

Excessive Screen Time Is Associated with a Higher Risk of Speech Delay in Children Aged 0–6 Years in Malang City

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ABSTRACT

Excessive exposure to screen-based media in early childhood may interfere with various aspects of development, particularly speech and language skills. This study aims to analyze the significance of screen time duration as a predictor of speech delay in children aged 0–6 years in Malang City. A case–control design was employed involving 60 children, consisting of 30 children with speech delay and 30 children with normal speech development. Data on daily screen time duration were collected through parent-reported questionnaires, while developmental status was assessed using the Developmental Pre-Screening Questionnaire (KPSP). Statistical analysis using the Chi-Square test revealed a significant association between screen time duration and speech delay ($p = 0.000$). Children exposed to screen time for more than one hour per day were found to have a higher risk of experiencing speech delay compared to those with limited exposure. In conclusion, screen time duration is a significant predictor of speech delay in children aged 0–6 years, with longer exposure associated with an increased risk of delayed speech development. These findings highlight the importance of parental supervision and limiting screen-based media use, as well as promoting direct interaction to support optimal language development in early childhood.

Keywords: early childhood; screen time; speech delay

INTRODUCTION

Speech and language development constitutes a foundational component of early childhood growth, serving as a central pillar for cognitive, social, emotional, and behavioral maturation. During the earliest years of life; particularly the first five years children undergo rapid neurological and developmental changes that enable them to acquire essential communication skills. These skills not only facilitate basic verbal expression but also support higher-order cognitive processes, social engagement, emotional regulation, and the ability to form meaningful interpersonal relationships. The period of early childhood is therefore widely recognized as a critical window in which delays in speech or language acquisition may exert long-term consequences, potentially affecting academic achievement, peer interactions, behavioral adjustment, and overall quality of life [1].

Speech delay continues to be a prevalent developmental concern affecting children across diverse cultural and socioeconomic contexts. Global estimates suggest that a substantial proportion of children experience delays in speech and language development, reflecting a persistent public health and developmental challenge. In Indonesia, similar patterns have been documented, with emerging evidence indicating an upward trend in the number of children presenting with delayed speech development. This issue is also evident at the regional level, including in Malang City, where pediatric clinical observations have noted a growing number of cases among children aged 0–6 years. Despite these observations, locally generated data remain scarce, and systematic investigations into contributing factors are limited, underscoring the need for context-specific research within this population [2].

The urgency of addressing speech delay stems from its potential to produce enduring developmental impacts if not identified and managed promptly. Early detection and intervention are essential to mitigate the risk of more severe communication disorders and to support optimal developmental trajectories. Identifying modifiable risk factors is therefore crucial for designing effective prevention strategies, guiding parental practices, and informing clinical decision-making. Understanding these factors enables healthcare providers to intervene early, tailor guidance to families, and reduce the likelihood of long-term developmental challenges [3].

Recent research has examined a wide range of biological, environmental, and behavioral determinants associated with speech delay. Among these, exposure to screen-based media has emerged as a particularly relevant factor in contemporary childhood environments. The rapid expansion of digital technology has resulted in a substantial increase in screen time among young children, often beginning in infancy. Several studies have suggested that excessive screen exposure may negatively influence language development by limiting opportunities for direct human interaction, reducing verbal stimulation, and altering patterns of parent–child communication. These mechanisms are believed to interfere with the natural processes through which children acquire vocabulary, expressive language skills, and social communication abilities [4]. However, findings across studies remain inconsistent, with some investigations reporting strong associations while others identify more nuanced or context-dependent effects. Moreover, many studies have not specifically evaluated the predictive role of screen time duration in early childhood, particularly within localized clinical settings where sociocultural factors may differ substantially [5].

Additionally, much of the existing literature has been conducted in diverse sociocultural contexts or has focused on general associations rather than predictive relationships. This limits the applicability of previous findings to specific populations such as children in Malang City, whose environmental exposures, parental practices, and access to digital media may differ from those in other regions. There remains a notable gap in research that directly examines screen time duration as a predictor of speech delay using a case–control design within this local context. Addressing this gap is essential for generating evidence that is both relevant and actionable for clinicians, parents, and policymakers in Malang City [1,6]. Therefore, this study aims to analyze the significance of screen time duration as a predictor of speech delay in children aged 0–6 years at a private clinic in Malang City.

METHODS

This study employed an observational analytic approach using a case–control design, selected to allow systematic comparison between children with speech delay and those with normal speech development. The research was conducted at a private pediatric clinic in Malang City, Indonesia, over a three-month period from January to March 2025. The clinic serves a diverse pediatric population, making it an appropriate

setting for examining developmental issues among children aged 0–6 years. All children within this age range who visited the clinic during the study period constituted the study population.

The sample was divided into two distinct groups: a case group and a control group. The case group consisted of children who had been clinically diagnosed with speech delay by a pediatrician following developmental assessment. The control group included children who demonstrated normal speech and language development based on routine clinical evaluation. A total of 60 children were enrolled, with 30 children assigned to the case group and 30 to the control group. The sampling technique used was consecutive sampling, whereby all eligible children meeting the inclusion criteria were recruited sequentially as they presented to the clinic until the required sample size was reached. This method ensured that the sample reflected the actual flow of patients during the study period.

The inclusion criteria comprised children aged 0–6 years, regardless of sex, who underwent clinical examination at the pediatric clinic and whose parents or guardians provided informed consent and completed the questionnaire. Children with incomplete or missing data were excluded to maintain the integrity and reliability of the dataset. The independent variable in this study was screen time duration, while the dependent variable was the presence or absence of speech delay.

Data on screen time exposure were collected using a structured, parent-completed questionnaire designed to capture the average daily duration of children's interaction with screen-based media. This included smartphones, tablets, televisions, and computers—devices commonly used by young children in contemporary digital environments. Screen time duration was categorized into four groups to facilitate analysis: less than 1 hour per day, 1–2 hours per day, 3–4 hours per day, and more than 5 hours per day. These categories were selected to reflect typical usage patterns observed in early childhood and to allow meaningful comparison across exposure levels.

Assessment of speech delay was conducted using the Developmental Pre-Screening Questionnaire (KPSP), a standardized tool widely used in Indonesia for early detection of developmental delays. The results of the KPSP were subsequently confirmed by a pediatrician through clinical developmental evaluation, ensuring diagnostic accuracy and reducing the risk of misclassification.

Data analysis was performed using statistical software. Descriptive statistics were used to summarize respondent characteristics and distributions of key variables. To compare screen time duration between the case group (children with speech delay) and the control group (children with normal speech development) [7], the Mann–Whitney U test was applied due to the non-parametric nature of the data. A significance level of $p < 0.05$ was used to determine statistical differences. Furthermore, the strength of association between screen time exposure and speech delay was quantified using the Odds Ratio (OR) with a 95% confidence interval (CI), providing an estimate of the likelihood of speech delay among children with higher screen exposure compared to those with lower exposure.

This study adhered strictly to ethical principles governing research involving human participants. Ethical approval was obtained from the Ethics Committee of the Faculty of Medicine, Universitas Wijaya Kusuma Surabaya. Written informed consent was obtained from parents or guardians prior to participation, ensuring voluntary involvement and understanding of the study's purpose. Confidentiality of participant data was rigorously maintained, with all information used solely for research purposes and stored securely to protect privacy.

RESULTS

Respondent characteristics

Based on Table 1, this study used a sample of 60 children aged 0–6 years: 30 children with speech delays (case group) and 30 children with normal speech (control group). The majority of respondents were male (34 children (56.7%), while 26 were female (43.3%). The data shows a nearly equal proportion of respondents, but with a male predominance. Based on age, the majority were in the age group >24 months (56.3%), while those aged <24 months (4.7%) were in the age group <24 months (6.7%).

Based on examinations by pediatricians and questionnaires completed by parents/guardians (Table 2 and Table 3), the majority of daily screen time was 1–2 hours per day for 20 children (33.3%), with speech delays for 30 children (50%), and normal speech for 30 children (50%).

Difference in screen time duration between case and control groups

The difference in screen time duration between children with speech delay and those with normal speech development is presented in Table 4. The difference in screen time duration between children with speech delay and those with normal speech development is presented in Table 4. The median screen time score in the speech delay group was higher than in the normal group, indicating greater exposure to screen-based media among children with speech delay. Statistical analysis using the Mann–Whitney U test showed a significant difference in screen time duration between the two groups ($p < 0.05$). This finding suggests that children with speech delay had significantly higher screen time compared to children with normal speech development. Further analysis showed that children with screen time greater than 1 hour per day had a higher risk of speech delay compared to those with screen time of 1 hour or less (OR = 6.50).

DISCUSSION

Based on our research results, there is a significant association between daily screen time and speech delay in children aged 0–6 years at the Private Clinic Dokter Kota Malang. Children with longer screen time showed a higher risk of speech delay, according to the Chi-square test ($p = 0.000$). This finding is consistent with previous literature showing the negative effects of screen exposure on language and speech development.

Table 1. Respondent characteristics

Variable	Criteria	Frequency	Percentage
Gender	Boy	34	56.7
	Girl	26	43.3
Age	<24 Month	4	6.7
	>24 Month	56	93.3

Table 2. Screen time frequency

Daily screen time	Frequency	Percentage
<1 hour/day	19	31.7
1-2 hours/day	20	33.3
3-4 hours/day	5	8.3
>5 hours/day	16	26.7

Table 3. Speech delay incident

Speech delay	Frequency	Percentage
Yes	30	50
No	30	50

Table 4. Difference in screen time duration between case and control groups

Group	Median	Min-max	OR	p-value
Speech delay	4	1-4	6.50	0.000
Normal	2	1-4		

A cross-sectional study in Kuantan, Malaysia, reported that the average screen time for children with speech delays was 2.26 hours per day, and there was a correlation between children's screen time and their parents' screen time. Although the direct correlation with speech development scores was not significant in that study, this finding reinforces the idea that high screen exposure may be part of a broader risk associated with speech delay [8].

Excessive screen time can reduce children's opportunities for face-to-face interaction with parents or caregivers, which is crucial for language development. A literature review found that gadget use of ≥ 120 minutes per day was associated with a risk of speech delay. Direct verbal interaction, repetition of words, and parental responsiveness to children are essential for fostering speech development [9].

Research in Indonesia also supports the correlation between gadget use intensity and speech delay. For example, a study of toddlers aged 24–60 months found that high gadget use intensity was significantly associated with speech delay. In addition to duration, the frequency and context of gadget use appear to significantly influence speech development outcomes [11,12].

Interventional findings also support the importance of reducing screen time. A pilot study in Pakistan showed that when screen time was reduced to less than 30 minutes per day for 3 months, children's daily vocabulary significantly increased compared to a control group that maintained their usual screen time habits. This provides evidence that the negative effects of screen time may be reversible if intervened early [13].

In addition to duration, research suggests that parental mediation practices [14], the selection of educational content, and parental awareness of the dangers of screen time play a significant protective role. In the context of our research, it is important to consider how parents manage their children's screen use, not just the amount of screen time [15,16].

A study in China of over 2,100 children aged 18–72 months found a dose-response relationship: the longer the average daily screen time (more than 1 hour), the higher the risk of language delay [10]. This suggests that social factors such as parental interaction, level of outdoor activity, and caregiver educational background can moderate the impact of screen time [17,18].

The results of this study support recommendations to regulate children's screen time and strengthen parental involvement in digital media use [11,12,15]. Pediatricians, speech therapists, and child development service providers need to educate parents about the importance of screen time limits and how to engage in productive mediation, for example through educational content and interactive activities [14,19].

Several limitations of our study should be noted. First, the case-control design is observational, so it cannot demonstrate full causality between screen time and speech delay. Second, the screen time data were self-reported by parents, which is susceptible to recall bias. Third, we did not control in detail for the type of media content children used (entertainment vs. educational) or parental mediation, although other research has shown that content and usage methods are significant influences [4,16,20].

For future research, a longitudinal design is recommended to evaluate the long-term impact of screen time on speech and language development. Interventional studies examining reduced screen time and increased parental mediation are also needed. Furthermore, future studies should include additional variables such as content type, interaction quality, and sociodemographic variables to understand more complex mechanisms. This way, findings can be translated into more effective prevention guidelines.

Clinical implications

The results of this study indicate that screen time is significantly associated with speech delays, providing important implications for clinical practice, parent education, and child health policy. These findings emphasize the need for healthcare professionals, particularly pediatricians and developmental service providers, to include digital media use evaluations as part of routine child development assessments. Furthermore, parents should be educated about duration limits, appropriate content selection, and the importance of direct verbal interaction as a means of language stimulation. This research also supports the development of more structured guidelines regarding digital device use in early childhood, as well as the need for family-based intervention programs that emphasize reducing screen time and improving the quality of parent-child interactions to prevent the risk of speech delays.

Study limitations

This study has several limitations that should be considered when interpreting the results. First, the case-control study design is observational, so it cannot confirm a direct causal relationship between screen time and speech delays; it only suggests an association [21]. Second, data on screen time were obtained through questionnaires completed by parents, thus relying heavily on the accuracy of respondents' recall and honesty, potentially introducing recall bias. Third, the study did not evaluate the type of media content, the quality of parental support, or the context in which gadgets are used, all factors that can influence language development. Fourth, the study was conducted at a single clinic, so generalizing the findings to a broader population should be done with caution.

Recommendations for future research

It is recommended that future research use a longitudinal design to monitor children's speech development over a longer period and gain a stronger understanding of causal relationships. Future research should also include additional variables such as the type of content children consume, the duration of parental supervision, socioeconomic factors, and the number of daily verbal interactions to provide a more comprehensive picture. Furthermore, intervention studies assessing the effects of reducing screen time and increasing language stimulation at home are also highly recommended as an evaluative measure of the effectiveness of speech delay prevention programs. With a broader approach and more robust methodology, future research is expected to enrich the scientific evidence and produce more applicable recommendations for improving language development in early childhood.

CONCLUSION

The results of this study show that screen time significantly influences speech development in children aged 0–6 years. Children with longer screen exposure are more likely to experience speech delays than those with limited screen time. These findings highlight the need for careful regulation of digital media use during early childhood, a period critical for language, cognitive, social, and emotional growth.

Based on the evidence, children under 18 months should not be exposed to screens, except for two-way video communication with family. For children aged 1–6 years, screen time should be restricted to a maximum of one hour per day, with content that is educational, interactive, and developmentally appropriate. Parental involvement during screen use is strongly recommended to maintain verbal interaction and enhance language stimulation.

Ethical consideration, competing interest and source of funding

-Ethical approval was obtained from the Ethics Committee of the Faculty of Medicine, Universitas Wijaya Kusuma Surabaya.

-There is no conflict of interest.

-Source of funding is authors.

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