

Negative Effects of Digital Technology on Children's Health



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ABSTRACT: Digital technology is being used by kids and teenagers more and more as the world becomes more digital. Computers, smartphones, video games, and digital media are just a few examples of the many types of digital technology that can hold someone's interest for lengthy periods. People of all ages are harmed by the rise of digital technology, but children and teenagers are particularly vulnerable. Teenagers use digital tools to engage with one another and spend more time online. They use it for various purposes, including social connection, education, and entertainment, and they go there for just about anything. Overuse of technology can lead to several health problems, such as obesity, poor sleep, musculoskeletal disorders, developmental challenges, and a lack of physical activity. This article reviews the most recent research on the harmful effects of digital technology on children's health; papers released before 2015 are excluded. Research has indicated that children's improper use of technology, including its content, duration, frequency, and posture, can pose health hazards.

KEYWORDS: Negative, effects, Health, Technology, Child

1. INTRODUCTION

Digital technology encompasses devices like computers, tablets, and mobile phones, along with various activities that children engage in through these devices. These activities include using the internet, visiting social networking sites, chatting online, and playing video games[1]. Adolescents who utilize technology can benefit from virtual classes, wider social networks, and improved visual thinking, among other advantages. It also increases self-esteem, develops creativity, and enhances technical proficiency. Teenagers who use digital devices excessively, however, may experience health problems, privacy concerns, and changes in social norms[2]. Overuse of digital media can affect teenagers' mental health and general well-being[3]. Teenagers are finding it more and more challenging. Social media might be a new issue to consider, and practitioners need to be able to assess risk. Even though there isn't much concrete evidence to support this notion, teens, and experts have a big influence on how social media is viewed regarding mental health. Cyberbullying, privacy concerns, and detrimental effects on mental health and education are among the risks associated with this population's usage of social media [4]. Early studies emphasized how traditional media, like television and movies, can cause severe anxiety and disrupt sleep. More recent research has examined the interactive aspects of modern media, particularly social media, and how they affect depression and anxiety. Social anxiety brought on by avoiding face-to-face encounters, emotional control issues brought on by excessive digital media use, and anxiety and despair associated with unfavorable social comparisons are major areas of worry[5]. Furthermore, studies show that young children's excessive indoor internet use is predicted to have a detrimental effect on their long-term psychological development, physical and mental development, and general health [6]. Teenagers' lives have been impacted by digital technology in a variety of ways, both positively and negatively, depending on how they utilize it. Because most digital devices are easy to use, teens can use them on their own. To reduce the chance of behavioral and psychological issues, parents must make an effort to monitor, regulate, and restrict screen use. As they steadily acquire their digital literacy abilities, teenagers thus require greater parental guidance and assistance [7].

2. DIGITAL TECHNOLOGY TOOLS AND THEIR NEGATIVE EFFECTS

2.1 Computer

A computer has become an essential part of children's lives. Depending on the setting, several studies have indicated that computer use may have a favorable or harmful effect on children's development [8]According to Palmer (2015), children who use

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computers excessively may display lower levels of creativity, imagination, and language skills, as well as poor focus, lack of attention, and disorganization, all of which can have a detrimental effect on academic progress. A review of 1,657,064 people from 71 nations examined the negative health impacts of sedentary behavior. Results showed that lower self-esteem was associated with more computer use and screen time in general [9].

2.2 Smartphones and Tablets

Nowadays, teens spend the majority of their time using smartphones and screens [10]. According to research, over 50% of 3-year-olds possess a tablet, showing that most kids, even younger ones, have their own devices [11]. According to a recent Pew Research Center survey, the internet is used "almost constantly" by 45% of teenagers, and 95% of them claimed they have access to a smartphone [12]. Additionally, research revealed that the group with the highest smartphone use scores had better scores on daytime dysfunction, anxiety, and depression than the group with the lowest smartphone use [1]. Overuse negatively impacts sociability (social isolation, reduced in-person interactions), physical health (physical discomfort, lack of sleep, low activity), mental health (stress, negative emotions), and academic performance. To decrease smartphone use, participants proposed awareness campaigns, family and social event promotion, physical activity encouragement, and internet usage limits [13].

2.3 Video games

The rapid advancement of mobile technology, which has a significant impact on gaming apps, has caused many desktop functions to be transferred to mobile devices like iPads and smartphones. Mobile video games, designed to be played on devices with internet connectivity, have become more and more popular [14]. However, this rise in mobile gaming has also raised awareness of the negative effects of childhood addiction to mobile games, which can lead to serious harm and social issues [15]. A longitudinal study found a reciprocal relationship between Internet gaming addiction and depression, suggesting that past addiction and depression severity may predict the future severity of both issues. People commonly utilize online gaming as a coping mechanism for emotional distress; nevertheless, prolonged and excessive gaming can lead to disengagement from real-world social connections, which can worsen mental health conditions like depression [16]. According to another study, teens who were addicted to mobile gaming had increased degrees of loneliness, social anxiety, and sorrow, supporting the original theories about these relationships. It's intriguing to note that research has also demonstrated a gender difference in the association between social anxiety and mobile gaming addiction, with a greater correlation seen in male teenagers. This implies that compared to female adolescents, male teenagers may be more susceptible to social anxiety linked to compulsive mobile gaming [17]

2.4 Digital Media

Digital media includes video games, streaming platforms, social media, augmented reality (AR), and virtual reality (VR), which are widely used by teens for pleasure, education, and communication. Along with these usages, some teenagers also gamble online using social media, video games, websites, and smartphone apps [18]. While digital media can provide advantages including early learning chances, health information access, exposure to novel concepts, and increased social interaction, it can also pose problems. There are hazards such as exposure to damaging information, privacy issues, rising obesity and depression rates, and detrimental impacts on learning, sleep, and focus [19]. Also, recent research shows how media use can interfere with sleep, especially when it comes to social media and using mobile devices in bed. Research indicates that increased use of social media and electronics while sleeping raises the possibility of sleep disruptions [20] [21]. Media use at or near bedtime not only affects sleep quality but also negatively impacts school performance. Results from a different study indicated that compared to two hours or less, spending more than two hours on social media was linked to a greater likelihood of experiencing depression often. The risks of experiencing frequent depression were greater while not watching TV than when viewing it [22].

3. HEALTH RISKS OF DIGITAL TECHNOLOGY USAGE

3.1 Digital Technology Usage and EYE

Digital eye strain and computer vision syndrome are two health issues that are becoming more prevalent in kids as a result of their addiction to electronic devices and screens. This condition is because of focusing up close which is difficult and tiring to the eyes and causes dryness and headaches and eventually may lead to more near-sightedness. The following strategies can help prevent these vision issues: adjusting the screen's position from 0 to 15 degrees below eye level, wearing computer glasses, or using anti-glare screens; taking a 20-minute break from focusing on the screen to look at something at least 6 meters away for 20 seconds to help relax the eyes [23]. Asthenopia, often known as digital eye strain, is a subjective feeling of visual exhaustion, eye weakening, or eyestrain brought on by an almost age-related increase in the usage of digital gadgets. Asthenopia is caused by uncorrected refractive defects, accommodative dysfunction, extraocular muscle imbalance, and poor illumination. Patients experience redness, itching, headaches, double vision, blurred vision, overly wet eyes, and dry eye sense. A recent meta-analysis

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by Ichhujani (2019) found that 19.7% of children had asthenopia. Long-term computer screen staring causes severe accommodation and stresses on the extraocular muscles, which frequently result in asthenopia[24]. The severity of symptoms related to digital device use is influenced by reading distance. 30 to 40 cm from the eyes is the ideal focus distance for writing and reading. Digital eyestrain is facilitated by the fact that smaller electronic gadgets, such as cell phones, are typically held 20 to 30 centimeters away from the eyes. According to recent research by Long et al., reading for 60 minutes on a smartphone results in closer viewing distances and more eye strain symptoms [25]. Additionally, prolonged use of smartphones at near reading distances may contribute to the development of acute acquired comitant exotropia, an uncommon manifestation of exotropia in older children [25]. Moreover, excessive smartphone use at a close reading distance might influence the development of a condition called acute acquired comitant exotropia which is an unusual presentation of exotropia in older children. It can potentially be induced by an increased tonus of medial rectus muscles resulting from disrupted accommodation advergence by video Display work. In these cases, avoiding smartphone usage can decrease the amount of esodeviation leading to successful management of residual exotropia and restoration of binocularity[26]. Blue light or high-energy visible (HEV) light wavelengths are emitted by the majority of backlit digital panels. According to Tosini et al. (2016), there is evidence that blue light exposure can harm the eye over time, increasing the risk and severity of eye problems such as cataracts and age-related macular degeneration. Furthermore, prolonged smartphone use reduces blink rate, which accelerates the evaporation of the tear film and can result in dry eye illness [26] In the meantime, poor posture, postural changes, and musculoskeletal complaints cause excessive eye strain and back hunching, which in turn causes neck and back pain [1].

3.2 Digital Technology Usage and Sleep Quality

Delaying going to bed has been connected in several studies to poor academic performance, learning disabilities, and psychological issues[27]. Media usage may interfere with sleep quality through the increase of psychophysiological arousal caused by stimulating content watched, or through bright light exposure. Bright light may impact sleep by delaying the circadian rhythm when exposure takes place in the evening and also by causing an immediate activation in itself. Sleep may also be negatively impacted by electromagnetic radiation. Furthermore, screen use over two hours per day is significantly associated with long sleep onset latency, especially in children who use more devices at the same time compared with those using only one device[26]. The study by Brockmann, concludes that among children aged between 1 to 4 years old, the presence of a television in the bedroom is associated with significantly reduced sleep quality, sleep terrors, nightmares, and sleep talking[28] Yoshimura et al. have reported that the reduced viewing distance when lying down has a positive correlation to poorer quality sleep ($R^2=0.27P<0.05$), longer sleep latency ($R^2=0.35$, $P<0.05$) and lower sleep efficiency ($R^2=0.38$, $P<0.05$)[29]. In another study about one-fifth of participants, 19.3% (111) used their smartphones at bedtime with lights switched off. They also observed that as age increased, the use of smartphones at bedtime with lights switched off also increased. Studies have previously shown that this type of usage may lead to reduced sleep quality, potentially increasing the likelihood of experiencing other ocular pathologies later in life[28][26]. Udorie stated in her article that usage of social media during late night hours may harm the sense of well-being among adolescents which requires sleeping more than adults. Recent studies point out that adolescents should sleep 9.5 hours per night rather than 7.5 hours which is an average one. Furthermore, signs of being tired, irritable, and depressed can be seen as a result of inadequate sleep hours. Moreover, it causes people to become ill easily like catching colds, flu, and gastroenteritis. In light of all these facts, it is undeniable that people who use social media instead of sleeping at night time can be an open target for physical and mental diseases. If we do not be careful about the usage of social media for children, it may harm all of the kids. Children mean the future and we should take care of our future[30].

3.3 Digital Technology Usage and Critical Thinking

Critical thinking and intellectual outcomes include the ability to originate ideas, examine and evaluate arguments, solve problems using inductive and deductive reasoning, keep an open mind, be interested, be flexible, and be able to develop individuality.

Children's critical thinking abilities are influenced by computers and programs, but so are their learning capacity. This may have happened as a result of a reduction in reading [31]. However, under some circumstances, youngsters under the age of three can learn words through videos. In particular, when the experimenter, parent, or caregiver provides extra verbal and nonverbal information during the live-action sequences, youngsters can learn from the movie [32]. Children and teenagers today spend a lot of time using digital technology; thus, it may be seen as an essential part of their lives. Using digital media more frequently is linked to negative behavior and health outcomes [33]. Unfortunately, the majority of downloaded applications are not made with both parents and kids in mind; they solely focus on rote academic abilities and are not based on standards set by educators or developmental specialists. Excessive internet use has been shown to affect children's mental health and social ties. According to empirical research, kids who use the internet a lot are probably going to spend 100 minutes less with friends and family than kids who use it less. It has also been shown that these children are happier with their virtual internet buddies than with real individuals.

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As a result, many children would rather communicate with their online pals than with their real family [34]. About half of kids are frequently or sporadically distracted, per research by Yilmaz et al. (2015). Nearly half of the youngsters in the research had sleep abnormalities, slightly more than half had cognitive impairments, and around two-thirds had emotional issues. The findings show that the use of technology has a substantial effect on users' physical and emotional well-being. Being overly connected may have a detrimental impact on mental health, resulting in psychological problems including narcissism, sadness, and unreasonable needs for instant satisfaction.

4.4 Digital Technology Usage and Physical Inactivity

Children's usage of technology significantly predicts their lack of physical exercise. Overuse of cellphones, tablets, computers, and video games is positively connected with a lack of physical exercise, according to research by Kenney and Gortmaker (2017). Technology use disrupts children's everyday routines, which lowers their levels of physical activity, according to the World Health Organization. A major risk factor for increased mortality, physical inactivity is responsible for over 3.2 million deaths worldwide each year. To maintain a healthy body weight, improve sleep patterns, boost metabolism and immunological response, and stabilize blood pressure and glucose levels, frequent physical exercise is essential. The World Health Organization (WHO) states that a developing youngster should engage in moderate-to-intense physical exercise for at least one hour each day. If the daily activity surpasses 60 minutes, the advantage is greater [35]. Studies have indicated that youngsters who use technology extensively have considerably lower levels of physical exercise. In comparison to children who use their gadgets for more than six hours a week, children who use them for less than five hours are often more physically active. Higher technology use is also associated with electronic device ownership. Furthermore, the studied children's levels of physical activity are strongly predicted by variables including screen time, device ownership, parental educational attainment, and the child's age. Reducing screen time requires parental engagement because it can significantly affect a child's level of physical activity [36].

4.5 Digital Technology Usage and Obesity

Obesity is one of the most challenging public health problems that both industrialized and developing countries throughout the world must address. Numerous observational studies discovered links between increased obesity risks and screen media usage. It is believed that exposure to screen media causes childhood obesity, and obesity is a known side effect of screen media exposure [37].

Current statistics on childhood obesity collected by the World Health Organization Commission on ending childhood obesity reveal that the number of overweight or obese infants aged 0 to 5 years has increased from 32 million in 1990 to 41 million in 2016 [38]. WHO estimates that this number will increase to 60 million worldwide by 2035, and simply ensuring that our children consume a nutritious diet won't be enough to prevent this from occurring. Obesity is one of the most challenging public health problems that both industrialized and developing countries throughout the world must address. According to the survey's results [6], the more time a youngster spends in front of a screen each day, the greater their obesity. To explain the link between screen time and childhood obesity, earlier hypotheses were founded on the idea that children who spend excessive amounts of time on screens will be less physically active and hence acquire weight. While experimental studies on the effect of reducing screen time on measurable gains in physical activity did not yield conclusive results, epidemiologic research raises the possibility of considerably more complex causal links [39]. Other studies have also shown several direct links between excessive screen usage and obesity and inactivity. Epidemiologic research indicates that kids who spend more time on screens eat less fruits and vegetables and more energy drinks, snacks, and fast food. As a result, they get a larger proportion of their energy from fats and consume more energy in general. The case for increased calorie intake as a primary cause of childhood obesity and screen time is growing [40].

3.6 Digital Technology Usage and Musculoskeletal System

An Electronic device such as mobile phones and touchscreen devices for many daily purposes like education, communication, and social media as well as research focusing on the effects of these devices on musculoskeletal symptoms/disorders [41] [42]. The examination of the substantial physical impacts of modern mobile devices has highlighted these findings. Therefore, using these gadgets for an extended period shouldn't increase your risk of musculoskeletal problems. The use of electronic devices by teenagers and young adults is associated with musculoskeletal problems, particularly in the upper and lower back, head and neck, and upper extremities [43]. Teenagers with musculoskeletal discomfort reported using laptops at home more frequently than they used desktop computers, but the latter were less readily available. Considering that desktop computers are more ergonomic than laptops, these results may be connected to the usage of electronic gadgets. A recent comprehensive study discovered a link between musculoskeletal diseases, particularly those about neck flexion position, and high phone, text, and game frequency [44]. Adolescents who used at least two electronic devices were more likely to experience musculoskeletal discomfort at a median age of 15 years (compared to 14 years). Musculoskeletal discomfort was linked to cell phone use, and the back, neck, and shoulders

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were the most common locations for these symptoms. Musculoskeletal pain symptoms were linked to decreased use of electronic games. This review [45]., examined the physical effects of touch technologies and found that more activities like texting, making frequent phone calls, and playing video games, as well as more painful areas in the neck, shoulders, and neck flexion posture, are linked to musculoskeletal disorders and increased muscle activity around the neck. Additionally, the majority of users' technology devices are touchscreens.

4. CONCLUSION AND FUTURE WORKS

Digital technology facilitates and encourages social interactions, as well as participation and engagement in content creation and viewing. However, the effects of technology use are complex and vary based on the type of media, how it is used, the frequency and duration of use, and the unique characteristics of the child or adolescent. Increased digital technology use among children is associated with several health risks, including poor sleep quality, obesity, musculoskeletal issues, physical inactivity, and developmental problems. For teenagers, overuse of digital devices introduces additional risks, such as digital eye strain and musculoskeletal disorders linked to excessive texting. Furthermore, prolonged exposure to digital technology has been connected to sleep loss and disruptions in daily activities, which contribute to decreased physical activity levels. To mitigate these risks, parents should establish limits on their children's internet usage and closely monitor their activities. It is also important to delay the introduction of technology to young children to foster optimal physical, mental, and social development. By implementing effective strategies for managing both online and offline interactions and staying informed about key issues, parents can provide the necessary support. Finally, further research is needed to identify the most effective health education strategies to raise parental awareness and promote healthier technology use among children and adolescents.

ACKNOWLEDGMENTS

I would like to thank my colleagues for their wonderful collaboration. You supported me greatly and were always willing to help me.

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