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The Effect Of Screen Time On Speech Delay In Children Aged 2–6 Years At The NTB Provincial General Hospital

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Abstract

The increasing use of digital devices has raised concerns about the impact of excessive screen time on children's speech and language development. This study aimed to determine the association between screen time and speech delay among children aged 2–6 years at the Child Growth and Development Clinic of West Nusa Tenggara Provincial Hospital. A cross-sectional study was conducted involving 34 children. Data were collected using parent-administered questionnaires, while child development was assessed using the Denver Developmental Screening Test II (Denver II). Statistical analysis was performed using the Chi-square test and Fisher's Exact test. Of the participants, 58.8% had high screen time exposure, and speech and language was the most frequently affected developmental domain (82.4%). However, no significant association was found between screen time and speech delay ($p = 0.172$). Likewise, daily screen time exposure and parenting patterns were not significantly associated with speech delay ($p > 0.05$). In conclusion, screen time was not significantly associated with speech delay among children aged 2–6 years in this study population.

Keywords: Early Childhood, Speech and Language Disorders, Screen Time, Child Development

INTRODUCTION

Screen time, or screen exposure, is defined as the amount of time spent with any screen, such as a television, computer, tablet, smartphone, or other screen device. In children, the duration of use of these screen devices has become an important issue because it is suspected to contribute to problems with health, growth, development, behavior, and cognitive function (AAP, 2016). Screen exposure includes both active and passive exposure. Active screen exposure is a child's cognitive or physical engagement in digital activities, whereas passive screen exposure involves screen-based activities without active interaction. Distinguishing between the two is important for understanding the specific effects of screen exposure, whether positive or negative (Karani, Sher, and Mophosho, 2022).

In the current generation, digital devices are present in almost every home, and children grow up with technology such as smartphones, televisions, computers, and tablets. The ease of accessing the internet has also driven an increase in children's *screen time* beyond the limits recommended by the WHO and the AAP (Alamri *et al.*, 2023). According to data from Statistics Indonesia (BPS) in 2022, 33.44% of young children in Indonesia were already using a mobile phone and 24.96% of them could access the internet. This figure increased in 2024 to 39.71% of young children using a mobile phone and 35.57% able to access the internet (BPS, 2024).

According to data from the Indonesian Pediatric Society (IDAI) in 2023, the prevalence of *speech delay*, or speech and language disorders, among preschool-aged children in Indonesia reaches 5–8%, meaning that about 5–8 out of every 100 preschool-aged children experience speech and language delays. In the province of West Nusa Tenggara (NTB), the prevalence of speech and language delay in young children is an important concern; a study at PAUD Permata Bangsa Mataram found that out of 40 young children, four experienced *speech delay*, indicating a prevalence of about 10% in that institution (Garnika and Rohiyatun, 2023).

Prolonged use of electronic screens can endanger a child's cognitive, linguistic, and socio-emotional development because it reduces the quantity and quality of active interactions between the child and the caregiver. According to Vygotsky's theory of *socio-cultural development*, a child's language development depends heavily on social interaction and support from surrounding adults, so when *screen time* replaces two-way communication, the child loses the opportunity to develop

language skills optimally (Vygotsky, 1978). In addition, Lenneberg's *critical period* theory states that there is a sensitive period for language development up to around 5 years of age, and during this time environmental stimulation is crucial for normal language development (Lenneberg, 1967).

The ages of 2–6 years constitute a critical period for speech and language development (the *golden age*), during which a child's language abilities develop rapidly and therefore require attention, especially if there are signs of speech delay (*speech delay*) that may affect the child's communication abilities and future development. *Speech delay* can be identified when a child fails to reach the developmental milestones expected for their age (Sunderajan and Kanhere, 2019). Responsive interaction and varied language exposure build strong language abilities, and stimulation from the environment together with linguistic input from caregivers greatly supports this process (Al Hosani *et al.*, 2023).

Some previous studies were conducted on populations at the global or regional level, such as in India, Canada, and the Middle East, which have different social and cultural contexts, parenting patterns, and access to technology compared with conditions in NTB Province. In addition, existing studies have tended to examine children aged 1–2 years or under 5 years, without focusing on children aged 2–6 years, which represents the crucial golden period. Therefore, this study is important to fill this gap by providing more specific contextual data on the effect of *screen time* on speech and language disorders in children aged 2–6 years in NTB Province.

RESEARCH METHODS

This was a quantitative study with an observational analytic *cross-sectional* design, conducted at the Child Development Clinic of the NTB Provincial Hospital during the period of July–November 2025. The study population was children aged 2–6 years who visited the clinic, while the sample consisted of 34 children who met the inclusion and exclusion criteria and were determined using a *non-probability sampling* technique of the *consecutive sampling* type, with sample size calculated using the formula for unpaired categorical analytic studies (Dahlan, 2013). The independent variable was *screen time* and the dependent variable was the incidence of speech and language disorders. The instruments used included an identity and *screen time* pattern questionnaire for parents/guardians, the *Seven in Seven Exposure* questionnaire to assess problematic screen exposure, and an assessment of speech and language development using the *Denver Developmental Screening Test II* (Denver II) on a nominal scale.

The research procedure began with an explanation of the purpose and the signing of *informed consent* by the parents/guardians, followed by interviews and completion of the questionnaires on *screen time* patterns and exposure. The *Seven in Seven* scores were summed and categorized into low exposure (score <7) and high exposure (score ≥7). Next, the child's speech and language development was assessed using Denver II, which evaluates receptive and expressive abilities, with results categorized as normal, *caution*, or *delay*. All data were analyzed using the *Statistical Package for the Social Sciences* (SPSS) software, both univariately (frequency and percentage distributions) and bivariately using the *Chi-Square* test, as well as the alternative *Fisher's Exact Test* where small cell frequencies (<5) were present, with a p value <0.05 considered statistically significant.

RESULTS AND DISCUSSION

Subject recruitment yielded 61 children, but 27 were excluded due to a diagnosis of autism (16 children), cerebral palsy (6 children), Down syndrome (3 children), and hearing function disorders (2 children), leaving 34 subjects for analysis. The study subjects were children aged 2–6 years who came to the Child Development Clinic of the NTB Provincial Hospital. The demographic characteristics of the subjects are presented in Table 1.

Table 1. Subject Characteristics

Characteristic	Frequency (n)	Percentage (%)
Age (years)		
2–3 years	14	41,2
3–4 years	7	20,6
4–5 years	6	17,6
5–6 years	7	20,6
Gender		
Male	25	73,5
Female	9	26,5
Parenting style		
Authoritative	29	85,3
Authoritarian	3	8,8
Permissive	2	5,9
Problematic screen time exposure		
High	20	58,8
Low	14	41,2
Speech and language disorder		
Yes	6	17,6
No	28	82,4

Based on Table 1, the majority of children were in the 2–3 year age range (41,2%), predominantly boys (73,5%) whose proportion was nearly three times that of girls (26,5%), with most parents applying an authoritative parenting style (85,3%). Although more than half of the children had high problematic screen time exposure (58,8%), most children showed no speech and language disorders (88,2%). The fact that most subjects were of a young age is consistent with the clinical profile of Kundu et al. (2024), who noted that children with neurodevelopmental disorders are generally first brought in for examination at a young age, while the male predominance reinforces the theory that boys have a higher biological risk of speech development obstacles and neurological maturation than girls (Hage et al., 2006).

Table 2. Screen Time Patterns of the Study Subjects

Characteristic	Frequency (n)	Percentage (%)
Most frequent time of access		
Morning	7	20,6
Midday	16	47,1
Afternoon	4	11,8
Evening	7	20,6
Most frequently used device		

Characteristic	Frequency (n)	Percentage (%)
TV	11	32,4
Phone/Tablet	23	67,6
Main activity during screen time		
Watching videos	34	100,0
Playing games	0	0,0
Learning with educational apps	0	0,0
Video calls	0	0,0
Expression while watching		
Very active	7	20,6
Fairly active	13	38,2
Less active	4	11,8
Passive	10	29,4
Preference (friends vs. device)		
Playing with friends	14	41,2
Depends on the situation	9	26,5
Prefers electronics	11	32,4
Child's interaction while using a device		
Mostly quiet	16	47,1
Mostly talking	9	26,5
Balanced	9	26,5
Given a device to calm down		
Never	12	35,3
Sometimes	3	8,8
Often	6	17,6
Almost always	13	38.2

Table 2 shows that most children accessed screens during the day (47,1%), with a phone or tablet as the most frequently used device (67,6%), and all subjects (100%) used screen time to watch videos. Almost half of respondents reported that the child became mostly quiet while using a device (47,1%), and most children were almost always given a device to calm down (38,2%). Children's expression while watching was most often in the fairly active category (38,2%), while in terms of play preference, 41,2% of children preferred playing with friends and 32,4% preferred electronic games, indicating that direct social interaction was still the main choice for some children even though screen time was fairly dominant.

Table 3. Overview of the Study Subjects' Screen Time Exposure

Screen Time Exposure Characteristic	Frequency (n)	Percentage (%)
Daily duration of use		
<1 hour	10	29,4
1–2 hours	13	38,2
>2 hours	11	32,4
Parental co-viewing		
Always	10	29,4
Sometimes	20	58,8

Screen Time Exposure Characteristic	Frequency (n)	Percentage (%)
Very rarely	4	11,8
Time-limit rules		
Present and followed	24	70,6
Present but not followed	5	14,7
No rules	5	14,7
Use during meals		
Yes	13	38,2
No	21	61,8
Use within 1 hour before sleep		
Yes	11	32,4
No	23	67,6
Age at first exposure		
<12 months	16	47,1
12–17 months	5	14,7
18–23 months	11	32,4
Not exposed	2	5,9
Content type (exposure)		
Age-appropriate (educational/prosocial)	34	100,0
1 type (fast-paced program)	0	0,0
≥2 types (fast-paced program)	0	0,0

Table 3 shows that most children had a daily screen time duration of 1–2 hours (38,2%), with most parents sometimes performing co-viewing (58,8%), and most stating that there were time-limit rules that were followed (70,6%). A total of 38,2% of children used a device during meals and 32,4% used a device within one hour before sleep. In terms of age at first exposure, most children began to be exposed before 12 months of age (47,1%), and all children (100%) were exposed to age-appropriate content (educational/prosocial).

Table 4. Results of the Children's Developmental Assessment Using the Denver II Test

Characteristic (Number of Items)	Caution n (%)	Delayed n (%)
Personal-social development		
0 items	18 (52,9)	10 (29,4)
1 item	11 (32,4)	24 (70,6)
≥2 items	5 (14,7)	0 (0,0)
Fine motor development		
0 items	19 (55,9)	22 (64,7)
1 item	10 (29,4)	12 (35,3)
≥2 items	5 (14,7)	0 (0,0)
Speech and language development		
0 items	7 (20,6)	6 (17,6)
1 item	2 (5,9)	28 (82,4)
≥2 items	25 (73,5)	0 (0,0)
Gross motor development		

Characteristic (Number of Items)	Caution n (%)	Delayed n (%)
0 items	24 (70,6)	26 (76,5)
1 item	7 (20,6)	8 (23,5)
≥2 items	3 (8,8)	0 (0,0)

Table 4 shows the Denver II assessment results for the 34 subjects. For personal-social development, the caution category was most common at 0 items (52,9%) and delayed was most common at 1 item (70,6%); for fine motor skills, caution and delayed were most common at 0 items (55,9% and 64,7%). For speech and language, the caution category was most common at ≥2 items (73,5%) and delayed was most common at 1 item (82,4%), whereas for gross motor skills caution and delayed were most common at 0 items (70,6% and 76,5%).

Table 5. Conclusion of the Denver II Test

Denver II Test Conclusion	Frequency (n)	Percentage (%)
Normal	6	17,6
Suspect	28	82,4
Untestable	0	0,0

Based on the final Denver II summary, the majority of children fell into the suspect category (82,4%), while only 17,6% were declared normal. This high suspect rate is consistent with the many delayed item findings, especially in the language and personal-social aspects, and aligns with the findings of Kundu et al. (2024) that speech delay is the main complaint in children with uncontrolled patterns of mobile device use, supported by Haura and Pranoto (2022), who emphasized early screen exposure as a dominant external risk factor for language delay.

Table 6. Overview of Children's Developmental Status by Domain

Developmental Domain	Frequency (n)	Percentage (%)
Speech and Language	28	82,4
Fine Motor	13	38,2
Gross Motor	7	20,6
Personal-Social	24	70,6

Based on Table 6, the developmental domain with the most problems was speech and language (82,4%), followed by personal-social (70,6%), fine motor (38,2%), and gross motor, which was the least affected (20,6%). This pattern confirms that high screen exposure and the use of devices as a calming tool have replaced the essential interpersonal stimulation during the golden period, as emphasized by Adistyo and Gunawan (2024) regarding children's low pragmatic abilities even when the accessed content is educational.

Table 7. Association Between Screen Time and Speech and Language Disorders

Screen Time	Yes n (%)	No n (%)	Total	p value
High	18 (52,9)	2 (5,9)	20	
Low	10 (29,4)	4 (11,8)	14	0,172a
Total	28 (82,4)	6 (17,6)	34	

a = Fisher's Exact Test

Table 7 presents the association between screen time categories and speech delay in children. Among the 20 children with high screen time exposure, 18 (52,9%) experienced speech delay, while 2 (5,9%) did not. In the low screen time group, 10 children (29,4%) experienced speech delay, whereas 4 (11,8%) did not. The results of Fisher's Exact Test showed a p-value of 0.172 ($p > 0.05$), indicating that there was no statistically significant association between screen time level and speech delay among children in this study.

Table 8. Association Between Screen Time Patterns and Speech and Language Disorders

Screen Time Pattern	Yes n (%)	No n (%)	p value
Daily screen time duration			
<1 hour	8 (23,5)	2 (5,9)	
1–2 hours	9 (26,5)	4 (11,7)	0,225[b]
>2 hours	11 (32,4)	0 (0,0)	
Watching with parents			
Always	8 (23,5)	2 (5,9)	
Sometimes	17 (50,0)	3 (8,8)	0,967[b]
Very rarely	3 (8,8)	1 (2,9)	
Time-limit rules			
Present and followed	18 (52,9)	6 (17,6)	
None	5 (14,7)	0 (0,0)	0,112[b]
Present but not followed	5(14,7)	0 (0,0)	
Screen time during meals			
No	16 (47,1)	5 (14,7)	0,244[b]
Yes	12 (35,3)	1 (2,9)	
Screen time before sleep			
No	18 (52,9)	5 (14,7)	0,381[b]
Yes	10 (29,4)	1 (2,9)	
Age at first screen time			
<12 months	14 (41,2)	2 (5,9)	
12–17 months	4 (11,8)	1 (2,9)	0,615[b]
18–23 months	8 (23,5)	3 (8,8)	
Not exposed	2 (5,9)	0 (0,0)	
Content Type			
Age-appropriate content	4 (11,7)	30 (88,2)	
One fast-paced program	0 (0,0)	0 (0,0)	
Two or more fast-paced programs	0 (0,0)	0 (0,0)	

b = X Chi-Square Test

Table 8 The analysis showed that screen time use during meals (p = 0,244), screen time use before bedtime (p = 0,381), and age at first screen exposure (p = 0,615) all had p-values greater than 0.05. Meanwhile, analysis of the content type variable could not be performed because all participants were classified as being exposed only to age-appropriate content. Therefore, no statistically significant association was found between the examined aspects of screen time exposure and speech delay among children.

Table 9. Association Between Children's Characteristics and Screen Time Patterns and Speech and Language Disorders

Characteristic and Screen Time Pattern	Yes n (%)	No n (%)	p value
Child's age			
2–3 years	12 (35,3)	2 (5,9)	
3–4 years	7 (20,6)	0 (0,0)	0,362[a]
4–5 years	4 (11,7)	2 (5,9)	
5–6 years	5 (14,7)	2 (5,9)	
Child's sex			
Male	20 (58,8)	5 (14,7)	0,549[a]
Female	8 (23,5)	1 (2,9)	
Electronic device			
TV	9 (26,5)	2 (5,9)	0,957[a]
Phone/Tablet	19 (55,9)	4 (11,7)	
Child's preference			
Playing with friends	12 (35,3)	2 (5,9)	0,811[a]
Depends on the situation	6 (17,6)	3 (8,8)	
Electronic device	10 (29,4)	1 (2,9)	
Given a device to calm down			
Never	10 (29,4)	2 (5,9)	
Sometimes	3 (8,8)	0 (0,0)	
Often	5 (14,7)	1 (2,9)	
Almost always	10 (29,4)	3 (8,8)	

a = Fisher's Exact Test

Based on Table 5.9, speech delay was most frequently observed among children aged 2–3 years, accounting for 12 children (35,3%), compared with the other age groups. By sex, most children with speech delay were male (20 children; 58,8%), while 8 children (23,5%) were female. Regarding the type of electronic device used, the majority of children used smartphones or tablets (19 children; 55,9%), whereas television use was reported in 9 children (26,5%). In terms of children's preferences during screen time, 12 children (35,3%) preferred playing with friends, 10 children (29,4%) preferred using electronic devices, and 6 children (17,6%) indicated that their preference depended on the situation.

Furthermore, regarding the use of electronic devices to calm children, 10 children (29,4%) had never been given a device for this purpose, while another 10 children (29,4%) were almost always given one. However, Fisher’s Exact Test indicated that child age (p = 0,362), sex (p = 0,549), type of electronic device used (p = 0,957), child preference (p = 0,811), and the use of electronic devices to calm children (p = 0,626) were not significantly associated with speech delay in this study.

Table 10. Association Between Parenting Style and Speech and Language Disorders

Parenting Style	Yes n (%)	No n (%)	Total	p value
Authoritarian	3 (8,8)	0 (0,0)	3	
Authoritative	23 (67,6)	6 (17,6)	29	
Permissive	2 (5,9)	0 (0,0)	2	0,534[a]
Total	28 (82,4)	6 (17,6)	34	

a = Fisher's Exact Test

Table 10 presents the distribution of speech and language delay according to parenting style. Speech delay was observed in 6 children (17,6%) from the authoritative parenting group, whereas no cases of speech delay were found among children with authoritarian or permissive parenting styles. In addition, 23 children (67,6%) with authoritative parenting, 3 children (8,8%) with authoritarian parenting, and 2 children (5,9%) with permissive parenting did not experience speech delay. Statistical analysis showed no significant association between parenting style and speech and language delay among children (p = 0,534).

Discussion

Overall, the statistical non-significance in this study differs from most of the previous literature, such as Annisa et al. (2025), who found a highly significant association (p<0.001), and the meta-analysis by Abida (2024), which concluded that screen time increases the risk of language delay by up to 2.67 times. This difference is most likely due to the homogeneity of problematic device-use behavior across nearly all of the sample, such that the rate of developmental suspect cases (82,4%) was evenly distributed across, which reduced statistical power. Nevertheless, the onset, or age at first exposure, appeared to be more decisive than daily duration, given that 47,1% of children had been exposed to devices before 12 months of age, violating the zero screen time recommendation for children under 18–24 months (Gath et al., 2025). This is consistent with the qualitative findings of Al Baqi and Afiah (2025) that passive screen exposure during the critical period without parental mediation is a primary predictor of loss of verbal ability.

This study also highlights the video deficit phenomenon, namely the cognitive limitation of young children in transferring information from a screen to the real world without adult assistance (Jing et al., 2023). The fact that 47,1% of children tended to be mostly quiet while watching and only 29,4% of parents always actively accompanied them reinforces the argument that the loss of reciprocal dialogue is the main cause of language delay. In addition, the use of devices as a digital pacifier by 38,2% of parents risks eliminating the child's opportunity to learn to self-regulate and communicate emotions verbally (Rademacher et al., 2025), while the habit of device use during meals confirms the displacement hypothesis, which replaces crucial face-to-face interaction activities (Rayce et al., 2024).

First, the use of self-report questionnaires is vulnerable to social desirability bias, which may cause discrepancies between the reported data and actual conditions. Second, the cross-sectional design captures the phenomenon at only a single point in time and therefore cannot explain causal relationships, and this study did not fully control for external confounding factors such as birth history, nutritional status, and the quality of non-digital literacy stimulation in the home environment.

CONCLUSIONS

This study confirms a high descriptive prevalence of speech and language delays within the pediatric developmental clinic population at RSUD Provinsi NTB, particularly among children aged 2–3 years and boys. However, bivariate analysis revealed no statistically significant relationship between screen time exposure levels and the incidence of speech delay (p=0.172). Other evaluated variables, including specific screen exposure patterns, digital device types, child demographics, and parenting styles, also showed no significant correlation with speech outcomes (p>0.05). These results imply that while passive screen habits are widespread among early childhood, screen time does not independently dictate developmental speech delays in a clinical environment. Future longitudinal studies utilizing more specific diagnostic tools, such as the Capute Scales, are warranted to better elucidate the multifactorial nature of speech delays

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