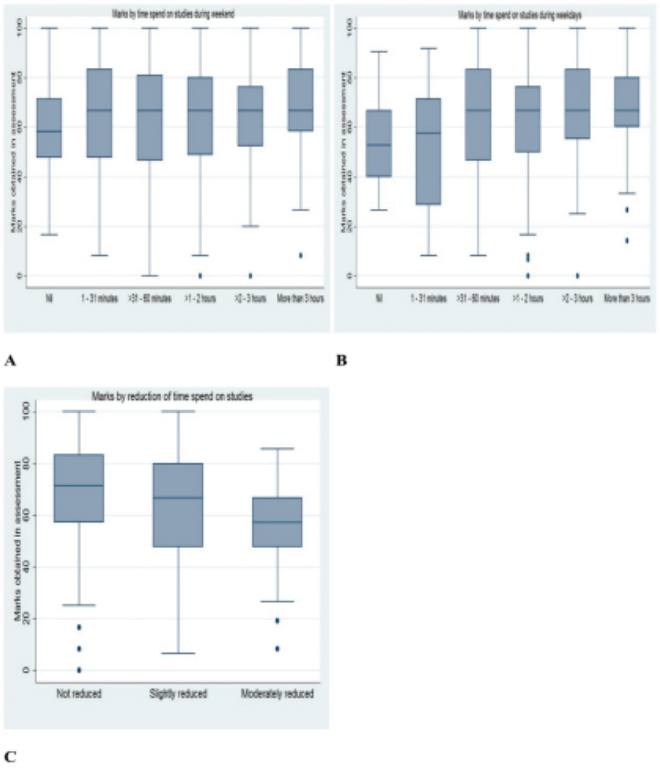

Figure 2: Distribution of total screen time score among the schools (A) and distribution of the marks in the assessment test among the schools (B).

Table 3: Screen time variables associated to behaviour and psychological status.

Variable	Variable category	Observation	Rank sum	Significance
Screen time by violence scenes in the screen	Never	254	55593.5	p<0.001
	Sometimes	239	66177.5	
Marks by violence scenes in the screen	Never	254	67595	p<0.001
	Sometimes	239	54176	
Screen time by behaviour change following screen exposure	No	378	87354	p<0.001
	Yes	113	33432	
Marks by behaviour change following screen exposure	No	378	94794	p=0.17
	Yes	113	25992	

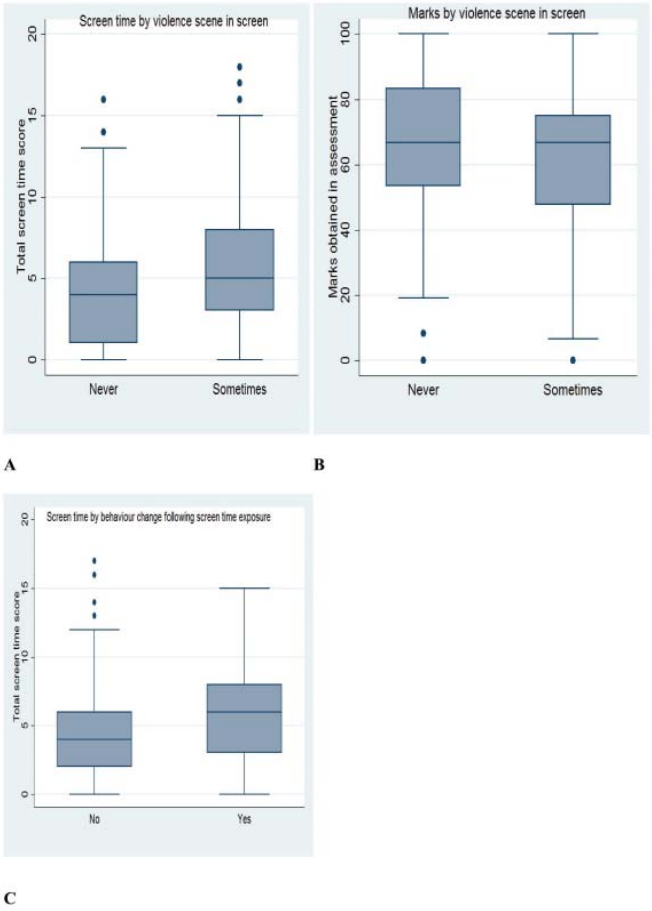

Figure 3: Screen time by vilonce scenes in the screen (A), marks by violence scenes in the screen (B) and screen time by change in behaviour following screen time (C).

The study showed that 6% of the children had more than 2 hours television time during weekdays, 12% during weekends and 7% had more than 2 hours of total screen time during weekends. This shows that a considerable proportion of the study population have a high screen time. It is also clear that children are showing an increase affinity towards screens during the weekends.

When focusing on the impact of screen time on school

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performance, screen time did not show any direct association with time spent on studies. However, time spent on studies was associated proportionately to marks obtained in the assessment and marks are proportionately associated with reduction of study time due to screen time. Children who had reduced study time due to screens, performed poorly in the General Education test showing the impact on their school performance. Consequently, the study has shown that increased screen time has an effect on study time and therefore reduction in marks obtained in the assessment leading to a negative impact on school performance.

There have been various studies completed in the past to assess the relationship between the screen time and academic performances however there has been no clear consensus about their relationship. Several studies have shown that screen time negatively influences the academic performance [16,17], in contrast some studies have found a positive association [18,19], or report no association [20]. This study adds value to the common thought that screen time has a negative association with academic performance.

When analysing the association between exposure to screen time and the behaviour, children have shown a clear change in their behaviour following exposure to screens. Violent behaviour, hyperactivity and poor attention are the common behavioural changes observed within the study population. It was noticed that there is a positive correlation between exposure to violent scenes and total screen time. Another interesting observation was that children with increased violent scenes exposure scored poorly in the assessment test. Numerous studies conducted all over the world have found that there is a significant association between screen time and behaviour in children [21,22]. Gentile DA, et al., evaluated 430 primary school children and their teachers and found children's exposure to media violence predicted higher aggressive verbal and physical behaviour [23]. This study population included children of the same age group as the above-mentioned study and also showed similar results as reported by Gentile DA, et al.

Our study revealed that TV time of parents showed a proportionate association with screen time of the children. Due to practical reasons, our study could not evaluate the parents screen usage behaviour. A cross sectional study conducted by the University of Bristol which included 1078 children, produced similar results confirming the significant role of parents on the screen time of children [24]. This finding in the study is vital for counselling the parents and will be useful in designing the recommendations on screen time.

Conclusions

In conclusion, the mean screen time of primary school children in Kandy district is within normal limits, but considerable percentage of children are having screen time of more than 2 hours, especially during weekends. The actual screen time can be higher than this considering the fact that there is a possibility of under reporting by the parents. Lower marks obtained in the assessment are associated with reduction of study time at home due to screens, hence screen time has an impact on the school performance of children. Screen time is associated with behavioural changes in children especially due to the increase risk of them being exposed to media of a violent nature. Television time of the parents is positively associated with the screen time of the children.

- Therefore, it can be suggested from this study that parents and teachers should make an effort to place limits on screen time of their children to ensure it does not interfere with their physical and psychological wellbeing, as well as academic achievements. Parents should set an example for children on screen time. More studies should be conducted to evaluate the screen time in different age groups, the contents of the screen time and the effects of social media on children. This study recommends that necessary steps should be taken to formulate National screen time guidelines for children in Sri Lanka and to improve public awareness.

Limitations

- Although 1200 children were invited to the study, only 66% responded.
- Few schools did not return the questionnaires completely or part of it.
- As screen time was calculated based on the answers reported by the parents, there is a possibility of parents under reporting the screen time of their children.
- The study was done in one of the districts of the country and therefore would not necessarily reflect the situation in the whole country.
- Although the study speaks about the screen time of the primary school children for practical reasons the study was conducted only among children of grade 3-5.

Contributions by authors

- KS- Analysing the results and writing the manuscript.
- KB- Analysing the results and statistical support.
- TT- Data entry and data cleaning.

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