

Is the screen time duration affecting children's language development? - A scoping review

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ABSTRACT

Background: How parents interact with their children and what they are exposed to can have a big impact on a child's language development. Nowadays, videos on different devices are an important source of information and stimulation for kids from a young age. Many researchers have studied how screen time may affect a child's language development.

Objectives: The purpose of this review was to explore the available research on the relationship between screen time and language development in children under 12.

Methods: This scoping review involved a systematic search of the database using predefined criteria for available research regarding the impact of screen time on language development in children younger than 12 years. Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for Scoping Reviews (PRISMA-ScR) framework was adhered to for this review. Researchers did a qualitative and thematic analysis of the included research. Any conflict of opinion was resolved by discussion.

Results: 16 studies were selected for this review, of which nine reported a negative impact of screen time on language development, five reported no significant impact and two reported a positive effect.

Conclusions: After reviewing various studies, it has been found that increased screen time can have a negative impact on a child's language development. While some studies show no impact or even a positive impact, factors such as the duration of viewing, video characteristics, content, and co-viewing with adults also play a role. Overall, it seems that the negative effects of screen time outweigh the positive ones.

1. Background

Screen media use in families has increased dramatically over the last decade, and infants are being exposed to screens at earlier ages than ever before. In the current era, screen time can be defined as exposure to audiovisual media through multiple devices, such as smartphones, televisions, computers, or gaming consoles.¹ Considering the impact of screen media on the language and physical development of children, guidelines by several organizations recommend no more than 2 h of screen time exposure for children aged two to four.² However, recent data from various publications indicate that children's average screen time exceeds the recommended amount. For instance, a survey reported

a mean screen time of 2 h and 24 min in children from the United States of America between zero to eight years.¹ A survey from Finland found that children aged three to six had an average daily screen time of 1 h and 51 min.³ According to a study on Indian children under 18 months, 99.7 % were exposed to screen-based media, with screen time exposure exceeding 1 h in 88.7 % and exceeding 2 h in 56.5 %.⁴ Another Indian study observed that children aged 2–5 years have in average 2 h and 19 min of screen time exposure average daily.⁵

It is pertinent to note that language domains like lexicon, phonology, morpho-syntax, and pragmatics develop during the crucial period of early childhood through interaction with adults. However, it has been observed that children who spend more time on screens have decreased

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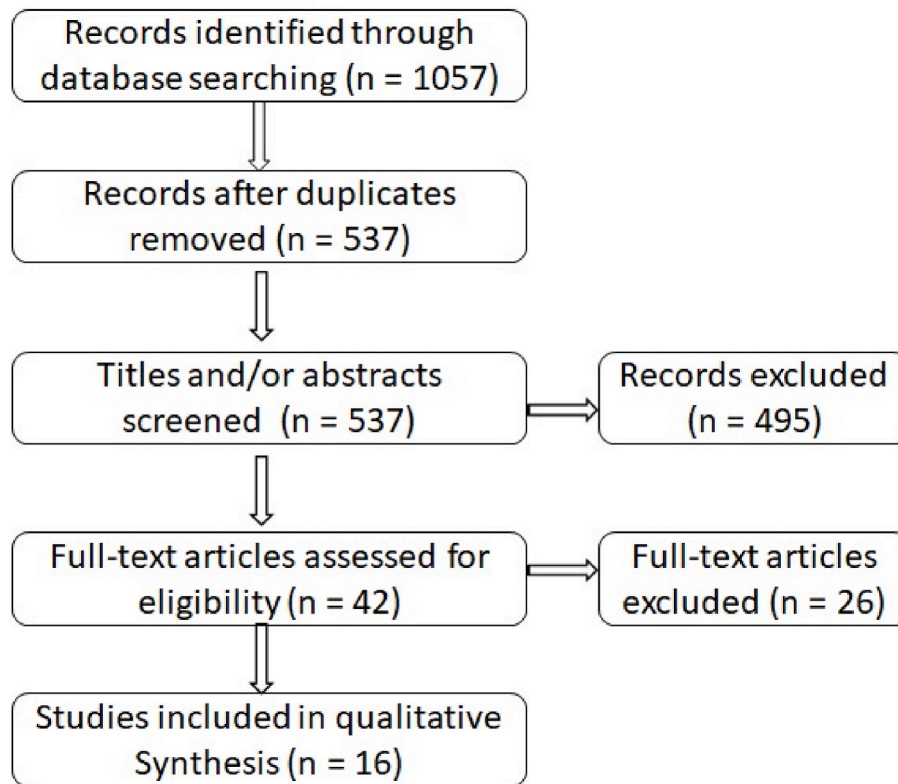


Fig. 1. PRISMA-SCR flow diagram of article search results.

parent-child interactions, which may hinder their development.⁶ Analyzing the influence of screen time on the development of speech and language requires consideration of several factors, such as the time spent, whether someone is watching along, the type of content being viewed, and other variables that might affect language abilities.

Though, a few studies have described no significant relationship between children's screen exposure and linguistic abilities,^{7,8} many researchers have observed the impact of increasing screen usage with delays in language development among children.^{9–11} On the other hand, some studies have suggested that watching educational videos with parents can reduce the negative impact of screen time and may even enhance a child's language skills.^{12,13} Increased educational value, enhanced vocabulary, exposure to diverse experiences and cultures, and safe engagement are some benefits reported for children in such scenarios.¹⁴ This indicates that the screen characteristics and contents have different impacts on children's language development.

Children under the age two have difficulties in comprehending the information and usually cannot incorporate knowledge learned through digital media.¹⁵ Children need to engage in face-to-face communication with family members or caregivers to enhance their language development and learning. Adults should be mindful of background media exposure when children are around. Research indicates that it can affect children's vocabulary, executive skills, play quality, language acquisition, concentration, and comprehension, especially for those under the age five. Additionally, too much of television time at a young age can affect a child's arithmetic and reading skills.¹⁵

Due to the rapidly increasing exposure to screens in childhood and growing knowledge in the field, this review has been done to identify the nature and scope of evidence from available ongoing research concerning the association between screen time among children younger than 12 years of age and language development.

2. Methods

This scoping review adhered to the methodology of 'PRISMA-SCR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses Scoping Review) criteria.¹⁶ This review was conducted stepwise manner such as: determining the research questions, finding relevant research, selecting appropriate data, organizing the data, and reviewing and stating the results.

2.1. Definition of screen exposure

The time spent watching movies and videos on smartphones, tablets, televisions, or other devices was typically measured in hours per day or week. How often caregivers watched with their children and the types of educational content they were exposed to were considered factors in determining screen time quality. The age when children first began using screens was considered their onset of screen use. Studies in this review assessed child language through parent-reported surveys or standardized tests like the Peabody Picture Vocabulary Test for receptive language or the MacArthur Communicative Development Inventory for expressive language.^{17,18}

2.2. Search strategy

In April 2023, we conducted searches using the keywords "screen time" and "language" on various academic databases such as Google Scholar, PubMed, Wiley Online Library, Medline, and Web of Science. We combined synonyms using the Boolean "OR" operator and then integrated the two phrases with the Boolean "AND" operator. To search for studies on children under 12 years old, we used the "Age Limitations" function and a text word search on the databases, which we integrated with the other two keywords.

Table 1
Collective characteristics of included studies.

Author-Year	Study Design	Country	Sample Size	Age Group	Screen/ media exposure	Screen Time ≥ 2 h/day	Mean screen time (hours)	Prevalence of delayed language development	Correlation between screen time and language development
Alloway et al., 2014	Cross-sectional study	United Kingdom	30	Early Childhood	N/A	N/A	1.9/day	N/A	Not significant
Blankson et al., 2015	Longitudinal study	United States	263	Early Childhood		N/A	9.67/week	N/A	Not significant
Byeon & Hong 2015	Cross-sectional study	South Korea	1778	Toddlers	N/A	32.60 %	1.21/day	5.20 %	Unfavorable
Chonchaiya & Pruksananonda 2008	Case-control study	Thailand	56 cases with delayed language development; 110 controls	Early Childhood	N/A	60.7 %; 28.2 %	3.05 \pm 1.90/day; 1.85 \pm 1.18/day	N/A	Unfavorable
Christakis et al., 2009	Longitudinal study	United States	329	Toddlers	N/A		1.3/day	N/A	Unfavorable
Dore et al., 2020	Cross-sectional study	United States	1583	Early Childhood	95.20 %	60.20 %	N/A	N/A	Not significant
Duch et al., 2013	Longitudinal study	United States	119	Early Childhood	N/A	55.60 %	2.5/day	11.90 %	Unfavorable
Lin et al., 2015	Case-control study	Taiwan	Cases: 75 (daily exposure to media >2 h; controls: 75	Mixed age groups	N/A	N/A	137.2 min/day; 16.3 min/day	49.3 %; 24 %	Unfavorable
Linebarger & Walker 2005	Longitudinal study	United States	51	Toddlers	N/A	N/A	N/A	N/A	Favorable
Mustonen et al., 2022	Cross-sectional study	Finland	164	Early Childhood	N/A	N/A	79 minuts/day	7 %	Unfavorable
Okuma & Tanimura 2009	Cross-sectional study	Japan	378	Toddlers	N/A	N/A	2.44 \pm 1.47/day	14.80 %	Unfavorable
Perdana et al., 2017	Case-control study	Indonesia	37 cases with delayed language development; 47 controls	Toddlers	62 %; 57 %	51 % vs 19 % (>4 h/day)	4.4/day; 2.9/day	N/A	Unfavorable
Ruangdaraganon et al., 2009	Longitudinal birth cohort study (birth–2 years old)	Thailand	203	Toddlers	96.70 %	38.40 %	1.69 \pm 1.56/day	7.90 %	Not significant
Taylor et al., 2018	Cross-sectional study	United Kingdom	131	Toddlers	82 %	N/A	85 min/day	N/A	Not significant
Yang et al., 2017	Cross-sectional study	China	119	Early Childhood	N/A	N/A	1.22/day	N/A	Favorable
Zimmerman et al., 2007	Cross-sectional study	United States	1008	Toddlers	71 %	N/A	N/A	N/A	Unfavorable

2.3. Study inclusion and exclusion criteria

We had two independent reviewers assess the titles and abstracts of all papers we found through our search strategy. Our criteria for inclusion were.

- The sample age had to be 12.0 years or younger to capture language development at its earliest stage.
- The study had to measure screen use.
- The study had to measure language proficiency (expressive, receptive, or both).
- The study had to be observational.
- Studies published in the English language.

The exclusion criteria were.

- Studies recruiting children older than 12 years of age.
- Those with preverbal language measures or combined linguistic skills with other non-linguistic skills.
- Research involving children with autism spectrum disorder or intellectual disabilities.

2.4. Data extraction, synthesis, and charting

We used RevMan 5.4 to manage, categorize, and sort our references. After removing duplicate records, two researchers independently evaluated study titles and abstracts and excluded studies not fulfilling the predefined criteria. A full-text review of eligible articles was done to decide which references to include in this scoping review. In cases of disagreement, a third researcher joined the discussion to help make a decision.

We analyzed the research topic, year of publication, the geographic distribution of study populations, locations, sample size, and methods used in the studies we included. Keywords from the included studies were used to create word clouds demonstrating how the literature conceptualized and measured screen time and language development.

We analyzed data from different studies on participants' age and categorized them into three groups: toddlers (<2 years), early childhood (2–5 years), and schoolchildren (5–11 years). Grouping data by age helped investigate the effects of screen usage on children and adolescents of various ages. Results and outcomes of these studies were categorized as 'unfavorable,' 'favorable,' or 'not significant' based on traditional statistical significance with a p-value of ≤ 0.05 considered significant.

3. Results

In total, 1057 articles were found during the initial database searches, and after removing the duplicate titles, titles, and abstracts of 537 studies were screened, out of which 495 articles were excluded. A full-text review was done for 42 articles, and 26 studies were rejected, as depicted in Fig. 1. The remaining 16 studies were included in this systematic scoping review,^{6–9,11,12,19–28} included data from 6565 subjects as described in Table 1.

3.1. Demographics

Eight out of 16 studies included children younger than two years, whereas 7 included children between 2 and 5 years of age. One study included children from both age groups; however, no research included children older than five. Most studies in this review were done in the United States of America (6/16). Three were from Europe (United Kingdom: 2, Finland: 1), and seven were from different Asian nations, including Thailand (2), Taiwan (1), China (1), Japan (1), Indonesia (1), and South Korea (1).

3.2. Study design

Cross-sectional study design was most common, accounting for 50 % of included studies (n = 8), followed by longitudinal (n = 5) and case-control study designs (n = 3). Among the three case-control studies, two defined cases as those with established language development abnormalities, whereas one study defined case groups as children with daily screen time >2 h.

3.3. Screen time

Out of the 16 research articles reviewed, five reported data regarding the proportion of the study population exposed to videos via mobile phones, televisions, or other sources. As reported by Dore et al. (2020),⁷ 95.2 % of children older than two years had nearly daily exposure to video content, with 60.2 % of children watching videos for more than 2 h per day. Among children younger than two years, four authors reported exposure to video content between 57 % and 96.7 % (median- 82 %). Table 1 summarizes data regarding screen time from the included studies.

3.4. Language development

Five population-based studies reported variable incidences of delay in language development ranging from 7 % to 14.8 %. Lin et al. recruited patients from a children's hospital and reported delayed language development in 49.3 % of children watching television for more than 2 h daily.²⁷

3.5. Correlation between screen time and language development

Through eight different studies, including children under the age of two, it was found that five reported a significant correlation between excessive screen time and language development delay, while two did not find any correlation. However, Linebarger and Walker (2005) have stated that educational programs based on effective curricula can positively impact vocabulary and expressive language production.²⁰

In children between ages 2–5 significant association between high screen time and language development delay was reported by three researchers, and no significant association between the two was reported by another three, whereas one study reported favorable effects of parent-regulated television viewing time and child-directed educational programs.

4. Discussion

Environmental influences are crucial for a child's development, and factors such as parents' interaction with their children and exposure to various stimuli play a vital role in language development. Video-based content seen on a myriad of devices has evolved as a vital source of information and stimulation starting at a very young age, and several researchers have studied their implications in a child's development.

This review analyzed 16 studies investigating how screen time at different ages affects language development in children. Nowadays, kids have more access to screens such as TVs, smartphones, gaming consoles, and computers.¹ Parents allow screen time when they can't interact with their kids adequately,^{21,22,28} or think it could benefit their children's cognitive, language, and social skills.^{19,29}

Two themes and seven sub-themes were recognized from the studies included that were relevant to this scoping review.

- Impact of screen time on language development:
 - Negative
 - Positive
 - No significant effect
- Factors influencing the effect of screen time on language development:
 - Duration of exposure.
 - Characteristics of video content.
 - Co-viewing with an adult.

The primary intent of this scoping review was to assess the nature of the evidence available regarding the correlation between increased exposure to video-based content and language development during childhood. Nine studies out of 16 included in this review reported a negative impact of screen time on language development.^{6,9,11,12,22–24,27,28} Amongst these, five studies included toddlers (<2 years),^{6,9,22,23,28} three included children between two to five,^{11,12,24} and one study recruited children from both age groups.²⁷ Eight studies reported a significant correlation between screen exposure duration and language development delay.^{6,9,11,12,22,24,27,28} In addition to this common finding, Byeon and Hong (2015) reported an incremental rise in the risk of language development delay with an increase in average screen time from two to 3 h.²⁸

Okuma et al. (2009) compared not the duration of screen time but the characteristics of the videos seen by children with and without language delay.²³ They reported that children with delayed language development were habitual to videos with realistic animation with close-ups of characters facing viewers, continued uninterruptedly by between stories or "baby education" videos played either with the sound on or off. Duch et al. (2013) also reported that watching long hours of video content specifically curated for children was associated with poor outcomes compared to watching programs meant for grown-ups.¹¹ Although multifactorial, one of the major reasons for the developmental delay associated with screen time is decreased interaction with adults and, thus, watching content meant for kids predominantly widens the communication gap. In contrast, complicated videos prompt questions or explanations that maintain communication. However, Zimmerman et al. (2007), in their study involving toddlers, reported delayed language in kids exposed to prolonged screen time; it was not associated with the type of content or co-watching with an adult.⁹ Mustoten et al. (2022) also reported a negative impact of prolonged screen time among both children and their mothers upon a child's language development.²⁴

Five studies have shown no significant connection between screen time and language development.^{7,8,19,21,26} Two of these studies involved children younger than two years old,^{8,19} while the other three included children between the ages of two and five.^{7,21,26} All these five studies compared the amount of time spent on screens to language development, except for one study by Alloway et al. (2014), which found that

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