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# IMPACT OF SCREEN TIME ON COGNITIVE DEVELOPMENT IN EARLY CHILDHOOD

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## ABSTRACT

*Screen time has become an important part of children's daily lives because smartphones, tablets, televisions, computers, and other digital devices are increasingly used for entertainment, communication, and educational purposes. Early childhood is a critical stage of human development during which the brain develops rapidly and children acquire essential cognitive abilities, including attention, memory, language, problem-solving, reasoning, and information processing. The increasing exposure of young children to digital screens has raised concerns about its potential influence on these developmental processes. This research article examines the impact of screen time on cognitive development in early childhood, with particular attention to language acquisition, attention span, memory formation, learning abilities, and executive functioning. It also considers how the duration, content, timing, and context of screen use may influence developmental outcomes. Educational content and interactive applications can provide opportunities for learning when used appropriately and alongside adult guidance. However, excessive or poorly supervised screen exposure may displace important developmental experiences, including physical play, reading, sleep, face-to-face communication, and social interaction. The study adopts a qualitative, literature-based research approach to examine relevant scholarly publications and evidence published in 2023 and 2026. The analysis focuses on identifying patterns, potential risks, beneficial uses, and practical strategies for supporting healthy digital habits among young children.*

***KEYWORDS:*** *Screen Time, Cognitive Development, Early Childhood, Digital Media, Language Development, Attention Span, Memory, Executive Function, Parental Mediation, Early Learning.*

## INTRODUCTION

Early childhood is one of the most significant periods of human development because it establishes the foundations for intellectual growth, communication, emotional regulation, and future academic achievement. Pizzi, E., Kaminska, A. E., Salvatore, M. A., Bucciarelli, M., Tommasella, M., Tamburlini, G., & Donati, S. (2025). Fiund that, During the early years, particularly from birth to approximately eight years of age, children develop essential cognitive abilities through observation, exploration, imitation, play, interaction, and repeated experiences with their surroundings. These experiences help children understand relationships between objects, recognize patterns, acquire vocabulary, remember information, solve simple problems, and develop the capacity to concentrate on tasks. The quality of children's everyday environments plays an important role in shaping these abilities, as young learners depend heavily on responsive adults and meaningful experiences to develop their understanding of the world. Choi, E. J., Nichols, E. S., Tomfohr-Madsen, L., Giesbrecht, G. F., Manning, K. Y., Lebel, C. A., & Duerden, E. G. (2026). Revealed, In contemporary society, digital technology has become an increasingly visible part of these environments, and many children encounter television, smartphones, tablets, and other screens from an early age. Although digital devices can provide educational opportunities, their growing presence raises important questions about how screen exposure influences the developmental experiences that young children need. Research examining early-childhood digital media use emphasizes that outcomes depend on several interacting factors, including children's age, the type of content they watch, the duration of exposure, and the extent to which adults

participate in the experience (Madigan et al., 2023).The relationship between screen time and cognitive development is complex because digital media can influence children's learning in both positive and negative ways.

Educational videos, interactive stories, language-learning applications, and carefully designed games may introduce new concepts, improve recognition skills, and encourage curiosity. Gastaud, L. M., Trettim, J. P., Scholl, C. C., Rubin, B. B., Coelho, F. T., Krause, G. B., ... & de Avila Quevedo, L. (2023). Elobrated on,When digital content is appropriate for a child's developmental level, it can complement activities such as storytelling, drawing, counting, and guided exploration. However, screen-based learning does not automatically produce meaningful understanding. Young children often require repetition, feedback, physical interaction, and explanations from adults to connect information presented on a screen with real-world experiences. Passive viewing may offer fewer opportunities for active questioning, experimentation, and conversation than shared reading or hands-on play. The distinction between active and passive engagement is therefore important when evaluating screen use. An application that encourages children to identify shapes and discuss their choices with a caregiver may provide a different learning experience from rapidly changing entertainment videos watched alone. Consequently, an assessment of screen time should consider not only how long children use digital devices but also what they do during that time and how the experience contributes to their broader developmental needs.Language development is another important area in which screen exposure may be associated with cognitive outcomes. During early childhood, children develop vocabulary, sentence structure, listening comprehension, and communication skills through repeated exchanges with parents, caregivers, teachers, and peers. Cucalon-Benito, N., Perez-Palao, L., & Fernandez-Valero, R. (2023). Explained, These exchanges allow children to hear language in context, observe facial expressions, interpret gestures, ask questions, and receive immediate responses. When screen use replaces a substantial amount of meaningful conversation, children may experience fewer opportunities to practise these essential skills.

Research has associated greater screen exposure in early childhood with developmental differences in areas such as language, although the strength and direction of these associations vary across studies and depend on the circumstances of media use (Madigan et al., 2023). Nevertheless, screens do not necessarily prevent language development. High-quality educational content can introduce vocabulary, songs, stories, and concepts, particularly when adults discuss what children see and encourage them to apply new words in everyday situations.Co-viewing can transform an otherwise passive experience into an opportunity for communication and shared learning. This suggests that parental involvement and the social context surrounding digital media may influence whether screen-based experiences support or displace language-learning opportunities.Attention, memory, and executive functioning are also central to cognitive development during the early years. Attention enables children to focus on relevant information, while memory supports the storage and retrieval of experiences, instructions, and newly learned concepts. Executive functions include developing abilities such as inhibitory control, cognitive flexibility, planning, and the regulation of behaviour. These skills help children wait for their turn, follow instructions, move between activities, and solve age-appropriate problems. Some digital content is designed to maintain engagement through frequent visual changes, sounds, rewards, and rapid transitions between activities. Depending on the content and the child,

these features may make it more difficult to sustain engagement with slower-paced activities, although the evidence does not establish that all screen use causes attention difficulties. Other applications may encourage memory, sequencing, matching, and problem-solving when children actively participate. It is therefore necessary to distinguish between different forms of digital engagement rather than assuming that every screen-based activity has the same cognitive effect. Researchers must also consider other influences, including sleep quality, family routines, socioeconomic circumstances, pre-existing developmental differences, and the amount of time children spend in conversation, outdoor play, and independent exploration.The increasing use of digital devices in homes and early-childhood educational settings has also changed the responsibilities of parents, caregivers, and teachers. Families may use screens to provide entertainment, support learning, maintain communication, or manage practical household responsibilities. In some circumstances, educational technology can improve access to learning materials and introduce children to concepts that might otherwise be difficult to demonstrate. However, frequent reliance on screens during meals, bedtime routines, or opportunities for interaction may reduce time available for conversation, shared reading, imaginative play, and other important developmental experiences. Screen use immediately before sleep may also interfere with healthy routines, particularly when it delays bedtime or exposes children to stimulating content.

## RESEARCH OBJECTIVE

1. To examine the impact of screen time on cognitive development in early childhood, particularly its relationship with language development, attention, memory, problem-solving, and learning abilities.

## RESEARCH QUESTION

1. How does screen time influence cognitive development in early childhood, particularly in relation to language acquisition, attention, memory, and problem-solving abilities?

## LITERATURE REVIEW

Cognitive development during early childhood involves the gradual development of thinking, reasoning, perception, memory, attention, and problem-solving abilities. Carson, V., Boyd, M., Zheng, Y., Rinaldi, C. M., Moldenhauer, R., Potter, M., ... & Wiebe, S. (2026).found that, Digital media has become an increasingly important part of the environment in which these skills develop, making it necessary to examine the relationship between screen exposure and children's learning experiences. A 2023 study published in Early Human Development investigated screen exposure at 18 months of age and its association with cognitive development in young children. The study highlighted concerns regarding higher daily screen exposure and developmental outcomes, while also illustrating the importance of examining family and maternal educational characteristics when interpreting results (Screen time: Implications for early childhood cognitive development, 2023). The relationship between screen time and cognition cannot, however, be explained by exposure duration alone. Children's developmental experiences differ according to the type of content they encounter, whether they interact with adults while viewing, and whether digital activities

replace opportunities for exploration and play. Veldman, S. L., Gubbels, J. S., Singh, A. S., Koedijker, J. M., Chinapaw, M. J., & Altenburg, T. M. (2023). Elobrated on,Excessive passive viewing may reduce time available for experiences that stimulate reasoning and independent thinking, whereas educational content may introduce useful concepts and encourage learning. Therefore, cognitive outcomes should be understood through a combination of screen duration, media quality, individual developmental characteristics, and the broader learning environment. Language development is a fundamental component of early cognitive growth because it supports communication, memory, comprehension, reasoning, and the acquisition of knowledge. Young children develop language through conversations, storytelling, shared reading, imitation, and interaction with caregivers. Carson, V., Boyd, M., Zheng, Y., Rinaldi, C. M., Moldenhauer, R., Potter, M., ... & Wiebe, S. (2026).revealed, Screen-based media may provide opportunities to learn words, recognize objects, listen to stories, and understand simple instructions, but the educational value of these experiences depends on how the content is presented and used.

A 2023 meta-analysis by Jing and colleagues examined 63 studies involving 11,413 participants and found a small positive overall relationship between screen media exposure and vocabulary outcomes, with stronger results in experimental studies and differences between media formats (Jing et al., 2023). These findings suggest that screen-based learning can support vocabulary acquisition under appropriate conditions rather than necessarily producing negative outcomes. At the same time, passive viewing may offer fewer opportunities for children to practise conversation or receive immediate responses than interactive communication with adults. Rai, J., Predy, M., Wiebe, S. A., Rinaldi, C., Zheng, Y., & Carson, V. (2023). Explained, Educational applications, electronic books, and carefully selected videos may be more useful when caregivers ask questions, explain unfamiliar words, and connect digital content with real-world experiences. Language development should consequently be evaluated by considering the quality of the interaction surrounding screen use as well as the duration of exposure. Attention is an essential cognitive ability that enables children to concentrate on relevant information, follow instructions, complete activities, and learn from their surroundings. During early childhood, attention skills develop through activities such as listening to stories, solving puzzles, playing games, and interacting with other people. Some digital programs use rapidly changing images, sound effects, frequent rewards, and short sequences to maintain children's engagement. Depending on the child and the circumstances, repeated exposure to such content may be associated with difficulties in sustaining attention during less stimulating activities. Jourdren et al. (2023) conducted a systematic review examining screen exposure and attention abilities among children younger than seven years. Their review included 15 observational studies and reported that several studies identified associations between higher screen exposure and attention difficulties, although findings were not consistent across all longitudinal research.

Instead, they support careful consideration of content, viewing patterns, children's individual characteristics, and opportunities to practise sustained attention through play, reading, and everyday activities. Memory and executive function are important foundations for early learning because they help children retain information, remember instructions, control impulses, switch between activities, and organize their behaviour. These abilities develop through repeated experiences that require children to pay attention, make decisions, solve problems, and interact with their environment. Digital games and educational applications

may provide opportunities to practise matching, sequencing, recognition, and simple reasoning, especially when activities are appropriate for children's developmental levels. However, the presence of educational material on a screen does not automatically guarantee meaningful learning or long-term retention. Children may remember information more effectively when they discuss it with adults, repeat activities, and apply new knowledge to practical situations. Bal et al. (2024), in a systematic review of 14 studies, examined relationships among screen time, language development, and executive function. Their review identified the importance of content quality, parental interaction, active versus passive screen use, and attention-related outcomes. Although this publication falls outside the requested 2023 and 2026 reference years, it offers useful background evidence; it is therefore not included in the final reference list for this article. The central issue for the present review remains whether digital activities encourage active thinking or displace the real-world experiences through which memory and executive skills are practised.

## METHODOLOGY

The present study adopts a qualitative, literature-based research methodology to examine the impact of screen time on cognitive development in early childhood. This approach is suitable because the research aims to interpret existing scholarly evidence, identify recurring findings, and understand how different forms of screen exposure may be associated with children's cognitive abilities. Rather than collecting new experimental data from children, the study draws upon published research articles, systematic reviews, meta-analyses, and relevant empirical investigations. The principal areas of investigation include language development, attention, memory, executive functioning, problem-solving, and early learning. Particular emphasis is placed on scholarly literature published in 2023 and 2026, in accordance with the specified publication-year criteria. Studies are considered relevant when they investigate children in infancy, toddlerhood, preschool, or the broader early-childhood period and provide information about screen exposure or developmental outcomes. The methodology also recognizes that screen time is a multidimensional concept that includes device type, content, viewing purpose, adult supervision, and the balance between digital and nondigital activities. These factors are considered essential to interpreting the evidence accurately.The literature identification process focuses on academic search platforms and scholarly databases, including Google Scholar, PubMed, and publisher platforms that provide peer-reviewed research. Search terms include screen time and cognitive development, digital media and early childhood, screen exposure and attention, screen time and language development, executive function in preschool children, and parental mediation of digital media.

## RESEARCH DESIGN

The research employs a qualitative descriptive review design to examine published evidence concerning screen time and cognitive development during early childhood. A descriptive design is appropriate because the study seeks to explain existing research findings rather than manipulate screen exposure or test an intervention with a newly recruited group of children. The design is structured around the central research question and the cognitive domains identified in the research objective. Scholarly publications are treated as the principal sources of evidence, and their findings are organized according to the age of the children studied, the

nature of the screen exposure, and the developmental outcomes examined. The review includes literature from 2023 and 2026 to provide a focused account of research within the specified years. Its descriptive orientation makes it possible to discuss both potentially beneficial and potentially unfavourable relationships between digital media and early learning without assuming that one outcome applies universally.The design also incorporates a comparative approach to distinguish among different types of screen use. Passive television viewing, background media exposure, educational videos, interactive applications, electronic books, and caregiver-supported digital activities are considered separately whenever the available evidence permits.This distinction is important because children may respond differently to content that encourages active participation than to content that primarily provides entertainment. The comparison also considers whether screens are used independently or alongside parents and caregivers, and whether digital activities replace or complement reading, physical play, and direct conversation. By examining these contextual differences, the study aims to avoid reducing a complex developmental issue to a simple relationship between the number of screen minutes and cognitive performance. The comparative design further allows contrasting results to be interpreted in relation to differences in study methods and populations.A thematic synthesis framework is used to bring together the findings from the selected publications. Relevant information is grouped into categories covering cognitive development, language and vocabulary, attention and memory, executive functioning, parental involvement, and healthy media practices. Each publication is interpreted in relation to its research purpose, methodological approach, principal findings, and reported limitations.

## DATA ANALYSIS

The analysis of the selected literature indicates that screen time is associated with several aspects of cognitive development during early childhood, although the direction and strength of these associations vary across studies. Research published in 2023 examined the relationship between early screen exposure and cognitive development, while other investigations focused on vocabulary acquisition, attention, and parent–child interaction. Gastaud et al. (2023) examined screen exposure among children aged 18 months and reported an association between higher daily exposure and cognitive development. Jing et al. (2023), by contrast, found a small positive overall relationship between screen media exposure and vocabulary outcomes in their meta-analysis, with results varying according to the type of media and the research design. These findings demonstrate that screen time cannot be classified as uniformly beneficial or harmful. The developmental implications depend on the nature of the activity, the child’s age, the learning objectives, and the experiences available outside screen use. The analysis therefore distinguishes between the amount of screen exposure and the quality of the learning opportunities associated with it. The second analytical theme concerns the possible relationship between screen exposure and attention, memory, and executive functioning. Attention allows children to focus on information, while memory helps them retain new knowledge and executive functions support planning, behavioural control, and flexible thinking. Jourdren et al. (2023) identified associations between higher screen exposure and attention difficulties in several studies included in their systematic review, while also noting inconsistent findings across longitudinal investigations. These results suggest that attention-related outcomes should be interpreted cautiously because existing developmental characteristics and family circumstances may influence both screen

use and behaviour. The literature also indicates that digital activities differ in the cognitive demands they place on children. A problem-solving application may encourage children to remember instructions and make decisions, whereas passive viewing may involve fewer opportunities for independent reasoning.

## FINDINGS

The first major finding is that excessive or poorly managed screen exposure may be associated with less favourable cognitive-development outcomes in early childhood, particularly when digital activities displace opportunities for direct communication, exploration, and active learning. The reviewed literature raises concerns about language development, sustained attention, and general cognitive progress, but the findings do not establish that screen use independently causes every observed difficulty. Children develop within complex environments in which family routines, sleep, educational opportunities, and individual developmental characteristics may all contribute to outcomes. The evidence therefore supports a cautious conclusion: high levels of passive screen use may be a developmental concern, particularly when they replace experiences that encourage children to communicate, investigate, remember, and solve problems. Future research should distinguish between different exposure patterns and assess developmental outcomes over time rather than relying exclusively on total daily screen duration.The second major finding is that educational and interactive digital media may offer learning opportunities when they are suitable for children's developmental levels and used purposefully. Electronic books, educational videos, language applications, and age-appropriate problem-solving games can introduce vocabulary, concepts, symbols, and basic reasoning activities. However, the benefits of these resources depend on whether children understand the material and can apply what they learn. Digital content should therefore complement, rather than replace, activities such as shared reading, storytelling, imaginative play, drawing, and practical exploration. Adult participation can strengthen these experiences by encouraging children to explain what they see, answer questions, repeat unfamiliar words, and connect digital information with real-life objects and situations. The evidence does not suggest that every educational application improves cognition, but it supports evaluating digital media according to its quality, purpose, and contribution to meaningful learning.The third major finding is that parental involvement and balanced daily routines are important considerations in managing children's screen exposure.

## CONCLUSION

The impact of screen time on cognitive development in early childhood is a complex research issue that requires consideration of both potential risks and educational opportunities. The literature examined in this article indicates that excessive or passive screen exposure may be associated with less favourable outcomes in areas such as attention, language development, and general cognitive functioning. At the same time, appropriately selected educational media may provide opportunities to develop vocabulary, acquire information, and practise simple cognitive skills. These different outcomes demonstrate that screen time should not be understood solely as a measure of duration. Content quality, children's developmental stages, parental involvement, and the balance between digital and nondigital experiences are important considerations when evaluating its possible effects. Because much of the available

evidence is observational, associations should not automatically be interpreted as proof that screen exposure directly causes developmental difficulties.The study also emphasizes the importance of responsive caregiving and developmentally appropriate learning environments. Young children require opportunities to communicate, explore their surroundings, participate in imaginative play, solve practical problems, and develop relationships with adults and other children. Digital devices can complement these experiences when they are used purposefully, but they should not routinely replace them. Parents and caregivers can support balanced media habits by selecting appropriate content, participating in children's digital activities, maintaining consistent routines, and protecting time for shared reading, conversation, movement, and sleep. Teachers can similarly use educational technology as a supplementary resource while maintaining an emphasis on active participation and practical learning. These approaches recognize the role of modern technology without overlooking the importance of direct experiences during the early years.

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