

Long-Term Effects Of Gadget Use On Children's Health

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ABSTRACT

Excessive use of gadgets in children has become an increasingly worrying issue in the digital era, especially because of its impact on physical, mental, and social health. Physically, excessive screen exposure can cause sleep disorders, progressive myopia, digital eye strain, and increase the risk of obesity due to a sedentary lifestyle. In addition, poor posture during gadget use contributes to musculoskeletal disorders such as neck and back pain. Mentally and socially, gadget dependence is associated with increased anxiety, depression, and attention disorders due to reduced direct social interaction and exposure to inappropriate digital content. The phenomenon of cyberbullying and social comparison in digital media can also lower children's self-esteem. To overcome these negative impacts, parental supervision and stricter regulation of gadget use are needed. Strategies such as limiting screen time, creating gadget-free areas, and encouraging alternative activities are important steps in balancing the use of technology. On the other hand, if used wisely, gadgets can be an effective learning tool. Therefore, a balanced and collaborative approach between families, schools, and governments is needed so that children can take advantage of technology without sacrificing their health and well-being.

Keywords: Gadgets, Children's Health, Mental Health, Regulation, Digital Education

INTRODUCTION

In the digital era, the use of gadgets by children has increased significantly, both for educational and entertainment purposes. Based on the Common Sense Media report (2021) in Rideout (2021), children aged 8-12 years spend an average of 5 hours a day in front of the screen, while teenagers can spend more than 7 hours. This phenomenon raises concerns regarding the shift in children's activity patterns, where time for playing outdoors, interacting directly with peers, and doing physical activities is decreasing. According to Al Sagr (2020), a sedentary lifestyle triggered by excessive gadget use can increase the risk of obesity and various other health problems, such as sleep disorders and decreased immunity.

In addition to the impact on physical health, high screen exposure also affects children's social and cognitive development. A study conducted by Nuzulah & Thoriquussud (2024) showed that children who spend too much time with gadgets tend to experience delays in communication and social skills due to lack of direct interaction with the surrounding environment. In addition, research from Hanipudin et al (2023) revealed that excessive exposure to digital content

can contribute to an increased risk of attention disorders and mental disorders such as anxiety and depression in children. Therefore, strict supervision from parents and better regulations are needed in managing gadget use so that the negative impacts can be minimized without ignoring the benefits of technology in child development.

In addition to the physical health risks mentioned, exposure to blue light from gadget screens is also associated with circadian rhythm disorders that affect children's sleep quality. A study published in Suri et al (2024) found that children who were exposed to gadget screens before bed experienced decreased production of melatonin, a hormone that regulates the sleep cycle. As a result, they are more susceptible to sleep disorders such as insomnia and restless sleep, which can ultimately affect their concentration and academic performance. Lack of quality sleep also contributes to an increased risk of obesity, as metabolic disorders caused by lack of sleep can trigger an imbalance in hormones that regulate appetite.

Furthermore, poor posture due to prolonged gadget use is a serious concern. According to research published in Imam et al (2024), children who frequently use gadgets in a hunched position are at greater risk of experiencing text neck syndrome – a condition in which the neck and spine muscles experience excessive pressure due to the habit of looking down for too long. This condition not only causes chronic pain in the neck and back, but can also interfere with the development of children's posture in the long term. Therefore, interventions such as limiting gadget use time, ergonomic settings when using digital devices, and increasing physical activity are very important to reduce these negative impacts. Stricter regulations and education for parents about the importance of balance in the use of technology are crucial steps in maintaining children's health in the digital era.

In addition to impacting physical health, excessive gadget use is also associated with an increased risk of mental health disorders in children. A study published by Aulia et al (2024) showed that children who spend more than three hours per day in front of screens are more likely to experience symptoms of depression and anxiety than those who use gadgets less often. One of the main factors contributing to this phenomenon is the reduction in direct social interaction, which is an important aspect of a child's emotional development. When children communicate more through digital devices than face-to-face, their social skills can be hampered, such as difficulty reading facial expressions, understanding other people's emotions, and building healthy interpersonal relationships. In addition, exposure to inappropriate content, such as cyberbullying and social comparison on digital media, further worsens the child's mental condition. Social media algorithms often encourage children to continue comparing themselves to unrealistic standards, which can ultimately reduce self-confidence and increase the risk of social anxiety disorders.

Furthermore, gadget addiction can also change children's behavioral patterns, including increasing impulsivity and decreasing self-regulation abilities. According to research published in Dwinata (2025), uncontrolled gadget

use can damage neural connections in the part of the brain that plays a role in self-control and emotional processing, such as the prefrontal cortex. As a result, children who are accustomed to getting instant gratification from using gadgets tend to have difficulty managing frustration and delaying gratification. This has implications for increased aggressive behavior, being easily provoked, and reduced resilience to situations that require patience and perseverance. In addition, exposure to content containing elements of violence or antisocial behavior can further worsen children's behavioral patterns, making them more vulnerable to aggressive actions or ignoring social norms in everyday life. Therefore, a holistic approach is needed that involves families, schools, and communities in educating and controlling gadget use so that children can use technology healthily and responsibly without sacrificing their mental health and social balance.

To overcome the negative impacts of excessive gadget use, a comprehensive supervision strategy is needed, both from the family, educational institutions, and the government. Parents have a major role in guiding children to use technology wisely by setting time limits for gadget use and ensuring that the content consumed is appropriate for their age. According to a report from Shafa et al (2025), children aged 2-5 years should not spend more than one hour per day in front of the screen, while children over 6 years old need to be taught to balance gadget use time with physical activity, social interaction, and sufficient rest time. However, many parents have difficulty implementing this rule due to a lack of understanding of the long-term impacts of digital technology and the challenges of supervising gadget use in an era where these devices have become an inseparable part of everyday life. Therefore, education and support are needed for parents in building healthy parenting patterns in the digital era, including by utilizing parental control features, implementing screen-free zones rules at home, and providing examples of responsible technology use.

In addition to the role of the family, regulations from the government and educational institutions are also key factors in controlling the negative impacts of technology on children. Several countries have implemented strict policies regarding the use of gadgets in school environments, such as France which prohibits the use of mobile phones in elementary and secondary schools to reduce distractions and increase social interaction between students. In Indonesia, this kind of regulation still needs to be strengthened with more specific policies, such as setting gadget usage hours in schools, developing a digital literacy curriculum, and cooperation between schools and parents in supervising children's use of technology. In addition, the technology industry also has a responsibility to ensure children's safety in the digital world, for example by tightening privacy policies, limiting children's access to dangerous content, and developing features that encourage healthy and productive gadget use. With synergy between families, schools, the government, and the technology industry, it is hoped that children's use of gadgets can be more controlled so that they can enjoy the benefits of technology without having to face long-term physical and mental health risks..

METHOD

This study uses a qualitative approach with a literature review method to analyze the long-term impact of gadget use on children's health. Literature studies were chosen because they allow identification, evaluation, and synthesis of various relevant previous studies. Data were collected from scientific journals, books, and reports from international health organizations such as WHO and AAP, with priority on research in the last five years to ensure the relevance and recency of the information.

Data analysis was conducted using a thematic approach, grouping literature based on its impact on physical health (visual impairment, obesity, posture) and mental health (anxiety, depression, attention deficit). To ensure validity, the study only used peer-reviewed academic sources and triangulated data to compare the results of various studies. Thus, this study provides an in-depth, evidence-based understanding of the implications of gadget use on children's health as well as recommendations for parenting policies and practices in the digital era.

RESULTS AND DISCUSSION

Long-Term Impact of Gadget Use on Children's Health

1. Physical Impact of Gadget Use on Children

Excessive use of gadgets in children has significant physical impacts, especially related to sleep patterns, eye health, posture, and physical activity levels. Exposure to blue light from gadget screens can inhibit the production of melatonin, a hormone that plays a role in regulating the sleep cycle. A study published by Zahro & Asih (2024) showed that children exposed to blue light before bed experienced a delay in melatonin release of up to 90 minutes, resulting in disruption of the circadian rhythm. As a result, they are more prone to difficulty sleeping, sleep for shorter durations, and experience impaired sleep quality. Another study by Bee & Pudjiati (2023) also found that children who use gadgets more than two hours before bed have a 2.5 times higher risk of experiencing sleep disorders compared to children who are not exposed to screens before bed. This condition has an impact on daytime fatigue, decreased concentration, and increases the risk of behavioral disorders due to lack of sleep, such as hyperactivity and difficulty in managing emotions.

In addition to sleep disturbances, prolonged screen use also increases the risk of digital eye strain, which is characterized by eye strain, dry eyes, blurred vision, and headaches. According to research by Jauhary et al (2023), children who stare at screens for more than three hours per day experience a 40% increase in eye fatigue compared to those who limit their screen time. The lack of blinking frequency while staring at the screen also worsens this condition, causing an imbalance in tear production and increasing the risk of dry eye syndrome. In the long term, this condition can trigger refractive disorders such as progressive myopia, which is currently a global problem with an increasing prevalence.

In addition to the impact on eye health, the habit of using gadgets in an unergonomic position also causes postural disorders. Children who often look down for long periods of time are at risk of experiencing text neck syndrome, which is neck pain due to excessive pressure on the upper spine. A study in the *Journal of Physical Therapy Science* (2021) revealed that pressure on the cervical spine increases by up to 27 kg when someone lowers their head 60 degrees, which often occurs when using gadgets in an unergonomic sitting position. In addition, poor sitting posture can also trigger back and shoulder pain, as well as increase the risk of mild scoliosis and other musculoskeletal disorders. Children in their growing years who are accustomed to using gadgets with poor posture are also more susceptible to developmental disorders of the spinal structure, which has the potential to affect their mobility and balance in adulthood.

In addition, excessive use of gadgets often replaces physical activity, leading to a more sedentary lifestyle. Children who spend more time in front of screens tend to experience higher body mass index (BMI), which increases the risk of obesity and metabolic disorders such as insulin resistance. A study published by Dampati et al (2020) found that children who spent more than four hours per day with gadgets had a 33% increased risk of obesity compared to those who only used them for one hour or less. This lack of physical activity also contributes to decreased muscle mass and cardiovascular disorders, which can have long-term health impacts. In addition, research from Hegde et al (2019) showed that children with a sedentary lifestyle due to excessive gadget use had a two-fold higher risk of developing metabolic syndrome compared to children who were physically active.

Therefore, to reduce these negative impacts, it is important for parents to supervise their children's gadget use and implement healthy habits, such as limiting screen time, ensuring ergonomic sitting positions, and encouraging children to be more physically active. The American Academy of Pediatrics (AAP) recommends that children under the age of six do not use screens for more than one hour per day, while for school-age children, gadget use time should not exceed two hours per day. In addition, it is recommended to take a break every 20 minutes to reduce eye strain and regulate better posture when using gadgets. With these steps, the risk of health problems due to excessive gadget use can be minimized, so that children can grow and develop optimally.

2. Mental and Social Impacts of Gadget Addiction

Gadget dependence in children not only affects their physical health, but also significantly affects their mental and social conditions. A study in *JAMA Pediatrics* (2019) showed that children who spend more than three hours per day in front of the screen are more susceptible to anxiety, depression, and attention disorders. This is reinforced by the findings of Putri (2021), which revealed that excessive use of digital media can reduce children's psychological well-being, especially due to reduced time for physical activity, direct social interaction, and quality sleep. Lack of interaction with the surrounding environment causes children to feel lonely and isolated more often, which in the long term can

increase the risk of mental disorders. In addition, exposure to negative content on social media, such as hate speech, hoaxes, and unrealistic standards of beauty or success, contributes to decreased self-esteem and feelings of dissatisfaction with themselves (Ismail et al., 2024). Repeated exposure to these things can worsen children's psychological conditions and increase the levels of stress they experience.

From a social perspective, dependence on digital interactions hinders the development of children's communication and interpersonal skills. A study conducted by Downey & Gibbs (2020) found that children who spend more time with digital devices than with face-to-face interactions experience a decline in their ability to recognize facial expressions and understand the emotions of others. This is because digital communication based on text and images often does not provide the same social experience as direct conversation, so children are not trained to pick up on nonverbal cues, such as tone of voice and body language. As a result, they find it more difficult to build healthy interpersonal relationships and tend to have difficulty adapting to the social environment. In addition, research from Widowati & Syafiq, (2022) highlights that the increasing use of social media also increases the risk of children experiencing cyberbullying, which can have serious impacts on their psychological well-being. Cyberbullying not only causes stress and anxiety, but is also associated with an increased risk of depression and even suicidal thoughts.

In addition to cyberbullying, social media also encourages the phenomenon of unhealthy social comparison, which can contribute to self-dissatisfaction. In the context of social media, children are often exposed to lives that are perfectly curated by others, which can create the illusion that their lives are less interesting or not good enough. A study conducted by Astriana et al (2024) in the *Personality and Social Psychology Bulletin* found that the more often someone compares themselves to others on social media, the lower their self-esteem levels. Children who do not yet have a critical understanding of digital content are more susceptible to being influenced by this social comparison, which can ultimately impact their mental health.

To overcome these negative impacts, the role of parents and educators is crucial in supervising and regulating gadget usage patterns in children. The American Academy of Pediatrics (AAP) recommends that children aged 6 to 12 years be limited to no more than 1–2 hours per day with parental supervision, while children under 6 years should only be allowed to use digital devices with supervision and for shorter durations (Ulfah, 2020). In addition, it is important for parents to encourage children to be more active in real-world social activities, such as playing outside, reading books, or participating in group activities. A study by Graciyal & Viswam (2021) in *Psychological Science* shows that a balance between technology use and real-world social activities contributes to better emotional well-being. In addition, education about the impacts of digital media and strengthening critical thinking skills can help children understand the risks in the digital world and avoid possible negative impacts.

Building open communication with children is also an important step in helping them face the challenges of the digital age. Parents and educators need to create a supportive environment so that children feel comfortable sharing experiences and getting the right guidance regarding the use of technology. With a wise and evidence-based approach, children can use technology in a healthy and productive way without sacrificing their mental and social development.

Strategy for Controlling and Regulating Gadget Use in Children

1. The Role of Parents in Controlling Gadget Use

Parents play a major role in shaping healthy and balanced digital habits in children. Children tend to imitate their parents' behavior, so it is important for parents to be role models in the wise use of technology. A study by Hidayatuladkia et al (2021) shows that patterns of technology use in families greatly influence how children interact with digital devices. In this context, excessive use of gadgets can have a negative impact on children's development, especially in cognitive, emotional, and social aspects. One of the main steps that can be taken is to set limits on gadget use time according to the recommendations of the American Academy of Pediatrics (AAP, 2016), which is no more than one hour per day for children under six years of age. Nuraida (2023) found that excessive use of gadgets in children contributes to an increased risk of emotional disorders, anxiety, and depression. Furthermore, research by Fajrin et al (2024) states that the relationship between the duration of gadget use and children's well-being is curvilinear, where moderate use can provide educational benefits, but excessive use has the potential to harm psychological well-being. Therefore, it is important for parents to limit screen time proportionally and ensure that children maintain a balance between digital activities and physical activities in the real world.

In addition to time limits, implementing screen-free zones in certain rooms, such as bedrooms and dining rooms, can also help reduce children's dependence on gadgets. Setiadi et al (2024) found that children who have limited access to digital devices in the bedroom tend to have better sleep quality compared to those who often use gadgets before bed. This is because exposure to blue light from screens can inhibit the production of melatonin, a hormone that regulates the sleep cycle, causing sleep disorders and increasing the risk of fatigue in children (Andas et al., 2024). In addition, social interaction within the family can be reduced if gadgets are used in spaces that should be places for communication. Amalia et al (2025) noted that families who implement a gadget-free policy in the dining room show closer relationship quality compared to families who do not have similar rules.

In addition to setting rules, parents should also model responsible technology use. A study by Rawanita & Mardhiah (2024) showed that children who see their parents frequently using gadgets during social interactions tend to show a higher dependence on digital devices. Children learn by observing and imitating the behavior of those around them. If parents demonstrate healthy

digital habits, such as limiting cellphone use when interacting with family, then children will also be more likely to follow suit. Avoiding gadget use when talking to children can show that direct communication is prioritized over digital interactions. Implementing habits such as not using cellphones during play sessions or during family dinners will help children understand the importance of real-world social relationships.

To further reduce dependence on gadgets, parents can also encourage various alternative activities that are beneficial for children's development, such as reading books, playing outdoors, or being creative with arts and crafts. Fikri (2023) found that children who read books more often have better cognitive development, literacy, and language skills than those who spend more time with gadgets. In addition, outdoor physical activity also has significant benefits. Playing outdoors can help improve physical health, reduce the risk of obesity, and support children's social development through interaction with peers. Free play outdoors plays an important role in increasing children's creativity, problem-solving skills, and mental resilience. Therefore, parents should provide an environment that supports various forms of non-digital activities, such as reading books together, encouraging participation in sports, or doing creative projects involving arts and crafts.

By implementing sensible time limits, creating screen-free areas, modeling healthy technology use, and encouraging alternative activities, parents can help their children develop a healthy balance between the digital world and real life. This approach not only reduces the risk of gadget addiction but also supports children's cognitive, emotional, and social growth. With increasing research highlighting the negative impacts of excessive gadget use, it is important for parents to actively monitor, guide, and guide their children in using technology responsibly and productively.

2. Making Gadgets a Positive Learning Tool

The use of gadgets as a positive learning tool has become a concern in various studies in the fields of education and technology. Several studies have shown that the use of digital technology in learning can increase student engagement and learning effectiveness. According to research conducted by Ardiansyah & Nana (2020), the use of mobile learning-based technology can significantly improve students' understanding of concepts and learning motivation. This is in line with the constructivism theory put forward by Piaget and Vygotsky, where learning that involves active exploration through digital media can improve information processing and accelerate the understanding of abstract concepts. Educational applications and interactive learning videos allow children to learn in a more fun and adaptive way, while educational games help train problem solving, strategic thinking, and other cognitive skills.

In addition, gadgets provide extensive access to various learning resources, allowing children to gain information from various global perspectives. Technology-based learning allows for broader communication and collaboration, increasing interaction between students and digital learning

resources. However, the effectiveness of gadgets in learning depends on several key factors. Selecting appropriate content is crucial, considering that not all applications or videos labeled “educational” have quality learning value. A study by Afdalia & Gani (2023) emphasized that digital content designed with the principles of interactivity, social engagement, and rich feedback is more effective in improving learning outcomes compared to passive content. Therefore, supervision from parents and educators is crucial in ensuring that children access truly useful materials.

In addition, time limits for gadget use must also be considered. The American Academy of Pediatrics recommends that children should not spend more than two hours a day on screen-based activities unrelated to schoolwork. Excessive gadget use can cause attention disorders, irregular sleep patterns, and reduce children's social interactions with their surroundings. Therefore, it is important for parents and educators to establish a balanced gadget use policy, combining digital learning activities with conventional learning methods, such as reading printed books, group discussions, and hands-on experiments.

Furthermore, the effectiveness of gadgets in learning will increase if used in methods that involve interaction and active participation. According to Bandura's (1986) social learning theory, children learn more effectively when they are involved in activities that involve interaction with others, either through virtual discussions, interactive quizzes, or project-based tasks. In this context, technology can be used to enhance the learning experience by providing an environment that supports active student exploration and engagement. For example, gamification-based learning platforms, such as Kahoot! and Duolingo, have been shown to increase learning motivation by providing immediate feedback and interesting challenges.

Therefore, the use of gadgets as a positive learning tool requires the right strategy so that its benefits can be felt optimally. With the selection of content based on scientific evidence, clear time limits, and guidance from parents and teachers, gadgets can be an effective means of increasing children's creativity, insight, and thinking skills. Integration between technology and conventional learning methods is the main key to creating a balanced and meaningful learning experience, allowing children to thrive in the digital world without sacrificing their social skills and psychological well-being.

CONCLUSIONS

Excessive use of gadgets in children can have negative impacts on their physical, mental, and social health in the long term. Physically, excessive screen exposure can cause sleep disorders, digital eye strain, poor posture, and increase the risk of obesity and metabolic disorders. In addition, uncontrolled use of gadgets also contributes to an increase in progressive myopia and musculoskeletal disorders such as neck and back pain. Mentally and socially, dependence on gadgets can trigger anxiety, depression, and attention disorders due to reduced physical activity and direct social interaction. Uncontrolled

exposure to social media can also lower children's self-esteem through unhealthy social comparisons and increase the risk of cyberbullying. Therefore, the role of parents and educators is very important in supervising and limiting gadget use according to health recommendations. Strategies such as setting screen time limits, creating gadget-free areas, and encouraging alternative activities can help children maintain a balance between the digital world and the real world. On the other hand, gadgets can be useful learning tools if used with the right strategy, such as through educational applications and interactive learning platforms. The effectiveness of technology utilization in learning depends on the selection of quality content, parental supervision, and appropriate screen time restrictions. With a wise and balanced approach, children can benefit from technology without experiencing the negative impacts of excessive gadget use.

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