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The Effects of Increased Screen Time on Cognitive Development in Children

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Abstract: ***The passing of the Online Safety Act into law in October 2023 by the parliament of the United Kingdom has brought back the studies on the impact of technology on the cognitive development of children, centre stage. With multiple studies showing an average screen time of over 4 - 7 hours daily among children in the age group of 8 - 18 globally, it is crucial that its long - term impact be factored in carefully before it begins to impact an entire generation adversely.***

Keywords: screentime, technology, children, teenagers, online education, cognitive development, social media, entertainment, obesity, anxiety, smartphones

1. Introduction

One of the foremost major studies on screen time was conducted by the Henry J. Kaiser Foundation, "Generation M: Media in the Lives of 8 - 18 Year Olds, " in 2010 had concluded that “on average, children 8 - 18 spend 7.5 hours a day in front of screens for entertainment alone — which amounts to 114 days a year” (**Henry J. Kaiser Foundation 2010).** At that time, it was considered more of a first world problem, one that had not impacted the developing world. A recent study by the Peking University revealed that as opposed to just 9.16% of primary and middle school children exceeding 3 hours of usage per day before 2020 in China, remote learning dependent on devices post COVID, made this number jump to over 19%. Close on its heels, an investigative study by the Fortune Magazine, found that kids aged 8 to 12 spend an average of 5.5 hours daily using phones, tablets, and computers. Alarmingly, teens over 13 exceed this, averaging 8.5 hours of screen time outside school (**David Rosenberg & Natalia Szura 2023 for Fortune. com).** According to the survey conducted by **Happinetz**, a leading parental control filter box in India, at least 42 per cent of children under the age of 12 spend an average of two to four hours daily glued to their smartphones or tablets while those in the higher age bracket dedicate 47 per cent of their day to screen time on various devices. The screen time according to this survey is only likely to increase with educational institutes also using smart technology tools and phones for assignments and homework making smart devices a necessary accessory and not a luxury anymore.

While it would be normal to assume that screen times would be higher among children from affluent families as they would have greater access to devices, studies have shown absolutely contradictory results. studies have reported that highly engaged screen use is more likely among children with low socioeconomic status (SES) than among those with higher SES (**Cameron AJ, Spence AC, Laws R, Hesketh KD, Lioret S, Campbell KJ.2015).** Studies have highlighted that the most influential factors contributing to children’s excessive screen time are the mother’s education level and the family’s income, indicative of the family’s socioeconomic status. Caregiver education is also strongly associated with screen time given findings that, among 0–8 - year - olds, the average daily screen time varies from 3 h 12 min for children whose caregivers have a high school diploma (or less) to 2 h 24 min for children whose caregivers have some college experience, and 1 h 38 min for children whose caregivers have a college degree (**Rideout, V. & Robb, M. B.2020).** This puts these children at higher risk as they forego the already limited opportunities for education and skill development which can greatly limit their ability to outgrow their financial hardship.

This growing trend has attracted worldwide attention with the medical fraternity linking the health and behavioural disorders directly to screen time. Numerous studies have shown how excessive screen time impacts the cognitive growth of children, as those years are crucial for the development of mental capacities like thinking, reasoning, and understanding **(Horowitz - Kraus T, Hutton JS. Brain2018).** In another study published in the BMC Public Health, children who spent more time on screens had a higher risk of developing myopia or near - sightedness, damaging eye health (**Liu Y, Wang L, Xu Y, Pang Z, Mu G.2021, Eirich R, McArthur BA, Anhorn C, McGuinness C, Christakis DA, Madigan S.2022).** A lancet study highlights the increasingly tangible side effects of screen time citing increased anxiety, irritability, sleep disorders and a noticeable decline in social interaction as its adverse consequences. Unregulated screen time is also known to cause changes in the brains of children and can hamper their development and increase their screen dependency (**Dumuid D.2020).**

The situation has worsened post - pandemic, with schools shifting to online platforms and parents juggling remote work, screen time skyrocketed across all age groups. Unfortunately, this increased exposure has come at a cost. In addition to mental health, childhood obesity has also surged, about 12.5 million of those between the ages of five and 19 overweight in 2022 compared to 0.4 million in 1990, according to a global analysis published in (**The Lancet journal 2022).**

The issue has also been red flagged by the WHO in its reports and health guidelines. This paper examines the impact of increased screen time on the cognitive development of children and the actionable steps that need to be taken to protect the children before its too late.

2. The Side - Effects of Excessive Screen Time on Cognitive Development:

The growing trend of escalating screen time among children has been flagged as a serious public health issue as increasing

number of studies have begun to substantiate its harmful effects on their cognitive, linguistic, and social - emotional growth. The principal areas of concern are as follows:

(a) Reduced physical activity:
Childhood is crucial for brain development as this is the time when motor skills develop the most dynamically (**Myer G. D., Faigenbaum A. D., Edwards N. M., Clark J. F., Best T. M., Sallis R. E.2015)** as well as cognitive functions, especially executive ones, which mature around the age of 12 years (**Anderson P.2002).** Physical exercise at this age is crucial to brain development as it increases circulation, which leads to better oxygen and nutrient supply to the brain (**Biddle S. J. H., Gorely T., Stensel D. J.2004).** Engaging in sports has a positive influence on all systems: the motor, cardiovascular, respiratory, hormonal, immunologic, and nervous systems. Thus, it stimulates the maturation of the motor areas in the brain, which in turn influences the motoric development and increases the speed of the conductance of nervous impulses (**Alesi M., Bianco A., Luppina G., Palma A., Pepi A.2016, Van der Fels I. M. J et. al 2015).** Physical activity also stimulates the increase of neurohormonal secretion (substances produced by hypothalamic neurons and transported by blood or cerebrospinal fluid), having a significant impact on the excitability of neurons forming synapses (**Hollmann W., Struder H. K. Gehirn, Psyche und Korperliche Aktivitat 2000).**

Physical activity has been shown to stimulate the secretion of serotonin by increasing the bioavailability of free tryptophan and enriching the diversity of gut microbiota. Due to its important role in modulating neuronal proliferation, differentiation, synaptic morphogenesis, and synaptic transmission, serotonin can regulate children's explicit cognitive and social interaction behaviour in the early stages of life. Therefore, we hypothesized that serotonin emerges as a pivotal transmitter that mediates the relationship between physical activity and brain development during early childhood (**Jia - Qi Jing, Si - Jia Jia, Chang - Jiang Yang 2024).**

Physical activity is known as an irreplaceable part of children's lives, which can impose a favorable impact on multiple developmental domains. In addition to enhancing muscular strength, bone density, and cardiorespiratory fitness, moderate - to - high - intensity physical activity has also been found to be significantly correlated with children's memory, learning, executive function, and emotional well - being in recent empirical studies **(Biddle et al., 2019)**

The after - school period (approximately 3 pm – 6 pm) - is viewed as being a crucial time slot and particularly important because it is relatively discretionary, and activities undertaken in this timeslot play a key role in determining whether children meet or fail daily movement guidelines, coining the term the "critical window" (**Evenson KR, Ballard K, Lee G, Ammerman A.).** Excessive screen time post school hours, gives children very little time for physical activity which could hurt their cognitive and brain development.

(b) Impaired Physical health:
Unlike children a few decades ago, children today are leading an increasingly sedentary lifestyles spending an increasing percentage of their waking hours with devices. This lifestyle leads them to neglect the physical activity that has been typical to this developmental period (**Graf C., Koch B. et al 2003).** Regular physical activity reduces the risk of childhood and adolescence overweight and obesity, and future associated chronic diseases (WHO 2020). Associations between screen time and poor health outcomes such as obesity and lack of exercise have been well - documented (**Chiasson et al., 2016; de Jong et al., 2013; Dumuid et al., 2017; Poitras et al., 2017**). High amounts of screen - based sedentary behaviours, along with insufficient physical activity, are associated with a large range of physical and psychological disorders, which may affect health and wellbeing negatively (**Braig S, Genuneit J, Walter V, Brandt S, Wabitsch M, Goldbeck L, et al.2018).** These behaviours are considered increasing public health concerns, especially in children, as prolonged screen time and low levels of physical activity are suggested as unhealthy behaviours that may persist into adulthood (**Motamed - Gorji N, Qorbani M, Nikkho F, Asadi M, Motlagh ME, Safari O, et al.2019)**

Limited physical activity, or often a complete lack thereof, leads to various health problems, including posture problems (such as idiopathic scoliosis), somatic conditions, being overweight and obese, problems with circulation, and even premature death (**Sandercock GRH, Ogunleye A, Voss C.2012, Rozgonjuk D, Levine JC, Hall BJ, Elhai JD.2018).**

Moreover, it is not about physical health alone. There is increasing empirical evidence of a relationship between a lack of physical activity and mental health measures. For instance, research suggests that overweight adolescents who do not practice sports are more prone to risk behaviors, including suicide attempts and addiction to both alcohol and illicit drugs (**Lipowski M., Lipowska M., Jochimek M., Krokosz D. Resiliency 2015).** Global obesity rates among almost 130 million children, adolescents, and adults have tripled since 1975, while in 2020 the World Health Organization reported that more than 340 million minors (5–19 years of age) were classified as obese (**World Health Organization Obesity and Overweight 2021).**

Childhood and adolescent obesity constitute a risk factor for several health issues such as precocious, irregularities and polycystic ovary syndrome in female adolescents, obstructive sleep apnea, and metabolic syndrome. An overwhelming proportion (80%) of the obese adolescents will carry this issue into their adulthood (**Kitani R. A., Letsou K., Kokka I., Kanaka - Gantenbein C., Bacopoulou F.2022, Liu G., Guo J., Zhang X., Lu Y., Miao J., Xue H.2021, Schwimmer J. B.2003).** A study has suggested that children and adolescents with extreme obesity report complaints that could simulate symptoms that are related to body dysmorphic disorders (**Britz B., Siegfried W., Ziegler A., Lamertz C., Herpertz - Dahlmann B., Remschmidt H., Wittchen H. - U., Hebebrand J.2000),** while others suggest that they suffer from sleep disorders, as well as headaches (**Turco G., Bobbio T., Reimão R., Rossini S., Pereira H., Barros Filho A.2013).** Research has also shown that obese individuals are more likely to not complete their education, due to adverse experiences within the school setting, the so - called weight bias, which refers to marginalization by peers or teachers (**Yu**

B. Kindergarten 2021). Moreover, social media platforms, despite their potential to connect, often promote unrealistic life expectations and appearance standards, potentially leading to decreased self - esteem and body image issues among young users (**Pedalino F, Camerini AL.2022).**

(c) Declining social interaction:
Excessive screen time can significantly reduce social interaction among children by limiting opportunities for face - to - face interactions, hindering the development of crucial social skills like empathy, communication, and cooperation, which are primarily learned through in - person interactions with peers and family members; this can lead to social isolation and potential difficulties in forming real - life friendships (**Carlota Nelson for UNICEF).** "Until babies develop language, " says Charles Nelson, a Harvard neuroscientist who studies the impact of neglect on children's brains, "all communication is non - verbal, so they depend heavily on looking at a face and deriving meaning from that face. Is this person happy with me, or are they upset at me?" That two - way interaction between children and adult caregivers is critically important for brain development.

Excessive screen time has complicated the understanding of loneliness and social isolation. Loneliness is that a person may be socially isolated but not lonely, or socially connected yet feels lonely (**Australian Institute of Health and Welfare, 2019).** This is a huge change that has come about in the lives of children, and they are failing to read the signs till such time they are completely overwhelmed. Lack of face - to - face interactions is creating a generation of children that are socially connected through their devices, and yet feel lonely and isolated. Lonely people express a preference for using the internet for social interaction and are therefore more likely to use the internet in a way that displaces time spent offline (ie. face - to - face and social activities) (**Nowland, Necka, & Cacioppo, 2018).** This is not a bad thing upfront. However, these people then hide behind devices, diminishing the limited opportunities that they might have had to help connect with others.

Between 2000 - 2015, the number of teens who got together with their friends everyday dropped by more than 40%; and this drop has gained momentum in recent years (**Twenge, 2017).** "It's not only a matter of fewer kids partying; fewer kids are spending time hanging out. "In 2021, face - to - face has been replaced by virtual spaces accessed through apps and the World Wide Web (**Taylor 2011)**

Online socialising may increase the experience of loneliness due to these online connections being typically shallow and fragile. A lack of quality in the relationships rather than the mere quantity of relationships appears to be the issue with online connections contributing to loneliness. We know that social relationships have short - term and long - term effects on mental and physical health. When one is socially isolated and socially deprived, the emotional support necessary to sustain one's personal health is not present (**Umberson & Montez, 2010.)**

Social isolation in the digital age is a complex and multifaceted phenomenon. While the digital age has brought about unprecedented connectivity and communication opportunities, it has also given rise to the paradox of loneliness amid online connections. A study by Newson et al. found that face - to - face contact was positively associated with well - being whereas communication using messaging apps (e. g., email, social media) was negative and that interestingly, phone calls and video chats had no significant association with well - being (**Newson M, Zhao Y, Zein ME, Sulik J, Dezecache G, Deroy O, Tunçgenç B.2021).**

Petrova and Schulz used the COVID - 19 pandemic situation to analyze the impact of different forms of communication (from most life - like communication, i. e., face - to - face to least life - like communication, i. e., text - based) onto well - being by using an ESM design. They found that the more life - like the communication was, the less lonely, less sad, more affectionate, more supported, and more happy people felt when compared to less life - like situation **(Petrova K, Schulz MS, 2022).** These findings support the notion that technology - mediated communication is not capable to be a substitute for a face - to - face communication and excessive screen time may result in children missing out on developing crucial people skills that are needed for a satisfying work and personal life.

(d) Reduced attention span:
Multiple studies demonstrate that the constant connectivity and online stimulation, heavy multi - tasking and frequent task - switching as more and more children surround themselves with technological devices like smartphones and laptops, impairs focus and attention span, time management, and work efficiency (**Valleywise Heaith 2020).** The constant stream of visual and auditory stimuli on screens can overstimulate their developing brains, making it difficult to focus on tasks requiring sustained concentration like reading, completing puzzles or finishing longer class assignments (**MedlinePlus Medical Encyclopedia).** For children to be successful, they need to learn how to concentrate and focus. That ability starts to develop during their earliest years when their brains are more sensitive to the environments around them. For a brain to develop and grow, it needs essential stimuli from the outside world. More importantly, they need time to process those stimuli. While reading storybooks out loud gives children time to process words, images and voices, the constant absorption of on - screen images and messages affects their attention span and focus (**Carlota Nelson for UNICEF).**

Studies reveal that heavy Internet and social media users delay initiating and completing tasks substantially more than their peers. Social media's strong pull factor–often described as "hedonic appeal" (**Brooks, 2015)** or temptation (**Hofmann et al., 2017)** –makes users "drawn to distraction**" (Aagaard, 2015)** and leads them to override their primary goals and tasks. This strong pull of social media has a high potential for distraction. For instance, research has found that students cannot focus for long on a task such as studying, and that, on average, they switch to social media after about six minutes of focused work (**Rosen et al., 2013)** and react to notifications shortly after their arrival (**Pielot et al., 2014**). The constant distraction and the need to stay connected online makes them habitual of taking brief micro - breaks to check notifications which derails momentum and impairs their ability to focus on the task at hand. The addictive nature of the social media

makes students experience withdrawal symptoms like racing thoughts, restlessness, and weakened abilities to concentrate for long periods on single tasks without digital diversion. Diminished capacities for sustaining attention and selective focus leads to poorer metacognitive control over where they direct their attention. Rather than consciously guiding focus towards productive goals, teens passively latch onto digital alerts, links, and stimuli competing for their attention. This impairs executive function which refers to skills that help people to focus, plan, prioritize, work towards goals, self - regulate behaviours and emotions. It is necessary for people to adapt to new and unexpected situations and ultimately engage in thinking and planning. Executive function skills begin to develop in the first year of life and are not fully developed until early adulthood. A recent study published in **JAMA Pediatrics** discusses an alarming association between screen time use greater than 2 hours in children under the age of 24 months and poorer executive function in the same children at 9 years. Certain kinds of wavy lines (theta waves) in the EEG of their sample are associated with poorer attentional control. This study showed that increased screen time before age 12 months, the EEG studies known to be with poor attention control found at 18 months could predict impairment of attention and executive function at 9 years of age. The fact that infant screen use is associated with altered cortical EEG activity before the age 2 years has serious implications for the long - term consequences for these children (**Dr. Sally Robinson for UTMB 2023)**

(e) Impaired language skills:

The early years of childhood are crucial for acquiring language skills and children develop various aspects of language, including vocabulary and phonology. These skills are acquired mostly through interactions with adults and caregivers. However, there is a growing concern that screen time diminishes the quantity and quality of interactions between children and their parents, resulting in fewer chances for the child to practice and develop their language abilities (**Mustonen R, Torppa R, Stolt S. Children (Basel) 2022).** Excessive screen time can negatively impact a child's language skills also by reducing the amount of time for engaging in meaningful conversations, which are crucial for vocabulary development, grammar acquisition, and overall communication abilities; studies show that children with high screen time may experience delays in expressive language skills, meaning they may say fewer words and have difficulty forming sentences due to the lack of real - life interaction. The impact of screen viewing is also influenced by contextual factors rather than the sheer amount of time spent watching. The context encompasses several aspects, such as the behavior exhibited by adult caregivers during screen time, the appropriateness of the content for the child's age, and the level of interactivity provided by the screen (**Guellai B, Somogyi E, Esseily R, Chopin A.2022).**

Studies have indicated that compared to children who view screens for ≤1 hour per day, those who engage in two or more hours per day, or three or more hours per day, are more likely to experience behavioral problems and have poorer vocabulary acquisition (**McArthur BA, Tough S, Madigan S. Pediatr Res.2022).** In addition, the content that young children engage with on mobile devices vary in quality and may in some cases be age - inappropriate (**Madigan S, McArthur BA, Anhorn C, Eirich R, Christakis DA.2020).** Children with high screen time in families that look at online educational apps also miss out on important communication opportunities with parents or significant others such as siblings, these missed communication opportunities may affect the children's language development. Sitting in front of a screen makes the communication largely one - way in which the child listens but only to a limited degree express words itself (**Weigel DJ, Lowman JL, Martin SS).**

(f) Sleep deprivation:

Sleep is essential for our bodies to repair and regenerate our cells, maintain a strong immune system, and feel mentally alert and focused. Lack of sleep over an extended period can lead to a range of health issues, including increased stress, depression, and a weakened immune system. It is essential to learning, memory formation, emotional regulation, and physical and mental development and naps are an essential part of a child's health and well - being. Children need a lot of sleep — up to 17 hours a day for infants under three months to 10 hours per night for 18 - year - olds, according to the **U. S. Centre for Disease Control and Prevention.** While naps count toward total sleep necessary at any age, they play a special role for young children because of the interaction of their circadian rhythms and the homeostatic process known as sleep pressure, or, in lay terms, tiredness. Scientists still aren't sure why sleep pressure builds more quickly in children than adults, but some suggest it's because they usually can't get 13 or 14 hours of uninterrupted sleep, in part because they must eat frequently, and they need naps to make up for the sleep they don't get at night.

Almost all human growth hormone is produced during slow - wave, or deep sleep, which a 45 - minute nap is long enough to produce and lack of sleep can result in decreased growth hormone secretion and cortisol levels. As early as in 2014, the **National Sleep Foundation in the Modern Family** reported that about 96% of teenagers between the ages of 15 and 17 have used devices before their sleep time (**Buxton OM, Chang AM, Spilsbury JC, Bos T, Emsellem H, Knutson KL 2015).** The situation has only escalated since then with the American Academy of Child and Adolescent Psychiatry that adolescent spends up to nine hours of screen time per day.

Over the years and especially post pandemic, teenagers have become increasingly reliant on devices such as mobile phones, laptops, tablets, and gaming consoles. These Electronic devices emit blue light that can suppress melatonin production and alter circadian rhythms, leading to disrupted sleep, delayed sleep onset and inconsistent sleep patterns.

Sleep deprivation can exacerbate existing health problems, impair cognitive function, and increase the risk of accidents and injuries. Nearly, two in three teenagers frequently sleep less than the proper duration, and screen time may be a main cause for sleep deprivation and other associated problems (**Alshoaibi Y, Bafil W, Rahim M.2023)** Additionally, the stimulating content on screens can keep children mentally aroused, further interfering with sleep onset. Engaging content on screens, like games or videos, can mentally stimulate children, making it difficult to wind down and relax before sleep (**Basile C, Gigliotti F, Cesario S, Bruni O (2021).**

(g) Information Overload:
Faster internet and access to smarter computer and communication technology has made information more accessible and instantaneous for children. The sheer volume of information now accessible online is staggering; there are around 50 billion pages on the Web, ensuring that children have input to information on practically every subject at an unprecedented rate and volume. Moreover, the growing access to powerful digital platforms offering content sharing (YouTube, TikTok, Twitter), instant messaging (WhatsApp, Messenger), social networking (Facebook, Twitter, Instagram), streaming (Netflix, to users around the world (**Armano et al., 2022; World Economic Forum, 2016)** also include children. In fact, students, being young, educated, and enthusiastic about technology—have been at the forefront of consuming, sharing, and creating content and socializing on these platforms (**Primack et al., 2017; Upadhyaya & Vrinda, 2021).**

Digital platforms are awash with content such as social media status updates, photo and video uploads, blog posts, podcasts, and streaming content, among others (**Masood et al., 2022; Matthes et al., 2020)** which push for constant engagement. Most of this content is cleverly attuned to their interests, lifestyles, and aspirations of students and rely on powerful algorithms that gather user data at scale and use it to make personalized content recommendations and serve push notifications making it difficult to ignore for young children **(Risi & Pronzato, 2022).** For many students, this algorithmic nudge makes the task of regulating their digital behavior an uphill battle (**Primack et al., 2017).**

Neuroscientists call this notion "cognitive overload", and it occurs when the inflow of information hinders rather than helps the ability to process that information and think clearly (**Jim Taylor for https: //www.psychologytoday. com).** This overflow of information affects children in several ways. First, in today's world of technology, information is coming at them from many directions, for example, television, computer, texts, hyperlinks, and on - screen ads. Children are enveloped in an environment of constant information and distraction. As a result, they have neither the time nor the attention to process most of the information and use it in productive ways, for instance, to learn a subject in school or explore a topic of personal interest in greater depth. They cannot simply ignore it; instead, they are compelled to interact with it, making digital overload a significant concern on their psychological well - being and academic performance **(Whelan et al., 2020).** Digital overload refers to excessive exposure to digital platforms as users constantly consume, create, and share content and socialize on these platforms **(Graf & Antoni, 2023).** Digital overload corresponds to the concept of information overload which occurs when decision - makers are presented with more relevant information than they can optimally process, resulting in negative consequences such as decreased attention, lower motivation, and reduced reasoning and decision - making abilities (**Jones & Kelly, 2018). Nicholas Carr the author of The Glass Cage: Automation and Us** aptly puts it, being a jet skier rather than a scuba diver, skimming at high speed over the surface of information rather than going deep. The absence of interruptive peaceful thinking time prevents children from taking ownership of the information—making it theirs—and not only incorporating it into their information "hard drive, " but also integrating it into their knowledge "library. " It also keeps them from transforming the input from cold and lifeless data into a power plant of insight, creativity, and innovation. It ultimately prevents children from putting the information into conscious, meaningful, and beneficial action.

(h) Impedes creativity:
The passive consumption of content caused by excessive screen time, limits opportunities for children to explore om their own and build their own opinion on it. it also limits opportunities for hand on experiences that shape an individual's unique thought process. Passive engagement through Screen time is increasingly limiting Hands - on activities which provide a rich sensory experience that stimulates the brain and promotes creative thinking (**N. Ferjan Ramírez, D. S. Hippe, N. Shapiro 2021).**

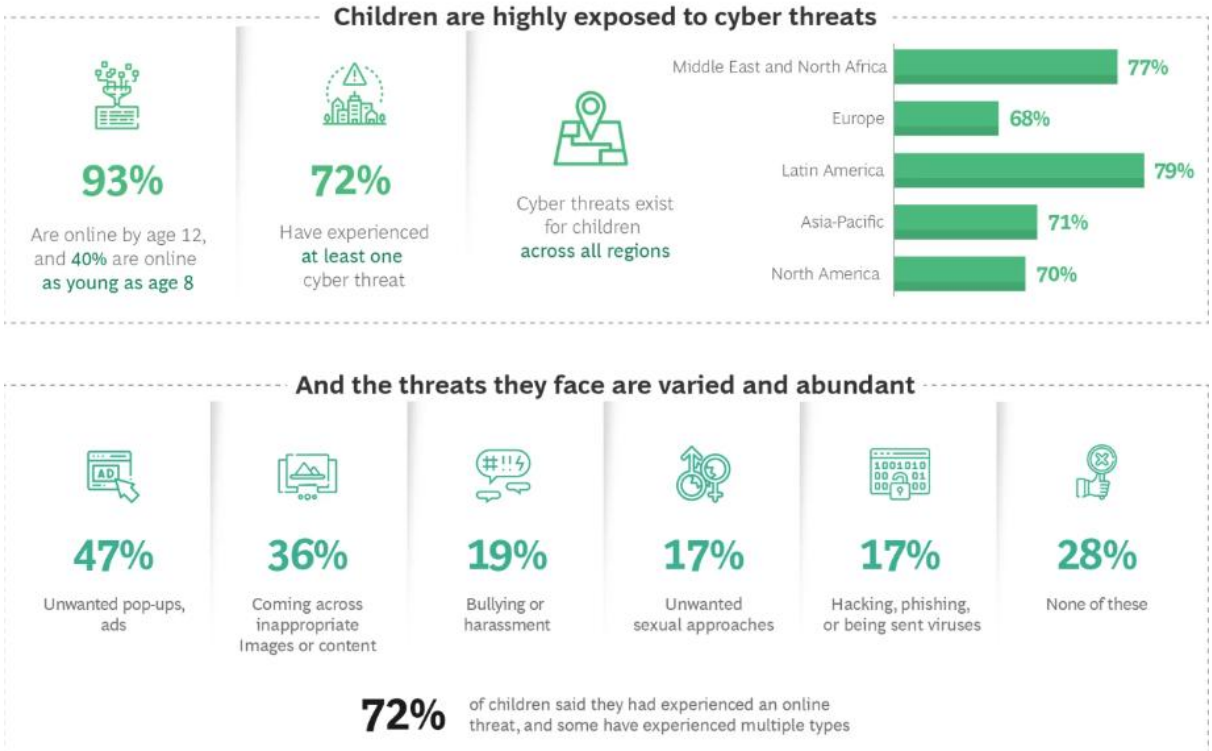
Creative thinking often involves trial and error, which is better practiced through hands - on activities where children can experiment and adapt their approach. Besides, passive engagement does not challenge the child's brain and even if it does the option to switching to more agreeable content, doesn't activate the brain to come up with solutions. Excessive digital conditioning fixates thinking rather than encouraging divergence (**M. Kühhirt, M. Klein 2020).** Unstructured play cultivates flexible thinking as young minds invent scenarios, characters, and rules organizing collaborative narratives, whereas absorption of pre - scripted digital content leaves less room for imaginative storytelling, improvisation, and role play and kills creativity. Since Technology environments condition linear stimulus - response thought sequences rather than promoting contemplation from divergent angles, absorption in digital directives appears to program adolescent minds for reproductive cognition versus flexible thinking (**Barr R., Linebarger D. N. (Eds.) 2017).**

Developing complex problem - solving abilities is crucial aspect of creativity and innovative thinking as children attempt to think out of the box. These problem - solving skills require experiences that requires the child to persist with grit through dead ends before generating successful strategies. Excessive tech use conditions brains for instant gratification, sapping mental stamina to keep grappling with multifaceted challenges before breaking through weakening patience and resilience to fight a situation or come up with innovative ways to overcome it. all that the students have to do is switch off from something challenging to something which makes the child happier instantly. Moreover, creative pursuits require patience and the diminished attention spans induced by digital distraction degrade capacities for following through on extended creative undertakings like composing music, writing stories, producing videos, or learning software programs. Fragmented focus obstructs completion of ambitious projects that were planned creatively and innovatively. Open - ended challenges are a must for children to build creativity must, which is limited by the easy access to packaged digital content and stimuli. In addition, social media sites frequently give priority to sensationalism over content in an effort to grab and hold users' attention. Because of this, people are constantly exposed to surface - level information, which leaves little opportunity for in - depth

thought or meaningful expression. People are under pressure to live up to well calibrated standards of perfection, which further stifles creativity as they try to imitate rather than create (**Michelle Ponti 2023).**

In fact, virtual worlds may be harming the development of children's imaginations by misleading the child's brain to thinking they are engaged in imaginative, pretend play, when they are actually engaged in a combination of practice and rule games. The digital playspace offers only superficial and artificial representations of children's imaginative worlds. Images are flat and fleeting, and toys are prescribed rather than imagined (**https: //mattersjournal. com).**

(h) Safety risks and cyber bullying:
With online access virtually universal, almost all children under 12 are now internet users. As these children spend more and more time online—a trend that has only accelerated since the COVID - 19 pandemic began—the cyber risks they face, such as online bullying, inappropriate content, and digital addiction, are worsening. According to a **BCG survey**, as many as 93% of children from ages 8 to 17 are on the internet, and remarkably, nearly three out of four respondents said they had experienced at least one cyber threat (figure below).



Source: BCG research

The **Organization for Economic Cooperation and Development (OECD) and the UNICEF** divided the risks faced online by children into four categories:

1) **Content,** including exposure to illegal and age - inappropriate content, embedded marketing, and online gambling.
2) **Contact,** including ideological persuasion; exploitation (sexual abuse and trafficking, harassment, and drug addiction); and violation and misuse of personal data.
3) **Conduct,** including cyberbullying and the effect on children of excessive screen time and owning digital devices.
4) **Consumer,** including marketing, commercial profiling, financial, and security risks.

There is no doubt, that all the four pose a serious threat to children and can have a dramatic impact on children's health and well - being.

Cyberbullying can be more pervasive than traditional bullying. While traditional bullying is generally limited to school and home is a reprieve, victims of cyberbullying can be reached anywhere, anytime, and the potential audience is huge. This is compounded by the fact that there is a lack of supervision. With traditional bullying, teachers are regarded as enforcers. With cyberbullying, there is no clear authority, and children express reluctance to tell adults for fear of losing computer privileges or being labelled as an informer (**Cassidy W, Jackson M, Brown KN.2009).** Victims who endure frequent cyberbullying can experience a decline in academic performance, begin 'acting out' and some report difficulties at home. These children are at increased risk for depression, anxiety and externalized negative behaviours, as well as an increased risk for suicide (**Låftman SB, Modin B, Östberg V.2013, Hinduja S, Patchin JW.2010)**

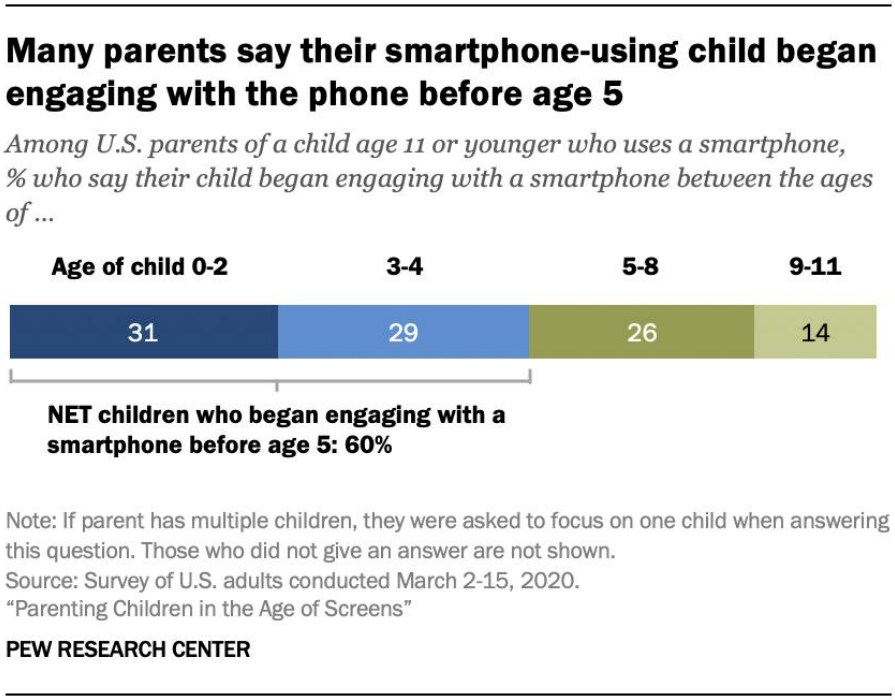
Children may unwittingly expose their families to internet threats, for example, by accidentally downloading malware that could give cyber criminals access to their parents' bank account or other sensitive information (**https: //www.kaspersky. com).**
Online child sexual exploitation and abuse (OCSEA) is a rising global problem affecting children and adolescents worldwide. Children may be exposed to adult or pornographic

content that is not age - appropriate, potentially including violent, sexual, hateful, or otherwise disturbing material, which can have negative impacts on their development and well - being; this can include images, videos, text, or comments that may be upsetting or harmful to a child's understanding of the world (**https: //www.unicef. org).**

According to the latest report by the **We Protect Global Alliance,** there has been an increase in the volume of child sexual abuse materials of 87% since 2019 according to data from the National Center for Missing and Exploited Children (NCMEC). Simultaneously, in some countries, 1/5 of children have become victims of OCSEA.

3. Conclusion

Children today live in a digitally connected world with devices becoming the principal gateways to entertainment, social interaction, information and education. The education bit is significant as it compels parents to hand over or buy devices for their children. Data from **Ofcom, the UK's communications regulator**, show that the vast majority of children in the UK own a smartphone by the age of 11, with ownership rising from 44% at age nine to 91% at age 11. And in a European study across 19 countries, 80% of children aged nine to 16 reported using a smartphone to go online daily, or almost daily. According to a study conducted by the **Pew Research Centre** in the US, among the 60% of parents who say their child younger than 12 ever uses or interacts with a smartphone, six - in - ten say their child began engaging with a smartphone before the age of 5, including roughly one - third (31%) who say their child began this before age 2 and 29% who say it started between ages 3 and 4. Some 26% of parents whose child uses a smartphone say the smartphone engagement began between the ages 5 and 8. This share falls to just 14% for parents with a child age 9 to 11. Nearly one - in - five parents of a child younger than 12 say their child has their own smartphone



This is not a first world issue anymore. India boasts the second - largest internet user base globally, with a significant portion of this growth driven by smartphone adoption. A survey by the **Local Circles online community** found that nearly 40% of Indian households with children have kids using smartphones by age 8 with over 40% urban Indian parents admitting that their children between ages 9 - 17 are addicted to videos, gaming & social media.55% urban parents say their children aged 9 - 13 years have access to smartphone for all or most of their day (outside of in - person school classes and a staggering 71% claimed their children aged 13 - 17 have access to a smartphone for all or most of day. Another Indian study reported that children as young as 2 months were exposed to devices - based media, with a median age of first exposure around 10 months. By the time a child reaches 18 months of age, the majority have already been exposed to screen - based media. Interestingly, the prevalence of smartphone usage (96%) surpasses that of television viewing (89%) among these young children (**Rajma J, Sathiyamoorthy K 2022).**

This widespread access, however, raises concerns about the potential negative consequences, particularly on a developing child's brain. Most studies have revealed the negative impact of screen time on the children's cognitive skills, emotional and physical wellbeing, academic performance and its potential to significantly reduce social interaction among children by limiting opportunities for face - to - face interactions, hindering the development of crucial social skills like empathy, communication, and cooperation, there is an urgent need to red flag this issue. The **WHO** has recommended 'No' screen time for a 1 - year - old and no more than an hour for 2–4 - year - olds, with less time preferred. It has recommended that teenagers too should limit their recreational screen time to no more than two hours per day. This includes time spent on phones, computers, tablets, and television, excluding educational use for homework.

These recommendations can be effectively enforced only when the parents are educated on its side effects and are able to set a personal example. On the contrary most adults across the world are averaging 7 - 8 hours of screen time (**Rebecca Moody 2024)** which does not make them the perfect role models for children. It is essential that parents set the rules for compulsory physical activity as an increasing number of Studies have shown that children who participate in outdoor play have better mental health outcomes, reduced risks of chronic diseases and improved social skills. The parents and caregivers must know that failure to meet current physical activity recommendations is responsible for more than 5 million deaths globally each year across all age groups. Currently, over 23% of adults and 80% of adolescents are not sufficiently physically active. If healthy physical activity, sedentary behaviour and sleep habits are established early in life, this helps shape habits through childhood, adolescence and into adulthood. “What we really need to do is bring back play for children, ” says Dr Juana Willumsen, WHO focal point for childhood obesity and physical activity. “This is about making the shift from sedentary time to playtime, while protecting sleep. The report of the **Commission on Ending Childhood Obesity** also calls for the restriction of screen time for children and greater emphasis on adherence to guidelines on physical activity, sedentary behaviour and sleep in young children issued by the WHO.

There is a contrary point of view which does show that screen time if kept in check may actually be good for enhancing the critical thinking with some gaming apps focussing on teaching children resilience, resource management, cooperation, strategic thinking, spatial thinking and reasoning (**Piangiamore, Giovanna & Maramai, Alessandra. (2022).** There are others like Canva that that encourage creativity by giving kids the tools and the platform to design everything from digital greeting cards to original artwork while, older kids and teens can experiment with CAD (computer - aided design) software programs that allow them to develop 3D - printable models (**Pedroso, John Erwin & Sulleza, Rv & Francisco, Keith Hae Moon & Noman, Ayya Jade & Martinez, Chynna Althea 2023).** A research review found that video games can improve gross motor skills in non - typically developing children but goes on to add that there is no substitute for traditional motor skill development activities (**BMC Sports Science, Medicine and Rehabilitation.2022).** Even the **American Academy of Pediatrics (AAP**) has also acknowledged this however forewarns parents to limit exposure. " [If you] want to introduce digital media, [you] should choose high - quality programming/apps and use them together with [your] children, " the AAP explains. "Co - view or co - play with your children and find other activities to do together that are healthy for the body and mind. " Limited Digital media may also be useful to build social and communication skills especially in students who are shy and quiet. However, excess of it produces the opposite effect and is potentially damaging.

The key advice to parents is to be more watchful and responsible in ensuring that the kids do not go beyond the recommended screen time, use only age - appropriate and good - quality media which has a proven track record of being beneficial for a child’s learning and development. It is important to encourage use of digital technology with a purpose. Since there is no way of reversing this trend, it is crucial for parents and caregivers to be more responsible in monitoring screen time of their children. Governments and medical associations could also play an important role in educating both parents and children of the harmful consequences of excessive consumption. Moreover, the increased urgency in medical research findings pointing to the long - term harm of screen time call for stricter regulations on content and safety to minimize the harm associated with it.

It is important to note that the high level of policy incoherence between the health and education sectors on the impacts of screen time is also sending confusing signals. While on one hand, Education authorities encourage the use of digital technology by children to prepare them for the digital world, although it is not uncontested within the education sector itself, in contrast, health authorities discourage young children from using these devices based on concerns for their cognitive, emotional and social wellbeing (**Straker et al.2018).** This has led to policy incoherence between education and health guidelines and recommendations regarding children’s use of digital technology. Health officials and professionals often seek to minimize screen time with an assumption that screen time is sedentary, passive and displacing beneficial activities that are important for well - being outcomes. On the other hand, digital education guidelines often look at active screen time as crucial to interactive activities linked to learning outcomes. It is important that key stake holders on both sides conduct joint research and come up with common guidelines keeping the children’s well - being at the heart of the screen time debate.

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