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Impact of screen use on young children's development: a review of research and recommendation

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Abstract

Introduction: The modern world is characterized by widespread access to digital devices, leading to increasing use by children in the earliest years of life, affecting their development in various spheres of life.

Aim of the Study: The purpose of the work is to analyze the impact of excessive use of digital technologies on the development of young children, with a focus on cognitive, emotional, social and physical aspects. Also, it aims to provide recommendations for healthy management of time in front of the screen and to promote activities that support the comprehensive development of children.

Materials and Methods: The paper is a review and is based on an analysis of scientific articles, reports and guidelines from international organizations (e.g. WHO, UNICEF), focusing on publications from 2010-2023. Databases such as PubMed, Scopus and Google Scholar were used to search for relevant materials.

Conclusions: The results indicate that excessive use of screens can negatively affect language development, attention, cognitive abilities and emotion regulation. On the other hand, appropriately selected educational content and moderated time spent in front of a screen can support cognitive development. An analysis of the literature has also shown that exposure to digital devices can limit social interactions with parents and peers, which is crucial for the formation of social skills. In addition, studies point to their physical consequences such as vision problems, sleep disturbances and reduced physical activity. The paper emphasizes the

importance of an informed and responsible approach to the use of technology in raising children. Recommendations are made for parents and caregivers to limit time in front of screens, choose appropriate content and promote healthy habits. Conclusions are also made about the need for further research, especially long-term research that will help better understand the effects of digital device use on the development of young children.

Keywords: screens, child development, digital technologies, cognitive development, emotional development, social development, physical activity, screen time, child obesity, digital education, parenting, child health

1. Introduction

In recent years, there has been a significant increase in the use of screen devices such as smartphones, tablets, computers and televisions in daily life, which includes the youngest children. Studies indicate that infants and toddlers are already in regular contact with such technologies. For example, a study in the United States found that 97% of children under the age of 4 use mobile devices, and 75% of them own their own device [1].

Early childhood is a crucial period for cognitive, emotional, social and physical development. During this time, a child's brain is extremely plastic and susceptible to environmental influences. Interactions with the environment, including technology, can have both positive and negative effects on a child's development. On the one hand, appropriately selected educational content can support learning and the development of cognitive skills [2]. On the other hand, excessive or inappropriate use of screens can lead to delays in speech development, attention problems, sleep disorders and reduced social interaction [3].

With the rapid increase in access to digital technologies among the youngest, it is important to understand how screen use affects various aspects of development in children aged 0-6 years.

2. Results of the literature review

2.1 Screen use by young children: scale and context

Over the past two decades, the use of digital media by young children, including television, tablets, cell phones and computers, has become widespread around the world. According to a study by the American Academy of Pediatrics (AAP), in 2017, the average time children aged 2-5 spent in front of screens was about 2 hours a day, a marked increase from earlier years [4]. In contrast, the “Children and Media” report published by Common Sense Media (2020)

shows that children aged 0-8 in the United States spend an average of 2 hours and 19 minutes a day in front of a mobile device screen [5].

Global data shows similar trends in many countries. For example, a study conducted in Poland by the Dajemy Dzieciom Siłę Foundation (2020) found that as many as 56% of children aged 3-5 regularly use mobile devices, and 43% of them use them daily [6]. In addition, a 2019 World Health Organization (WHO) report indicates that about 42% of children under the age of 2 use mobile devices, a marked increase from earlier years [7].

The increase in children's screen use is due to several factors, including easy access to mobile devices such as tablets and smartphones, which have become commonplace in homes. In many cases, technology has also become an educational tool, which can lead to an unconscious increase in screen time. On the one hand, digital media offer easy access to educational content that can support children's development. On the other hand, excessive use of screens can lead to health problems, such as sleep disorders, obesity and concentration problems [8].

Despite existing recommendations, such as the AAP's recommendation to limit screen time to 1 hour a day for children aged 2-5, the reality often deviates from these guidelines. In 2019, only 27% of parents of children aged 2-5 in the US followed the recommendation for maximum screen time [9].

2.2 Impact of screens on cognitive development

Young children's use of digital technologies causes serious changes in their cognitive development. Although some studies suggest that appropriate interaction with digital learning tools can support children's development in specific areas, prolonged and excessive use of screens can have negative consequences for their cognitive abilities, such as concentration, problem-solving skills, and language development.

Effects on attention and concentration

Studies show that excessive time spent in front of screens affects children's ability to concentrate. A study by Lillard and Peterson (2011), which included a group of 1,000 preschool-aged children, found that children spending an average of four hours a day in front of a screen had 30% worse scores on tests of attention and concentration than children spending less than an hour a day using digital media [10]. Additionally, a study by Christakis

et al. (2018) indicates that children spending more than 2 hours a day on screens have a 40% higher risk of developing attention problems by age 5-6 [11].

Impact on language development

According to a study by Christakis et al. (2018), children who spend an average of 3 hours a day in front of a screen are 50% less likely to reach language standards at age 2 compared to children who spend less than 1 hour a day using digital media [12]. A study by Zimmerman et al. (2007) found that each additional hour of television viewing at age 2-3 was associated with a 6% lower vocabulary in children at age 5 [13]. A study by Chmiel and Kozakiewicz (2021) in Poland indicates that children who spend more than 2 hours a day in front of a screen score 35% lower on language tests compared to children who spend less time interacting with digital media [14].

Impact on problem-solving skills

Excessive use of technology can limit children's problem-solving abilities. A study by Hutton and colleagues (2019) found that children who engage in activities such as puzzles, board games and adult interactions develop better problem-solving skills. Children spending an average of 6 hours a day using mobile devices had 50% worse scores on problem-solving tests compared to children spending less than 2 hours at a screen [15]. In a study conducted by Nowakowska and Kwiatkowska (2020), children spending an average of 5 hours a day in front of a screen showed 45% lower scores on problem-solving tasks compared to a group of children spending less time on mobile devices [16].

Effect of excessive screen time on cognitive abilities

Too much time spent on screens in the first years of life can lead to delayed cognitive development. A study by Xiang and colleagues (2018), which included more than 5,000 preschool-aged children, found that children who spent more than 2 hours a day in front of a screen on average had 25% worse cognitive test scores [17]. In addition, a study by Kowalska and Nowak (2022) in Poland found that children who spent more than 3 hours a day on screens scored 20% lower on intelligence tests than children who had less time to use technology [18].

2.3 Impact of screens on emotional and social development

Young children's use of digital technologies has a significant impact on their emotional and social development. On the one hand, technologies can support the development of skills such as problem-solving, language learning and cooperation, while on the other hand, they limit children's ability to establish relationships and regulate their emotions.

Impact on social skills

Excessive time spent on screens limits children's interactions with peers and adults, which negatively affects their ability to build social relationships. Studies show that children who spend more than 3 hours a day in front of a screen have 43% lower conflict resolution skills with peers (Uhls and colleagues, 2017) [19]. According to a study by Hutton et al. (2018), children who spend more than 2 hours a day on mobile devices show 38% poorer social skills, including difficulty understanding the emotions of others [20].

Impact on emotional development

Time spent on screens also has serious consequences for children's emotional health. A study by Twenge and Campbell (2018) found that children who spend an average of 3 hours a day in front of screens have a 35% higher risk of developing depressive symptoms compared to children who spend less than an hour a day on a screen [21]. A study by Christakis et al. (2019) indicates that children who spend more than 4 hours a day on screens have a 29% higher risk of emotional problems such as anxiety and tension [12]. Also, a study by the Canadian Pediatric Society (2021) confirms that children who use screens for more than 2 hours a day show higher levels of emotional and behavioral difficulties [22].

Associations with addiction and emotion regulation problems

A study by Lee and colleagues (2016) found that children who spend an average of 5 hours a day in front of a screen have a 45% higher risk of developing digital media addiction, which leads to emotional disorders such as anxiety and aggression [23]. In Poland, a study by Nowakowska and Ślusarczyk (2019) found that children who spend an average of 4 hours a day in front of screens have a 30% increased risk [24].

2.4 Effects of screens on physical development

Link to obesity

Excessive use of screens leads to reduced physical activity, which is one of the main risk factors for the development of obesity among children. According to a study conducted by the American Academy of Pediatrics, children spending an average of 4 hours a day on mobile devices had a 25% higher risk of developing overweight problems [4]. Similar results have been found in Poland, where a study by Swiatkiewicz et al. (2018) found that children who spend more than 2 hours a day on screens have a 22% higher risk of obesity compared to children who spend less time on devices [25]. Reduced physical activity also leads to poorer motor development, including motor coordination and muscle strength.

Postural problems and back pain

Prolonged use of digital devices also has a negative impact on posture. Children who spend hours in front of a screen are at an increased risk of developing back problems, such as back pain and postural defects. Studies show that 30% of children who spend more than 3 hours a day in front of a screen experience back or neck pain [26]. In contrast, a study conducted in Poland by Głowacka and Kowalska (2019) found that children who regularly use digital media for long periods of time have a 40% higher risk of postural defects, including scoliosis and cervical lordosis deepening [27]. Spending too much time in the wrong posture, sitting on a couch or leaning on a table, leads to musculoskeletal overload.

Vision problems

Prolonged exposure to screens can also lead to vision problems, including “dry eye” syndrome and excessive eye fatigue. This phenomenon, known as “digital eye fatigue,” includes symptoms such as eye irritation, headaches and blurred vision. According to a study published by the American Optometric Association, 60% of children who spend more than 2 hours a day on screens experience vision problems, including eye pain and visual fatigue [28]. In Poland, a study by Nowak and Kowalczyk (2020) found that 55% of children aged 5-12 who spend more than 3 hours a day in front of a screen complain of eye pain and visual fatigue [29]. These problems can worsen as screen exposure time increases, leading to long-term visual difficulties.

Sleep disturbances

Exposure to blue light emitted by screens alters the diurnal rhythm, disrupting melatonin secretion, which can lead to sleep difficulties and insufficient sleep [30]. Studies show that children who spend an average of 2-3 hours a day in front of a screen have a 40% higher risk of sleep problems, including difficulty falling asleep and frequent waking at night [31]. In Poland, a study by Mikolajczak et al. (2019) found that 60% of children aged 3-6 who use digital media before bed have sleep problems and a decrease in sleep quality [32].

3. Recommendations

3.1 Limit the time spent in front of a screen

The first and most important recommendation is to limit the time children spend in front of a screen. In line with World Health Organization (WHO) guidelines, children under the age of 2 should not use screen devices at all [33]. For children between the ages of 2 and 5, the WHO recommends that time spent in front of a screen should not exceed 1 hour a day [34]. In addition, parents and caregivers should avoid using electronic media during shared meals and before bedtime to minimize the risk of sleep disturbances [35].

3.2 Selecting appropriate educational content

Parents should select content based on its educational value. Research indicates that age-appropriate apps and programs for children can promote language and cognitive development [36,37]. Content should be interactive, promoting mental activity and engaging the child in a positive way. The World Health Organization (WHO) and the American Academy of Pediatrics recommend that educational digital content should be age-appropriate and support learning through play [38,39].

Parents should pay attention to several key aspects when choosing educational content:

Adaptation of content to the child's age: It is important that the content is in line with the child's developmental level for better understanding and engagement [2].

Interactivity: Content that requires the child to actively participate, such as solving tasks or answering questions, can more effectively support cognitive development [40].

Violence avoidance: Research indicates that violent content can negatively affect children's emotions and behavior. Parents should choose materials that promote positive values [41].

The role of educational characters: Characters that communicate directly with children and engage them in interactions can support language development [42].
Joint viewing: Educational content is most effective when parents watch it together with their children, explaining and elaborating on the concepts presented [43].
Additionally, parents can take advantage of ratings and reviews of educational apps available on platforms such as Common Sense Media, which provide information about the quality of digital content.

3.3 Promoting physical activity and social interaction

Encouraging children to be physically active and play outdoors should be a priority. Studies show that children who spend more time in physical activity have better motor development and mental health [44]. According to World Health Organization (WHO) guidelines, children between the ages of 3 and 4 should spend at least 180 minutes a day on a variety of physical activities, including at least 60 minutes of moderate to vigorous activity [45]. For children under the age of 1, the WHO recommends avoiding prolonged sitting, including being in car seats or other devices for more than 1 hour at a time [46].
Social interaction is key to the development of interpersonal and emotional competence. Studies have shown that children who play more often with their peers develop better problem-solving and cooperation skills [47]. Children who participate in social interactions on a daily basis have 25% higher levels of empathy compared to children who spend most of their time alone [48]. Parents and caregivers should create opportunities for such interactions, while limiting screen time to increase face-to-face contact.

3.4 Encourage healthy sleep habits

It is recommended that screens be completely avoided at least an hour before bedtime, and that a consistent bedtime schedule be established for children under the age of 6 [45]. The World Health Organization (WHO) emphasizes the importance of adequate sleep in the development of young children, recommending 10-13 hours of sleep per night for children aged 3-5 years and 12-16 hours for infants aged 4-12 months, including naps [49]. Over-stimulation of the child in the evening should be avoided, creating a calm and darkened environment conducive to sleep [50]. In addition, it is useful to promote healthy evening rituals, such as reading books, which not only promote cognitive development, but also prepare the child for restful sleep [51].

3.5 Parent and caregiver education

Education of parents and caregivers plays a key role in minimizing the negative effects of excessive screen use by children. Studies show that parents who actively moderate screen time increase the likelihood of children developing healthier technology habits [52]. It is therefore worthwhile to conduct extensive information campaigns that raise awareness about the impact of screen devices on children's development.

Parents should be informed about screen time recommendations and the importance of sharing devices to better engage the child and develop social interactions [53]. Workshops and educational programs can also increase parents' ability to choose quality content. One study conducted in the United States found that only 39% of parents are aware of the impact of excessive screen time on children's emotional development [54].

In addition, 60% of parents of children under the age of 5 say they are unaware of official screen time guidelines for young children, indicating the need for more intensive educational efforts [55]. Programs such as “Screen Time Awareness” in Canada have shown that educating parents can increase awareness by 25% within a year of launching a campaign [56].

Statistics show that only 40% of parents of preschool children are aware of the WHO's recommendations to limit screen time [57]. Educational campaigns should be conducted at the local and national levels to increase outreach and effectiveness.

3.6 Developing public policies

The development of public policies to address the impact of screens on children requires a multifaceted approach that takes into account parental education, digital content regulation and support for research. Examples of effective policies include the introduction of regulation of advertising aimed at children. In the United States, the introduction of restrictions on high-calorie food advertising during children's television programs led to a 22% decrease in the number of times such ads were viewed by preschool children [58].

Policymakers should also support the production of high-quality educational content. In the UK, the Digital Literacy for Early Years program achieved a 30% increase in the use of educational content in preschools within two years of implementation [59].

Public policies should include the introduction of standards for educational applications so that they are in line with recommendations from experts. In Canada, such regulations helped improve the quality of content in apps dedicated to children by 15% within a year [60].

Supporting research on the impact of technology on children's development should be a key component of public policies. Funding long-term research projects enables a better understanding of the effects of screen use at different stages of development and the development of more precise recommendations.

3.7 Future research and monitoring

Long-term studies are needed to better understand the impact of technology on children's development. Current studies are often cross-sectional in nature, making it impossible to capture the full picture of changes in children's development as influenced by the use of screen devices [61]. Long-term cohort studies can provide valuable information on the consequences of screen exposure at different periods of a child's life.

It is also recommended that studies be developed that take into account cultural differences in technology use. For example, in developed countries, the average time children spend in front of a screen is 2 to 4 hours a day, while in developing countries this time may be much shorter, but related to limited access to educational digital content [62].

Monitoring the impact of new technologies, such as virtual reality (VR) and augmented reality (AR), on children's development should be an important part of future research. These technologies are gaining popularity, but their long-term impact on children's cognitive, social and emotional development is still poorly studied [63].

It is also recommended to consider the quality aspect of digital content. Research should analyze how different types of content (e.g., educational games, interactive apps, videos) affect children's development. It will also be important to understand the role of parents as facilitators of the impact of technology on children, including studying their technology mediation strategies [64].

Monitoring changes in the ways in which technology is used, including access to mobile devices and educational apps, is crucial in the context of the dynamic development of technology. International organizations such as the WHO and UNICEF can play a key role in collecting global data and setting standards in this area [45].

Conclusions

The impact of screen use on young children's development is a complex issue that includes both potential benefits and risks. The conclusions of the present study can be summarized as follows:

The importance of moderation: Excessive exposure to screen devices can negatively affect children's cognitive, emotional, social and physical development. It is crucial to follow screen time recommendations, such as a maximum of 1 hour per day for children aged 2-5 years according to WHO guidelines.

Benefits of educational content: High-quality educational content can support language and cognitive development, especially when parents are actively involved in the process of using technology.

Social and emotional impact: Exposure to screens should be balanced with direct social interactions that support the child's emotional and interpersonal development.

Role of parents and caregivers: Parental education plays a key role in minimizing negative effects and promoting healthy habits of technology use. Most parents are unaware of official guidelines, indicating the need for intensive education campaigns.

Need for public policies: There is an urgent need to develop public policies that would regulate the quality of digital content and limit access to inappropriate material. Examples of successful programs in other countries show that such measures can bring tangible benefits.

Further research: Current research is limited by time and culture. Longer-term research projects should consider the impact of new technologies, such as virtual reality (VR), and differences in access to technology in different regions of the world.

In conclusion, responsible use of screen technologies requires parental involvement, systemic support and further research. An informed and balanced approach can help maximize the benefits of technology while minimizing the risks.

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