

## Do children need humans or screen? Institutional-based cross-sectional study

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### Abstract

**Introduction:** Screen exposure is on the rise and has been virtually unavoidable in the post-Covid era. Screen exposure during the critical period of brain development results in delayed language, learning and behaviour problems and subsequent sedentary lifestyle results in non-communicable disease later in life.

**Objectives:** To assess the burden of digital screen exposure and parental perceptions of its effects in children.

**Method:** This institution-based cross-sectional study was conducted among children aged 1-13 years in a tertiary healthcare centre in Puducherry, India, from April 2022 to June 2022. Data were collected using the Digital Screen Exposure Questionnaire (DSEQ), administered by trained Compulsory Rotatory Residential Internship (CRRI) after pilot testing.

**Results:** Our study shows that the prevalence of excessive screen exposure (>1 hour) was 25% during weekdays and 44.9% during weekends. The most common media used was television (TV) in 92.8%, closely followed by smart phones in 90%. Most frequently watched content (>5 times/ week) was random things for enjoyment in 57.8% followed by rhymes in 25.7%; 57.1% had no outside play during weekdays. Mother's education was the main predictor which influenced the duration of screen exposure in study participants.

**Conclusions:** Our study shows that the prevalence of excessive screen exposure (>1 hour) was 25%

during weekdays and 44.9% during weekends. Common media used were TV in 92.8% and smart phones in 90%. Except for mother's education, no other socio-demographic factor influenced the duration of screen exposure in study participants. There was excessive screen exposure in children despite parental perception of its harmful effects

(Key words: Screen time, Digital media, Smartphone, TV, Video game)

### Introduction

Children's exposure to digital media is increasing, which is a point of concern as screen time exposure has a major impact on the health of children and also affects the families. Children now have access to more screens and media than ever before, in their room as a television (TV), in their backpacks as tablets and in their hands as their caregiver's or their own smart phones<sup>1</sup>. With the Covid-19 pandemic, children are spending even more time with screens for online learning, entertainment and socialization with friends virtually<sup>2</sup>. Overall, screen time ranged from 0.9 to 3.5 hours/day among under-five year old children and 1-3.1 hours/day among school-aged children. Indian studies showed that children are exposed to screen-based media as early as 2 months of age with the median age of first exposure to screens at 10 months. There is greater use of smart phones (96%) than TV (89%) especially for games and videos<sup>3</sup>. Screen time during holidays (3.9 hours/day) is more than school days (2 hours/ day) among adolescents<sup>4</sup>.

Early childhood is the critical phase in development when the brain is more sensitive to the environment around them. Screens curtail the ability to control impulses and reduce empathy and the ability to read human emotion. It also detracts from activities that help boost their brain power like play and interaction with other children<sup>5</sup>. Hence, excessive screen exposure has been linked to delayed language, learning and behaviour problems<sup>6</sup>. It can cause sleep disturbances by suppressing and disrupting melatonin secretion<sup>7</sup>. Other problems include computer vision syndrome, refractive errors, headaches, body image perception disorders and drug abuse<sup>8-11</sup>. Due to sedentary life style and the consumption of unhealthy food promoted by advertisements, excessive screen time is considered as one of the major role players in causing non-

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communicable diseases (NCDs) and health risks later on in life<sup>12,13</sup>.

As per recent Indian Academy of Paediatrics (IAP) guidelines, children below the age of 2 years should not be exposed to any type of screen with the exception of an occasional video call with relatives. Screen time for children between the age of 2 and 5 years should not exceed 1 hour, the less, the better. For older children and adolescents, other than online classes, there should be a maximum of 2 hours screen time. It is important to balance screen time with other activities that include an hour of physical activity (play time), adequate duration of sleep and time for schoolwork, meals, hobbies, and family time<sup>14</sup>. This is similar to World Health Organisation (WHO) and AAP guidelines for screen time<sup>15,16</sup>. Parental awareness of screen time of their children and its effects are crucial to regulate screen media exposure in children.

The above guidelines are updated regularly but are criticized as to be not completely evidence-based. In the outpatient department (OPD) waiting area and in the wards in our institution even after repeated sensitization of the parents, it has been noticed that the parents are voluntarily giving children phones to keep them silent. which emphasizes need-based counselling for the parents There is limited published data from India on the burden of screen exposure, especially its content and context and associated factors using standardized tools, the knowledge of which is essential to formulate policy for screen hygiene in children.

### Objectives

We conducted the present study to assess the burden of digital screen exposure and parental perceptions of its effects in children.

### Method

This was an institution-based cross-sectional study conducted in a tertiary healthcare centre in Puducherry, India, from April 2022 to June 2022. The institution has an in-patient capacity of 932 beds, with exclusive 100 critical care beds in different specialties.

**Sample size and sampling:** The sample size of 135 was calculated after considering that the prevalence of excessive screen time was 73%, absolute precision of 7.5% with 95% confidence Interval (CI) (calculated by Epi Info version 3.5.4)<sup>1</sup>; consecutive sampling was applied.

**Inclusion criteria:** All children aged 1 to 13 years were included.

**Exclusion criteria:** Sick children and children whose parents were not willing to give consent were excluded.

**Data collection:** All eligible children in the age group one to 13 years were included in the study. The first participant was selected by simple random sampling technique and the following study participant was selected by systematic random sampling technique. Data were collected using the Digital Screen Exposure Questionnaire (DSEQ), administered by trained Compulsory Rotatory Residential Internship (CRRI) after pilot testing.

**DSEQ** is an 86-item caregiver reported questionnaire developed by Dr Madhu Gupta, Department of Paediatrics, Postgraduate Institute of Medical Education and Research (PGIMER) from the Department of Community Medicine and School of Public Health, PGIMER, Chandigarh, India and it is freely available in the internet<sup>17</sup>. It is not copyright protected and permission was obtained from the author. It has five domains, sociodemographic, screen time exposure and home media environment, level of physical activity, media related behaviours and parental perceptions. It has good face and content validity, internal consistency and test-retest reliability<sup>17</sup>.

**Ethical issues:** Approval for the study was obtained from the Ethics Committee of Sri Manakula Vinayagar Medical College and Hospital, Pondicherry, India (No. EC/21/2022). Written informed consent was obtained from parents of all participants in addition to oral consent for 8-11-year-old children and assent for 12-13-year-old children.

**Statistical analysis:** Data were entered in the Epi info software version 7.2 and analysis was done using Statistical Package for the Social Sciences (SPSS) software version 24.0. Categorical variables were expressed in percentages and continuous variables in mean and standard deviation. Association between socio-demographic factors and excessive screen time was done by Chi square test. p-value <0.05 was considered statistically significant.

### Results

Table 1 gives the socio-demographic details of the 140 study participants. The mean age of the study participants was 6.09 years; 16 (11.4%) attended day care for more than 3 days a week. Parents were the caregivers in 131 (93.5%) cases.

Table 2 gives the home media environment.

**Table 1: Socio-demographic details of study participants (n=140)**

| Characteristic                     | Number (%) |
|------------------------------------|------------|
| <i>Age (years)</i>                 |            |
| 1 to <3                            | 40 (28.5)  |
| 3 to <6                            | 48 (34.2)  |
| 6 to 12                            | 48 (34.2)  |
| >12                                | 04 (02.8)  |
| <i>Gender</i>                      |            |
| Boys                               | 73 (52.1)  |
| Girls                              | 67 (47.8)  |
| <i>Residence</i>                   |            |
| Urban                              | 99 (70.7)  |
| Rural                              | 41 (29.2)  |
| <i>Family type</i>                 |            |
| Nuclear                            | 64 (45.7)  |
| Joint family                       | 43 (40.0)  |
|                                    | 24 (17.1)  |
| <i>Education of mother</i>         |            |
| School                             | 64 (45.7)  |
| Diploma                            | 43 (40.0)  |
| Graduate and above                 | 24 (17.1)  |
| <i>Socio-economic status</i>       |            |
| Upper                              | 22 (15.7)  |
| Upper middle                       | 40 (28.5)  |
| Lower middle                       | 20 (14.2)  |
| Upper lower                        | 21 (15.0)  |
| Lower                              | 37 (26.4)  |
| <i>Primary caregiver</i>           |            |
| Mother                             | 118 (84.2) |
| Father                             | 12 (08.6)  |
| Other                              | 10 (07.2)  |
| <i>Play/ Garden area available</i> | 36 (25.7)  |

**Table 2: Home media environment**

| Home media available   | Number (%) |
|--|------------|
| <i>Television (TV) with cable/satellite connection available</i> | 130 (92.9) |
| <i>Computers/Laptop available</i>                                | 21 (15.0)  |
| <i>Mobile phone with internet (smart phone) available</i>        | 126 (90.0) |
| <i>Mobile phone without internet available</i>                   | 57 (40.7)  |
| <i>Hand held devices to play videogames</i>                      | 15 (10.7)  |
| <i>Only children's channel allowed</i>                           | 11 (06.4)  |
| <i>No media gadgets 1 hour before sleep</i>                      | 07 (05.0)  |
| <i>Watches only under supervision of adults</i>                  | 17 (12.1)  |
| <i>Not allowed to sit near TV</i>                                | 11 (07.8)  |

Almost all participants had more than one digital media at home; 33 (23.5%) had TV in the room where child sleeps and 24 (17.1%) watched screen for more than one hour. Only 38 (27.7%) parents thought that placement of TV in bedroom increases screen time and only 20 (14.2%) parents restricted screen time for children at home. Most common gadget used by mothers was the smart phone (n=34, 24.2%) and the average duration of screen exposure was 1-5 hours in 57.8% and 0-1 hour in 24.2%. Average duration of screen usage by father was 1-5 hours in 39.2% (n=55) and 0-1 hour in 38.5% (n=54); 121 (86.4%) fathers spent less than 5 hours with children at home and 41.4% mothers spent

around 5-10 hours with children at home. Average duration screen exposure was more than 1 hour per day in 25% participants during week days and 44.5% participants during weekends. Most frequently viewed media (>5 times/week) was TV in 83 (59.2%) followed by smart phone in 59 (42.1%).

Table 3 shows the duration and frequency of digital media exposure in study participants. Average duration of outside play was less than one hour in 41 (29.2%) during weekdays and around 1-5 hours per day in 74 (52.8%). Around 80 (57.1%) had no outside play during weekdays.

**Table 3: Screen time exposure**

| Home media                                     | Frequency                                      | Number (%) |
|--|--|------------|
| Television (TV)                                | <i>Frequency /week</i>                         |            |
|  | <5 times                                       | 44 (31.8)  |
|  | >5 times                                       | 83 (59.2)  |
|  | Never  | 03 (02.1)  |
|  | <i>Average duration per day on school days</i> |            |
|  | <1 hour  | 31 (22.1)  |
| >1 hour  | 35 (25.0)                                      |            |
| Smart phone                                    | <i>Frequency /week</i>                         |            |
|  | <5 times                                       | 69 (41.9)  |
|  | >5 times                                       | 59 (42.1)  |
|  | Never  | 08 (05.7)  |
|  | <i>Average duration per day on school days</i> |            |
|  | <1 hour  | 24 (17.1)  |
| >1 hour  | 26 (18.5)                                      |            |
| Other (video games)                            | <i>Frequency /week</i>                         |            |
|  | <5 times                                       | 27 (19.24) |
|  | >5 times                                       | 03 (02.1)  |
|  | Never  | 66 (47.1)  |
|  | <i>Average duration per day on school days</i> |            |
|  | <1 hour  | 09 (06.4)  |
| >1 hour  | 05 (03.4)                                      |            |
|  | <i>Average duration per day on weekends</i>    |            |
|  | <1 hour  | 90 (86.3)  |
|  | >1 hour  | 36 (03.5)  |
|  | <i>Frequency /week</i>                         |            |
|  | <5 times                                       | 27 (19.24) |
|  | >5 times                                       | 03 (02.1)  |
| Never  | 66 (47.1)                                      |            |
| <i>Average duration per day on school days</i> |  |            |
| <1 hour  | 09 (06.4)                                      |            |
| >1 hour  | 05 (03.4)                                      |            |
| <i>Average duration per day on weekends</i>    |  |            |
| <1 hour  | 23 (22.7)                                      |            |
| >1 hour  | 15 (14.7)                                      |            |

The purpose of using digital media was commonly to watch random things for enjoyment like music, advertisements, baby TV, click photos etc. in 81 (57.8%) rather than for educational purposes; 29 (20.6%) used digital media for homework, 85 (70.7%) for video calling, 73 (52.1%) for learning rhymes, alphabets, 36 (25.7%) to learn mathematics, 106 (75.8%) to watch stories, 33 (23.6%) to learn

various sciences online and 67 (47.8%) to watch adult programs (soap operas, news, movies). Around 18 (12%) talked to the characters on screen and 16 (11.4%) acted out story/ role play character while watching the screens.

Table 4 shows the media related behaviour of study participants.

**Table 4: Media related behaviour of study participants**

| Characteristic   | Frequency | Number (%) |
|--|-----------|------------|
| <i>Child uses media for learning poems, rhymes, ABC etc. online</i>  | ≤5 times  | 37 (26.4)  |
|  | >5 times  | 36 (25.7)  |
|  | Never     | 64 (45.7)  |
| <i>Child uses media to learns mathematics, numbers, tables, online</i>   | ≤5 times  | 33 (23.5)  |
|  | >5 times  | 03 (02.1)  |
|  | Never     | 104 (74.2) |
| <i>Child uses media to recognize shapes/ sounds/ colours when shown online</i>                                   | ≤5 times  | 58 (41.3)  |
|  | >5 times  | 33 (23.5)  |
|  | Never     | 43 (30.7)  |
| <i>Child plays video-games</i>   | ≤5 times  | 29 (20.6)  |
|  | >5 times  | 33 (23.5)  |
|  | Never     | 78 (55.7)  |
| <i>Child watches adult programs (soap opera, news, sports, movies etc.)</i>                                      | ≤5 times  | 35 (24.9)  |
|  | >5 times  | 32 (22.8)  |
|  | Never     | 73 (52.1)  |
| <i>Child uses media to watch random things for enjoyment (music, advertisements, baby TV, click photos etc.)</i> | ≤5 times  | 46 (32.7)  |
|  | >5 times  | 81 (57.8)  |
|  | Never     | 13 (09.2)  |

Table 5 shows the media literacy of parents. Enquiring about parental perceptions of the effect of digital media on children, 54.2% believe that it increases his/ her knowledge and 47.7% believe that it is good for growth and development. Only 11.4%

think that it has no negative effects. Among the behaviour effects, 69.2% think that the child might become aggressive, 59.2% think that it might impair concentration and 46.4% think that the child might isolate himself.

**Table 5: Media literacy of parents**

| Digital screen exposure                     | Number (%) |
|---|------------|
| <i>Increases his/ her knowledge</i>         | 76 (54.2)  |
| <i>Starts imitating what he/she watches</i> | 65 (46.4)  |
| <i>Might develop sleep problems</i>         | 77 (55.0)  |
| <i>Might start eating unhealthy food</i>    | 43 (30.7)  |
| <i>Might cause behaviour problems</i>       | 95 (67.8)  |
| <i>Might impair eye sight</i>               | 44 (31.4)  |
| <i>Has no negative effects</i>              | 16 (11.4)  |
| <i>Has no positive effects</i>              | 42 (30.0)  |

Analysing the influence of sociodemographic factors on excessive screen time >1 hour shows that age, gender, residence and socioeconomic status had no influence. Only education of the mother was significantly associated with excessive screen time (p <0.001).

**Discussion**

Our study shows that the prevalence of excessive screen exposure (>1 hour) was 25% during weekdays and 44.9% during weekends. The most common media used was TV in 92.8%, closely followed by smart phones in 90%. Most frequently watched content (>5 times/ week) was random things for enjoyment (57.8%) followed by rhymes (25.7%); 57.1% had no outside play during weekdays. Except for mother’s education, no other socio-demographic factor influenced the duration of screen exposure in study participants.

The burden of excessive screen time was 10-93% in developed countries and 21-98% in developing countries<sup>18</sup>. Criteria for excessive screen time was >2 hours per day in some studies and >1 hour/day in a few studies. The prevalence was also higher during weekends (25-63%) than weekdays (10-48%). A recent study from Tamilnadu by Varadarajan S, *et al*<sup>1</sup> showed that rates of excessive screen time in children aged less than 2 years was 73.3% and in those more than 2 years was 73%; 24.2% reported more screen time during weekends<sup>1</sup>. Another study from Tamilnadu by Shirley SA, *et al*<sup>19</sup> showed that 48.6% had a screen time between 60-120 minutes among 24-60 months of age and average daily screen time was 139.4 minutes. Most studies reported more screen time during weekends compared to weekdays. One study by Priya *et al*<sup>20</sup> reported that 10.6% had >5 hours screen time during weekends. In the study by Shirley SA, *et al*<sup>19</sup> only 14.2% had screen time less than one hour as recommended by WHO and AAP<sup>19</sup>. In a study from Western India among 2-6-year-old rural children 17.2% had screen time less than one hour<sup>4</sup>.

TV and smart phones are the common media available in most studies similar to ours. Since screen viewing is totally unavoidable, emphasis is on high quality content that is age appropriate and co-viewed or under supervision. Only few studies have explored the content in detail like our study. In our study 57.8% used to watch random gadgets for entertainment; other common uses were for video calling and watching. This is similar to studies by Shah R, *et al*<sup>4</sup> and Shirley SA, *et al*<sup>19</sup>. These studies also showed that screen media were commonly used to calm children. Even those meant as educational videos are not developed based on inputs from actual educators or paediatricians and cannot offer human interaction or develop complex thinking. As per IAP guidelines, screen time has to be balanced with physical activities but play time is very limited in our children especially during weekdays. However, this may not be totally attributable to screen exposure. In our study only 25.7% had a play area or garden near home.

Many studies have analysed the factors influencing excess screen time in children. Systematic review shows age of introduction of screen, sedentary life style, eating in-front of screen, parent screen time and perceptions, large number of devices, socio-economic status and lock down all influence screen time of children<sup>21,22</sup>. Older children and boys were reported to have more screen time by Shah R, *et al*<sup>4</sup> and Priya *et al*<sup>20</sup>. Shah R, *et al*<sup>4</sup> and Varadarajan S, *et al*<sup>1</sup> reported that increased screen usage by mothers influenced the screen time in children. In our study, only mother's education had a significant influence similar to the study by Priya *et al*<sup>20</sup>. In our study, age, gender, residence and socioeconomic status had no influence on screen time. This is similar to studies by Shirley SA, *et al*<sup>19</sup> and Varadarajan S, *et al*<sup>1</sup>.

Parental knowledge and perceptions on the effect of screen time highly influences screen time behaviour in children. In a study by Shirley SA, *et al*<sup>19</sup> on the

attitude and awareness among parents, majority of parents seemed to be concerned about screen time of children<sup>23</sup>. Majority were aware of the adverse effects on behaviour, sleep, social interaction and life style related problems similar to that reported in our study; 91.8% believed that establishing screen time limits was important and 89.6% believed that increasing awareness among children was important. This is in contrast to the study by Meena P, *et al*<sup>3</sup> in children between 15-18 months where 72% were not concerned about screen time in children. In our study, only 11.4% believed that it has no negative effects.

Using a validated questionnaire is a strength of the study as it gives a robust estimate of screen media exposure in children. Limitations of the study are that it is an institution-based cross-sectional study and temporarily cannot be maintained; because of the smaller sample size, the findings cannot be generalised. This study has also captured only parental perceptions and not the actual effects of screen exposure in children

The results of our study show that screen media exposure is widely prevalent in our region. As tech free zone is virtually impossible, paediatricians need to impart need-based counselling on screen time guidelines and its implications on health and behaviour in children. Interventional strategies like individualizing screen time, discussing with children, home based rules regarding TV turn off time, co-viewing/ co-sharing and supervising the content might promote healthy screen behaviour. Parents also should follow healthy media usage as they model children. Longitudinal studies exploring content and context across various age groups and effect of interventional strategies are required to update guidelines and promote screen hygiene in children.

### Conclusions

Our study shows that the prevalence of excessive screen exposure (>1 hour) was 25% during weekdays and 44.9% during weekends. Common media used were TV in 92.8% and smart phones in 90%. Except for mother's education, no other socio-demographic factor influenced the duration of screen exposure in study participants. There was excessive screen exposure in children despite parental perception of its harmful effects

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