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ORIGINAL ARTICLE

Prevalence of screen use in children: an observational study in the extreme south of Santa Catarina

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Keywords:
Child,
Child health,
Screen time.

Abstract

Objective: Excessive exposure to screens during early childhood has been progressively associated with inadequate cognitive and psychosocial development. In this sense, this study has as objective to assess the prevalence of screen use in early childhood in the pediatric outpatient clinics of a university in the extreme south of Santa Catarina in the second half of 2022. **Methods:** Cross-sectional observational study, with primary data collection, in the predetermined location, and that involved 135 patients from zero to six years, whose parents and/or guardians answered the questionnaire prepared and signed the informed consent form. **Results:** Of the total children evaluated, an 85.92% prevalence of screen use was found. The main technological devices used were television (73.3%), followed by cell phones (19.8%). The average daily exposure time found was 1.07 hours. Of the twenty-one variables tested, six showed a significant association with screen exposure time: age, type of screen, school/daycare attendance, presence of physical activity stimuli, screen used during meals, and presence of limit on screen use. **Conclusions:** Was observed highly prevalent and early screen use in early childhood in the population studied. The sociodemographic profile findings, as well as the associations between screen time and predisposing factors, expand the brazilian literature, showing similarities and differences with previous studies.

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INTRODUCTION

According to the Brazilian Society of Pediatrics (SBP), early childhood spans from birth to six years old.[1] During this time, the development of the central nervous system is influenced by various factors, including intrauterine and postnatal experiences.[2] Neuroplasticity allows the neurological system to adapt to positive and negative stimuli, peaking between birth and the first year of life.[3] Therefore, the environmental experiences encountered during early childhood are crucial for child development, as they can impact both behavior and the brain's structure.[4]

The increase in time and the precocity with which children are exposed to screens has become a topic of growing relevance.[5,6] Although some studies suggest that screen use during early childhood may be beneficial, excessive exposure has been linked to harmful consequences for the five domains of early childhood development: physical, cognitive, communicative, socio-emotional, and adaptive.[7,8] Furthermore, both early and prolonged exposure to screens is associated with various organic disruptions, including nutritional disorders, decreased mental health, and visual changes.[9,10,11] Thus, while national and international health guidelines encourage limiting screen time for children aged zero to six, the prevalence of screen exposure remains high, especially among children under two years of age, and occurs continuously across all ages.[12]

It is important to recognize that early screen exposure results from a combination of intrinsic and extrinsic factors, with the latter primarily related to the family environment.[13] Such influences include establishing rules, encouraging interaction and communication, socioeconomic conditions, parental health behaviors, and even the importance parents place on limiting screen usage.[12,14,15]

Given the few studies in Brazil on screen time for children under six, it becomes crucial to understand how this phenomenon relates to the rise in digital accessibility. Therefore, this study aimed to evaluate the prevalence of screen time among children under six who were seen at the pediatric outpatient clinics of a university in southern Santa Catarina during the second half of 2022. This includes analyzing the epidemiological profile of the population studied, the primary technological devices used, the average daily screen exposure time, and the connections between factors contributing to prolonged and early screen exposure.

METHODS

Study Design: This cross-sectional observational study incorporates primary data collection and quantitative analysis.

Population Studied and Selection Methods: The population included patients aged zero to six years who received treatment at a university's pediatric outpatient clinics in southern Santa Catarina from August to December 2022. The children's parents and guardians completed a questionnaire and signed an informed consent form.

The size of the study population was determined by estimating the likely number of patients. Considering that the number of weekly visits to the pediatric outpatient clinics is B, and there are ten outpatient clinics with four patients each, B equals 40. Since about 50% of the patients may be over six years old, and approximately half of the remaining patients are likely return appointments, the number of patients meeting the inclusion criteria seen weekly at the outpatient clinics (A) was calculated as follows:

$$A = [(B)/2]/2 = [(10x4)/2]/2 = [40/2]/2 = 20/2 = 10$$ patients per week.

With the size of the study population (N) being equal to the number of patients per week (A) times the number of weeks allocated for data collection (C), we found that:

$$N = AxC = 10x18 = 180$$ patients.

Assuming that 25% of the parents and guardians will not allow their children to participate in the study, the study population was calculated to consist of 135 patients.

Procedures: A questionnaire created by the authors to assess screen time in children aged zero to six was administered to the parents and guardians of the participants. The questionnaire examined the following variables: gender, age, ethnicity, monthly household income, school or daycare attendance, school year, daily screen time, context of screen exposure, types of screens, content viewed, oversight by parents or guardians, screen use during meals, availability of a television in the child's bedroom, time for family interactions without screens, limits on screen time, passive screen time, encouragement of physical activity, educational level of parents and guardians, awareness of screen time limits for children, and perception of whether screen time may be harmful to the child's health. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist was utilized to prepare this article.

Statistical method: The data were analyzed using the International Business Machines Corporation (IBM) Statistical Package for the Social Sciences (SPSS), version 21.0. Quantitative variables were expressed as means and standard deviations, and qualitative variables were expressed as frequencies and percentages.

A significance level of 0.05 and a confidence level of 95% were used in the statistical analysis. The association between categorized qualitative and quantitative variables was investigated using the Pearson Chi-square, Mantel-Haenszel Chi-square, and likelihood ratio tests, followed by residual analysis when statistical significance was observed.

Ethics: This study was approved by the Research Ethics and Human Resources Committee under opinion number

5,551,996. It included only individuals whose parents or guardians signed an informed consent form.

RESULTS

The study included 135 children aged zero to six. Most were under two (51.9%) or between two and five (40.7%). There was no significant difference in prevalence between the sexes; 77.8% of the children were white, and 54.1% had a household income of one to three minimum wages. Details of the sociodemographic factors are presented in Table 1.

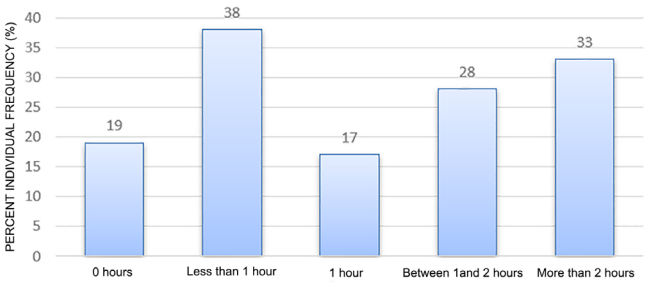
Of the 135 children in the sample, 116 were exposed to screens, resulting in a prevalence of 85.92%. In decreasing order of frequency, the main technological devices used by them were televisions (73.3%), cell phones (19.8%), tablets (6%), and computers/laptops (2%).

The average daily screen time was 1.07 hours. This is an approximate value, as the daily exposure time was collected categorically (zero, between zero and one hour, one hour, between one and two hours, or more than two hours). Consequently, a variance of 1824.179 (SD = 0.71) hours was considered to calculate the average exposure time for the prevalence of screen use, as illustrated in Graph 1.

Table 1. Epidemiological profile of children seen at the pediatric outpatient clinics of a university in southern Santa Catarina in the second half of 2022.

	n (%) **n = 135**
Age (years)	
Less than two	70 (51.9)
Two to five	55 (40.7)
Six and older	10 (7.4)
Sex	
Female	69 (51.1)
Male	66 (48.9)
Skin color	
White	105 (77.8)
Brown	24 (17.8)
Black	6 (4.4)
Socio-economic status*	
Up to one minimum wage	21 (15.6)
One to three minimum wages	73 (54.1)
Three to six minimum wages	38 (28.1)
Six to nine minimum wages	3 (2.2)

Source: study data, 2022.
According to the Federal Gazette, the minimum wage in Brazil was R$1,212 in 2022.



Graph 1. Prevalence of screen time and length of exposure.

Six of the twenty-one tested variables showed a significant association with screen time: age, type of screen, school or daycare attendance, encouragement of physical activity, screen use during meals, and limits on screen time.

A significant association was found between age and screen time ($p < 0.001$): individuals under two years old were exposed to screens for zero to one hour; those aged two to five years had screen time of one to two hours; and children over six years spent more than two hours in front of screens. Significant associations were observed regarding screen time and the devices used, with tablets linked to one hour of screen time and computers/laptops associated with more than two hours ($p = 0.023$), as shown in Table 2. Children attending school or daycare had one to two hours of screen time, while those not enrolled had no exposure ($p < 0.001$).

Relevant findings also emerged concerning factors related to the family environment. Children who were encouraged to participate in physical activities spent one hour in front of a screen ($p = 0.018$), while those with restrictions on screen time averaged between one and two hours ($p = 0.026$). Additionally, a correlation was identified between children who used screens during meals and a screen exposure duration of one to two hours or more than two hours. In contrast, those who did not use screens at mealtimes were associated with shorter screen time, ranging from zero to one hour ($p = 0.002$).

No statistically significant association was found between the other variables, such as family socioeconomic status, perception of screen use, or the education level of parents and/or guardians ($p > 0.05$). These correlations are detailed in Tables 2 and 3. Table 3 presents the variables for children exposed to screens (n = 116).

DISCUSSION

This study evaluated the findings from 135 children to assess the prevalence of screen use in early childhood. The analysis concluded that screen use is highly prevalent (85.92%) in this age group. The epidemiological profile predominantly consisted of children under two years old, with a monthly family income of one to three minimum wages. Unlike a previous study in which most participants were males (50.2%),[16] most of the individuals included in our study were females. No statistical difference was found when analyzing screen time by gender.

Table 2. Associations between screen time and predisposing factors in the study population.

	n (%), n = 135					*p-value*
	Screen time (hours)					
	0	**0 to 1**	**1**	**1 to 2**	**> 2**	
	n=19	**n=38**	**n=17**	**n=28**	**n=33**	
Age (years)						<0.001†
Less than two years	18(94.7)[b]	30(78.9)[b]	5(29.4)	7(25.0)	10(30.3)	
Two to five years	1(5.3)	8(21.1)	11(64.7)[b]	17(60.7)[b]	18(54.5)	
Six and older	0(0.0)	0(0.0)	1(5.9)	4(14.3)	5(15.2)[b]	
Sex						0.233 ††
Female	8(42.1)	23(60.5)	5(29.4)	16(57.1)	17(51.5)	
Male	11(57.9)	15(39.5)	12(70.6)	12(42.9)	16(48.5)	
Skin color						0.380†††
White	16(84.2)	28(73.7)	12(70.6)	24(85.7)	25(75.8)	
Brown	3 (15.8)	6 (15.8)	5 (29.4)	3 (10.7)	7 (21.2)	
Black	0 (0.0)	4 (10.5)	0 (0.0)	1 (3.6)	1 (3.0)	
School/daycare attendance						<0.001††
Yes	2(10.5)	15(39,5)	15(88,2)[b]	20(71,4)[b]	18(54,5)	
Não	17(89.5)[b]	23(60.5)	2(11.8)	8(28.6)	15(45.5)	
Passive screen exposure						0.281††
Yes	13(68.4)	29(76.3)	13(76.5)	15(53.6)	20(60.6)	
No	6(31.6)	9(23.7)	4(23.5)	13(46.4)	13(39.4)	
Encouragement to engage in physical activities						0.018†††
Yes	14(73.7)	33(86.8)	17(100.0)[b]	19(67.9)	25(75.8)	
No	5(26.3)	5(13.2)	0(0.0)	9(32.1)	8(24.2)	
Household income (minimum wages)						0.306†
Up to 1	4(21.1)	2(5.3)	4(23.5)	5(17.9)	6(18.2)	
1 to 3	13(68.4)	25(65.8)	7(41.2)	16(57.1)	12(36.4)	
3 to 6	2(10.5)	9(23.7)	6(35.3)	7(25.0)	14(42.4)	
6 to 9	0(0.0)	2(5.3)	0(0.0)	0(0.0)	1(3.0)	
Level of education of parents/guardians						0.618†
Incomplete middle school	1(5.3)	4(10.5)	3(17.6)	4(14.3)	0(0.0)	
Complete middle school	2(10.5)	4(10.5)	1(5.9)	1(3.6)	3(9.1)	
Incomplete high school	3(15.8)	5(13.2)	4(23.5)	5(17.9)	4(12.1)	
Complete high school	9(47.4)	12(31.6)	7(41.2)	13(46.4)	17(51.5)	
Incomplete higher education	1(5.3)	5(13.2)	2(11.8)	1(3.6)	4(12.1)	
Complete higher education	3(15.8)	8(21.1)	0(0.0)	4(14.3)	5(15.2)	
Parents/guardians are aware of daily screen time limit						0.851†††

Yes	3(15.8)	4(10.5)	1(5.9)	4(14.3)	3(9,1)	
No	16(84.2)	34(89.5)	16(94.1)	24(85.7)	30(90.9)	
Perception of parents/guardians that screens harm their children's health						0.115[†††]
Yes	19(100.0)	34(89.5)	13(76.5)	23(82.1)	29(87.9)	
No	0(0.0)	4(10.5)	4(23.5)	5(17.9)	4(12.1)	
School hours (n =70)						0.330[†††]
Morning	1(50.0)	3(20.0)	2(13.3)	1(5.0)	4(22.2)	
Afternoon	0(0.0)	5(33.3)	5(33.3)	6(30.0)	9(50.0)	
Full day	1(50.0)	7(46.7)	8(53.3)	13(65.0)	5(27.8)	

[b] Statistically significant values. [†] Values obtained after applying the Mantel-Haenszel Chi-Square test. [††] Values obtained after applying the Pearson's Chi-Square test. [†††] Values obtained after applying the likelihood ratio test. Source: Study data, 2022.

Unlike existing literature, our study also found that white individuals engaged in greater screen use. For instance, 73% of the studies included in a systematic analysis indicated a positive association between longer screen time and belonging to racial minorities (Blacks and Hispanics).[17] This discrepancy can be explained by the demographic makeup of southern Brazil, which, according to the 2022 census, had a higher percentage of whites (72.6%) compared to browns (21.7%), blacks (5%), Asians (0.4%), and indigenous people (0.3%).[18]

We also discovered that individuals under two years old had zero to one hour of screen time, those aged two to five years had one to two hours, and children over six years had more than two hours. This indicates that screen time tends to increase throughout childhood, as seen in previous studies, with older children exhibiting a higher prevalence of screen use.[17]

In contrast to these findings, the recommendations put forth by the SBP state that children under two years of age should have zero daily screen time, those aged two to five should be limited to less than one hour, and those aged six to ten should have one to two hours.[1] This is necessary to allow time for other important activities for children. The detrimental effects of early screen exposure are highlighted by a recent study, which found that preschoolers with daily screen time exceeding one hour were more vulnerable across all five domains of developmental health: physical, cognitive, communicative, socio-emotional, and adaptive.[8]

The primary screen devices used by the children in this study were the television and cell phones. This is supported by another study, which found that watching television was the most common form of screen viewing (44.8%), followed by mobile devices (30.5%), computers (6.6%), and video games (0.4%).[13] Approximately 43% of the children in the present study who spent time in front of a screen had a television in their bedroom, a factor strongly linked to a sedentary lifestyle, overweight, and obesity.[19]

Additionally, the type of screen was associated with a specific amount of viewing time: tablets were linked to about one hour of exposure, while computers and laptops were linked to more than two hours (p = 0.023). This increased screen time on mobile devices is well documented in a previous study that evaluated 338 children and found that at 4 years old, 96.6% used mobile devices, three-quarters had their own device, and the age of first use decreased with each age cohort. This data reflects the easier access to mobile devices in today's environment and a shift in social behavior, as screens are being used at increasingly younger ages.[20]

Our study also revealed a significant link between screen time and school attendance. Contrary to other authors ' findings, children attending schools or daycares had longer screen times. In a study on problematic screen exposure (PSE), employing a scale of 0 to 13 with high risk indicated by scores of ≥ 7, the authors found that children in kindergarten or daycare had a lower PSE risk than their peers who stayed at home.[21] However, these results should be interpreted cautiously, as the variable location of screen exposure did not significantly correlate with screen time (p = 0.271). This may be because most parents were unaware of their children's screen time in daycare or school. Therefore, the actual screen time could be longer than reported.

Our study also revealed that children encouraged to engage in physical activity spent significantly less time in front of a screen: one hour per day (p = 0.018). This illustrates the inverse relationship between a home environment that promotes physical activity and screen time.[14] However, it was also noted that 20% of the children interviewed were not encouraged to exercise. Therefore, even if parents reduce the time allocated to

Table 3. Correlation between screen time and predisposing factors in children exposed to screens.

	n (%), n = 116				*p-value*
	Screen time (hours)				
	0 to 1	**1**	**1 to 2**	**>2**	
	n=38	**n=17**	**n=28**	**n=33**	
Supervision by parents or guardians					0.356[†††]
Yes	37(97.4)	17(100.0)	27(96.4)	30(90.9)	
No	1(2.6)	0(0.0)	1(3.6)	3(9.1)	
Use of screens during meals					0.002[†††]
Yes	4(10.5)	5(29.4)	2(7.1)	14(42.4)[b]	
No	34(89.5)[b]	12(70.6)	26(92.9)[b]	19(57.6)	
Television in the bedroom					0.507[††]
Yes	18(47.4)	9(52.9)	9(32.1)	14(42.4)	
No	20(52.6)	8(47.1)	19(67.9)	19(57.6)	
Spends time with the family without screens					0.469[†††]
Yes	0(0.0)	0(0.0)	0(0.0)	1(3.0)	
No	38(100.0)	17(100.0)	28(100.0)	32(97.0)	
Screen time limit					0.026[††]
Yes	16(42.1)	12(70.6)	20(71.4)[b]	14(42.4)	
No	22(57.9)	5(29.4)	8(28.6)	19(57.6)	
Location of screen use					0.271[†††]
Home	35(92.1)	15(88.2)	26(92.9)	32(97.00)	
School/daycare	3(7.9)	2(11.8)	2(7.1)	0(0.00)	
Other	0(0.00)	0(0.00)	0(0.00)	1(3.0)	
Type of screen					0.023[†††]
Television	29(76.3)	10(59.8)	22(78.6)	24(72.7)	
Cell phone	9(23.7)	4(23.5)	3(10.7)	7(21.2)	
Tablet	0(0.00)	3(17.6)[b]	3(10.7)	0(0.00)	
Computer/laptop	0(0.00)	0(0.00)	0(0.00)	2(6.1)[b]	
Viewed content					0.096[†††]
Cartoons	28(83.7)	10(58.8)	18(64.3)	25(75.8)	
Games	0(0.00)	4(23.5)	5(17.9)	4(12.1)	
Movies	0(0.00)	0(0.00)	1(3.6)	0(0.00)	
Music	9(23.7)	3(17.6)	3(10.7)	3(9.1)	
Does not know	1(2.6)	0(0.00)	1(3.6)	1(3.0)	

[b] Statistically significant values. [†]Values obtained after applying the Mantel-Haenszel Chi-Square test. [††] Values obtained after applying the Pearson's Chi-Square test. [†††] Values obtained after applying the likelihood ratio test. Source: Study data, 2022.

outdoor activities for various reasons, such as a busy schedule,[22] it is evident that there is an information gap where interventions can be implemented to prevent consequences arising from excessive screen use.[23]

Regarding meals in front of screens, we found that children who used devices during meals had screen time exceeding two hours, while those who did not had screen times ranging from zero to one hour ($p = 0.002$). This relationship has been noted in a previous study that analyzed 847 children aged 2 to 5 years, observing that 55.7% were exposed to television or other screens during meals. Furthermore, longer screen time predicted that these children would be fed in front of screens daily ($p < 0.001$), and this habit tends to increase with age ($p < 0.022$).[11]

This study also noted a significant relationship between screen time limits and a daily screen time of one to two hours ($p = 0.026$), which is somewhat encouraging given the high prevalence of children exceeding two hours of screen time. Consequently, the variables—screen time limits and meals in front of screens—reflect the impact of parental rules. Kabali et al.[20] found that most parents provide devices to their children to manage household chores (70%), keep the child calm (65%), or help them sleep (29%). However, it is recognized that a more "controlling" parenting style is associated with a perception of excessive screen time, while the existence of rules correlates with reduced television and computer use.[24]

Other variables related to the intrinsic characteristics of children or the family environment were not significantly associated with screen time. Although no significant findings regarding viewed content and school hours were uncovered in this study, other authors have established links between watching aggressive, antisocial, and unrealistic content and the onset of behavioral problems.[25] Regarding school hours, children who attend preschool for less than five hours a day tend to spend more time watching television than those in full-time school.[14] Thus, being aware of the content being watched, as well as turning off screen devices when at home, are measures that can help reduce the risks associated with screen time.[23]

No significant association was found between variables linked to parents and guardians (household income, passive exposure to screens, level of education, family interaction time, knowledge about screen time limits, supervision of screen use, or perception of the harm that screen time can cause to children's health) and screen time. However, there is well-defined evidence of such associations. Noble et al.[26] demonstrated that parental education and household income account for individual variations in the independent characteristics of the brain's structural development in regions related to language development, executive functions, and memory. Interestingly, while 118 parents in this study acknowledged that screen exposure can cause harm, only 15 knew the appropriate daily screen time limit. This indicates that although most parents believe maintaining a digital balance is important in family life,[15] they often encourage television viewing for educational reasons, which likely yields some benefit.[27,28]

Problematic screen exposure leads to poor health outcomes for children.[29] Growing evidence suggests that early childhood is ideal for implementing positive interventions. Therefore, health professionals must understand the effects of improper screen use to mitigate risks to child development and promote care through health education.[23] In this regard, it is important to emphasize that pediatricians have a significant role and must remain vigilant, guiding families and guardians on how to use technology.[30]

One recognizable limitation of our study is its cross-sectional nature, which limits its ability to make inferences about cause and effect. Furthermore, although the questionnaires were developed based on existing literature, they were not validated, and screen time was not determined objectively.[13] Longitudinal studies, such as cohort studies, with larger populations, fewer variables, and detailed questions, may more effectively characterize screen use by children.

Our study found a high prevalence of early screen use among children. The findings connected to sociodemographic profiles and the relationships between screen time and predisposing factors significantly enhance the Brazilian literature and may inform future research. This is attributed not only to the small number of studies conducted in Brazil—most have been published in North America and Europe—but also because many of the examined variables had never been assessed regionally, revealing similarities and differences among populations from different backgrounds.

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