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## Impact of Screen Time on Development in Children Using the TDSC and LEST chart

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### KEYWORDS

Development delay, language delay, screen time, LEST chart, TDSC chart

### ABSTRACT:

Background:

Screen time in young children, has been a growing area of concern regarding its potential impact on developmental delays. Research indicates that excessive screen time can negatively influence various aspects of a child's development, including language acquisition, social skills, and cognitive abilities and physical health. Hence, this study aims to investigate the relationship between screen time and the acquirement of developmental milestones in children aged 1 to 3 years.

Methodology:

A hospital based cross-sectional study was conducted among children of 1 to 3 years of age. Children with known developmental disorders and those children who have chronic illnesses affecting development were excluded from the study. A sample size of 151 study participants was calculated to meet the study objectives. The developmental delay was evaluated using the Trivandrum Development Screening Chart (TDSC) chart and the language delay was assessed using the Language evaluation scale Trivandrum (LEST) chart. The chi-square test was utilised to determine the relationship between qualitative variables. P value less than 0.05 was deemed to be statistically significant.

Results:

37.7% children had developmental delay and nearly 42.4% had language delay in the present study. Children aged between 25 to 36 months, male children by gender, children with screen time exposure of >2 hours daily and parents with no set time limit for child's screen exposure were found to be the positive factors significantly affecting the development of the children in this study.

Conclusion:

The results firmly suggest that in order to promote healthy developmental outcomes, parental education, interactive non-screen-based play, and adherence to pediatric screen time standards as recommended by the World Health Organization are necessary.

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## Introduction:

The amount of time spent in front of a screen—whether it be a computer, tablet, smartphone, or television—is referred to as screen time.<sup>1</sup> In the modern era of technology, screens have permeated every aspect of everyday life and have a significant impact on how kids learn, engage with others, and pass the time. Although technology provides many advantages, such as information access and educational resources, questions have been raised concerning how it can affect kids' physical and mental development.

Children's development can be impacted by excessive screen time in ways that are good and bad. Overuse of screens has been connected to decreased physical activity, cognitive problems, sleep disruptions, and developmental delays. Academic achievement, emotional control, and social skills can all be impacted by extended use of digital media.<sup>2</sup> The kind of content ingested, the span of being exposed, and parental participation in screen-based activities all influence how severe these effects are.<sup>3</sup>

The World Health Organization advises against screen time for infants under two and for children ages two to four to spend no more than an hour a day on screens.<sup>4</sup> The age at which children regularly interact with media has decreased from four years in 1970 to four months in the present.<sup>5</sup>

In the early years of childhood, children are highly responsive to their surroundings, and their ability to focus and pay attention begins to develop. A brain requires vital external stimuli in order to develop and flourish. They require time to process such stimuli, which is more crucial. Children's attention span and focus are impacted by the continuous ingestion of visuals and messages on screens.<sup>6</sup>

Boredom teaches children impulse control and how to deal with frustration. Young children who are exposed to screens all the time lose the ability to find entertainment on their own or from others.<sup>7</sup>

Numerous studies have emphasized the importance of human interaction in language development, specifically the quantity and caliber of interactions between adults and children. Nonetheless, there is growing worry that screen time reduces the amount and quality of

interactions between parents and children, which means the child has fewer opportunities to practice and improve their language skills.<sup>8</sup>

According to research, young children who spend too much time on screens are less able to learn social skills and read faces, the two critical abilities for the development of empathy. Young children can only learn to recognize and comprehend nonverbal signs through face-to-face encounters. Children who are exposed to screens have a harder time controlling their irritability and reading human emotions. It also takes away from play and socializing with other kids, which are activities that help them develop their cognitive abilities.<sup>9</sup>

Limiting or even cutting away with screen use during these formative years will have long-term advantages.<sup>10</sup> Therefore, it is crucial to comprehend how screen time affects important facets of a child's development, such as gross motor, fine motor, social and language, given the growing early exposure to digital technology. Hence, this study aims to investigate the relationship between screen time and the acquisition of developmental milestones in children aged 1 to 3 years.

## Methodology:

The study employed a hospital-based cross-sectional design and was done in the Paediatrics OPD of a private medical college located in Chengalpattu district, Southern India, from January 2024 to March 2024.

**Inclusion Criteria:** Parents of children aged 1 to 3 years who expressed willingness to engage in the study were eligible for inclusion from the geographical study area. **Exclusion criteria:** Children with known developmental disorders and those children who have chronic illnesses affecting development, those already getting steroids or chemotherapy, or have already been identified as malnourished were excluded. The study eliminated parents who were unwilling to participate and not provided informed written consent.

**Sample size:** The minimum sample size for the study was calculated using the formula,  $n=4pq/d^2$  at 95% confidence interval and 7% absolute precision and  $p=0.74$ , referred from the previous study done by Varadarajan S et al<sup>11</sup> where the prevalence of excessive screen time was 74.35%. Hence a sample size of 151 study participants was calculated to meet the study objectives.



Study procedure: Following the institution's IHEC approval, a simple random sampling technique was used to approach all participants who met the study criteria. A total of 151 such children with their parents were recruited for participation over the study period. Data was collected through the use of a semi-structured questionnaire. The questionnaire consisted of three components. The initial segment of the questionnaire was filled by the parents which included inquiries regarding screen time of children. The second segment consisted of task to be completed by the children according to their age which was derived from the Trivandrum Development Screening Chart (TDSC) chart.<sup>12</sup> The third segment consisted of task to be completed by the children according to their age which was derived from the Language evaluation scale Trivandrum (LEST) chart.<sup>13</sup> There are 33 things in the LEST and 27 in the TDSC. A vertical line is drawn through the chart at the child's current age, and if they cannot complete any item on the right side of the line, they are considered delayed for that item. Given its high percentage of negative predictive value and good sensitivity and specificity in identifying speech and

language impairments, a one item delay in both tools will be interpreted as a positive test.

Quantitative analysis: The collected data were entered into a Microsoft Excel spreadsheet and analysed using IBM SPSS version 21. The categorical variables were described using frequency and percentages, whereas the continuous variables were described using mean and standard deviation. The chi-square test was utilised to determine the relationship between qualitative variables. P value less than 0.05 was deemed to be statistically significant.

### Results:

Majority of the informant were reliable (i.e.) mothers and the mean age of the study participants was  $23 \pm 14$  months (Table 1). Almost all the children had access to screens in the study group with majority being exposed to smartphones and television for entertainment purpose mainly during feeding time. Of which only 28% of the study participants parents had set time limit on screen exposure (Table 2).

**Table 1: Demographic details of the study participants (n =151)**

Variable	Frequency	Percentage
<b>Age (in months)</b>		
12 - 24 months	79	52.3
25 – 36 months	72	47.7
<b>Mean <math>\pm</math> SD (in months)</b>	23 $\pm$ 14	
<b>Gender</b>		
Male	73	48.3
Female	78	51.7
<b>Informant</b>		
Mother	83	54.9
Father	47	31.2
Others	21	13.9

**Table 2: Screen time related details of the study participants (n =151)**

Variable	Frequency	Percentage
<b>Child's access to screens</b>		
Yes	151	100
No	0	0
<b>Age at initiation of screen exposure (in months)</b>		



Mean $\pm$ SD	27 $\pm$ 9	
<b>Average daily screen time</b>		
< 1 hour	9	5.9
1-2 hours	20	13.2
2-3 hours	78	51.8
>3 hours	44	29.1
None	0	0
<b>Type of screens used</b>		
Television	74	49
Smartphone	104	68.9
Computer	9	5.9
Others	2	1.3
<b>Screen access control</b>		
Children itself	55	36.4
Parents	96	63.6
<b>Screen used during day</b>		
Morning	20	13.2
Afternoon	54	35.8
Evening	42	27.8
Before bedtime	35	23.2
<b>Purpose of screen usage</b>		
Entertainment	69	45.7
Educational content	42	27.8
Interactive activities	67	44.3
Others	9	5.9
<b>Set limit on screen usage</b>		
Yes	42	27.8
No	109	72.2
<b>Circumstances for screen usage</b>		
While feeding the child	63	41.7
Parents at household chores	41	27.3
As reward	13	8.6
As a distraction	19	12.5
While travelling	15	9.9

Table 3: Parents perceptive on child's screen time (n =151)

Variable	Frequency	Percentage
<b>Impact of screen time on their child's sleep pattern</b>		
Positive impact	21	13.9
Negative impact	115	76.2
No impact	15	9.9
<b>Impact of screen time on their child's behaviour</b>		
Positive impact	10	6.7
Negative impact	126	83.4



No impact	15	9.9
<b>Parents awareness on WHO / AAP recommended screen time</b>		
Yes	5	3.3
No	146	96.7

Only 3% of the parents were aware of the recommended screen time for their child's age (Table 3). 37.7% children had developmental delay and nearly 42.4% had language delay in the present study (Table 4).

**Table 4: Prevalence of developmental and language delay among the study participants (n = 151)**

Variable	Frequency	Percentage
<b>Development delay</b>		
Yes	57	37.7
No	94	62.3
<b>Language delay</b>		
Yes	64	42.4
No	87	57.6

**Table 5: Association of developmental delay and its determining factors (n = 151)**

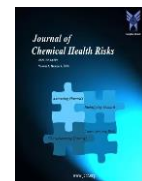
Variable	Development delay		p-value
	Yes (n = 57)	No (n = 94)	
<b>Age</b>			
12 - 24 months	18	10	<b>0.001</b>
25 - 36 months	39	84	
<b>Gender</b>			
Male	35	48	0.213
Female	22	46	
<b>Average daily screen time</b>			
< 1 hour	5	32	<b>0.001</b>
1-2 hours	12	40	
2-3 hours	20	15	
>3 hours	20	7	
<b>Set limit on screen usage</b>			
Yes	15	66	<b>0.0001</b>
No	42	28	

\*  $p < 0.05$  is statistically significant, Chi-Square test

Children aged between 25 to 36 months, children with screen time exposure of >2 hours daily and parents with no set time limit for child's screen exposure were found to be the positive factors significantly affecting the development of the children in this study (Table 5).

**Table 6: Association of language delay and its determining factors (n = 151)**

Variable	Language delay		p-value
	Yes (n = 64)	No (n = 87)	
<b>Age</b>			



12 - 24 months	18	26	0.784
25 - 36 months	46	61	
<b>Gender</b>			
Male	41	43	<b>0.072</b>
Female	23	44	
<b>Average daily screen time</b>			
< 1 hour	6	31	<b>0.0001</b>
1-2 hours	14	36	
2-3 hours	22	15	
>3 hours	22	5	
<b>Set limit on screen usage</b>			
Yes	18	65	<b>0.001</b>
No	46	22	

\*  $p < 0.05$  is statistically significant, Chi-Square test

Male children by gender, those with screen time exposure of > 2 hours daily and parents with no set time limit for child's screen exposure were found to be significantly affecting the language development of the children in this study (Table 6).

#### Discussion:

The detrimental effects of extended and uncontrolled screen time on young children's general and language-specific developmental milestones were amply demonstrated by this study. TDSC and LEST, both the tools were easy-to-use, community-level screening techniques that are often used in India to evaluate language acquisition and global development, respectively.

The study findings showed a strong correlation between increasing screen time particularly more than two hours per day with language and developmental deficits as measured by the LEST and TDSC, respectively. Also, children of parents who did not impose time restrictions on screen usage showed the highest rates of delay.

Developmental delays are more likely to occur in kids who don't have strict screen usage limits. According to a study done in India, children under the age of five who spend too much time on screens have developmental problems.<sup>11</sup> The present study findings coincided with some of the previous existing research like the one by Takahashi I et al which found that increased screen usage at ages 2 and 3 was directly linked to less successful outcomes on developmental assessment tests at years 3 and 5. The study also found that personal-social skills,

problem-solving abilities, motor skills, and communication were some of the developmental domains impacted.<sup>14</sup>

According to the Quebec Longitudinal Study of Child Development cohort study, there is a lasting relationship between early screen media exposure and cognitive abilities. Every hour of additional TV exposure at age two is associated with a 7% decrease in class participation and a 6% decrease in fourth-grade math proficiency.<sup>15</sup> According to Chakhunashvili et al, male children are more likely than female children to experience the higher prevalence and more severe effects of problems associated with expressive language delay.<sup>16</sup>

Over two hours of screen usage per day was found to be significantly linked to lower expressive and receptive language outcomes in children between the ages of 24 and 36 months, according to research done in the Philippines.<sup>17</sup> Toddlers who spent more than two hours a day using mobile devices demonstrated noticeably worse comprehension of language and expressive language skills than those who did not use screens, according to a study published by Rayce et al.<sup>18</sup>

Nonetheless, research on very young children suggests that using screens is a risk factor for worse psychological health on its own. According to one study, emotional reactivity, aggressiveness, and externalizing behaviours were linked to greater TV exposure between the ages of six and eighteen months.<sup>19</sup> A small number of research suggest that increased screen usage at age four is linked to poorer emotional comprehension at age six.<sup>20</sup>



The notable strengths of the present study were its concentration on a crucial developmental age group (1–3 years) and usage of culturally appropriate, validated screening instruments, which increased the findings' applicability. Additional depth is added by including gender-specific analysis. Its cross-sectional design limits the ability to draw conclusions about causality, and its reliance on self-reported screen time data raises the possibility of bias. The study's single-centre design arguably limited its generalizability, and it did not account for confounding variables like socioeconomic status, parental education qualification and parental screen usage hours.

## Conclusion:

As determined by the TDSC and LEST charts, this study concludes that excessive screen time is significantly linked to developmental delays in children between the ages of one and three. Delays were more common among children who were male and who spent more than two hours a day in front of a screen, particularly in cases where there was little screen time control from parents. The study facilitates early screening, which enables prompt identification and intervention. These results firmly suggest that in order to promote healthy developmental outcomes, parental education, interactive non-screen-based play, and adherence to pediatric screen time standards (those from the AAP and WHO) are necessary. To direct early treatments and guarantee positive developmental outcomes, regular developmental screening, public awareness campaigns, and additional longitudinal research are crucial.

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