

Adverse Effect of Screen Time on Child and Adolescent Development: A Review

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Abstract Screen time has become an integral part of the daily lives of children and adolescents. While digital media offers educational and recreational opportunities, concerns have been raised regarding its potential impact on various domains of child and adolescent development. This review aimed to (a) define screen time; (b) examine the potential negative effects of excessive screen exposure on cognitive, social, emotional, and physical development; (c) explore the potential benefits of screen use and strategies to maximize benefits while minimizing risks; and (d) summarize existing guidelines and recommendations for parents and caregivers regarding children's screen time. A systematic review of the literature was conducted using electronic databases including PubMed, Scopus, and Google Scholar. A total of 18 peer-reviewed articles published between 2010 and 2024 were included based on predefined inclusion criteria. The findings indicate that excessive screen time is consistently associated with adverse outcomes across multiple developmental domains. Increased screen exposure was linked to higher risks of obesity, reduced physical activity, sleep disturbances, and social and emotional difficulties. Although electronic devices may enhance educational engagement and learning, prolonged screen use and media multitasking were associated with poorer executive functioning and lower academic performance. Prolonged and excessive screen time poses significant risks to both physical and mental health in children and adolescents. Adherence to recommended screen time guidelines, encouraging regular breaks, and promoting offline activities are essential strategies to mitigate these negative effects while supporting healthy development.

Keywords: Children, digital health, Eyestrain, Mental health, Screen time, Sedentary lifestyle

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INTRODUCTION

In the current digital era, screens play a crucial role in everyday life, with children encountering digital media at younger ages than ever before.^[1] Electronic devices have transformed the ways we learn, communicate, and access information. Nevertheless, mounting evidence indicates that excessive use of screen media can lead to serious long-term negative impacts on children's physical, cognitive, social, and emotional well-being, presenting a major public health issue.^[2] Research shows that heightened screen exposure increases the

likelihood of childhood obesity, behavioral issues, sleep disruptions, and subpar academic performance.^[3,4]

This review examines the multifaceted impact of screen time on child development, emphasizing both the potential risks and advantages of digital media usage. It serves as a crucial resource for parents, caregivers, and healthcare professionals. The objective of this review article was to perform a thorough analysis of the available evidence regarding the influence of screen time on child development, particularly focusing on

Cognitive and academic growth, as well as physical, social, and emotional development. In today's world, children are introduced to screens at a very young age. Screen time is defined as the amount of time spent engaging with electronic devices like televisions,

computers, tablets, and smartphones for either entertainment or educational activities. This screen time can be categorized into various types based on the degree of interaction and intended use, including passive, active, educational, recreational, and background screen time. (Table 1)

Types of screen time	Description	Effect
Passive screen time	Watching television or videos without interaction	Helps in limited cognitive engagement
Active screen time	Use of tablets, smartphones, computers, or video games requiring user engagement	Helps in cognitive, motor and problem-solving skills
Educational screen time	Screen use for learning purposes such as educational apps, online classes, or academic videos	Supports learning outcomes and skill development especially when guided by caregivers or educators
Recreational screen time	Screen use for entertainment, including gaming and social media	Adverse effects on physical activity levels, sleep patterns and psychological well being
Background screen exposure	Screens operating in the environment while the child is engaged in other activities	Disrupts attention, reduces parent child interaction, negative influence on language and cognitive development

Table 1: Various types of screen time users

The significant dependence of children on screen media has led to critical public health concerns, as it may negatively impact their cognitive, academic, social, emotional, and physical development, as well as their sleep, vision, reproductive health, and long-term well-being. (Table 2)

Cognitive and Academic Outcomes: Numerous studies suggest that extended screen exposure can have detrimental effects on children's attention span, language development, memory, and motor skills. Increased screen time has been linked to slower learning rates and a diminished ability to acquire knowledge, which can negatively impact academic performance. Moreover, excessive passive screen time, such as watching television, has been correlated with delays in language development and inferior academic results. Children between the ages of 5 and 6 who experience higher levels of screen exposure show diminished attention skills, a crucial cognitive ability for achieving academic success. Delays in the development of attention may result in long-term learning challenges. Additionally, high screen time during preschool years has been associated with reduced cognitive abilities, indicating that negative effects may start early and continue into later childhood.^[5]

Social and Emotional Development: Prolonged screen usage has been associated with difficulties in social and emotional growth. Hinkley et al. indicated that high levels of screen time in children aged 2–5 years

correlated with diminished social skills.^[6] Anderson et al. identified a notable link between violent media exposure and aggressive behavior in children. Furthermore, a meta-analysis conducted by Twenge and Campbell (2009) revealed a direct connection between screen time and depression in adolescents. Increased television exposure during the ages of 6 to 18 months has been linked to heightened emotional reactivity, aggression, and externalizing behaviors.^[7] Video gaming, especially violent games, has been associated with elevated anxiety and aggressive tendencies. Sleep disturbances related to screen time, nighttime device usage, and dependency on mobile phones have been connected to symptoms of depression and behaviors associated with ADHD. Exposure to rapid and violent content activates dopamine and reward pathways in the brain, which may lead to behavioral dysregulation.^[8] The psychoneurological consequences of excessive screen time include diminished social coping abilities and craving behaviors similar to substance dependence. The presence of smartphones in personal environments, such as bedrooms, blurs the lines between work, leisure, and rest, heightening emotional stress and adversely affecting mental health.^[9] Preschoolers with significant television exposure exhibit lower social competence, cooperation, and self-control, while excessive use of social media fosters unhealthy social comparisons and diminished self-esteem.^[10] Excessive screen time can have a profound effect on the physical development of children and

adolescents. A decrease in physical activity results in weaker muscles, poor coordination, and fewer chances for developing gross and fine motor skills. Extended use of screens leads to poor posture, which can cause neck, back, and shoulder pain. The phenomenon known as "tech neck" and issues with spinal alignment are becoming increasingly prevalent among younger users. Sedentary behaviours associated with screen time are closely linked to weight gain, obesity, and unhealthy eating patterns, such as snacking while watching TV. Long periods of screen exposure can lead to digital eye strain, dryness, and discomfort. Additionally, exposure to blue light can disrupt circadian rhythms, negatively impacting sleep quality. Using screens before bedtime can interfere with melatonin production, resulting in shorter and poorer quality

sleep, which in turn affects growth, immunity, and cognitive abilities. Children may be particularly susceptible to RF-EMR due to their higher tissue conductivity and the longer cumulative exposure they experience throughout their lives. The greater RF penetration in relation to head size raises concerns about possible neurological impacts. Emerging research indicates that thermal and RF-EMR exposure from devices kept close to reproductive organs could hinder spermatogenesis and diminish sperm quality. Mobile phones, laptops, and tablets have been identified as potential factors contributing to the decline in male fertility.^[11] There are many observed effects of excessive screen time on a child's overall development, influencing attention and concentration, language acquisition, memory and executive functions, academic performance, and early cognitive growth. (Table 2)

Outcome	Observed Effects of Excessive Screen Time
Attention and concentration	Reduced attention span and poorer focus
Language development	Delayed language acquisition, reduced vocabulary
Memory and executive function	Impaired working memory and decision-making skills
Academic performance	Lower academic achievement and learning difficulties
Early cognitive development	Reduced cognitive abilities in preschool-aged children

Table 2: Impact and outcomes of screen time on the development of child

Preventive Strategies to Reduce Screen Time

Parents and caregivers are essential in reducing the adverse impacts of screen exposure. It is important to set age-appropriate limits on screen time, encourage physical activity, outdoor play, and social interactions, ensure that media content is educational and suitable for the child's age, foster learning and strengthen parent-child relationships, make use of device restrictions and monitoring tools, model healthy screen behaviours, restrict device usage in bedrooms and during mealtimes, and promote responsible decision-making concerning screen use.^[12] (Table 3)

Strategy	Description
Screen time limits	Establish age-appropriate daily limits
Content monitoring	Ensure media is educational and age-appropriate
Co-viewing/co-playing	Parents engage with children during screen use
Encouraging alternatives	Promote outdoor play and social activities
Parental controls	Use device-based restrictions and monitoring tools
Tech-free zones	Avoid screens in bedrooms and during meals
Role modelling	Parents demonstrate healthy screen habits

Table 3: Preventive Strategies to Reduce Harmful Effects of Screen Time

Recommendations for Healthy Screen Use:

The American Academy of Pediatrics (AAP) advises that children under 2 years should avoid media exposure entirely, while those aged 2 to 5 years should have their screen time limited to less than 1 hour per day. The AAP's Healthy Media Plan in Family highlights the crucial role of parental supervision. It encourages outdoor play and physical activity in accordance with age-appropriate screen time recommendations (for instance, the American Academy of Pediatrics suggests a maximum of 1 hour per day for young children), advocates for

regular breaks to alleviate eye strain, and promotes correct posture and ergonomic use of devices. (Table 4) Additionally, global guidelines from the World Health Organization stress the significance of adhering to similar limits. [13]

Recommendation	Guideline
Age-appropriate limits	≤1 hour/day for young children (AAP guidelines)
Physical activity	Encourage regular outdoor play
Breaks during screen use	Follow the 20–20–20 rule for eye health
Ergonomics	Maintain proper posture and screen positioning
Night-time screen use	Avoid screens at least 1 hour before bedtime

Table 4: Recommended healthy screen use by AAP

Benefits and Risk of Screen Time

The various advantages of screen time indicate that high-quality educational applications and interactive media can have a beneficial impact on literacy and numeracy, stimulate creativity, provide instructional resources, promote social interaction, and enhance communication and creative growth. When utilized correctly, technology can aid in achieving educational goals; however, it is crucial to implement regulation and supervision to ensure well-rounded development. The dangers of screen time are linked to excessive usage, which can lead to numerous risks affecting the physical, cognitive, emotional, and social growth of children and teenagers. Extended periods of screen exposure have been consistently correlated with diminished attention spans and lower concentration levels, which may hinder learning abilities and performance in the classroom. High levels of screen engagement, especially with rapid or non-educational content, can adversely affect executive functions such as working memory, self-regulation, and decision-making abilities. [14] (Table 5)

Aspect	Benefits (Controlled Use)	Risks (Excessive Use)
Learning	Improved literacy and numeracy	Poor academic performance
Social interaction	Digital communication opportunities	Reduced real-life social skills
Emotional development	Educational emotional content	Anxiety, depression
Physical health	Limited benefit	Obesity, sleep disorders

Table 5: Benefits and risk of screen time

CONCLUSION

Screen time can have both positive and negative effects on child development, influenced by its duration, content, and context of use. Excessive exposure to screens is linked to various physical health issues, including headaches, eye strain, musculoskeletal pain, sleep deprivation, and decreased physical fitness, along with mental health challenges such as anxiety, depression, and low self-esteem. Using screens at night can worsen sleep problems and emotional challenges. Recent studies also indicate that mobile phone exposure may adversely affect male reproductive health. To foster optimal physical, cognitive, and emotional growth in children and adolescents, it is crucial to raise awareness, follow

screen time guidelines, and encourage balanced digital habits.

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