THE ATLANTIC Journal of Medical Science and Research

Atlantic J Med Sci Res 2026;6(3):314-20
DOI: 10.5455/atjmed.2026.03.038

Original Article

Screen time exposure in children aged 24–60 months with delayed speech: A case-control study

Agit Simsek

İnönü University, Faculty of Health Sciences, Depertmant of Speech and Language Therapy, Malatya, Türkiye

Received: 31 March, 2026
Accepted: 14 May, 2026
Published: 07 September, 2026

Corresponding Author: Agit Simsek, İnönü University, Faculty of Health Sciences, Depertmant of Speech and Language Therapy, Malatya, Türkiye
Email: agit.simsek@inonu.edu.tr

CITATION
Simsek A. Screen time exposure in children aged 24–60 months with delayed speech: A case-control study. Atlantic J Med Sci Res. 2026;6(3):314-20. DOI: 10.5455/atjmed.2026.03.038

Abstract

Aim: This study compared screen exposure patterns between children aged 24–60 months with speech delay receiving rehabilitation services and their typically developing peers, with particular attention to parent–child interaction and sociodemographic characteristics.

Materials and Methods: This case–control study included 22 children with speech delay and 26 typically developing children. Parent-report questionnaires were used to collect data on daily screen time, age at first screen exposure, screen device type, parental education, socioeconomic status, maternal employment, number of siblings, and daily parent–child interaction time. Data were analyzed using the Shapiro–Wilk test, independent samples t-test, Mann–Whitney U test, chi-square test, and Spearman correlation analysis.

Results: Children with speech delay had significantly longer daily screen time than controls (177.27 ± 53.91 vs. 116.54 ± 43.54 minutes; $p < .001$) and were exposed to screens at a significantly younger age (7.00 ± 2.45 vs. 15.15 ± 3.87 months; $p < .001$). Daily screen time was moderately and negatively correlated with age at first screen exposure ($\rho = -0.356$, $p = .013$). No significant between-group differences were found in parental education, socioeconomic status, maternal employment, number of siblings, screen type, or sex distribution. However, daily parent–child interaction time was significantly longer in the control group (128.7 ± 41.2 vs. 92.5 ± 35.4 minutes; $p = .004$).

Conclusion: Children with speech delay are exposed to screens earlier and for longer durations than their typically developing peers. Reduced parent–child interaction may represent an additional pathway through which excessive screen exposure influences language development, underscoring the importance of early interventions targeting both screen use and parent–child interaction.

Keywords: Screen time, speech delay, early childhood, language development, digital media, case-control

INTRODUCTION

Early childhood represents a critical neurodevelopmental period during which the foundations of language and communication skills are established. The rapid formation of synaptic connections during the first five years of life creates a "sensitive window" that is highly responsive to rich verbal interactions with the environment (1). During this period, interactive activities such as caregiver–child conversations, shared book reading, and play facilitate language acquisition, whereas prolonged exposure to passive screen media may displace these essential experiences, raising significant developmental concerns.

With the rapid integration of digital technologies into daily life, the age at which children are first exposed to screens has decreased, while the overall duration of screen use has increased substantially. Recent evidence suggests that infants are introduced to screen media as early as four months of age on average (1). The World Health Organization guidelines recommend no screen use for children under two years of age and limit screen time to no more than one hour per day for children aged 2–4 years (2). However, accumulating evidence indicates that the majority of preschool-aged children exceed these recommendations (3).

The relationship between screen exposure and language development has been extensively investigated over the past two decades. In a meta-analysis including 42 studies and 18,905 participants, Madigan et al. (2020) reported a significant negative association between higher screen time and language outcomes (r = -0.14, 95% CI: -0.18 to -0.10). Conversely, educational content and co-viewing with caregivers were found to have beneficial effects on language development (3). Similarly, a large-scale study conducted in Korea demonstrated that two-year-old children who watched television for 2–3 hours per day had a 2.74-fold increased risk of language delay compared to those who watched less than one hour daily (4).

In a comprehensive scoping review, Bhutani et al. (2024) found that nine studies reported a negative association between screen time and language development, five reported no significant relationship, and two suggested a positive association (5). These mixed findings indicate that the impact of screen exposure is not solely determined by duration but also by factors such as content quality, parental involvement, and age of onset. Notably, earlier initiation of screen exposure has been associated with a higher risk of language delay (3).

In Türkiye, research on this topic remains limited, particularly studies that systematically compare children undergoing rehabilitation with typically developing peers. Addressing this gap, the present study aims to compare screen exposure patterns in children aged 24–60 months diagnosed with delayed speech and currently receiving rehabilitation services with those of typically developing children. The primary hypotheses of the study are as follows: (a) children in the case group will have significantly higher daily screen time compared to the control group; (b) children in the case group will have an earlier age of first screen exposure; and (c) there will be no significant difference between groups in terms of the distribution of screen types.

MATERIALS AND METHODS

Study Design

This study was designed as a case–control investigation. This design enables the comparison of a group with a defined clinical condition (cases) to a group with similar demographic characteristics but without the condition of interest (controls).

Participants

A total of 48 children aged 24–60 months were included in the study. The case group (n = 22) comprised children diagnosed with delayed speech by a pediatric neurologist or child psychiatrist and currently receiving rehabilitation services at a speech and language therapy center.

The control group (n = 26) consisted of typically developing children with no history of speech or language delay and no prior rehabilitation.

Exclusion criteria included hearing loss, autism spectrum disorder, intellectual disability, neurological disorders, history of prematurity (birth before 37 weeks of gestation), and exposure to a bilingual environment.

The groups were comparable in terms of age ($t = -0.844$, $p = .403$) and sex distribution ($\chi^2 = 0.678$, $p = .410$), indicating successful matching.

Data Collection Instruments

Data were collected using a structured parent-report questionnaire developed by the researchers. The instrument assessed three primary variables: (1) daily screen time (calculated as the average of weekday and weekend use, reported in minutes), (2) age at first screen exposure (in months), and (3) primary type of screen used (television, tablet, smartphone, or combinations thereof).

To enhance recall accuracy, parents were provided with a categorical time scale (0–30 min, 30–60 min, 60–120 min, 120–180 min, and ≥ 180 min).

For the calculation of daily screen time, responses obtained from the categorical time scale (e.g., 0–30, 30–60, 60–120, 120–180, and ≥ 180 minutes) were converted into continuous variables by assigning the midpoint value of each category. For the highest category (≥ 180 minutes), a conservative estimate of 210 minutes was used. These values were then used to compute group means and standard deviations.

Additionally, parental sociodemographic information—including educational level, socioeconomic status, employment status, number of siblings, and parent–child interaction time—was collected using a structured form.

Daily parent–child interaction time was assessed using parental self-report. Parents were asked to estimate the average duration (in minutes per day) of direct interaction with their child, including activities such as play, verbal communication, shared book reading, and routine caregiving interactions. To enhance accuracy, weekday and weekend estimates were obtained separately and averaged to compute a composite daily interaction time.

Ethical Approval

Ethical approval for this study was obtained from the Scientific Research and Publication Ethics Committee of İnönü University (Session No: 5, Decision No: 41, 2026, Date: 26.03.2026).

Data Analysis

An a priori power analysis was conducted using G*Power 3.1 to determine the required sample size. For comparisons between two independent groups, a medium effect size ($d = 0.50$), a significance level of $\alpha = .05$, and a statistical power of $(1 - \beta) = 0.80$ were assumed. The analysis indicated that at least 22 participants per group were required. With a total sample of 48 participants (22 cases, 26 controls), the study achieved adequate statistical power.

All statistical analyses were performed using IBM SPSS Statistics version 26.0. The normality of data distribution was assessed using the Shapiro–Wilk test ($n < 50$). For between-group comparisons of continuous variables, independent samples t-tests were applied when normality assumptions were met, and Mann–Whitney U tests were used when normality was violated.

Categorical variables were analyzed using chi-square tests. The association between daily screen time and age at first exposure was examined using Spearman's rank correlation coefficient.

Effect sizes were calculated using Cohen's d and interpreted as small ($d < 0.20$), small-to-moderate (0.20–0.50), moderate (0.50 – 0.80), and large (> 0.80) (6). The level of statistical significance was set at $p < .05$.

RESULTS

Demographic Characteristics

The mean age of the case group was 38.82 ± 11.15 months, while the mean age of the control group was 41.38 ± 9.91 months. There was no statistically significant difference between the groups in terms of age ($t = -0.844$, $p = .403$).

Regarding sex distribution, the case group included 10 males (45.5%) and 12 females (54.5%), whereas the control group consisted of 16 males (61.5%) and 10 females (38.5%). The difference between groups was not statistically significant ($\chi^2 = 0.678$, $p = .410$).

Demographic characteristics are summarized in Table 1.

Table 1. Descriptive statistics of demographic characteristics and screen exposure by group

Variable	Case group (n = 22)	Control group (n = 26)
Age, mean ± SD (months)	38.82 ± 11.15	41.38 ± 9.91
Sex (M/F)	10 / 12	16 / 10
Screen time, mean ± SD (min/day)	177.27 ± 53.91	116.54 ± 43.54
Screen time, median (min/day)	180.0	120.0
Age at first exposure, mean ± SD (months)	7.00 ± 2.45	15.15 ± 3.87
Age at first exposure, range (months)	3 – 14	6 – 23

SD: standard deviation, mean: arithmetic mean

When the sociodemographic characteristics of the groups were examined, no statistically significant differences were found between the experimental and control groups in terms of parental education level, socioeconomic status, maternal employment status, or number of siblings (all $p > .05$).

In contrast, a significant difference was observed in daily parent–child interaction time. Children in the control group had significantly longer daily interaction with their parents (128.7 ± 41.2 minutes) compared to those in the case group (92.5 ± 35.4 minutes) ($t = 3.28$, $p = .004$) (Table 2).

Table 2. Sociodemographic characteristics of the parents of participants

Variable		Case group (n = 22)	Control group (n = 26)	P
Maternal education level, n (%)	**Primary school or below**	6 (27.3%)	4 (15.4%)	.312
	Middle school	5 (22.7%)	6 (23.1%)	
	High school	7 (31.8%)	8 (30.8%)	
	University or higher	4 (18.2%)	8 (30.8%)	
Paternal education level, n (%)	**Primary school or below**	5 (22.7%)	3 (11.5%)	.284
	Middle school	6 (27.3%)	5 (19.2%)	
	High school	7 (31.8%)	9 (34.6%)	
	University or higher	4 (18.2%)	9 (34.6%)	
Socioeconomic status, n (%)	**Low**	8 (36.4%)	5 (19.2%)	.198
	Middle	10 (45.5%)	14 (53.8%)	
	High	4 (18.2%)	7 (26.9%)	
Maternal employment status, n (%)	**Employed**	9 (40.9%)	14 (53.8%)	.221
	Unemployed	13 (59.1%)	12 (46.2%)	
Number of siblings, mean ± SD		1.64 ± 0.95	1.38 ± 0.80	.327
Daily parent–child interaction time (min), mean ± SD		92.5 ± 35.4	128.7 ± 41.2	.004**

SD: standard deviation; Categorical variables were analyzed using chi-square tests, and continuous variables were analyzed using independent samples t-tests; Statistical significance was set at $p < .05$

Comparison of Screen Time

The mean daily screen time in the case group was 177.27 ± 53.91 minutes (median = 180.0; 95% CI: 153.4 – 201.2), whereas the control group had a mean screen time of 116.54 ± 43.54 minutes (median = 120.0; 95% CI: 99.0 – 134.1). According to the Mann–Whitney U test, this difference was highly statistically significant (U = 466.5, p < .001).

As the normality assumption was violated (Shapiro–Wilk test, p < .05), between-group comparisons for daily screen time were conducted using the Mann–Whitney U test, which revealed a statistically significant difference between the groups (U = 466.5, p < .001).

Notably, the mean daily screen time in the case group was approximately three times higher than the upper limit of 60 minutes recommended by the World Health Organization for children aged 2–5 years, whereas the control group exceeded this recommendation by approximately two fold (7).

The difference in screen time between groups is visually presented in Figure 1.

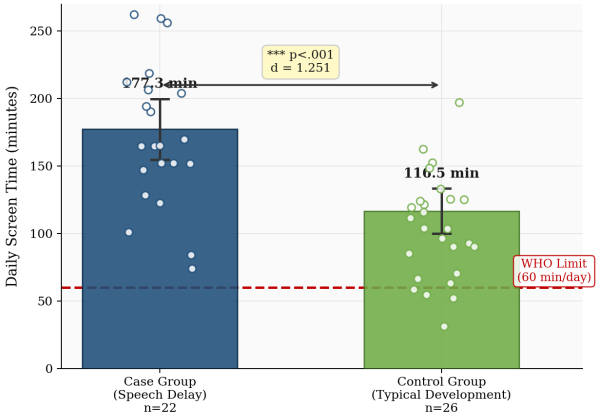

Figure 1. Daily screen time comparison between groups (95% CI and individual data points)

Comparison of Age at First Screen Exposure

The mean age at first screen exposure was 7.00 ± 2.45 months (95% CI: 5.91 – 8.09) in the case group and 15.15 ± 3.87 months (95% CI: 13.59 – 16.72) in the control group. The independent samples t-test revealed that this difference was highly statistically significant and associated with an extremely large effect size (t = −8.526, p < .001, Cohen's d = 2.47). Notably, approximately half of the children in the case group were exposed to screens well before the 24-month threshold recommended by the World Health Organization, with initial exposure occurring as early as 3–8 months of age.

A visual representation of this finding is presented in Figure 2.

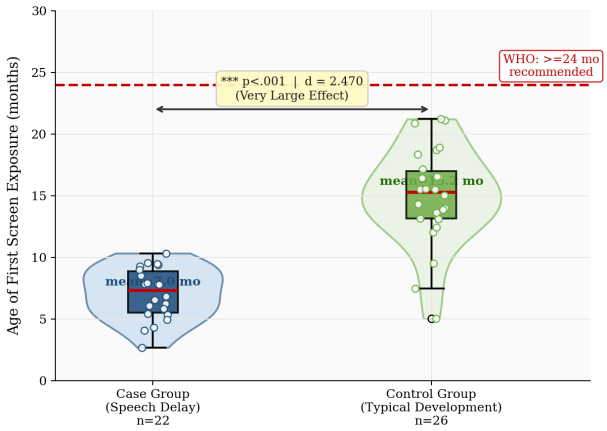

Figure 2. Age of first screen exposure by group (Violin + Box plot; red line = median)

Distribution of Screen Type

Chi-square analysis indicated that screen type preferences did not differ significantly between groups ($\chi^2 = 2.585$, df = 5, p = .764). In both groups, television use and combined screen use (e.g., TV + tablet, TV + smartphone) were among the most common preferences.

Although tablet use was relatively more frequent in the case group (22.7%) compared to the control group (11.5%), this difference did not reach statistical significance.

Detailed data on screen type distribution are presented in Table 3, and the between-group comparison is illustrated in Figure 3.

Table 3. Between-group comparisons and statistical analysis results

Variable	Statistic	P	Effect size
Normality – experimental (screen time)	W = 0.900	.030	–
Normality – control (screen time)	W = 0.907	.023	–
Screen time comparison (groups)	U = 466.5	< .001***	–
Screen time comparison (groups)	t = 4.318	< .001***	d = 1.25 (large)
Age at first exposure (groups)	t = -8.526	< .001***	d = 2.47 (very large)
Screen type distribution	$\chi^2 = 2.585$	.764	–
Sex distribution	$\chi^2 = 0.678$	.410	–
Age comparison (covariate)	t = -0.844	.403	–
Screen time ~ age at first exposure	ρ = -0.356	.013*	Moderate

*** p < .001, * p < .05, d: Cohen's effect size, ρ: Spearman's rank correlation coefficient

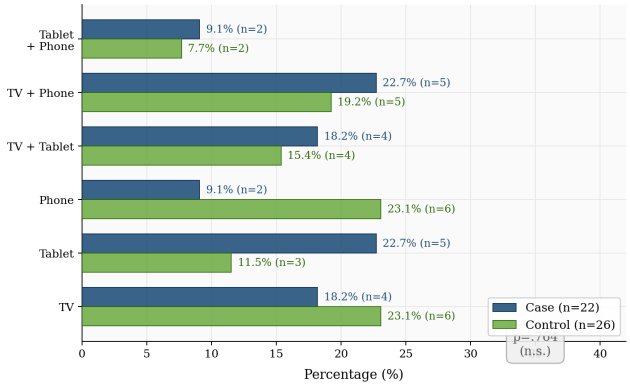

Figure 3. Distribution of screen type by group (Chi-square: $x^2 = 2.585$, p = .764 - no significant difference)

Correlation Between Screen Time and Age at First Exposure

Spearman correlation analysis conducted across the entire sample revealed a moderate, statistically significant negative association between daily screen time and age at first screen exposure (ρ = -0.356, p = .013).

This finding suggests that children who are introduced to screen media at earlier ages tend to accumulate longer daily screen time in later developmental stages.

Detailed statistical results are presented in Table 3, while the distribution of screen types is shown in Table 4. The relationship between screen time and age at first exposure is illustrated in Figure 4.

Table 4. Distribution of screen types in the experimental and control groups

Screen type	Experimental (n)	Experimental (%)	Control (n)	Control (%)	p
TV	4	18.2%	6	23.1%	.764
Tablet	5	22.7%	3	11.5%	
Smartphone	2	9.1%	6	23.1%	
TV + Tablet	4	18.2%	4	15.4%	
TV + Smartphone	5	22.7%	5	19.2%	
Tablet + Smartphone	2	9.1%	2	7.7%	

The p-value reflects the overall chi-square test for group differences

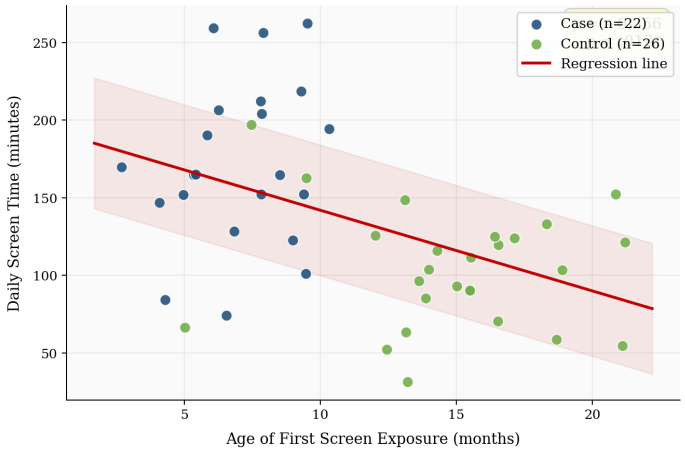

Figure 4. Relationship between screen time and age of first exposure (Spearman ρ = -0.356, p = .013)

DISCUSSION

The primary finding of this study is that children diagnosed with delayed speech exhibited significantly higher daily screen time compared to their typically developing peers, with an average difference of approximately 61 minutes, and were exposed to screens nearly 8 months earlier. The large effect sizes observed for both variables (d = 1.25 and d = 2.47) indicate that these differences are not only statistically significant but also clinically meaningful.

Our findings regarding screen time are consistent with the broader literature. In a meta-analysis encompassing 42 studies, Madigan et al. (2020) reported a negative association between screen time and language outcomes (r = -0.14), while later age of onset was associated with stronger language skills (r = 0.17) (3). Similarly, Byeon and Hong (2015) demonstrated that watching television for 2–3 hours per day increased the risk of language delay by 2.74 times among two-year-old children (4). In line with these findings, the average daily screen time observed in the case group in the present study (approximately 3 hours) may represent a substantial risk factor for delayed language development.

The remarkably early age of first screen exposure—averaging 7 months in the case group—is particularly concerning. During infancy, when language acquisition critically depends on reciprocal caregiver–infant verbal interaction, passive screen exposure may displace essential social and communicative experiences. Live social interactions play a fundamental role in infants' acquisition of communicative sounds and early vocabulary (1). Research on the "video deficit effect" consistently demonstrates that young children learn less effectively from screen-based input compared to live human interaction (3).

The absence of a statistically significant difference between groups in terms of screen type suggests that delayed speech is not associated with a specific technology (e.g., television, tablet, or smartphone), but rather with the overall duration and timing of exposure. This finding supports the argument proposed by

Bhutani et al. (2024), emphasizing that quantitative aspects (exposure duration) and temporal factors (age of onset) may be more influential than qualitative differences in content type (5). Indeed, the overlapping variability across screen types in our data further reinforces this interpretation.

The observed moderate negative correlation between screen time and age at first exposure ($\rho = -0.356$, $p = .013$) indicates that earlier initiation is associated with prolonged exposure over time, suggesting a cumulative pattern of screen use. This pattern aligns with the "early habit formation" mechanism highlighted by Muppalla et al. (2023), whereby early-established media use behaviors tend to persist and intensify across development (1).

Overall, these findings highlight a potentially critical interaction between early exposure timing and cumulative screen engagement in shaping language development outcomes. Visual comparisons of effect sizes for these variables are presented in Figure 5.

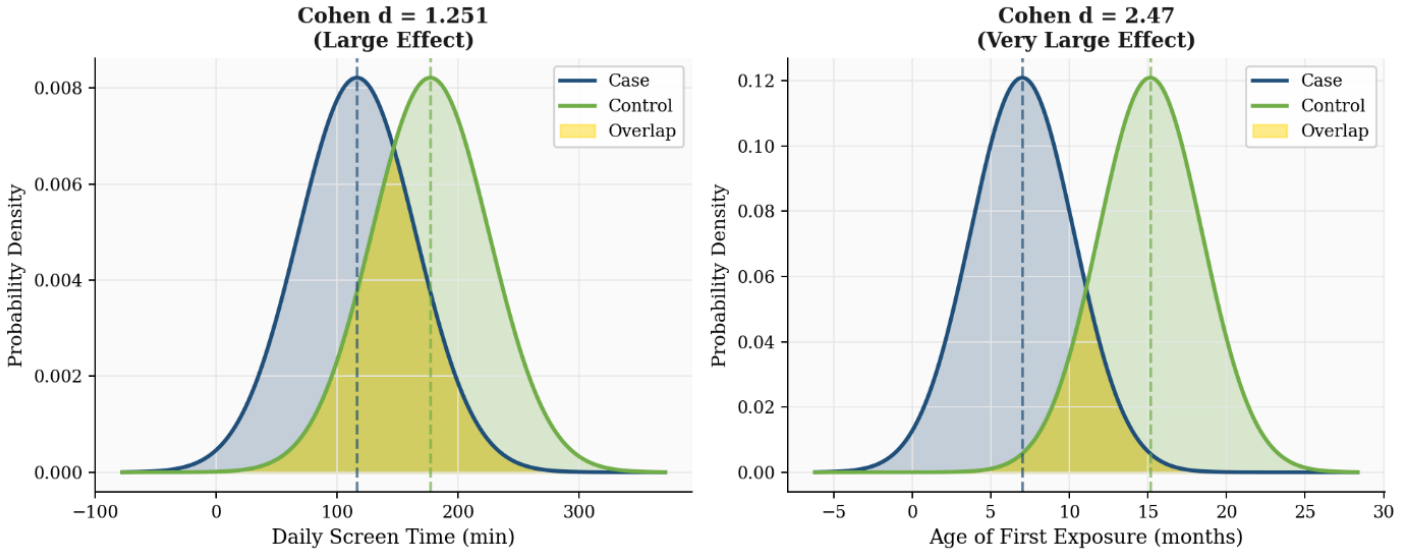

Figure 5. Visualization of Effect Sizes (Cohen d) Yellow area: overlapping region between groups

Limitations

Several limitations of this study should be acknowledged. First, data on screen time and age at first exposure were based on parental reports, which may be subject to recall bias and social desirability bias. Second, the relatively small sample size (N = 48) may limit the generalizability of the findings. Third, the cross-sectional design precludes causal inferences; it remains unclear whether increased screen exposure contributes to delayed speech development or whether children with delayed speech are more likely to engage in prolonged screen use.

Importantly, the absence of significant differences between groups in parental education level, socioeconomic status, and other sociodemographic variables supports the interpretation that the observed group differences are unlikely to be confounded by these factors.

Taken together, these findings suggest that screen exposure may function not only as a direct risk factor but also as an indicator of reduced parent–child interaction.

CONCLUSION

This study demonstrates that children aged 24–60 months diagnosed with delayed speech exhibit significantly different screen exposure patterns compared to their typically developing peers, both in terms of duration and age of onset. Children in the case group had daily screen times reaching approximately three times the limit recommended by the World Health Organization and were introduced to screens at a median age of 7 months (2). These findings are consistent with previous international research, including studies by Madigan et al. (2020), Byeon and Hong, and Bhutani et al. (2024) (3-5). Furthermore, the lower levels of parent– child interaction observed in the case group suggest that the impact of screen exposure on language development may operate through both direct and indirect mechanisms.

From a clinical perspective, the following recommendations are proposed: (1) Speech and language therapists should systematically assess screen time and age at first exposure as part of routine clinical evaluations. (2) Pediatric healthcare services should standardize screen time counseling for families in line with international guidelines. (3) Rehabilitation programs should incorporate family-centered psychoeducational components that address not only the child's needs but also family screen-use behaviors.

Future research should prioritize longitudinal designs and the use of objective screen time measurement methods (e.g., digital tracking applications) to better elucidate causal relationships.

Conflict of Interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
The authors declare that there is no financial support.

Ethical Approval
Ethical approval for this study was obtained from the Scientific Research and Publication Ethics Committee of İnönü University (Session No: 5, Decision No: 41, 2026, Date: 26.03.2026).

Informed Consent
All participants' parents have signed a consent form.

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