



Association Between Screen Time and Delayed Speech Among Children Under Speech Therapy at a Rehabilitation Center in Islamabad, Pakistan

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Abstract

Excessive screen time is a growing concern for child development, particularly language acquisition. This study investigated the relationship between screen time and speech delay in Pakistani children aged 2-6 years receiving speech therapy. An analytical cross-sectional study was conducted at a rehabilitation center in Islamabad from April to May 2024. A sample of 80 children was recruited via consecutive sampling. Data on demographics and screen time were collected via questionnaire, and speech delay was assessed using the Blank Level of Questions tool. The mean age of participants was 4.57 years (± 1.24). Most were male (61.3%), from urban (72.5%) and high-income (80%) backgrounds. The majority (58.75%) had severe screen exposure (>2 hours/day). A highly significant correlation was found between screen time and the degree of speech delay ($\chi^2=69.073$, $p<0.001$). Critically, only children in the severe screen time category are presented with the most severe speech impairments (Levels III and IV). These results underscore a strong association between excessive screen time and delayed speech severity, highlighting an urgent need for public health campaigns and parental education to limit screen exposure in young children.

Keywords: Screen Time, Delayed Speech, Child Development, Speech Therapy, Public Health.



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Introduction

The digital age has fundamentally transformed human interaction, with screen-based devices becoming ubiquitous in daily life. This shift is particularly pronounced among children, who are exposed to televisions, smartphones, tablets, and computers from an increasingly young age (Rideout, 2017). While these technologies offer potential educational benefits, excessive screen time has raised significant concerns among healthcare professionals regarding its impact on early childhood development, notably speech and language acquisition (Madigan *et al.*, 2019). The American Academy of Pediatrics (AAP, 2016) recommends limited screen use for young children, emphasizing the risks associated with overexposure.

Despite these guidelines, many children exceed recommended limits, engaging in passive consumption of content that often replaces critical, interactive human engagement (Zimmerman, Christakis, & Meltzoff, 2007). Language development is a complex process reliant on rich, reciprocal social interactions with caregivers. Excessive screen time can impede this process by reducing opportunities for conversational turn-taking, limiting exposure to diverse vocabulary, and fostering passive rather than active learning (Duch, Soomi, & NICHD Early Child Care Research Network, 2013; Linebarger & Walker, 2005). Delayed speech and language development is one of the most common developmental disorders in children aged three to six years, with global prevalence estimates ranging from 3% to 10% (Law, Boyle, Harris, Harkness, & Nye, 2000). It can lead to long-term deficits in verbal skills, reading, spelling, and psychosocial adjustment, ultimately affecting academic achievement and cognitive function into adulthood (Sunderajan & Kanhere, 2019). While etiology is multifactorial, encompassing genetic, neurological, and environmental factors, the role of modern environmental influences like screen time requires urgent investigation, particularly in underserved regions.

In Pakistan, there is a paucity of research examining the link between digital media exposure and developmental outcomes in children. This study, therefore, sought to fill this gap by investigating the association between screen time and delayed speech among children presenting for speech therapy at a major rehabilitation center in Islamabad.

Literature Review

Introduction and Prevalence

Five to ten percent of preschoolers worldwide suffer from speech and language delays, which hinder their long-term social and intellectual development (Bishop, Snowling, Thompson, & Greenhalgh, 2017; Law *et al.*, 2000). Despite AAP (2016) rules that discourage screen use under 18 months, excessive screen time exacerbates these risks by replacing language-rich interactions. Young children in Pakistan are becoming more exposed to screens due to growing digital access (Siddiqui, Kundi, & Baber, 2021), but less is known about how this affects clinical populations. To assess how screen time affects the severity of speech delays and to create culturally appropriate interventions for children who are at risk, research in rehabilitation settings is essential. To lessen linguistic impairments brought on by screens, these findings can help guide family education initiatives and public health policies.

Screen Time and Language Development: Mechanisms of Impact

Overuse of screens can hinder language development in a few ways. Screen time takes the place of important parent-child interactions, which are necessary for language modeling and reinforcement, according to displacement theory (Duch *et al.*, 2013). Through responsive and contingent communication, which is frequently lacking during passive screen exposure, children acquire vocabulary, grammar, and pragmatic abilities throughout these interactions (Madigan *et al.*, 2019). Furthermore, the caliber of the content is important because non-educational, fast-paced applications may overstimulate young brains without offering valuable language input (Linebarger & Walker, 2005). According to neurobiological research, excessive screen time may also have an impact on the development of language processing-related brain regions, including the left inferior frontal gyrus (Hutton, Dudley, Horowitz-Kraus, DeWitt, & Holland, 2020).

Empirical Evidence and Contradictions

There is evidence from numerous studies linking excessive screen usage to speech delays. According to a long-term cohort study, children who spend an extra hour a day on screens are more likely to experience expressive language delay (McArthur, Browne, McDonald, & Tough, 2021). In a similar vein, a cross-sectional study found that delayed speech was more common in those who exceeded the AAP screen time recommendations (Kushima, Nishimura, & Oka, 2022). Nonetheless, some research indicates that context is important and that choosing instructional content and co-viewing with parents may lessen adverse impacts (Neuman & Wong, 2021). Most experts concur that excessive, solitary screen time is harmful to language development, notwithstanding these subtleties.

The Pakistani Context and Gaps

Screen time patterns and their effects may be influenced by regionally specific cultural and socioeconomic factors in Pakistan. According to a recent poll, a significant percentage of urban Pakistani children under the age of five spend more time on screens than is advised, frequently because of parents using gadgets as "digital pacifiers" (Hashmi, Khan, & Iqbal, 2021). However, rather than focusing on clinical cohorts undergoing rehabilitation, many investigations have examined general populations. Because rehabilitation clinics house children with significant delays who need specialized interventions, research conducted there is essential. By concentrating exclusively on kids who have previously been diagnosed with speech difficulties, this study fills this knowledge gap by shedding light on how screen time aggravates pre-existing disorders.

Methods and Materials

Study Design and Setting

At the National Institute of Rehabilitation Medicine's (NIRM) Speech Therapy Department in Islamabad, a cross-sectional analytical study was carried out.

Study Duration, Participants, and Sampling

Data collection took place from April 1 to May 25, 2024. Participants were recruited via nonprobability consecutive sampling. The sample size was calculated as 80 using the Raosoft sample size calculator software, assuming a power of 80%, a 95% confidence level, and a conservative expected proportion of speech delay of 5% in the population.

Inclusion and Exclusion Criteria.

The study included children aged 2-6 years of both genders who were diagnosed with delayed speech and were undergoing speech therapy. Children with neurological disorders, hearing impairments, malnourishment, low birth weight, preterm birth history, antenatal complications, or a history of ICU/NICU hospitalization were excluded to minimize confounding factors.

Data Collection Tools and Variables.

Data was collected using a pre-designed proforma consisting of three sections:

1. *Demographic Variables:* Age, gender, residence, educational status, and socioeconomic status.
2. *Screen Time Assessment:* A parent-reported questionnaire documenting the child's average daily screen time at home. Screen time was categorized as Normal (<1 hour), Moderate (1-2 hours), or Severe (>2 hours) based on WHO guidelines (World Health Organization, 2019).
3. *Delayed Speech Assessment:* The level of speech delay was clinically assessed and classified into Level I to Level IV using the Blank Level of Questions tool, a standardized instrument for evaluating language comprehension and expression (Blank, Rose, & Berlin, 2003).

Results and Findings

Descriptive Statistics

The study comprised 80 children with a mean age of 4.57 years ($SD = \pm 1.24$). The demographic characteristics are summarized in Table 1. The sample had a male predominance (61.3%). Most participants resided in urban areas (72.5%) and came from high socioeconomic backgrounds (80%). Regarding education, 71.2% were under primary education, while 28.8% were not attending any school.

Table 1
Socio-Demographic Characteristics of Participants (n=80)

Variable	Category	n	%
Gender	Male	49	61.3
	Female	31	38.7
Residence	Rural	22	27.5
	Urban	58	72.5
Education Status	Not attending school	23	28.8
	Under primary education	57	71.2
Socioeconomic Status	Middle (15,000-25,000 PKR)	16	20.0
	High (>25,000 PKR)	64	80.0

Note. PKR = Pakistani Rupee.

Distribution of Screen Time and Delayed Speech

Only 13.75% of children had screen time within the recommended limit (<1 hour). The majority (58.75%) were in the severe category (>2 hours/day). Level I delay was the most prevalent (31.25%), followed by Level III (26.25%), Level II (22.50%), and Level IV (20.00%).

Association Between Screen Time and Delayed Speech

A highly significant association was found between the amount of screen time and the level of delayed speech ($\chi^2 = 69.073$, $p < .001$). The results, detailed in Table 2, show a clear gradient:

- All children with Level I delay had screen time in the Normal or Moderate categories.
- Children with Level II delays had Moderate or Severe screen time.
- All children with Level III and Level IV delays fell exclusively into the Severe screen time category.

Table 2
Association Between Screen Time and Delayed Speech Level (n=80)

Delayed Speech Level	Screen Time Category		
	Normal (<1 hr)	Moderate (1-2 hrs)	Severe (>2 hrs)
Level I	11	14	0
Level II	0	8	10
Level III	0	0	21
Level IV	0	0	16

Note: $\chi^2(6, N = 80) = 69.07$, $*p < .001$

Discussion and Conclusion

This study provides compelling evidence of a strong association between excessive screen time and the severity of delayed speech in children aged 2-6 years. The finding that 58.75% of children exceeded the recommended screen time guidelines is alarming and consistent with global trends of increasing digital media use among young children (Rideout, 2017).

The core finding—a highly significant statistical association ($p < 0.001$) where greater screen exposure correlated directly with more severe speech delays—aligns with existing international literature. Studies have postulated that screen time displaces vital parent-child interactions, reduces opportunities for language-rich engagement, and provides passive, non-interactive content that does not adequately stimulate the neural circuits involved in language acquisition (Duch *et al.*, 2013; Linebarger & Walker, 2005; Zimmerman *et al.*, 2007). The absence of children with severe delays in the low screen time categories, and conversely, the concentration of all children with the most severe delays (Levels III & IV) in the high screen time group, suggests a dose-response relationship.

The demographic profile of our sample, predominantly from urban and high-income families, may reflect greater access to digital devices in these households. This contradicts the common assumption that digital divides protect wealthier children from such risks; instead, it may indicate that accessibility leads to overuse without adequate supervision or guided interaction (Livingstone & Helsper, 2007).

This study concludes that a strong, statistically significant association exists between excessive screen time and the severity of speech delay in young children undergoing rehabilitation. The dose-response gradient observed—where the most severe speech delays occurred exclusively in children with the highest levels of screen exposure—provides powerful evidence of this relationship. These findings are of paramount public health importance, particularly in a developing country like Pakistan, where digital device usage is rapidly rising without concomitant awareness of its potential developmental risks. The results underscore that screen time is a critical modifiable environmental factor that can exacerbate speech delays in clinically vulnerable populations.

Limitations

There are various restrictions on this study. Because of its cross-sectional design, causality cannot be established. The results may not be as applicable to the larger Pakistani community because the sample was taken from a single public rehabilitation facility in an urban area. Additionally, parent reports, which are prone to memory and social desirability bias, were used to quantify screen time. Remaining confounding from unmeasured factors (such as the quality of parent-child relationship outside of screen time) may exist even after adjusting for a few confounders using exclusion criteria.

Recommendations

1. **Public Health Policy:** National health guidelines should explicitly address and promote safe screen time limits for young children, aligned with WHO and AAP recommendations.
2. **Parental Education:** Healthcare providers, particularly pediatricians and community nurses, should incorporate counseling on the risks of excessive screen time and the importance of interactive play into routine child health visits.
3. **Clinical Practice:** Speech therapists should routinely screen for digital media habits as part of their initial assessment for language delays and integrate screen time reduction as a core component of family guidance.
4. **Further Research:** Longitudinal studies are needed to establish causality. Future research should also explore the impact of content quality and co-viewing (parent watching with child) on speech outcomes in the Pakistani context.

Declarations

Ethical Statement

This study strictly adhered to the Declaration of Helsinki and relevant national and institutional guidelines for ethics. Informed consent was not required, as secondary data available on websites was obtained for analysis. All procedures performed in this study were conducted in accordance with the ethical standards of the Helsinki Declaration.

Ethical approval was obtained from the Institutional Review Committee of the National Institute of Rehabilitation Medicine NIRM, and management of the NIRM granted administrative permission (Reference Number: No.F.1-2/2024-(Research) NIRM dated 15th May 2024).

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Authors' Contributions

MA: Original draft writing, data curation, methodology, and conceptualization. **AK:** Formal analysis, research, writing, editing, and review. **RA:** Project administration, focal person for project resources, investigation for data collection, and manuscript structuring. **NN:** Verification, illustration. **SK:** Editing, reviewing, and supervising. The final manuscript has been read and approved by all writers.

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Declaration of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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