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## Study on Screen Time and its Association with Behaviour in Children of Age Group 8-15 Years

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### Abstract

**Background:** The use of visual media in the present generation is growing at an alarming rate. The popularity of multimedia and screen time is widespread. The nature and quality of the content in screen time is influencing the different behavioral aspects of children. Children have lack of differentiating fantasy and reality, which makes them more vulnerable to risk of multimedia. This research focuses into children's screen time and its various effects especially on behavior in children. The first objective were to find out the screen exposure time of children to visual media of age 8-15 years and the second objective was to assess the association between screen time and behavior in children of age group 8-15 years (using pediatric symptom checklist-17). **Methodology:** The study was conducted as a cross sectional observational study with a sample size of 400 students of age group 8-15 years. Students were randomly selected from 2 private schools and 2 public schools of Vadavukode block of Ernakulam district, in Kerala state in India. The children were interviewed and data sheet was filled. The Behavior assessment checklist about each student was filled by their class teacher. Data was then analysed and significance levels were calculated. Performed Spearman's correlation coefficient for finding relation. Also used Kruskalwallis Test for analyzing some data. **Results:** Children of age group 8 - 15 years when studied it was observed that mean screen time is 147.8 minutes and maximum for television screen time with 67.5 minutes followed by laptop screen time 25.5 minutes and mobile phone screen time 24 minutes. Screen time is then compared to children's behavior and it was found that there is significant

relationship ( $r_s = 0.14$ ,  $P = 0.005$ ) between these parameters. Screen time and internalizing behavior had a weak positive relationship ( $r_s = 0.193$ ,  $P < 0.001$ ). **Conclusions:** Multifactorial effects of screen time were observed during this study, conducted among children of age group 8-15 years. It was found that Mean screen time in the age group was far more than AAP recommendation. Television screen time scored the maximum with an average of 67.5 minutes followed by mobile phones and laptops. A significant relationship was also observed between screen time and child behavior.

**Keywords:**-Screen time,Television,Mobilephone,Laptop,media.

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## Introduction

Adults and children are spending much of their time on media nowadays. Regarding visual media and their screen time, the trend in present generation is happening at an alarming rate. Multimedia has become a double edged sword with both benefits and risks. The edge lies on whom and how it is being used.

The popularity of multimedia and the screen time is widespread. Screen time depending on the nature and quality of content is influencing the different behavioral aspects of children of all age groups.

There is much use of media in improving educational potential of children, which is also accompanied by the fears about their overuse. However researches in this area still remains limited. American Academy of Paediatrics (AAP) has policy statement regarding this which is referred to as "Media and young minds".(1) AAP, the White House task force on childhood obesity recommends discouraging any screen time for children aged below 2yrs and for older children a screen time less than 2 hrs.

More children are using newer digital technologies like mobile phones.

Media use in school aged children and adolescents study among children aged 8 yrs and older, has found average daily TV time remains 2hrs per day. (2).Children are becoming target of marketing through visual media.(3)

Contents of media use were also changed over past decades. Overall media use among children are also increasing day by day and most of them own a smart device with online access.Video games remains very popular device

screen time can be habit forming. If children at younger age are exposed to too much screen time, it becomes more difficult to control their screen time when becomes older children.(4)

Boys are remaining as the most avid video game players.(5) The gaming consoles and online video game access through mobiles are main modes for the gaming.

Gamification refers to application of gaming in real activities of the world, that is for behavior modification etc. The portable media use including gaming consoles, mobiles, laptops, tablets has done challenging modifications in gaming world. The user friendly self explaining apps and attractive presentations has brought gaming ways ahead. Wifi, bluetooth, internet etc has given children, the freedom of its use even while travelling. The modification of games and applications into academic, informative and wellness oriented. For example Nike+ app which tracks exercise routines and give the subscriber a healthy competitive spirit oriented towards wellness. They also reinforce good behaviours.(6)

According to Australian institute of family studies – their children's screen time increased from ages 4-5 to 12-13years. On an average 12-13yr old spends almost 3hrs per day weekday and 4hrs a day weekend with screens.This was found through a longitudinal study by waves in Australia.(7)

Recommendation by digital health task force of Canadian pediatric society is that no screen time for children below 2 yrs, for children 2-5yrs a recommended screen time is 1hr per day and avoid screens for atleast 1hr before sleep.(8)

Indian studies on screen time are rare. One among the first studies conducted on screen time of Indian children was by R.K Gupta et al (9) at Jaipur, Rajasthan. The study was to measure the impact of television on children, taking a sample size of 250 children. Duration of television exposure per week was about 18.5hrs and TV exposure and physical activity, sleep pattern were found to be significantly linked.30.4% cases with decrease in physical activity ,24 % children with altered sleep pattern was observed.

As per studies screen use is increasing as age advances.(10) Video gaming is regarded as one of the major cause of childhood obesity.(11).

Excessive screen time in children results in self regulation problems, social emotional delays, difficult temperament .(12,13) Televisions are being used as “electronic baby sitter ” for infants and also used to control tantrums in toddlers.

Health consequences linked to media use includes weight gain, obesity, emotional instability, depression, mental health issues, loneliness, anxiety and impulsivity as per Augner et al 2012.(14) Also in adolescents screen time is inducing low self esteem, depressive symptoms and social withdrawal .( 15)

Social medias has also become a platform for sharing personal matters and rendering ability to overcome challenges in one's life. Depression and other mental illnesses are also associated with this. (16) This research focuses into children's screen time and its various effects on their behavior .

## **Materials and Methods**

### **Study design and setting**

Initially a pilot study was done and using the mean and standard deviation the sample size was calculated. Sample size decided as 400 students. The study was done in such a way that students of 8-15 years age group are randomly selected from 2 private and 2 public schools of Vadavukode Block of Ernakulam district in Kerala state. They are then interviewed and behavior assessment checklists (Pediatric symptom checklist-17) was distributed to their respective class teachers who are with the children for almost 8 hours a day and who could give an unbiased assessment about the children. Teachers were pre-educated regarding the use of checklist and mod records from the last major exam details. Using grade point average system marks were then analysed. It was then tabled.

The exposure time for each of the visual media was assessed separately, personal ownership of visual medias, objective of watching screens, type of programs watched more frequently were noted, access to internet, usage of multiple visual media at same time, parental rules about screen exposure, morning/afternoon and evening screen exposures separately, background TV viewing, bedtime screen exposure, meal time screen usage, holiday screen exposure, screen time's relation to time spent for physical activity.

### **Sampling method**

All schools from Vadavukode Block from Ernakulam district were clustered into 2 category as private and public schools. 4 schools - 2 private schools and 2 public schools selected from Vadavukode block by cluster sampling. From each school 100 students by cluster sampling. From each class 15 students from each class selected by random sampling (lottery Method)

### **Study definition**

Screen time refers to time spent with any screen, including smart phones, tablets, television, video games, computers or wearable technology like smart watch. The study concerns recreational media use only. That is unless otherwise noted, all findings concern non school related media use. Total Screen time exposure relates to amount of screen time children of age group 8-15yrs consume in a day – the number is obtained by simply adding up the amount of time spent on watching TV, mobile phone, tablet, video games, computers or other smart devices. Digital media refers to content transmitted over the internet, computer networks on all devices. Effect on behavior in this study refers to effect on attention, conduct, mood using pediatric symptom checklist -17.

**Study participants and sampling****Study population**

Children of age group 8-15 years studying in schools selected for study. (From Vadavukode Block in Ernakulam district) .

**Study instrument**

Interview of children and behavior assessment checklist (pediatric symptom checklist-17) to their teachers. PSC 17 checklist is the one used by primary care providers to find any mental health disorder in the children of 8-15 years old. It is a brief and easy score which has fairly good mental health screening characteristics. Sensitivity of this scale ranges from 31% to 73% and specificity ranges from 74% to 96%.

PSC-17 Internalising score positive if sum  $\geq 5$  (For screening of any anxiety or mood disorder)

PSC-17 Externalising score positive if sum  $\geq 7$  (For screening of conduct disorder, oppositional defiant disorder, adjustment disorder with disturbed conduct or mixed disturbed mood and conduct)

PSC-17 Attention score positive if sum  $\geq 7$  (for screening of ADHD)

PSC -17 total score if total sum  $\geq 15$  (for likelihood of behavior disorder being present)

**Study area:** Multiple schools from in Vadavukode Block in Ernakulam district on random basis.

**Selection criteria :** Students are selected from target population based on listed inclusion and exclusion criteria.

**Inclusion criteria :** Children aged 8-15 years age attending schools selected for study.

**Exclusion criteria:**

- 1) Students with known development delay, mental retardation, epilepsy.
- 2) Time spent over screen for school related media use. (Eg: for book read for a school assignment, online search conducted for a class project), are not included in total screen time.

**Sample size**

The sample size was calculated based on a pilot study with a random group. Anticipated mean and anticipated standard deviation was found.

If we desire a confidence interval of 95% and statistical precision of 10%, the minimum number of subjects needed will be 340 using the formula for sample

size calculation. The sample size thus taken as 400 subjects.

**Study design:** Cross sectional study. Using simple random sampling.

**Study duration:** One Year; January 2018 – December 2018

#### **Data collection tool and technique**

Data was obtained by interviewing students by the investigator and giving pediatric symptom checklist to teachers, and their academic grades were noted. Teachers were educated regarding the checklist filling and the need for unbiased filling of the forms. The results were interpreted using clear definitions by avoiding all possible biases. Multiple visits are done to each school for data collection. Result is then combined tabled and detailed analysis was done.

The data is collected by distributing behaviour assessment forms in English to the teachers and by directly interviewing children (childrensself reporting) in their free class after getting permission from the school authorities.academic grades were collected from school records.

Categorical variables were summarized as frequency and percentage; continuous variables were summarized as mean and SD for normality distributed variables .Statistical tests were applied then.  $P < 0.05$  was considered the threshold for statistical significance. statistical analysis was performed using statistical software package SPSS.

#### **Ethical considerations**

The study protocol was submitted to the institutional review board and ethical committee and approval was obtained. The ethical approval of the present study was gained from the Institutional Review Board of the research ethics committee (**number: MOSC/IEC/262/2017**).Written informed consent was obtained from every student included in the study. Personal information of patients was kept confidential. No additional charges were taken from the student for the study.

Budget-No additional funds were required.

#### **Results**

The study was conducted with a sample population of 400 children and the results were as follows.

**Table 1** shows the percentage distribution of study sample according to the age. According to age distribution,the studied population belongs to age group 8-15years,maximum of age group 8yrs(13%) and minimum of 15years(12%) . Based on the gender classification 45% were males and 55% were females. There was a female predominance in sample size from the total population(55%).

**Table 2** and **figure 1** shows the Distribution of Median Screen time per day .The observed findings were as follows.Median screen time observed from the study 142.5(142minutes and 30 sec).[Interquartile ranges -Q1 =105, Q3 =180] .Screen time for laptop/computer 45mts as an average. Where 50 % of study population falls in between 15mts and 45mts.Screen time for mobile phone viewing as an average is 45mts.Where 50% of study population falls in between 15 to 45mts.Screen time for TV viewing as an average is 45mts Where 50% of study population falls in between 45mts to 90mts.Although average screen time is 45mts for all types of screen used, calculating TV screen viewing most of them are above 45mts, with 50% of the population falls in between 45 -90mts.

**Table 3** shows the screen exposure time of children of age group 8-15years. Thoughmedian screen exposure time of Laptop, mobile phone and television are same as 45mts, mean screen time for television is 67.5minutes(1 hour 7minutes) and for laptop and mobile phone 25.5minutes and 24 minutes respectively. Mean of total screen time is 147.8mts(2 hour 27minutes), mode 105mts(1 hour 45minutes) and median is 142.5 minutes(2 hour 12minutes).

**Table 4** shows the distribution of Computer viewing time per day.Among the entire sample population 48.75% of children are viewing computers/laptops at an average of <30mts per day,33.25 % are viewing for 30mts to 1 hr per day and 18% are viewing for 1-2hr per day. All screen time are calculated based on non educational screen time.

**Table 5** shows the distribution of Mobile phone viewing time per day. 50.2% of children in the sample are using mobile more than 30mts.out of which 8.3% are viewing mobile screen for more than 1 hour per day.that is every 5 out of children are using mobile screen for more than 30mts per day on a weekday.

**Table 6**shows the distribution of Television viewing time per day.362/400 watching more than 30mts tv per day.90.5% of children are indulged in television for more than 30mts.out of this 45.7% children are watching television for more than 1 hr per day.

**Table 7** and **figure 8** shows the relationship between Screen time and Child BehaviourScore.Spearman's correlation coefficient was performed to check the relationship of behavior with screen time and observed that total screen time has a positive relationship with behavior.(rs = 0.14,P = 0.005).Screen time and internalizing behavior has a positive relationship(rs = 0.193,P<0.001).Screentime and inattention and externalizing behavior has a very negligible weak correlation (rs=0.009,P=0.85) and (rs =0.075,P=0.13) respectively.

**Table 8** depicts the Relationship between Laptop screen time and behavior in children of age group 8- 15 yrs.There significant association between laptop



screen time and introvert behavior ( $p < 0.05$ ). No other relationship between laptop screen time, attention deficit, extrovert behavior or total behavior score.

**Table 9** shows the relationship between Mobile phone Screen time and Behavior in children of age group 8- 15 yrs. There is no significant relationship between mobile phone screen time introvert behavior, attention deficit, extrovert behavior or total behavior score.

**Table 10** shows the relationship between Television Screen time and Behavior in children of age group 8- 15 yrs. It was found that there is significant association between TV screen time and introvert behavior ( $P < 0.05$ ). No association was found between attention deficit behavior, extrovert behavior and TV screen time. Significant association ( $p < 0.05$ ) was present between total behavior score and TV screen time.

**Table 11** shows the frequency of usage in sample population. On assessing device usage frequency, maximum is with Television, with 81.75% of children of age group 8-15 yrs watching television. Next comes mobile and laptop 58.75% and 59% respectively. Video games used by 9.5%, Tablet by 17.75% of children, other screens by 2.5%. **TABLE 23.** Frequency of Multiple screen Usage in sample population

## Discussion

Various researchers have studied on effect of media and screen time on children. Keeping this in mind this study was undertaken with objective to assess the average screen time and its effects on behavior in children in a developing country like India.

Pediatric health providers can offer specific guidance to families in managing screen time in children, not only in terms of content or time limits but also on parent child shared media use, bedtime and meal time screen time and other aspects. (1,15,16)

Kaiser family foundation survey in US found average screen time in US children aged 8 -18 yrs as 7hrs and 38mts a day. (5) An American youth spends almost 1/3<sup>rd</sup> of a day on electronic media. (17) In Indian study by Dr Dhyansingh, it was found that Television viewing habits come to 22hrs per week, i.e. 3 hour 8 minutes per day. (18) McCreary foundation of Canada conducted a study and observed adolescent screen time 3hrs a day on average school day and 15% are involved in videogames more than 3hrs a day. (19) In the present study out of 362 children watching more than 30mts television per day. 90.5% of children are indulged in television for more than 30mts; out of this 45.7% children are watching television

for more than 1 hr per day. So it is a significant problem in our families and society.

The age group of the study varied from 8-15 years which is a deviation from few of the previous studies where preschool children are studied. The concrete operational stage of cognitive development is the age group 7-12yrs as studied by previous good old studies by piaget, 1969(20): lemish 2007(21). According to age distribution, the studied population in the present study belongs to age group 8-15years, maximum of age group 8yrs (13%) and minimum of 15years(12%). These children develop abstract thinking and televisual literacy which makes them think on story lines, comprehends observations.(22) This is thus the stage where children feel so much attracted to screen especially television.

The change of traditional media to newer digital medias resulted in drastic changes in screen time of children, in past decade it was a 4yr old child watching TV and now a 4 month old interacting with mobile phones. Evolution has crossed barriers and very severely affected our young generation. Mobile screen time observed in the study is maximum frequency of usage <30mts (49.8%). 50.2% had more than 30mts mobile screen time. Average mobile screen time is 24mts (mean), mode (15mts), median (45mts). In gen m2 study in American children Mobile screen time average is 49minutes per day. Gen M2 study (23) also focuses on increasing trend of mobile use in adolescents over years (2004 -2009). This can be the stage that now developing country like India is going through. The time period in the present study group population using mobile screen has almost reached equivalent to US children when Gen M2 study was going on (2009). Children from less affluent families may be less likely to get smartphones, which is the reason for less time spent compared to other screens, explaining the trends observed in this study.

Average laptop screen time is 25.5mts. Maximum frequency is distributed at <30mts.(48.75%). 51.25% has more than 30mts lap top screen time. Median 45mt ,mode 15mts. This results also coincides with the Gen M2 study(22) suggesting average laptop/computer screen time is less compared to television screen time reaching almost half to one third of television screen time. Not much Indian studies on children's screen time are available to compare. Economic and income status of the families are playing a major role in children's access in to laptops and computers. It was found in a European study "Net Children go mobile project", in which greater proportions from high socioeconomic backgrounds uses laptops daily than children from low socioeconomic backgrounds .(24) Television screen time was studied and the following was noted. Maximum frequency distributed between 30mts to 1 hour.44.8%. 1 hour to 2 hr 31.5%. Average TV screen time is 67.5mts, median 45 mts mode 45mts. In gen M2 study average TV screen time is 4 hr 29minutes. Though the study

population is not having such a large television screen time, the maximum screen that is being used is Television in Gen m2 study as well as in the present study.

A study by Vasan in 2010 on films and TV viewing patterns and influence on college going children establishes influence of media on attitudes and behaviors of Indian children. (25). Also 1970s and 1980s media content and sexual behavior in children are studied much in india.(26)Goswami and Kashyapalso conducted a similar study on tobacco in movies and health. It also contained the behavior of children to walk, talk and accessorize like actors of popular movies.(27)

In the present study it was found that total screen time has a significant positive relationship with total behavior score ( $p < 0.005$ ). Total Screen time and internalizing behavior also has a significant positive relationship ( $p < 0.001$ )

It was also observed that there is significant association between TV screen time and total behavior score( $P = 0.008$ ). Also TV screen time and internalizing behavior has a weak positive relationship ( $p < 0.01$ ). These all are in accordance with the studies in developed countries as mentioned in the Review of literature. Screen time and behavior problems associations are found positive in seattle study.(28) Screen time and aggressive behavior studied by American national violence study.(29)Child's aggressive behavior is related to violent action contents in television and other medias as per many studies.(30)

An explanation processed for more internalizing behavior in children is that These children stay indoors more , they also suspect unsafe in neighbourhoods. Parents of these children are preferring TV and screen viewing as more safer alternative to playing outside.(31,32)

### **Limitations of the study**

Main limitation of the study is that the population taken may not be a representative of target population of mid Kerala. Hence results cannot be extrapolated to entire population.

Self reported measure – Data collected may rely on participant's memory. Recalling exact time periods, type of screens and programmes seen are all difficult processes and are subject to bias.

Social desirability biasing is there in this study where the reporting can be biased with socially acceptable norms. The subjects may modify actual data on social frames like screen time watching, which is not a socially acceptable mode of time utilization. Absence of non longitudinal nature of the study also adds to the limitation.

### **Impact of the study and recommendations**

Screen time is a topic of interest in general population as well as among clinicians. Its associations are very high but less studied. Although good studies and protocols are made for screen time in developed countries, India is yet to adopt a protocol for screen time. The study focuses on these important aspects of media viewing using various gadgets. Although there is considerable evidence regarding the consequences of increased screen time, further research have to be done in this field as now artificial intelligence(AI) platforms and AI applications have changed the whole scenario.

### **Conclusion**

Multi factorial effects of screen time were observed during this study. Apart from this screen time, type of screen used, extend of screen used were also considered in deciding the impact on children. There is a significant positive relationship between screen time and behavior score. Behavior score is a sum of inattention, externalizing behavior and internalizing behavior. In this study a separate positive relationship was found between screen time and internalizing behavior. The study also showed Television screen time to be more related to behavior score than other screen times. One of the remarkable finding of the study was that parent rules on the screen time were present in more than half of the population and that most of the time it is obeyed. Screen time is affecting our children's sleep, studies, behavior attitude, and general health. An increase in physical activity of the children is the need of the hour, which can reduce the screen time significantly.

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**Conflicts of interest :**There are no conflicts of interest.

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## Results-11 Tables and 2 Figures

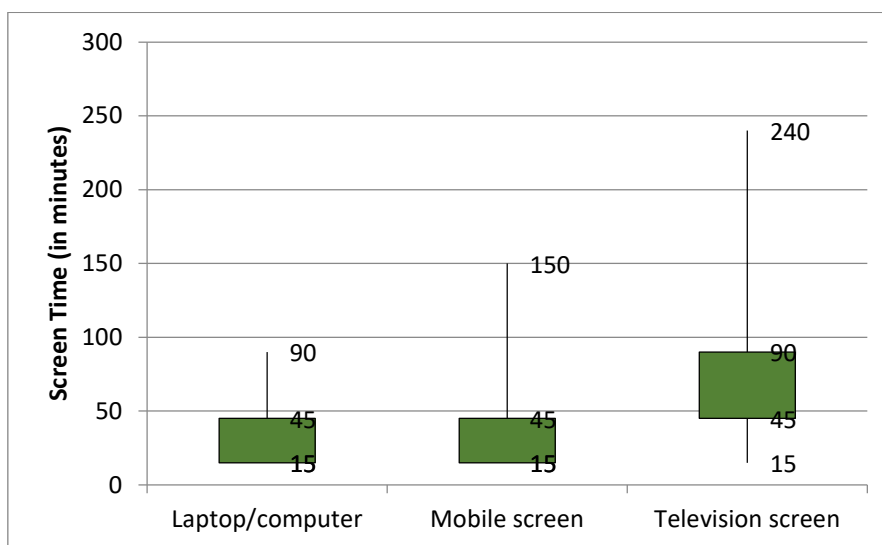
**Table 1: Percentage distribution of sample according to age**

Age	Frequency	Percent
8 yr	52	13.0
9yr	51	12.8
10yr	50	12.5
11yr	49	12.2
12	51	12.8
13	50	12.5
14	49	12.2
15	48	12.0
Total	400	100.0

**Table 2 : Distribution of Median Screen time per day**

	Screen	Median	( Q1 - Q3 ) Interquartile range
1.	Laptop/computer	45mts	15mts -45mts
2.	Mobile screen	45mts	15mts – 45mts
3.	Television screen	45mts	45mts – 90mts
	All screens total	142mts 30sec	105mts to 180mts

**Figure 1 : Distribution of Median Screen time per day**



**Table 3 : Screen Exposure time of children of age group 8-15years**

	Laptop screen time	Mobile phone screen time	TV screen time	Total screen time
Mean	25.5mts	24mts	67.5mts	147.8mts
Median	45mts	45mts	45mts	142.5mts
Mode	15mts	15mts	45mts	105mts

SD	12mts	10.5mts	13.5mts	62.8mts
Minimum	15mts	15mts	15mts	45mts
Maximum	90mts	150mts	240mts	375mts

**Table 4 : Distribution of Computer viewing time per day**

TIME	FREQUENCY	PERCENTAGE
<30MTS	195	48.75
30MTS TO 1 HR	133	33.25
1 HR – 2HR	72	18
TOTAL	400	100

**Table 5 : Distribution of Mobile phone viewing time per day**

	FREQ	PERCENTAGE
<30MTS	199	49.8
30MTS – 1HR	168	42
1HR TO 2 HR	30	7.5
2-3 HR	3	0.8
TOTAL	400	100

**Table 6 : Distribution of Television viewing time per day**

	FREQ	PERCENTAGE
<30MTS	38	9.5
30MTS – 1HR	179	44.8
1HR TO 2 HR	126	31.5
2-3 HR	40	10

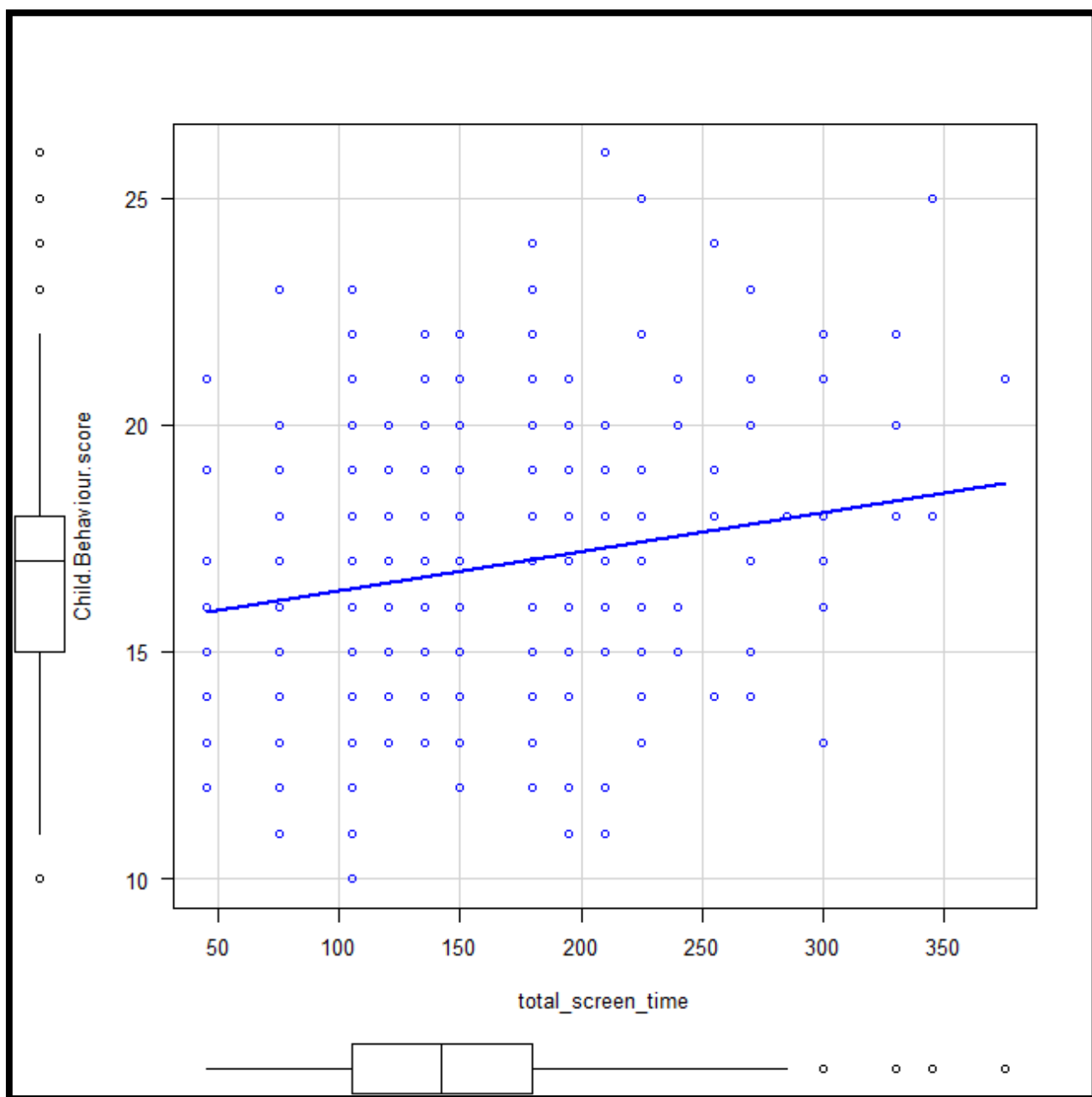


>3HRS	17	4.2
TOTAL	400	100

**Table 7 : Relationship between Screen time and Child Behaviour Score**

Behavior	Rs	P value
Internalizing behavior	0.193	<0.001(significant)
Inattention	0.009	0.85
Externalising behavior	0.075	0.13
Child behavior	0.140	0.005(significant)

**Figure 2 - Relationship between Screen time and Child Behaviour Score**



**Table 8. Relationship between Laptop screen time and behavior in children of age group 8- 15 yrs**

	Normal			Positive			T	p
	Mean	SD	N	Mean	SD	N		
Introvert	35.6	26.7	223	42.1	28.4	177	2.36*	0.019
Attention deficit	38.6	27.9	216	38.3	27.3	184	0.11	0.915

**Table 9: Relationship between Mobile phone Screen time and Behavior in children of age group 8- 15 yrs**

	Normal			Positive			T	P
	Mean	SD	N	Mean	SD	N		
Introvert	32.9	21.9	223	35.9	26.0	177	1.27	0.206
Attention deficit	34.9	22.8	21	33.4	25.1	184	0.63	0.529

Extrovert	39.0	27.8	242	37.7	27.3	158	0.46	0.646
Total behaviour score	40.8	29.8	83	37.9	27.0	317	0.88	0.381

\*: - Significant at 0.05 level

			6					
Extrovert	33.1	22.7	24	36.0	25.5	158	1.18	0.238
Total behaviour score	37.0	22.5	83	33.5	24.1	317	1.21	0.228

**Table 10: Relationship between Television Screen time and Behavior in children of age group 8- 15 yrs**

	Normal			Positive			T	P
	Mean	SD	N	Mean	SD	N		
Introvert	67.2	41.1	22	85.1	58.8	177	3.58	p<0.01
Attention deficit	70.0	46.5	21	81.1	54.2	184	2.21*	0.028
Extrovert	74.6	54.2	24	75.9	44.1	158	0.24	0.812
Total behaviour score	62.0	42.3	83	78.5	51.8	317	2.68*	0.008

\*\* - Significant at 0.01 level, \* - Significant at 0.05 level

**Table 11: Frequency of device usage in sample population**

Device	Frequency	Not using
Tv	327(81.75%)	73
Computer	236(59%)	164
Videogame	38(9.5%)	362
Tablet	71(17.75%)	329
Mobile	235(58.75%)	165
Other gadgets	10(2.5%)	390