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Original Article

The impact of passive screen time on early childhood speech and language development: parental perspectives and behavioral correlates

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Abstract

Excessive and early exposure to digital screens has raised growing concerns about its implications for children's speech and language development. This study investigated the associations between passive screen exposure and speech and language delays in children aged 5–8 years, focusing on behavioral and clinical risk factors such as screen-use duration, content type, contextual usage, parental awareness, and screen-time mediation strategies. A descriptive cross-sectional study was conducted with 203 parent–child dyads via a structured questionnaire. Most children were exposed to screens before age two, with more than 57% exceeding two hours of daily screen time. Social media and entertainment content were the most frequently consumed, while only 47.3% engaged with educational content. Parental mediation practices were inconsistent, and only 28.6% reported frequent supervision. Language delay severity was high, with 62.1% classified as having severe delays. Chi-square analysis revealed a significant association between average daily screen time and language delay status ($p = 0.001$). Binary logistic regression revealed that greater screen time increased the odds of delay (AOR = 2.67, $p < 0.001$), whereas greater parental awareness [adjusted odds ratio (AOR) = 0.45, $p = 0.002$], educational content consumption (AOR = 0.40, $p = 0.041$), and active mediation (AOR = 0.35, $p = 0.048$) were protective. A modest but significant negative correlation was observed between parental awareness and language delay severity (r = -0.183, $p = 0.009$). This study revealed that excessive and early screen exposure is strongly linked to speech and language delays in children aged 5–8 years, whereas greater parental awareness, a preference for educational content, and engaged mediation practices are associated with reduced risk. These findings emphasize the pivotal role of parents in shaping digital environments and highlight the need for early, targeted interventions to enhance parental digital engagement, promote content supervision, and guide balanced screen use. Public health efforts and pediatric counseling should collaboratively support families in promoting healthy language development amid evolving digital habits.

Keywords

Speech disorders; Language development disorders; Screen time; Parenting; Child behavior

1. Introduction

The growing integration of digital screens in children's daily routines has raised developmental concerns, particularly regarding speech and language acquisition [1,2]. The widespread availability of smartphones, tablets, televisions, and similar devices has led to extended exposure from an early age [3,4]. Passive screen time refers to noninteractive

engagement—such as watching videos or television—in which children are not actively involved, thus limiting opportunities for language stimulation, cognitive engagement, and social interaction [5,6]. As digital content consumption becomes increasingly common, its developmental implications warrant systematic investigation.

Speech and language development during early childhood is strongly influenced by environmental factors, caregiver interactions, and verbal communication [7,8]. A lack of direct verbal contact, reduced exposure to vocabulary, and limited opportunities for practicing communication may contribute to developmental delays [9]. Several studies have linked excessive screen time to impaired receptive and expressive language skills in children [10,11]. These impairments can have long-term consequences for academic performance and social adjustment.

Although some parents are aware of the risks and impose screen time limitations, others permit excessive or unsupervised screen use, often due to limited awareness or competing responsibilities [12]. When appropriately designed, educational applications may facilitate learning across multiple developmental domains [13,14]. However, the effectiveness of these tools heavily depends on parental involvement and content quality. Therefore, understanding how parents navigate the digital environment is key to shaping effective interventions.

Furthermore, parental education, socioeconomic background, and cultural practices influence children's screen use behaviors [15,16]. Families with greater access to educational resources are more likely to prioritize verbal interaction, whereas others may rely on screens as a means of convenience [17,18,19]. The role of the socioenvironmental context is thus essential in interpreting screen-time practices across diverse populations.

Given the increasing prevalence of speech and language delays and the ubiquity of screens in early childhood, investigating how passive screen time interacts with developmental pathways is clinically relevant. Parental insight and practices are pivotal in mediating screen-related risk, and understanding these dynamics can support the development of targeted health communication, early counseling strategies, and anticipatory guidance in pediatric care.

The primary objective of this study was to explore the associations between passive screen time and speech and language development in early childhood, with particular attention to clinical and behavioral risk factors. Specifically, the study aims to assess parental perceptions of the impact of screen exposure and analyze patterns of screen use—including duration, content type, and contextual usage—that may contribute to developmental delays. It further examines how parental education, parental screen-time mediation practices, and awareness are related to early literacy behaviors and communication outcomes. By identifying potential behavioral predictors of speech and language delay, this study aims to inform pediatric and public health interventions aimed at early identification and clinical guidance for screen-time management in young children. We hypothesized that a greater duration of passive screen time would be associated with an increased risk of speech and language delay, whereas higher parental awareness, educational content use, and active mediation would be associated with reduced risk.

2. Methods

2.1. Study design and duration

This descriptive cross-sectional study was conducted over a period of six months, from November 2023 to April 2024.

2.2. Study setting

Data were collected from multiple pediatric clinical and rehabilitation facilities across Lahore, Pakistan, including the Children's Hospital, Riphah Rehabilitation Clinic, Rehab Care Poly Clinic, Emerging Minds, and the Lahore Residency and Rehabilitation Center. These centers cater to children with developmental delays and provide access to a diverse population of caregivers seeking speech and language therapy services.

2.3. Participants and sampling approach

The sample size was informed by findings from a study conducted at a tertiary care facility on the periphery of Islamabad, which reported a 15.2% prevalence of delayed speech and language disorders among children presenting to a speech-language pathology department [20]. On the basis of the sample of 196 children used in that study, a 10% increase was applied to ensure adequate statistical power and account for potential data loss or incomplete responses. This yielded a final target sample size of 216 participants. Participants were recruited via a nonprobability consecutive sampling technique from pediatric hospitals and rehabilitation centers.

2.4. Eligibility criteria

Parents of children aged 5–8 years who presented to speech-language services for concerns related to speech and language development were included. The participants were required to be primary caregivers and capable of understanding the questions presented during face–to-face interviews. Only those who provided written informed consent were enrolled. In contrast, parents of children with known comorbid conditions such as autism spectrum disorder, neurological disorders (e.g., cerebral palsy, epilepsy), intellectual disabilities, or hearing impairment were excluded. Additionally, children receiving current pharmacological treatment for behavioral or developmental conditions were excluded to avoid confounding factors.

2.5. Questionnaire development

The structured questionnaire consisted of five main sections. The first section collected demographic and socioeconomic information. The second section explored the screen exposure profile, including age at first screen use, daily screen duration, type of content viewed, and contextual usage, such as during meals or before bedtime. The third section assessed parental awareness and attitudes through Likert-scale items, using a five-point scale ranging from "strongly disagree" to "strongly agree," without any reverse or negative scoring. The fourth section examined parental screen-time mediation practices, including coviewing, enforcement of screen-time rules, assistance in content selection, and discussions about screen content. The response options for these items included “always,” “often,” “sometimes,” “rarely,” and “never” for frequency-based behaviors and “yes” or “no” for rule-setting and content supervision. The final section captured parent-reported speech and language development milestones, such as cooing, babbling, vocabulary growth, sentence formation, following instructions, and early literacy abilities. Each milestone was rated as “on time,” “late,” or “not yet achieved,” allowing for categorical assessment of developmental progress.

The questionnaire was developed through an extensive review of the relevant literature and incorporated items adapted from previously validated tools used in studies such as those of Takahashi et al. (2023) [21], Kerai et al. (2022) [22], and Al Hosani et al. (2023) [23]. Language milestone items were aligned with developmental norms used in pediatric clinical assessments to enhance clinical relevance.

Content validity was ensured through expert review by pediatricians, speech-language pathologists, and child development specialists. On the basis of expert feedback, the instrument was refined to improve clarity, cultural appropriateness, and construct alignment. A pilot version of the questionnaire was tested with a small group of parents (not included in the main analysis) to ensure item comprehension and response reliability.

2.6. Parental interview protocol

The finalized questionnaire was administered in paper format through structured, face–to-face interviews with parents. Data collection was conducted at selected study sites where children diagnosed with speech and language delays were receiving care. Each interview lasted approximately 20–25 minutes. The principal investigator and coprincipal investigators, fluent in the local language, conducted the interviews to ensure accurate interpretation of the questions and responses. Prior to participation, parents were briefed on the purpose of the study and provided written informed consent.

2.7. Language delay classification

Parental responses to a series of language development milestones were used to determine speech and language delay status among children. The assessed milestones included cooing by six months, babbling by nine months, imitating sounds by eleven months, saying simple words by twelve months, acquiring a vocabulary of 10–20 words by 18–24 months, combining three to five words into sentences by three years, following two-step instructions, reading simple words or letters, and writing simple words or letters [24,25]. Each developmental milestone was rated by the parent as “on time,” “late,” or “not yet achieved.” For the purpose of analysis, responses marked as either “late” or “not yet” were interpreted as indicative of developmental delay. Children were classified as having a language delay if they were delayed in at least one of the assessed milestones. Additionally, a severity score was calculated by summing the number of delayed milestones across nine key domains, resulting in a total possible score ranging from 0–9. Severity was categorized as follows: a score of 0 indicated no delay; scores of 1–2 were considered mild delay; scores of 3–5 indicated moderate delay; and scores greater than 5 were classified as severe delay. These cutoff points were developed specifically for this study, guided by clinical reasoning and milestone-based approaches, in the absence of standardized scoring thresholds in the literature.

2.8. Operationalization of mediation practices

A composite mediation score was created by summing the number of positive responses across four parental behaviors: coviewing, setting screen-time rules, selecting content, and discussing screen content. Each positive response (yes, always, often, or sometimes) was assigned a score of 1, whereas negative responses (no, rarely, or never) were assigned a score of 0. Participants with scores of 0–1 were categorized as practicing passive mediation, whereas those with scores of 2 or more were classified as active mediators.

2.9. Ethical considerations

Ethical approval for this study was obtained from the Research and Ethics Committee of Riphah College of Rehabilitation and Allied Health Sciences, Lahore, Pakistan (No. REC/RCR&AHS/23/0632). Written informed consent was obtained from all participants prior to data collection. Participation was voluntary, and the confidentiality of all per-

sonal and clinical information was maintained throughout the study in accordance with the ethical principles outlined in the Declaration of Helsinki.

2.10. Statistical analysis

The data were analyzed via IBM SPSS Statistics version 25. Descriptive statistics were computed to summarize the study variables. Chi-square tests were used to examine associations between categorical variables, including screen use behaviors, parental mediation practices, and developmental outcomes. Binary logistic regression was conducted to identify independent predictors of speech and language delay. Spearman's rank correlation was used to assess the associations between parental awareness and literacy-related behaviors. The internal consistency of the Likert scale items was assessed via Cronbach's alpha. A p value of less than 0.05 was considered statistically significant.

3. Results

Among the 216 participants, 203 completed the questionnaire, yielding a response rate of 93.98%. Table 1 presents the sociodemographic profile of the sample. Most of the children were approximately 6 years old (mean = 6.11, SD = 1.04), and two-thirds were male (66.5%). The majority of fathers (35.96%) and mothers (35.96%) held graduate degrees, while approximately 21% of each had intermediate education. Over half of the families (57.6%) fell within the middle-income category.

Table 1. Sociodemographic characteristics of the participating children and their parents.

Variables		Frequency (%)
Age of the child (in years), Mean ± SD		6.108 ± 1.038
Gender of the child	Male	135 (66.50)
	Female	68 (33.50)
Father's education	Illiterate	10 (4.93)
	Primary	42 (20.69)
	Matric	34 (16.75)
	Intermediate	44 (21.67)
	Graduate	73 (35.96)
Mother's education	Illiterate	10 (4.93)
	Primary	42 (20.69)
	Matric	34 (16.75)
	Intermediate	44 (21.67)
	Graduate	73 (35.96)
Family income	Low	24 (11.80)
	Middle	117 (57.60)
	High	62 (30.50)

Table 2 shows the digital exposure and mediation patterns among families. Most children were introduced to screens before the age of 2, with 33% starting before 1 year and another 32% between 1–2 years. The duration of daily screen use exceeded 2 hours for more than half of the samples (57.6%). Social media (74.9%) and entertainment content (33%) were commonly consumed, whereas 47.3% of parents reported that their children viewed educational content. Screen use frequently occurred during calming (76.4%) and meals (60.6%). Only 28.6% of parents reported always or often supervising screen use, and 40.4% did not set screen-time rules. Overall, 62.1% of the children were classified as having severe language delays.

Table 2. Patterns of screen exposure, content type, contextual usage, parental awareness, and parental screen-time mediation practices among participating families.

Variables		Frequency (%)
Age at first screen exposure	< 1 year	67 (33.00)
	1–2 years	65 (32.02)
	2–3 years	29 (14.29)
	3–4 years	19 (9.36)
	> 4 years	23 (11.33)
Average daily screen time	< 1 hour	22 (10.84)
	1–2 hours	64 (31.53)
	2–3 hours	67 (33.00)
	> 3 hours	50 (24.63)
Type of content consumed	Educational	96 (47.29)
	Entertainment	67 (33.00)
	Social media	152 (74.88)
Contexts of screen use	During Meals	123 (60.59)
	Before bed	104 (51.23)
	While playing	61 (30.05)
	To calm/manage	155 (76.35)
	Studying	57 (28.08)
Parental awareness and attitudes, Mean ± SD		3.19 ± 1.03
Coviewing or supervision	Always	22 (10.84)
	Often	36 (17.73)
	Sometimes	45 (22.17)
	Rarely	72 (35.47)
	Never	28 (13.79)
Screen-time rule setting	Yes	121 (59.61)
	No	82 (40.39)
Content selection guidance	Yes	117 (57.64)
	No	86 (42.36)
Discussion of screen content	Always	41 (20.20)
	Often	46 (22.66)
	Sometimes	67 (33.00)
	Rarely	29 (14.29)
	Never	20 (9.85)
Language delay severity	No delay	38 (18.72)
	Mild delay	12 (5.91)
	Moderate delay	27 (12.30)
	Severe delay	126 (62.07)

The binary logistic regression model was statistically significant, $\chi^2(4) = 42.594$, $p < 0.001$ (Omnibus test), indicating that the included predictors reliably differentiated between children with and without language delay (Table 3). The model explained between 18.9% (Cox & Snell R^2) and 30.6% (Nagelkerke R^2) of the variance, with a -2 log likelihood value of 153.149. Table 5 further shows that greater average daily screen time was significantly associated with increased odds of language delay ($p < 0.001$, AOR = 2.67). In contrast, greater parental awareness and attitudes ($p = 0.002$, AOR = 0.45), consumption of primarily educational content ($p = 0.041$, AOR = 0.40), and active screen-time mediation practices ($p = 0.048$, AOR = 0.35) were each associated with reduced odds of delay.

Table 3. Associations of average daily screen time and parental screen-time mediation practices with speech and language delay status among children.

Variables		Language Delay Status		*p* Value
		No Delay (N = 38)	Language Delay (N = 165)	
		Frequency (%)	Frequency (%)	
Average daily screen time	< 1 hour	13 (34.21)	9 (5.45)	0.001 *
	1–2 hours	14 (36.84)	50 (30.30)	
	2–3 hours	7 (18.42)	60 (36.36)	
	> 3 hours	4 (10.53)	46 (27.88)	
Parental screen-time mediation practices	Passive mediation	6 (15.79)	50 (30.30)	0.071
	Active mediation	32 (84.21)	115 (69.70)	

* Variables were compared via the chi-square test. ** Significant value ($p \leq 0.05$).

There was a statistically significant negative correlation between parental awareness and attitudes and the severity of language delay (r = -0.183, $p = 0.009$), indicating that lower awareness is modestly associated with greater delay severity in children (Table 4).

Table 4. Correlation between parental awareness and early literacy-related speech behaviors.

Independent Variables	Pearson Correlation	*p* Value
Parental awareness and attitudes	-0.183	0.009 *
Language delay severity		

* Pearson correlation (2-tailed). ** $p < 0.01$ was considered statistically significant.

The binary logistic regression model was statistically significant, $\chi^2(4) = 42.594$, $p < 0.001$ (Omnibus test), indicating that the included predictors reliably differentiated between children with and without speech and language delays (Table 5). The model explained between 18.9% (Cox & Snell R^2) and 30.6% (Nagelkerke R^2) of the variation in language delay outcomes. Among the predictors, average daily screen time was the strongest risk factor: for each increase in screen time, the odds of a child having a language delay increased by 2.67 times (AOR = 2.67, 95% CI: 1.684–4.240, $p < 0.001$). Conversely, greater parental awareness and positive attitudes significantly reduced risk by approximately 55% (AOR = 0.45, 95% CI: 0.274–0.744, $p = 0.002$). Similarly, children who primarily consumed educational content were approximately 60% less likely to experience a delay (AOR = 0.40, 95% CI: 0.168–0.962, $p = 0.041$). Moreover, active parental screen-time mediation, such as coviewing or enforcing screen-time rules, was associated with a 65% reduction in the odds of delay (AOR = 0.35, 95% CI: 0.124–0.989, $p = 0.048$). Overall, greater average daily screen time was positively associated with increased odds of language delay, whereas parental awareness, educational content consumption, and mediation practices were each negatively associated with delay classification.

Table 5. Binary logistic regression identifying predictors of speech and language delay.

Variables	B	S.E.	Sig.	Exp (B)	95% CI for EXP (B)	
					Lower	Upper
Average daily screen time	0.983	0.236	< 0.001 ***	2.672	1.684	4.240
Parental awareness and attitudes	-0.795	0.255	0.002 ***	0.451	0.274	0.744
Type of digital content primarily consumed	-0.913	0.446	0.041 ***	0.401	0.168	0.962
Parental screen-time mediation practices	-1.050	0.530	0.048 ***	0.350	0.124	0.989

* Exp (B) = odds ratio. ** CI = confidence interval. *** Variables with $p < 0.05$ were considered statistically significant. **** The overall model was statistically significant, $\chi^2(4) = 42.594$, $p < 0.001$. It explained 18.9% (Cox & Snell R^2) to 30.6% (Nagelkerke R^2) of the variance in language delay classification, with a -2 log likelihood of 153.149.

4. Discussion

The current findings highlight trends in early digital exposure and its potential impact on language development. A majority of the children in the sample began screen use before the age of two, with more than 65% introduced to screens by that age and more than half exceeding the recommended two-hour daily limit. The predominant use of screens for social media and entertainment, often during meals and as a calming tool, suggests that screens are deeply integrated into daily routines. However, inconsistent parental mediation may contribute to an increased risk of developmental challenges. A notably high proportion of children were reported to have severe language delays.

These findings are consistent with a growing body of research. Multiple studies have established a significant association between excessive screen time and delays in expressive and receptive language development. Meta-analyses have shown that children with high screen time are more than twice as likely to experience language delays than are those with limited exposure [26,27]. Cross-sectional studies from various settings, including Pakistan, Indonesia, South Africa, and South Korea, have also demonstrated that children with more than 2–3 hours of daily screen time have significantly lower language milestone achievement [28,29,30,31]. For example, children with screen exposure exceeding 9 hours daily are substantially less likely to meet language milestones by the age of five [30].

Moreover, the age at first exposure plays a critical role. Studies confirm that screen use initiated before 24 months is strongly linked to higher odds of speech delay [1,31], especially when the content lacks educational value or when screens are used passively without parent interaction [32,33,34,35]. One case–control study in the UAE revealed that more than 90% of children with language delays were exposed to electronic devices before the age of two, underscoring the timing of exposure as a key risk factor [31].

While some studies suggest that educational screen content and coviewing with caregivers may buffer negative effects [36,37], the overall consensus is that excessive and unsupervised screen use remains detrimental. In fact, children whose screen use was reduced showed significant improvement in vocabulary within just a few months, demonstrating that intervention is possible and effective [38]. Additionally, socioeconomic factors, such as maternal education and the home language environment, further interact with screen exposure to influence language outcomes [39].

In contrast to the findings of the present study, other studies have highlighted that both active and passive screen time, as well as the use of smart screen technologies, are not associated with mental development and may actually enhance interactive abilities [40]. A Malaysian study reported that the screen time of parents and children was associated with monthly family income. Furthermore, there was no association between screen time and developmental quotient (DQ) levels [41]. In children aged 12–16 months, the primary predictor of expressive and receptive vocabulary was the context of screen use, with frequent interactive joint media engagement supporting language development. In contrast, in children aged 17–36 months, greater screen exposure—reflected in higher daily use, background television, and earlier onset—was negatively associated with expressive vocabulary and mean length of utterance, suggesting that increased screen use may impede both lexical growth and syntactic development [42]. Another study highlighted that pragmatic development was positively associated with parental device use during child routines, which may reflect children's adaptation to intermittent attention by employing strategies to re-engage caregivers. Joint media engagement further supported pragmatic skills, which is consistent with evidence that coviewing and discussion facilitate social communication. Additionally, girls outperformed boys, in line with the literature reporting earlier attainment of communicative milestones among females [43].

Our findings show that increased parental awareness and positive attitudes significantly reduce the likelihood of language delays in children. Parents who actively monitor their children's digital consumption can help mitigate negative outcomes, especially when children engage with educational content rather than entertainment or social media [44,45]. This finding supports research emphasizing that content quality, in addition to screen time duration, is critical for developmental outcomes. Active parental mediation strategies, such as coviewing and discussing content, have emerged as important protective factors that support language development [46,47]. Overall, both the quality and quantity of digital engagement, together with parental involvement, are key determinants of language outcomes.

While these findings are robust, the study is not without limitations. First, the cross-sectional design restricts causal inferences. Second, parental reporting may be subject to recall or desirability bias, particularly with respect to screen use behaviors and developmental milestones. Third, the sample was derived from clinical and rehabilitation centers, potentially limiting generalizability. However, the key strengths include a high response rate, the use of validated milestone indicators, and the inclusion of diverse family backgrounds, enriching the contextual understanding. Future research should include more diverse and representative populations, along with longitudinal tracking and objective screen usage measures, to establish causality and assess long-term developmental trajectories.

5. Conclusions

This study revealed that excessive and early screen exposure is significantly associated with speech and language delays in children aged 5–8 years. Conversely, higher parental awareness, engagement with educational content, and active screen-time mediation were linked to reduced odds of delay. These findings emphasize the critical role of parental involvement in shaping digital habits and mitigating developmental risk. Based on the study outcomes, we recommend that early interventions prioritize enhancing parental digital literacy, promoting evidence-based screen-time guidelines, and supporting active content supervision and mediation strategies. Pediatric counseling and public health initiatives should work collaboratively to equip families with the tools and knowledge necessary to support healthier language development in the digital age.

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