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The Effect of Screen Time on Children's Cognitive, Emotional, Social and Physical Developmen

Hassan Zahoor
BS Clinical Psychology University of lahore-
hassanzahoorpsychologist786@gmail.com

ABSTRACT

Excessive screen time use has become a major concern in the early stages of development among children. This review writing emphasizes on different realm of children's development, such as physical and non-physical development over the period of five years(2019-2025). Deep analysis indicates high level of screen time especially passive viewing of noneducational content is linked to delay in language acquisition, executive function including attention, and academic skills, as well as increased behavioral problems and poorer social skills due to little to no interaction with humans while supervised viewing within recommended watch time improve short term memory and pose less negative impact. Also, Physical health correlates of heavy screen use include sedentary behavior contributing to higher obesity risk and sleep disruption, among other issues. In essence, the developmental consequences of screen time are complex and moderated by factors like content type, context of use (e.g. caregiver engagement), the child's age and disposition, and family socioeconomic status thus the findings suggest that screen exposure should be conceptualized according to content, interaction patterns, and developmental stage rather than duration alone. The gap in the literature suggests more longitudinal research with higher sample size to establish causal relationship and reset recommendation hours of screen use. To sum up, the current findings support limiting screen use for children under 5 and highly scrutinize content and use of screen above age 5 by caregiver to benefit in this digital age.

Introduction:

Younger children are more exposed to screens in this digital era than ever before with easy access in the past decade. By 2017, an estimated 42% of children under age 8 had their own digital device in USA. One survey shows how children born after 2010 began regular screen viewing at just 4 months old on average, compared to 4 years old in the 1970s indicating use of screen among infants as well. The findings also suggest recommended screen time and context of use and interaction patterns impact the developmental progress in children thus screen time alone is too generic to make any conclusion.

The American Academy of Pediatrics (AAP) and the World Health Organization (WHO) both recommend **no screen time** for infants under 18 months (except for video chatting), and **at most 1 hour per day** of high-quality programming for children 2–5 years old, always within adult supervision and interaction. Compliance with these guidelines is low — studies report that the majority of families exceed the recommended limits . This inconsistency highlights the need to understand how varying amounts and types of screen exposure actually affect child development across domains. Early evidence linking heavy television viewing to attentional problems and delayed language in toddlers has

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been strengthened by newer longitudinal studies and meta-analyses. Madigan et al. (2019) found that 2- and 3-year-olds with more than 2 hours of screen time per day had significantly poorer performance on developmental screening tests (covering communication, problem-solving, social and motor skills) by 3 and 5 years of age . Similarly, a recent meta-analysis of 87 studies concluded that children aged ≤12 years with higher screen use show more internalizing and externalizing behavior problems, albeit with small effect sizes. Educational and social content can have positive impacts on language and social outcomes, and interactive screen experiences (e.g. video chats, learning apps) engage children differently than random scrolling thus stressing on the importance of content in screen use through parental supervision and control.

Considering our interpretation of the complexities, this paper provides link of screen time in different contexts on different realms of children's developmental milestones over a period of half a decade, reflecting the most recent research, including large longitudinal cohorts, experimental and observational studies, and meta-analyses. Moderators and mediator a such as content type, age of exposure, and socioeconomic factors are also discussed to illuminate when and for whom screen time might be more or less harmful.

Methodology

Data extraction: Conducted narrative review focusing on peer-reviewed studies that examined screen time in relation to child's physical and cognitive development outcomes. A narrative review was chosen because the literature on screen time and child development is highly heterogeneous. The studies differ in their populations, age groups, outcome measures, screen types, study designs, and definitions of screen exposure. A narrative approach allowed findings from longitudinal studies, cross-sectional studies, experimental studies, systematic reviews, and meta-analyses to be integrated and compared across multiple developmental domains, including cognitive, language, social-emotional, and physical development. The literature search was conducted between January and March 2026. Studies published between January 2019 and December 2025 were considered for inclusion to ensure that the review reflected the most recent evidence available on screen time and child development. Boolean operators (AND, OR) were used to combine search terms such as "screen time," "screen media," "children," "preschool," "cognitive development," "language development," "social development," "behavior," and "health." Searches were limited to peer-reviewed studies involving human participants. Only English-language publications were included. Search strategies were adapted to the indexing systems of individual databases.

Study Selection: From an initial pool of several hundred titles, studies were screened according to predefined inclusion and exclusion criteria. Titles and abstracts were reviewed first, followed by a full-text assessment of potentially relevant articles. Studies meeting all eligibility criteria were included in the final analysis. Studies were included if they were published in peer-reviewed journals between 2019 and 2025, written in English, and examined the relationship between screen time or digital media exposure and developmental or health outcomes among children and adolescents (0–18 years of age). Eligible studies included original empirical research (longitudinal, cross-sectional, and experimental studies), systematic reviews, meta-analyses, and official guidelines. Studies were excluded if they focused primarily on adult populations, did not directly assess screen exposure, failed to report developmental or health outcomes, or lacked sufficient methodological detail. Editorials, commentaries, conference abstracts, duplicate publications, and other non-peer-reviewed sources were also excluded.

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Scope and limitation: It encompasses general screen time (all devices and content combined) as well as studies distinguishing different screen activities (TV viewing, video games, mobile device use. Screen time generally as exceeding 1–2 hours per day for young children as per WHO, in line with common definitions in the literature. Recognizing the potential for bidirectionality and residual confounding, children with developmental delays or difficult temperaments might be given screens more often by stressed parents. Causal inferences are thus cautious, supported mainly by longitudinal trends and structural basis (e.g. displacement of enriching activities, sensory overstimulation).

Cognitive Development

Early childhood is an important stage for brain development. During these years, children quickly develop language, memory, attention, and problem-solving skills. Because of this rapid growth, researchers have become concerned that spending too much time on screens may affect children's development. One possible reason is that screens can replace activities that normally help children learn, such as playing, talking with family members, and exploring their surroundings. Recent studies generally suggest that children who spend more time using screens tend to perform slightly worse in some areas of cognitive development. However, the effects are not the same for every child, and factors such as the type of content and the way screens are used seem to play an important role.

Language and Literacy: Many recent studies have found a relationship between high screen use and slower language development, especially during the first few years of life. A review published by Massaroni et al. (2024), which analyzed 18 different studies, concluded that exposure to screens before the age of two was associated with poorer language development. Children who spent more time using screens often had smaller vocabularies and weaker communication skills.

Television appears to have a stronger negative effect because children usually watch it passively. In many cases, the content is not designed for a young child's level of understanding. Some studies found that infants and toddlers who watched more television reached language milestones later than children with lower exposure. One study reported that children younger than 12 months who watched television for more than two hours each day had lower communication scores.

At the same time, not every form of screen use produces the same results. Interactive media, such as educational applications and electronic books, may have different effects. Hu et al. (2020), in a study of 579 Chinese children aged five years, found that passive activities like watching television were associated with lower language and mathematics scores. In contrast, educational applications and other active forms of screen use were linked to better receptive vocabulary and science knowledge. These findings suggest that the quality of the content matters. Educational programs that encourage participation may support language development, while passive viewing may be less helpful.

Research on expressive language, which refers to speaking ability, has produced mixed results. However, more recent studies generally point toward negative effects. Research involving Canadian preschool children found that greater screen use increased the risk of speech delays. Similarly, Zhang et al. (2022) reported that children aged 3–5 years who exceeded one hour of daily screen time were more likely to show lower working memory performance. However, the researchers did not find a significant relationship between screen use and expressive vocabulary.

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One explanation is that children who spend a lot of time using screens have fewer opportunities to talk with parents, siblings, and other children. As a result, they may have fewer chances to practice language skills. Madigan et al. (2019) also found that toddlers with higher screen exposure performed worse on language and communication assessments one to two years later. In addition, some neuroimaging studies suggest that excessive screen exposure may be associated with changes in brain areas involved in language and literacy.

Executive Function and Attention: Executive functions include important mental skills such as working memory, self-control, and cognitive flexibility. These abilities help children solve problems, regulate their behavior, and prepare for school.

Several studies have examined whether screen time affects these skills. Zhang et al. (2022) found that preschool children who spent more than one hour per day using screens were less likely to have strong working memory skills. Interestingly, the researchers found that total screen time had a greater effect than any individual activity. Television and video games alone did not show a significant relationship unless overall screen exposure was high.

Researchers have also investigated the relationship between screen use and attention problems. A meta-analysis by Eirich et al. (2022) found a small but significant relationship between screen time and symptoms related to inattention and hyperactivity. One possible explanation is that screen activities may replace activities such as independent play, which helps children develop concentration and self-regulation. Another explanation is that fast-paced content may overstimulate children and make it more difficult for them to maintain attention in everyday situations.

Longitudinal studies provide additional evidence. **McArthur et al. (2022)** found that children who spent more than two hours per day using screens between the ages of 24 and 36 months were more likely to develop attention problems later. The study also showed a dose-response relationship. Children who spent three or more hours per day using screens had the highest risk, while those who spent one hour or less had the lowest risk.

Although these findings are important, the reported effects are usually small. **Yang et al. (2023)** analyzed data from more than 13,000 children in France and found that the relationship between screen time and cognitive development became much weaker after factors such as family background and previous cognitive ability were considered. Children who watched more than two hours of screens each day scored only slightly lower on cognitive assessments than children with lower exposure.

These findings suggest that screen time is only one factor among many that influence cognitive development. Other factors, including parental education, home environment, and access to learning opportunities, may have a greater effect. Some researchers even argue that moderate screen use alone is unlikely to cause major developmental problems. However, children with very high levels of screen exposure may still face greater risks.

Positive and Neutral Findings: Despite concerns, some studies have reported neutral or even positive outcomes. Fitzpatrick et al. (2023) found that after accounting for factors such as family income and parenting practices, total screen time was not significantly associated with overall cognitive performance among preschool children.

Educational media may also provide certain benefits. Programs designed specifically for children can improve early literacy, vocabulary, and story comprehension. For example, educational television programs and interactive applications have been associated with

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better counting skills and improved vocabulary.

Hu et al. (2020) found that children who used educational applications performed better in receptive language and science-related tasks. Similarly, Rai et al. (2023) reported that educational screen content was associated with better performance in working memory and self-regulation, while non-educational content was linked to poorer outcomes.

Overall, most studies suggest that excessive screen time is associated with slightly weaker cognitive development, particularly in language, memory, and attention. However, the relationship is not straightforward. The amount of screen time, the quality of the content, and the presence of parental involvement all influence children's developmental outcomes. Therefore, it may be more useful to focus on how children use screens rather than simply measuring the total number of hours they spend in front of them.

Emotional and Social Development

Children learn emotions and social skills mostly through everyday experiences. Talking with parents, playing with other children, and spending time with family all help them understand feelings and relationships. Screen use can affect these areas in different ways. Sometimes it happens because of the content children watch. Other times, screens simply replace activities that normally help children develop social skills. Most recent studies show that spending too much time on screens during early childhood is linked with more behavioral problems and weaker social skills. Still, the type of content and the way children use screens can change the outcome.

Behavioral Problems and Mental Health: Many studies have found that children who spend more time using screens are more likely to develop behavioral and emotional problems. These problems can be external, such as aggression, impulsive behavior, or hyperactivity. They can also be internal, including anxiety, sadness, or symptoms related to depression.

A study by McArthur et al. (2022) followed almost 2,000 Canadian children around the age of three. The researchers found that children who spent about two hours a day using screens were more likely to develop behavioral problems than children who spent one hour or less. The risk became even higher among children who spent three or more hours a day in front of screens.

The same pattern was seen for emotional problems. Children who used screens for three or more hours each day showed much higher levels of anxiety and sadness. What makes these findings more important is that the researchers controlled for many other factors, including family background and children's earlier behavior. Even after those adjustments, the relationship between heavy screen use and emotional problems remained.

Other studies have reported similar findings. Madigan et al. (2019) found that toddlers with higher screen exposure were more likely to develop behavior problems later. This suggests that the effects may continue over time rather than appearing only for a short period.

There are several possible explanations for this relationship. Children who spend too much time with screens may lose valuable opportunities to interact with other people. They may spend less time playing, talking, and learning how to manage emotions. These activities are important because they teach children how to communicate and control their feelings.

The content children watch may also influence their behavior. Fast-moving programs can overstimulate young children, while violent content may encourage aggressive behavior.

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Some children may copy what they see on a screen without fully understanding it. Over time, this can affect emotional development and social behavior.

Among older children and teenagers, the relationship between screen use and mental health is less clear. Some studies report only small effects, while others suggest stronger connections. Nagata et al. (2024) analyzed data from the ABCD study and found that children aged 9–10 who spent more time using screens showed slightly higher levels of depressive symptoms two years later.

The study also found that certain activities, such as social media use, texting, and watching videos, had a stronger relationship with depression than other forms of screen use. Attention problems and conduct problems were also linked to higher screen exposure, although the effects were relatively small.

Similar results were reported in a meta-analysis by Eirich et al. (2022). The researchers concluded that children who spent more time using screens were more likely to experience both emotional and behavioral problems. However, they also pointed out that the size of these effects was generally small.

Interestingly, the type of screen activity seemed to matter. Video games showed a weaker relationship with behavior problems than overall screen time. One possible explanation is that some games involve social interaction and problem-solving, while television watching is usually more passive and may reduce face-to-face interaction.

Researchers have also become interested in problematic screen use, sometimes called digital addiction. Although most forms of screen use are not officially classified as addictions, some children develop unhealthy habits. They may struggle to stop using screens, become upset when access is limited, or spend so much time online that it affects their daily lives. These cases are less common, but they show that excessive screen use can sometimes be part of a larger pattern involving emotional and behavioral difficulties.

Attention and ADHD-Related Behavior: Many researchers have also looked at the connection between screen time, attention problems, and ADHD symptoms. These problems are related to both cognitive and behavioral development. Studies discussed earlier have already shown that children who spend more time using screens during early childhood are more likely to develop attention problems later.

Several studies have found similar results among school-aged children. Chen et al. (2019) reported that children between 6 and 12 years of age who spent more than two hours a day using screens had a higher rate of ADHD diagnoses than children with lower screen use. A meta-analysis by Eirich et al. (2022) also found a small but consistent relationship between screen time and behaviors such as hyperactivity and impulsiveness.

Nagata et al. analyzed data from the ABCD study and found that screen use at ages 9–10 was linked to a slight increase in ADHD symptoms two years later. Interestingly, the relationship was stronger in White children and was not statistically significant in Black or Asian children. The researchers suggested that differences in culture, lifestyle, or screen-use patterns might help explain these findings.

These results show that screen time may play a role in attention problems, but it is probably not the only reason. Other factors, such as genetics, sleep patterns, nutrition, and the home environment, can also affect children's attention and behavior.

The type of content children watch may also influence outcomes. Fast-moving cartoons and action-based programs often contain frequent scene changes, which may affect a child's ability to concentrate for longer periods. In comparison, slower and more

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educational programs may not have the same effect.

Another concern is the use of screens as a way to calm young children. When parents regularly hand a device to a child during moments of frustration or distress, the child may become dependent on that external source of comfort. As a result, they may have fewer opportunities to develop self-control and learn how to manage emotions on their own.

At the same time, researchers point out that the relationship may work in both directions. Children who already have attention difficulties might naturally spend more time using screens because they find digital activities more stimulating. Parents may also rely more on screens to keep these children occupied. Therefore, it is difficult to determine whether screen time causes attention problems or whether children with attention problems are simply more likely to spend more time using screens.

Social Skills and Relationships: Social skills develop through regular interaction with family members, friends, teachers, and other children. These everyday experiences help children learn important abilities such as communication, cooperation, empathy, and conflict resolution. When screen use begins to replace these activities, social development may be affected.

John et al. (2021) studied preschool children in Kerala, India, and found that children whose screen use was not consistently supervised were much more likely to experience difficulties with social skills. Although the study involved a relatively small sample and used a screening tool rather than a clinical assessment, the findings still suggest that unsupervised screen use may have negative effects on social development.

Similar findings were reported by Hu et al. (2020), who found that higher levels of passive screen use were associated with weaker social skills among Chinese children.

One explanation is that children who spend long periods watching screens have fewer opportunities to interact with other people. Activities such as pretend play, group games, and conversations teach children how to understand social cues and respond to other people's feelings. Children who miss these experiences may have more difficulty building relationships.

Researchers have also raised concerns about emotional regulation. Children who depend heavily on screens may struggle to deal with boredom, disappointment, or frustration without a device.

Radesky et al. (2019) found that infants who were regularly given mobile devices to calm them down showed signs of weaker self-regulation. Muppalla et al. (2023) also reported that excessive screen use was associated with greater emotional dysregulation and more difficulty understanding emotions.According to these researchers, children who spend most of their time interacting with screens may experience fewer real-life social situations. Because of this, they may have fewer opportunities to develop emotional awareness and understand how other people think and feel.

Autism, Social Development, and Screen Use: One topic that has received a lot of attention is the possible connection between screen time and autism spectrum disorder (ASD). Autism is a neurodevelopmental condition and is not caused by parenting or screen exposure. Still, researchers have questioned whether spending too much time in front of screens during infancy could make social difficulties worse in children who are already more vulnerable.

A large study from Japan by Kushima et al. (2022) followed almost 84,000 children to examine this relationship. The researchers found that children who spent more than four hours a day using screens at the age of one were much more likely to be diagnosed with

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ASD by the age of three than children who spent less than one hour a day using screens. Even children who used screens for one to four hours a day showed a higher risk.

Although these findings seem important, they should be interpreted carefully. It is difficult to know which factor came first. Some children who later developed ASD may already have shown early signs, such as reduced social interaction or a stronger interest in visual stimulation. Because of this, parents may have been more likely to use screens to keep them occupied. In that case, increased screen use may have been a result of early symptoms rather than the cause.

Heffler et al. (2020) reported similar findings. Their study found that infants who showed more autism-related behaviors at 12 months of age were also more likely to spend more time with screens and less time interacting with caregivers. The researchers suggested that lower levels of parent-child interaction could contribute to social difficulties in children who are already at risk. At the same time, they also recognized that every child is different, and individual characteristics can influence both behavior and screen use.

The main point is that screens should not be viewed as a direct cause of autism. Instead, higher screen exposure during infancy appears to be associated with greater social and communication difficulties during the early years. Children who already have ASD or problems with social communication may also be more affected by excessive screen use because it can further reduce opportunities for real-life interaction.

Westby (2021) also argued that children with autism may be especially sensitive to the effects of excessive screen use. The study recommended setting clear limits and choosing content that encourages social engagement instead of passive viewing.

Emotional Understanding and Empathy: Researchers have also started to study how screen use affects emotional understanding and empathy. These skills help children recognize other people's emotions and respond appropriately in different social situations.

Some studies suggest that spending less time with digital devices can improve these abilities. In one experiment, school-aged children spent several days without using screens. Afterward, they became better at recognizing facial expressions and understanding emotions. This finding suggests that face-to-face interaction plays an important role in social and emotional learning.

Children who spend a lot of time on screens may pay less attention to social signals because much of their communication happens through devices rather than direct interaction. According to Muppalla et al. (2023), excessive screen use may reduce children's ability to recognize emotions and may also increase aggressive behavior.

One reason could be that screen use sometimes replaces interactions between parents and children. These everyday conversations are one of the main ways children learn how to understand emotions and develop empathy.

The type of content children watch also seems to matter. Violent games and fast-paced cartoons may encourage aggressive behavior or reduce emotional sensitivity. On the other hand, educational programs that focus on social and emotional learning can have positive effects.

Programs such as *Sesame Street* and *Daniel Tiger's Neighborhood* have been shown to improve children's emotional understanding and encourage positive social behavior. This suggests that the effects of screen use depend not only on the amount of time children spend with screens but also on the type of content they consume.

Parental involvement also makes a difference. When parents watch programs with their

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children and talk about the characters, emotions, and situations being shown, children appear to benefit more from the experience.

Summary: Overall, studies suggest that excessive screen use is linked to several emotional and social challenges during childhood. Children with higher screen exposure are more likely to experience behavioral problems, attention difficulties, emotional dysregulation, and weaker social skills.

Even so, the effects reported in most studies are relatively small. This means that screen time alone cannot explain every emotional or behavioral problem. Other factors, including family environment, parenting style, education, and socioeconomic conditions, also influence child development.

Moderate and supervised screen use does not appear to have the same negative effects. In some cases, educational and age-appropriate content may even support emotional learning.

A review by Odgers and Jensen (2020) found that digital media does not affect every child in the same way. The researchers argued that concerns about a widespread mental health crisis caused entirely by technology are not strongly supported by current evidence. Instead, they emphasized the importance of separating problematic screen use from normal and healthy use.

Perhaps the most important factor is the way screens are used. A child who spends hours alone with a device may have a very different experience from a child who watches educational content with family members. Studies consistently show that children generally have better social outcomes when parents participate in screen activities instead of leaving children to use devices on their own.

Physical and Motor Development

When people talk about the effects of screen time, they usually focus on learning, behavior, or mental health. Physical development often receives less attention, even though it is just as important. During early childhood, physical development includes movement, coordination, sleep, growth, and overall health. Because most screen activities involve sitting for long periods, researchers have become concerned that too much screen time may affect children's physical development. Studies in recent years have mainly focused on four areas: motor skills, physical activity, obesity, and sleep.

Motor Skill Development: Children develop motor skills through movement and play. Activities such as crawling, walking, climbing, running, drawing, and holding objects help strengthen both large and small muscles. When children spend too much time sitting in front of screens, they may have fewer opportunities to practice these important skills.

Some studies support this idea. Madigan et al. (2019) found that children with higher screen exposure during their toddler years were more likely to experience delays in both fine and gross motor skills by the age of five. The researchers suggested that screen use may reduce the amount of time children spend exploring their surroundings and participating in physical activities.

Other studies have reported similar findings. Research discussed by Neophytou et al. found that children who were exposed to screens at an early age developed basic movement skills more slowly. These skills included activities such as running and throwing.

However, not every study has reached the same conclusion. A large French study found little evidence that screen time had a strong effect on motor development after other factors were taken into account. This suggests that the relationship may be more

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complicated than it first appears.

John et al. (2021) also found that children between the ages of two and five who spent more time using screens were more likely to experience delays in both language and motor development. One possible explanation is simple. Children who spend long periods sitting with tablets or watching television have less time to move around. Infants may spend less time crawling or practicing balance. Older children may spend less time running, climbing, or participating in active play.Fine motor skills may also be affected. Activities such as stacking blocks, coloring, and drawing help children develop hand movements and coordination. Swiping and tapping on a screen cannot completely replace these experiences, although some educational applications may still encourage certain fine motor movements.

A review by Liu et al. (2022) concluded that excessive screen use was linked to delays in physical development and weaker motor coordination. At the same time, the researchers noted that the available evidence was limited and that some findings were inconsistent.

Overall, very high levels of screen use during early childhood may affect motor development. Moderate screen use, on the other hand, is unlikely to have a major impact if children continue to spend enough time playing and being physically active.

Physical Activity and Obesity: One of the strongest and most consistent findings in the literature is the relationship between screen time and physical activity. Time spent using screens usually means less time spent moving.

A systematic review by Stiglic and Viner (2019) found that children who spent more time using screens generally had lower levels of physical activity and fitness. Although the effects were not very large, the pattern appeared in many different studies.

This relationship became even more noticeable during the COVID-19 lockdowns. A study involving children from several countries found that as screen use increased, physical activity decreased. Children walked less, participated in fewer outdoor activities, and spent more time sitting indoors.

Lower activity levels can eventually contribute to weight gain. Several studies have found that children with high levels of screen use are more likely to become overweight or obese.

Kerai et al. (2022) studied kindergarten children and found that those who spent more than one hour a day using screens were more likely to show lower levels of physical well-being. Although the results were close to, but did not reach, statistical significance, the overall trend still suggested that more screen time was associated with poorer physical health.

There are several reasons why this may happen. First, children often eat snacks while watching television or using other devices. Second, advertisements can encourage unhealthy eating habits. Studies have shown that children often consume more calories while watching television, and those who have televisions in their bedrooms are more likely to become overweight.

Another study by Cespedes et al. found that preschool children who watched more television not only gained more weight over time but also slept less.

Screen-based activities also require very little physical effort. According to Liu et al. (2022), children who spend a large amount of time using screens often have lower fitness levels and higher body fat percentages than children who are more physically active.

These findings suggest that the health effects of screen use are not caused only by the screen itself. Instead, the problem may come from the behaviors that often accompany

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excessive screen use, such as inactivity, unhealthy eating, and reduced outdoor play.

Sleep Disruption: sleep is one of the areas most affected by screen use. Many studies have found that children who spend more time using screens usually go to bed later, sleep for fewer hours, and often have poorer sleep quality.

Research from **Project Viva** in the United States found that children who watched more television during infancy slept slightly less later in childhood. The study reported that every extra hour of television at six months of age was linked to a small reduction in sleep time. The effect became slightly stronger by the age of seven. Children who had a television in their bedrooms slept much less than children who did not.

There are several reasons why screens may affect sleep. One reason is the blue light coming from devices, which can reduce melatonin production. Melatonin is a hormone that helps the body prepare for sleep. Another reason is that some content keeps children mentally active when they should be relaxing before bedtime. Sometimes, children simply spend so much time on screens that their bedtime gets pushed back.

McArthur et al. (2022) also reported that three-year-old children who used screens for more than one hour each day experienced more sleep-related problems. Parents often say that children who spend a lot of time with screens have more difficulty falling asleep, resist bedtime, or wake up more frequently during the night.

Interestingly, some studies have shown that reducing screen use can improve sleep. Children who avoid screens before bedtime often fall asleep more quickly and sleep for longer periods. Since sleep plays an important role in growth, learning, attention, and emotional development, poor sleep may become an indirect way through which excessive screen use affects overall development.

Because of these concerns, health professionals usually recommend keeping screens out of children's bedrooms and limiting device use before bedtime. Small changes in daily routines may have a positive effect on sleep habits.

Vision and Other Health Issues: Researchers have also examined whether long periods of screen use can affect children's eyesight. One major concern is **myopia**, or nearsightedness. Children who spend many hours focusing on screens at a short distance may have a higher chance of developing vision problems.

A systematic review and meta-analysis by Foreman et al. (2021) found that frequent use of smartphones and tablets was associated with an increased risk of myopia. Researchers believe that spending less time outdoors may also contribute to this problem because natural light and looking at distant objects help support healthy vision.

The COVID-19 lockdowns provided another opportunity to study this issue. During this period, many children spent more time indoors, used digital devices more often, and participated in fewer outdoor activities. Several studies reported a noticeable increase in the number of children developing myopia during this time.

Extended screen use can also cause temporary problems such as eye strain, dry eyes, headaches, and blurred vision. These symptoms are sometimes described as computer vision syndrome. Although these effects often improve with rest, researchers continue to study whether long-term screen exposure during childhood could have more serious consequences later in life.

Other physical problems have also been linked to excessive screen use. Children and teenagers who spend long hours using phones, tablets, or computers may develop poor posture and experience neck or back pain. They are also less likely to participate in physical activities, which can reduce overall fitness and muscle strength.

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Some researchers have even started examining how screen use might affect brain development. A study by Hutton et al. (2019) used brain imaging to examine children between three and five years of age. The researchers found that children with higher screen exposure showed differences in areas of the brain related to language and literacy development.

Another idea that has received attention is **digital dementia**, a term introduced by Manwell et al. (2022). This theory suggests that excessive screen use during childhood might increase the risk of cognitive problems later in life by reducing physical activity and limiting activities that stimulate the brain. At present, this idea remains largely theoretical, and more research is needed before any clear conclusions can be made.

Overall, the evidence suggests that the physical effects of excessive screen use go beyond reduced physical activity. Sleep, eyesight, posture, fitness, and even brain development may all be affected to some degree, although the strength of these relationships can vary between studies.

When all the evidence is looked at together, too much screen time seems to affect children's physical health in several ways. Children who spend many hours with screens are usually less active, which can increase the chances of weight gain. Screen use can also disturb sleeping habits and, in some cases, may slow down the development of motor skills and physical fitness.

These problems are usually seen in children who spend a very long time using screens, especially more than 2–3 hours every day. The effects become more noticeable when screen use starts replacing important daily activities such as exercise, outdoor play, and sleep.

At the same time, it is important not to exaggerate these findings. Moderate screen use does not automatically lead to physical problems. A child who watches an educational program for one hour and then spends the rest of the day playing outside will probably develop normally.

The real problem begins when screen use takes the place of activities that children actually need for healthy growth. Researchers often call this the **displacement effect** because one activity is replacing another. In this case, screen use replaces movement, physical play, social interaction, or sleep.

This is why health organizations such as the WHO recommend not only limiting screen time but also increasing physical activity. Young children are encouraged to spend several hours every day in active play while also maintaining healthy sleeping habits.

The good news is that these effects can be changed. Studies have shown that when children reduce their screen use, they often become more physically active and show improvements in body weight and overall health.

Several intervention studies have also produced encouraging results. Programs that involve parents, track daily screen use, and encourage alternative activities have been successful in reducing children's screen time. Many of these programs also led to improvements in physical activity.

To sum up, screens mainly affect learning and social behavior, but they can also influence physical development and everyday health habits. Parents should try to create a healthy balance between screen activities and other important parts of childhood, such as outdoor play, movement, and rest.

The goal should not be to completely remove screens from children's lives. Instead, families should make sure that screens do not replace the experiences children need for

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healthy growth and development. The next section will examine the factors that explain why screen time does not affect every child in the same way and why some children experience stronger effects than others.

Moderators and Mediators of Screen Time Effects

Recent research shows that screen time does not affect every child in the same way. The effects depend on many things, such as the type of content children watch, how they use screens, their age, their family environment, and even their personality. Because of this, researchers now believe that simply counting screen hours is not enough. The important questions are: **What are children watching? How are they watching it? And which children are more likely to be affected?**

Media Content Quality: The type of content children watch may be the most important factor. Educational and age-appropriate programs can produce very different results compared with entertainment or violent content.

Many studies have found that educational programs are linked with better developmental outcomes. Earlier studies by Hu et al. (2020) showed that educational screen activities were associated with better vocabulary and higher knowledge scores. At the same time, passive viewing of cartoons and non-educational content was linked with weaker cognitive and social development.

Yellamelli (2024) reported similar findings. Children who mostly watched educational programs performed better on developmental assessments than children who mainly watched entertainment content. In other words, educational content seemed to reduce some of the negative effects usually linked with screen use.

The opposite pattern was seen with violent or fast-paced programs. Studies have shown that children exposed to violent media often display more aggressive behavior. Fast-moving programs with frequent scene changes may also affect executive functioning and attention.

Programs that are not suitable for a child's age can create additional problems. Toddlers may struggle to understand content that changes quickly or contains little interaction. Instead of learning from these programs, children may simply become passive viewers.

On the other hand, programs designed for learning can be beneficial. Educational shows such as *Sesame Street*, *Super Why!*, and other children's programs can help improve language, reading, mathematics, and social skills. The benefits become even greater when parents participate and discuss the content with their children.

Researchers have also found that children who regularly watched *Sesame Street* performed better in school later, especially when parents reinforced what they learned at home.

Some programs can also slow language development. Neophytou et al. (2021) noted that shows such as *Teletubbies*, which use unusual language patterns and provide little interaction, were linked with slower language development in infants.

This suggests that screens themselves may not always be the problem. The real issue may be the type of content children consume and whether it supports their developmental needs.

Active and Passive Screen Use and Co-Viewing: How children use screens is another important factor.Passive screen use usually means watching television or videos without interacting. Active screen use includes activities such as educational apps, interactive games, and digital learning programs.

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Studies generally show that passive screen use is associated with more negative outcomes. Yellamelli (2024) found that children who spent more time passively watching screens were more likely to experience developmental delays than children who used interactive media.

One possible explanation is that children watching videos for several hours are not actively participating. They are not practicing communication, movement, or problem-solving skills. Interactive games may still involve thinking and decision-making, even if they cannot completely replace real-world experiences.

Another important factor is **co-viewing**, which means parents or siblings using media together with children.

Rai et al. (2023) found that activities such as reading digital books together created better parent-child interactions than simply watching videos.

John et al. (2021) also reported that children who used screens without supervision experienced more problems related to attention and social development.

When parents participate, they can ask questions, explain ideas, and connect what children see on the screen to real-life situations. For example, a parent might ask, "What do you think will happen next?" or say, "Remember when we did something like that?"

These small conversations can improve understanding and help children learn important social skills.

The purpose of screen use also matters. Suggate and Martzog (2022) found that entertainment-based screen use was more strongly associated with weaker cognitive outcomes than screen use for educational purposes.

This suggests that screens used for learning may not have the same negative effects as screens used only for entertainment.

Age of the Child: Age is another major factor.The first two years of life are considered a very sensitive period because the brain develops rapidly during this stage. This is one reason why the AAP and WHO recommend avoiding screen use during infancy.

Infants learn much better through real-life experiences than through screens. Researchers sometimes call this the "video deficit" because babies have difficulty understanding and learning from what they see on screens.

Several studies have shown that screen exposure during infancy is associated with later problems involving language, attention, and social development.

Madigan et al. (2019) found that children who spent more time using screens between 12 and 24 months showed weaker developmental outcomes by the age of three.

The situation changes during the preschool years. Children between three and five years old become better at understanding stories, recognizing symbols, and learning from educational programs. Some studies have even reported positive effects from high-quality educational media during this age.

At the same time, researchers suggest that negative effects may become stronger if heavy screen habits continue for many years.

Heffler et al. (2020) found that infants with high television exposure showed more autism-related symptoms, highlighting how sensitive early childhood can be.

Older children and teenagers face different challenges. Social media, online communication, and cyberbullying become more important than simple screen time. Research suggests that the effects during adolescence often depend on the individual child rather than the amount of screen use alone.

Overall, younger children appear to be more vulnerable because they rely heavily on

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direct interaction, physical play, and communication for healthy development.

Child Characteristics: Every child is different, and this may explain why screen use affects some children more than others.

Children with difficult temperaments, such as high irritability or poor self-control, may naturally spend more time using screens. These same children may already be at greater risk for developmental problems, making it difficult to know whether screens are causing the problem or simply becoming part of it.

Fitzpatrick et al. (2023) reported that children with behavioral difficulties often have higher levels of screen use. These children may also be more sensitive to overstimulation, which means excessive screen use could make existing problems worse.

Children with conditions such as ASD or ADHD may also use screens more often. Parents sometimes use tablets or videos to calm them, but this may reduce opportunities for social interaction and physical activity.

At the same time, technology can also be helpful. Some applications are specifically designed to support children with developmental disorders by teaching communication and social skills.

Gender differences have also been observed in some studies. Boys often spend more time using screens during childhood, possibly because of different interests such as video games.

Research has also found differences between ethnic groups. Nagata et al. (2024) reported that the relationship between screen use and mental health was stronger in White adolescents than in Black or Asian adolescents.

Researchers believe these differences may be related to culture, content preferences, or environmental factors, but more research is needed.

Family Environment and Socioeconomic Status: Family environment plays a major role in how children use screens.Studies have shown that children from lower-income families often spend more time using screens. Several factors may contribute to this, including limited access to recreational activities, long working hours for parents, and lower awareness of screen-use recommendations.

Socioeconomic status also affects many other areas of development, including nutrition, education, and parent-child interaction. Because of this, it can be difficult to separate the effects of screen time from other family factors.

Kerai et al. (2022) found that excessive screen use was linked to developmental problems in both lower-income and higher-income families. However, children from lower-income households generally spent more time using screens.

Yellamelli (2024) found that children from higher-income families usually had better developmental outcomes. One possible reason is that these families often provide more educational activities, better resources, and more interactive forms of screen use.

Parental education may also influence children's experiences. Parents who know more about child development may be more likely to choose educational programs, set time limits, and participate in screen activities with their children.

Several studies have shown that some negative effects of screen time become smaller after researchers adjust for parental education. This suggests that the home environment itself may be just as important as screen exposure.

Parental Involvement and Screen Rules: Parental involvement may be one of the strongest protective factors.Families that establish clear rules about screen use often have children with lower screen exposure and fewer developmental problems.

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In homes where televisions remain on throughout the day or devices are freely available, children usually spend much more time with screens. These children are also more likely to experience speech and attention problems.

Researchers have identified different parenting styles related to media use. Some parents actively limit and monitor screen use, while others allow children to use devices without many restrictions.

Studies have shown that children generally have better outcomes when parents watch programs with them, explain what is happening, and discuss the content.

For example, mothers who actively discussed television programs with their infants had children with better language development than mothers who did not participate, even when total screen time was similar.

Another important point is that children often copy their parents' behavior. Parents who spend many hours using phones, televisions, or computers usually have children who do the same.

Reducing parents' own screen use may increase family interaction and reduce children's dependence on digital devices.

In the end, screen time should not be viewed as an isolated factor. Content, age, personality, family environment, and parental involvement all work together. These factors help explain why the same amount of screen time can have very different effects on different children.

Discussion:

The findings of this review show that the relationship between screen time and child development is not simple. Most studies included in this review reported that spending too much time on screens was linked with poorer developmental outcomes. However, the size of these effects was usually small, and the results were not always the same across different studies.

One clear pattern was that children with higher screen use often showed lower scores in areas such as language, attention, behavior, and physical health. Children who spent more than the recommended amount of time on screens were more likely to experience delays in some developmental areas. In many studies, these differences were not very large, but they were still important because small delays in early childhood can influence later learning and development.

Language development was one of the areas most often affected by screen use. Several studies found that children who spent more time watching screens, especially television, had weaker language skills. Executive functions such as attention, self-control, and working memory were also negatively associated with high screen use. Similar findings were reported for emotional and social development, where children with greater screen exposure showed more behavioral problems and weaker social skills.

Physical health was also affected. Children who spent long periods using screens were generally less active, slept less, and had a greater risk of becoming overweight. These findings support the idea that screen time can replace activities that children need for healthy development, including outdoor play, exercise, and face-to-face interaction.

At the same time, the evidence does not suggest that all screen use is harmful. Several studies included in this review found either very small effects or no significant relationship between screen time and some developmental outcomes after family factors were considered. This is an important finding because it suggests that the amount of screen time alone may not fully explain developmental differences between children.

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The type of content children watch appears to be very important. Educational programs and interactive applications were often linked with better outcomes than passive viewing. Children who used educational media sometimes showed improvements in vocabulary, early learning, and problem-solving skills. In contrast, passive viewing of entertainment content was more commonly associated with negative outcomes.

Parental involvement was another important factor. Studies repeatedly showed that children benefited when parents participated in screen activities. Talking about what children were watching, asking questions, and helping them understand new information appeared to reduce some of the negative effects of screen use. In contrast, children who used screens alone or without supervision were more likely to experience developmental difficulties.

Age also seemed to influence outcomes. The evidence suggested that children younger than three years were more vulnerable to the negative effects of excessive screen exposure. This may be because early childhood is a period of very rapid brain development. During this stage, children learn mainly through direct interaction with people and through physical exploration of their environment. When screens replace these experiences, development may be affected.

Another important finding was that family environment played a major role. Socioeconomic status, parental education, household routines, and parenting practices influenced both screen use and child development. This makes it difficult to separate the effects of screen time from other factors. A family with limited time and resources may rely more heavily on screens, but those same circumstances may also affect a child's development in other ways.

This review also found several important limitations in the existing literature. One major problem is that many studies depend on parent-reported screen time. Parents may not always remember how much time their children spend using devices, which can reduce the accuracy of the findings. Another limitation is that many studies measure only the total amount of screen time without considering the content being viewed or the circumstances in which screens are used.

Causality is another challenge. Although many studies found a relationship between screen use and developmental outcomes, this does not automatically mean that screens caused these problems. It is possible that children with existing behavioral or developmental difficulties are more likely to spend time using screens. This creates the possibility of reverse causation.

Longitudinal studies provide stronger evidence because they follow children over time and allow researchers to examine developmental changes. However, even these studies cannot completely eliminate the influence of confounding variables. Randomized controlled trials provide stronger evidence for outcomes such as sleep and body weight, but similar experimental studies are difficult to conduct for cognitive and social development because of ethical concerns.

Another issue is that technology changes faster than research. Much of the earlier evidence focused on television, while children today spend more time using smartphones, tablets, social media platforms, streaming services, and interactive applications. These technologies may affect development differently. Because of this, findings from television studies cannot always be applied to newer forms of media.

The COVID-19 period should also be considered when interpreting recent research. During lockdowns, many children relied on screens for education, communication, and

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entertainment. This increase in screen exposure may have influenced some findings reported between 2020 and 2025. Future studies should examine whether these changes had temporary or long-term effects.

The findings of this review also have practical implications. Parents should focus not only on reducing screen time but also on improving the quality of media use. Setting limits, encouraging outdoor activities, creating screen-free routines before bedtime, and participating in children's screen activities may help reduce possible negative effects.

Healthcare professionals can also play an important role. Pediatricians, psychologists, speech therapists, and educators should ask about screen habits when evaluating children's development. Early identification of unhealthy screen use may help prevent later problems.

From a policy perspective, governments and educational institutions should continue promoting digital literacy and public awareness programs. Technology is now a normal part of childhood, which means that realistic and practical guidelines are needed instead of complete restrictions.

Overall, the evidence suggests that excessive screen time should be viewed as one risk factor among many rather than the only explanation for developmental difficulties. The strongest message from this review is that children benefit most when screen use is balanced with activities that support healthy development, including play, social interaction, physical activity, and adequate sleep.

Future Research Directions

Although research on screen time has increased in recent years, several questions still remain unanswered. One important limitation is that many studies only follow children for a short period. Because of this, it is still unclear whether the effects of screen exposure during early childhood continue into adolescence or become less noticeable over time. Future longitudinal studies that follow children across different stages of development may provide a better understanding of these long-term outcomes.

Another area that needs more attention is the rapid change in digital technology. Most of the available evidence focuses on television and overall screen time. However, children today are exposed to many different types of media, including smartphones, social media platforms, streaming services, virtual reality applications, and interactive digital content. These forms of media may influence development differently, but research in these areas is still limited.

Future studies should also move beyond measuring only the number of hours children spend using screens. Many existing studies treat all screen activities as equal, even though watching an educational program, playing an interactive game, and scrolling through social media are very different experiences. Research should examine specific aspects of screen use, such as content type, the purpose of use, multitasking, notifications, and the amount of parental involvement.

Another important issue is the way screen use is measured. Many studies depend on information reported by parents, which may not always be accurate. More objective methods, such as digital tracking applications, screen-use diaries, or device-based monitoring, could improve the quality of future research and provide more reliable results.

Intervention studies should also receive greater attention. Current evidence shows that reducing screen time can improve outcomes such as sleep and physical activity. Some interventions that combine parent education, counseling, and changes in the home

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environment have already produced encouraging results. However, more research is needed to determine which strategies are most effective and whether these improvements continue over the long term.

Individual differences between children also require further investigation. Not all children respond to screen exposure in the same way. Some children appear to experience negative effects even with moderate use, while others show few developmental difficulties despite spending more time with screens. Factors such as temperament, attention, sensory processing, genetics, and existing developmental conditions may explain these differences. Future studies that combine behavioral assessments with biological or neuroimaging data may help researchers understand why some children are more vulnerable than others.

There is also a need for more research in different cultural and socioeconomic settings. Most of the studies included in this review were conducted in high-income countries such as Canada, France, Japan, and China. Children living in low-income communities or developing countries may have very different patterns of screen use because of differences in education, parenting practices, family structure, and access to technology. Expanding research into these populations would improve the generalizability of current findings.

Policy-related research should also continue. Future studies could examine whether regulations related to advertising in children's applications, media content standards, or screen-use policies in childcare settings improve developmental outcomes. More evidence is needed before clear recommendations can be made.

Finally, future research should continue to explore problematic forms of screen use, including digital addiction and excessive gaming. Although these problems affect only a small number of children, they are often associated with behavioral and emotional difficulties. A better understanding of these patterns may help researchers develop more effective prevention and intervention strategies.

Overall, future research should focus on improving study design, using more accurate measurement methods, examining newer forms of technology, and following children over longer periods. These efforts will help researchers better understand not only whether screen time affects child development, but also when, how, and for whom these effects are most significant.

Conclusion

Today, screens are almost everywhere, so understanding how they affect children's development has become more important than ever. Research on this topic is still growing, and the findings continue to change as new technologies appear. This review of studies published between 2019 and 2025 shows that the effects of screen time are not completely good or completely bad. Instead, the results depend on several factors, including how long children use screens, what they watch, and how they use them.

Most studies included in this review found that too much screen time, especially during the early years of life, was linked with delays in language development, weaker cognitive skills, behavior and attention problems, poor sleep, and a higher risk of becoming overweight. In many cases, the effects were small, but they appeared repeatedly across different studies.

At the same time, the findings also showed that screens are not always harmful. Educational and interactive media sometimes helped children learn new words, improve certain skills, and gain educational benefits. These positive effects were more common

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when adults were involved and when the content was suitable for the child's age.

One important point became clear throughout this review. The amount of screen time alone does not explain everything. The quality of the content, the child's age, parental supervision, and the way screens are used all play an important role. Because of this, children who spend the same amount of time using screens may not have the same developmental outcomes.

Overall, the findings suggest that screen use should be managed carefully rather than completely avoided. Children still need conversation, physical play, social interaction, and real-life experiences for healthy development. Screens can be included in everyday life, but they should support these activities, not replace them. The results of this review suggest that both the quality and quantity of screen use should be considered when making decisions about children's media habits.

Key Conclusions and Takeaways

Cognitive Development: Children who spend a lot of time using screens, especially more than 2 hours a day during the preschool years, often show lower language abilities and weaker skills related to memory, attention, and self-control compared with children who have less screen exposure. However, the findings also suggest that the type of content is important. Educational programs and interactive activities may help children learn and can reduce some of the negative effects linked with screen use. Even so, talking with parents, reading, and playing with other people are still much more important for healthy cognitive development. Screens can support these activities, but they should not take their place.

- **Emotional and Social Development:** Higher screen use is often linked with more behavioral and emotional problems in children. Studies have reported increased levels of aggression, hyperactivity, anxiety, and weaker social skills among children who spend longer periods in front of screens. Some research also found that toddlers with very high screen exposure had a greater risk of developing significant behavioral problems later in childhood. There is also some evidence showing a relationship between heavy screen use during infancy and social communication difficulties by the age of 3, although it is still unclear whether screen time directly causes these problems. At the same time, positive and educational content may help children develop empathy and social understanding. Activities such as video calls and shared games can also support social connections. Overall, the effect of screen use on emotional and social development depends largely on whether it replaces real-life interaction with family members and friends.
- **Physical and Motor Development:** Spending long periods sitting in front of a screen can reduce the time children spend being physically active. As a result, children with higher screen use often exercise less and may have a greater risk of becoming overweight. Screen use before bedtime is also associated with poorer sleep, which can affect learning, mood, and overall health. Some studies have suggested that excessive screen use may also influence motor skill development because children spend less time practicing physical activities. However, moderate screen use does not automatically lead to physical problems. Children can still develop normally when screen time is balanced with outdoor play, exercise, and healthy sleep habits. Parents also play an important role by setting rules such as avoiding screens during meals or before bedtime.

Moderating Factors: One important finding of this review is that not all screen use affects children in the same way. Several factors can change the outcomes, including the child's age, the type of content, parental involvement, and the family environment. Educational

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content and shared screen activities with parents usually produce better outcomes than passive and unsupervised viewing. Age also seems to be an important factor. The first two years of life appear to be a particularly sensitive period because language, communication, and social skills develop very quickly during this stage. Family routines and access to other activities, such as reading, outdoor play, and social interaction, can either reduce or increase the effects of screen use.

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