International Journal of Innovative Technologies in Social Science

e-ISSN: 2544-9435

Scholarly Publisher
RS Global Sp. z O.O.
ISNI: 0000 0004 8495 2390

Dolna 17, Warsaw,
Poland 00-773
+48 226 0 227 03
editorial_office@rsglobal.pl

ARTICLE TITLE	IMPACT OF SCREEN TIME AND MEDIA USE ON NEURODEVELOPMENT, EMOTIONAL AND BEHAVIORAL OUTCOMES, AND MENTAL HEALTH IN CHILDREN
DOI	https://doi.org/10.31435/ijitss.4(48).2025.4467
RECEIVED	28 October 2025
ACCEPTED	14 December 2025
PUBLISHED	20 December 2025
LICENSE	The article is licensed under a **Creative Commons Attribution 4.0 International License.**

IMPACT OF SCREEN TIME AND MEDIA USE ON NEURODEVELOPMENT, EMOTIONAL AND BEHAVIORAL OUTCOMES, AND MENTAL HEALTH IN CHILDREN

Aleksandra Oparcik *(Corresponding Author, Email: aleksandra.oparcik@gmail.com)*
Medical Center HCP, Poznań, Poland
ORCID ID: 0009-0008-0438-3797

Anna Baranowska
University Clinical Hospital No. 2, Pomeranian Medical University in Szczecin, Szczecin, Poland
ORCID ID: 0009-0006-1762-2414

Marta Cieślak
University Clinical Hospital in Poznań, Poznań, Poland
ORCID ID: 0009-0004-5522-3786

Laura Kurczoba
Józef Struś Multi-Specialist Municipal Hospital, Poznań, Poland
ORCID ID: 0009-0004-1330-991X

Anastazja Orłowa
University Clinical Center of the Medical University of Warsaw, Warsaw, Poland
ORCID ID: 0009-0005-5125-3686

Anita Pakuła
Medical University of Silesia in Katowice, Katowice, Poland
ORCID ID: 0009-0002-7866-2939

Klaudia Martyna Patrzykąt
109 Military Hospital with Polyclinic in Szczecin, Szczecin, Poland
ORCID ID: 0009-0000-9440-5444

Julia Pawłowska
St. Barbara Provincial Specialist Hospital No. 5 in Sosnowiec, Sosnowiec, Poland
ORCID ID: 0009-0004-4309-0226

Kinga Szyszka
J. Gromkowski Provincial Specialist Hospital in Wrocław, Wrocław, Poland
ORCID ID: 0009-0001-3467-4121

Kamil Turlej
University Clinical Center of the Medical University of Warsaw, Warsaw, Poland
ORCID ID: 0009-0008-2919-284X

ABSTRACT

Digital devices offer opportunities for learning and communication, but growing evidence links excessive screen exposure to negative cognitive, language, auditory, and psychosocial outcomes, as well as increased sedentary behavior. These concerns intensified during the COVID-19 pandemic, when lockdowns and school closures led to substantial increases in screen use, as digital media became essential for remote learning, emotional regulation, and social connection. Moreover, emerging research suggests that these elevated screen habits may persist beyond the pandemic, underscoring the need for parental guidance and developmentally appropriate limits.

This review analyzed articles from the PubMed, Scopus, and Google Scholar databases, with particular emphasis on recent systematic reviews, meta-analyses, and cross-sectional studies investigating how screen time and media use affect children's neurodevelopment, emotional and behavioral outcomes, and mental health.

During the pandemic, children frequently exceeded recommended screen limits. Across studies, prolonged early screen exposure was linked to increased risk of cognitive, language, and social delays, particularly among children with emerging ASD symptoms or higher genetic susceptibility to ADHD. Fast-paced content correlated with ADHD-related behaviors and video gaming with conduct problems, whereas interactive and communication-based media showed fewer negative associations. Language development appeared especially vulnerable: excessive mobile device use, background television, and parental "technoference" were associated with fewer conversational turns, reduced child vocalizations, poorer language outcomes, and weaker auditory responsiveness.

These findings highlight the importance of parent-focused strategies that promote balanced media habits, such as screen-free routines, time limits, and active monitoring. Future research should clarify the specific pathways linking screen time to developmental outcomes and identify effective intervention strategies that can help mitigate potential risks.

KEYWORDS

Screen Time, Digital Media, Technoference, Language Development, Neurodevelopment, COVID-19, Autism Spectrum Disorder, ADHD, Parental Mediation

CITATION

Aleksandra Oparcik, Anna Baranowska, Marta Cieślak, Laura Kurczoba, Anastazja Orłowa, Anita Pakuła, Klaudia Martyna Patrzykąt, Julia Pawłowska, Kinga Szyszka, Kamil Turlej. (2025). Impact of Screen Time and Media Use on Neurodevelopment, Emotional and Behavioral Outcomes, and Mental Health in Children. *International Journal of Innovative Technologies in Social Science*. 4(48). doi: 10.31435/ijitss.4(48).2025.4467

Introduction

In recent years, digital devices have become ubiquitous in the daily lives of children and adolescents. This has raised growing concerns about their potential effects on neurodevelopment, behavioral and emotional outcomes, and mental health. The accessibility of screens, ranging from televisions, tablets, smartphones to computers, has drastically transformed how children develop language, respond to sounds, interact, play, and form habits (Panjeti-Madan & Ranganathan, 2023). While digital technologies provide opportunities for education, communication, and entertainment, the accumulated evidence has identified possible associations between excessive screen exposure and adverse effects on cognitive processes, language development, auditory responsiveness, and psychosocial outcomes in children and adolescents (Marriage et al., 2024). Moreover, screen time seems to contribute to the formation of sedentary behavior. There are also studies linking excessive screen time with unhealthy eating patterns (Votsi & Koutelidakis, 2025). Additionally, a growing body of research has investigated the COVID-19 pandemic. This period altered the daily lives of children and families worldwide, reshaping patterns of education, leisure, and social interaction. Digital media took on new roles, becoming a tool for managing children's emotions, facilitating remote learning, and providing social connection amid isolation (Hedderson et al., 2023). Longitudinal cohorts suggest that elevated screen habits established during early childhood may continue post-pandemic, emphasizing the need for parental involvement and age-appropriate limits (Y. Li, 2024). Nevertheless, during the worldwide pandemic, lifestyle changes were necessary. Screen time increased significantly during lockdowns as it became essential

for maintaining relationships, managing leisure time, and supporting educational activities (Arundell et al., 2021). Amid the COVID-19 health crisis and the self-isolation requirement, digital technologies became indispensable and beneficial for the well-being of children and adolescents.

Methods

This review was based on articles sourced from the PubMed, Scopus, and Google Scholar databases, with particular emphasis on recent systematic reviews, meta-analyses, investigating how screen time and media use affect children's neurodevelopment, emotional and behavioral outcomes, and mental health.

The literature search was carried out using the following keywords: excessive screen time exposure, digital media, technoference, language development, cognitive development, neurodevelopment, mental health, COVID-19, autism spectrum disorder, attention-deficit/hyperactivity disorder.

Screen time during COVID-19 pandemic

The COVID-19 pandemic provided a distinct context for examining the influence of screen media on children's development. Mandated stay-at-home policies and the widespread closure of schools and childcare centers significantly disrupted the daily routines of families with children. These shifts, along with the associated stressors, likely strained family well-being and contributed to increased screen exposure among children (Hartshorne et al., 2021). It also offered an opportunity to identify both individual and cultural factors influencing digital media use among children. Current research provides insight into how families perceive, use, and are impacted by screens in their everyday routines as well as during times of disruption. According to the World Health Organization's (WHO) recommendations, infants and children under 2 years should not be exposed to screens, while those aged 2 to 4 years should have less than one hour of screen time per day.

Numerous studies have explored patterns of screen use throughout the COVID-19 pandemic. A longitudinal cohort study carried out in the United States indicated that children's screen use rose by approximately 1.75 hours per day at the onset of the pandemic and remained elevated by about 1.11 hours per day compared with pre-pandemic levels as the pandemic continued. The overall increase was primarily driven by greater recreational screen use, and across most categories, a higher proportion of screen time involved shared engagement with a caregiver. Moreover, across the study period, children from self-identified racial or ethnic minority groups consistently exhibited higher overall screen time than their non-Hispanic White peers (Hedderson et al., 2023).

Additionally, a cross-sectional study explored media use patterns among Canadian preschoolers during the COVID-19 pandemic, focusing on factors associated with excessive screen exposure (more than two hours per day) and bedtime media use. The study found that over half of the children exceeded recommended screen time limits, and over half were regularly exposed to screens before bed. Older children and those with parents who reported higher screen use were more likely to exceed recommended limits (Fitzpatrick et al., 2022). In contrast, parents who practiced restrictive mediation, defined as setting clear rules regarding duration and content, had children with lower overall media use (NATHANSON, 1999). Instructive or active mediation involves talking with children about the content they encounter in media, while social co-viewing refers to watching media together without engaging in discussion (Valkenburg et al., 1999). Co-viewing has also been highlighted as a valuable approach for enhancing the benefits of media use and minimizing its risks, whereas instructive mediation has been associated with better learning outcomes from educational media (Strouse et al., 2013). Moreover, restrictive parental mediation was associated with reduced bedtime exposure, whereas co-viewing and instructive mediation, were linked to more frequent bedtime screen use. Children's temperament played an additional role: those with stronger effortful control (better emotional and attentional regulation) were less likely to engage in bedtime media use. Families with higher levels of education, income, and work-from-home arrangements reported less excessive use, while greater satisfaction with the division of childcare was also linked to healthier screen habits (Fitzpatrick et al., 2022).

Other scientific research made similar observations. It examined screen use among children aged 8 to 36 months, recruited from 12 countries during the first COVID-19 lockdown. Toddlers who were not engaged in online schooling experienced higher screen exposure during the lockdown compared with the period before it. This increase appeared to be especially pronounced in countries where lockdowns lasted longer. There was no indication that the rise in screen time was directly linked to sociodemographic factors such as child age or socioeconomic status (SES). Nonetheless, during the lockdown, screen use showed a negative association with SES and positive associations with child age, caregiver screen habits, and caregivers' attitudes toward children's screen use (Bergmann et al., 2022). The findings underscore the influence of the COVID-19 lockdown on young children's screen exposure.

Neurodevelopmental disorders and behavioral issues

In recent years, the rapid growth in the use of electronic devices has greatly increased children's exposure to screens, leading to growing public concern about their effects on neurodevelopment and mental health. Considerable attention has been given to the possible link between prolonged screen exposure in infancy and the risk of neurodevelopmental disorders (Takahashi et al., 2023). Neurodevelopmental disorders (NDDs) are a group of conditions resulting from atypical brain development that lead to impairments in cognition, communication, behavior, or motor functioning, typically manifesting in early childhood and persisting throughout life (Kalin, 2020). The most prevalent are autism spectrum disorder (ASD) and attention-deficit/hyperactivity disorder (ADHD), both of which show a steady increase over time (Abdelnour et al., 2022) (Francés et al., 2022) (Maenner et al., 2023). ADHD is characterized by primary symptoms of inattention, hyperactivity, and impulsivity, which can hinder a child's ability to learn, interact socially, and regulate emotions effectively (Sadr-Salek et al., 2023). In contrast, autism spectrum disorder is a neurodevelopmental condition that affects brain maturation and impairs social functioning. Children with ASD typically experience difficulties in communication and social interaction, as well as delays in language and cognitive development, learning challenges, and atypical or inappropriate emotional responses (Hirota & King, 2023).

The relationship between the multi-dimensional aspects of screen exposure and autistic symptoms is being investigated. Although the exact causes of ASD remain unclear, the condition is thought to result from a combination of genetic and environmental influences (Yasuda et al., 2023). For children with autism spectrum disorder (ASD), early and frequent screen exposure is considered a potentially significant environmental factor influencing their developmental trajectories (Heffler et al., 2020). The American Academy of Pediatrics (AAP) recommends that infants and toddlers younger than 18 to 24 months should not be exposed to digital media and should avoid independent use of electronic devices. Moreover, excessive and frequent screen exposure has been associated with worsening autistic behaviors and delays in cognitive, language, and social development (Peng et al., 2024). A cohort study that analyzed information collected from mothers and their children in Japan suggested that boys who had longer screen exposure at age one were more likely to show ASD symptoms by age three. This may reflect the fact that, at younger ages, the brain is more sensitive to genetic influences that shape later development, whereas by age three it has already achieved certain developmental milestones that lessen this vulnerability (Kushima et al., 2022). Early screen exposure may place children at a greater risk of developing ASD compared with those who are introduced to screens at a later age (Sarfraz et al., 2023). Screen time may displace crucial activities like parent–child interaction, outdoor play, and real-world social experiences (Chan, 2024). Additionally, children with more severe ASD symptoms may naturally gravitate toward screens, making the direction of causality unclear. Prolonged screen use in early childhood may not directly cause autism spectrum disorder but could reflect early behavioral traits, as children with a higher genetic risk for ASD tend to be more drawn to objects than to social interactions. In contrast, a higher polygenic risk for ADHD was linked to increased screen use over time, possibly due to a greater vulnerability to impulsivity and gaming addiction. The findings highlight that genetic predispositions may influence children's screen habits (Takahashi et al., 2023).

Other findings were reported in a 2023 Chinese cross-sectional survey that investigated the relationship between screen time and attention deficit/hyperactivity disorder in preschool children. It was observed that the link between screen time and ADHD symptoms was not significant among preschoolers overall, except for those who were overweight or obese. This association may indirectly suggest that obesity could influence the relationship between ADHD symptoms and screen exposure. Increased screen use contributes to greater sedentary behavior, which can raise BMI, while children with obesity may, in turn, be more likely to engage in prolonged screen use due to physical limitations (Zhou et al., 2023). Moreover, children's physical activity is an important factor in enhancing attention and reducing hyperactive behaviors (Suchert et al., 2017). Other studies suggest that a higher polygenic risk for ADHD was linked to increased screen use over time, possibly due to a greater vulnerability to impulsivity and gaming addiction. The findings highlight that genetic predispositions may influence children's screen habits (Takahashi et al., 2023).

Furthermore, as research in this field has expanded, it has become clear that not only the amount of time spent on screens but also the type of content viewed plays an important role in children's psychological development. Different kinds of screen content may affect children in distinct ways (Kostyrka-Allchorne et al., 2017). When analyzed by type of content, both educational videos and cartoon videos were significantly linked to ADHD risk. In contrast, interactive videos (such as video calls or apps involving active participation) showed no significant association with ADHD risk. The authors suggest that the rapid scene changes and overstimulation typical of educational and cartoon content may disrupt attention regulation and self-control,

while interactive content might engage children in more cognitively active and socially reciprocal ways (Wu et al., 2025). Although the direct influence of screen time on the development of neurodevelopmental disorders remains uncertain, evidence suggests that having siblings may encourage more outdoor activities and foster social skill development (Sugiyama et al., 2023).

Around one in five children and adolescents experience mental health difficulties, which often present as behavioral issues. Even moderate behavioral problems can interfere with healthy development into adulthood. Many childhood mental health concerns fall under the category of "behavioral problems," yet they are frequently missed or insufficiently addressed (Copeland et al., 2015). Because these difficulties can have lasting effects, it is essential to identify the factors that contribute to them. Extended screen use has been linked to poorer mental health in children, partly through its negative impact on sleep and its promotion of sedentary behavior and reduced physical activity (C. Li et al., 2020)(Oswald et al., 2020) (Tandon et al., 2021). Concerns are increasing about problematic patterns of internet gaming, and the ICD-11 now formally recognizes gaming disorder. Numerous cross-sectional studies have reported associations between excessive screen time and behavioral difficulties in children (Song et al., 2020) (Anitha et al., 2021). In a large cross-sectional analysis from the Hokkaido Study on Environment and Children's Health, video gaming emerged as the screen activity most strongly associated with behavioral problems. Children who played video games for two or more hours on weekdays had more than double the odds of exhibiting elevated behavioral difficulties compared with those who did not play games. Increased gaming time was particularly linked to higher rates of conduct problems, hyperactivity/inattention, and lower prosocial behavior. Conversely, moderate use of email, messaging, or social networking services (about one hour per day) was associated with fewer peer relationship problems. Watching television or videos showed no meaningful association with behavioral difficulties (Tamura et al., 2025).

Some research suggests that reducing screen time may help prevent neurodevelopmental difficulties, whereas other work, such as a Chinese study found that genes that predispose people to spend more leisure time on screens are linked to a lower ADHD risk but to a higher risk of reduced intelligence, with no genetic causal relationship for several other neurodevelopmental disorders (Cai et al., 2025). Given these inconsistencies, it remains challenging to establish a clear relationship between screen time and neurodevelopmental outcomes.

Language development

The significance of providing a language-rich home environment in the early years of life is well recognized. Research shows that early language exposure is positively linked to children's language and socioemotional development, intelligence, and brain functioning. Children's language abilities play a crucial role in their social and academic growth, making language acquisition one of the most vital aspects of early development (Massaroni et al., 2024). In contrast, early language delays or disorders have been linked to behavioral problems and to poorer academic performance both at school entry and later in life. Consequently, many programs now aim to increase parent–child verbal interaction within the home (Ferjan Ramírez et al., 2019). From infancy, language emerges through interactions with parents and other important caregivers (Brushe et al., 2024). Providing a cognitively stimulating environment—for example, by reading to the child—can further support and enrich this developmental process. Studies from Australia and the United States have revealed substantial variation in how much families engage in such talk (Gilkerson et al., 2017) (Brushe et al., 2020) (Brushe et al., 2021). Although speaking with children may appear straightforward, the demands of modern family life often make it challenging. It is therefore essential to identify factors within the home environment that may hinder parents' ability to communicate and interact with their children, in order to guide interventions that foster language-rich interactions and promote healthy language development.

An expanding body of evidence has explored how screen time influences parent–child communication, including the number of adult words spoken, children's vocalizations, and conversational turn-taking. The concept of "technoference" (technology + interference) refers to situations in which a parent's use of digital devices interrupts or distracts from interactions with their child (McDaniel & Radesky, 2018) It suggests that parents' engagement with screens reduces opportunities to talk and respond to their children (Brushe et al., 2024). Systematic reviews have shown that parental smartphone use is linked to lower responsiveness and attention toward young children (Knitter & Zemp, 2020), as well as reduced emotional and verbal engagement, harsher interactions, and fewer positive communications when parents are occupied with digital devices (Beamish et al., 2019) Recent data indicates that children aged two and three who spent at least one hour per day using mobile devices had notably lower language development scores, along with an increased likelihood

of difficulties in both understanding language and expressing themselves. Moreover, background television—when it is on but not being actively watched—can also negatively affect expressive language, executive functioning, attention, and the overall quality of children's play (Sugiyama et al., 2023).

Language development is closely linked to the hearing process and is stimulated by the sounds in a child's environment. Recent research has examined whether young children's responsiveness to simple auditory cues is associated with their exposure to entertainment screen time (EST). A 2023 study found that higher EST was consistently related to poorer vocabulary, weaker social-communication skills, and an increased likelihood of unresponsiveness to simple sounds during hearing assessments (Marriage et al., 2024).

Research indicates that screen use can have both beneficial and detrimental effects on language development. On the positive side, it may support vocabulary growth, introduce children to diverse cultural and linguistic experiences, and provide a safe way to keep them engaged (Balton et al., 2019) On the other hand, it is important to note that children only start meaningfully processing and interpreting information around age two, which may make it harder for them to understand content presented on screens (Ponti et al., 2017).

Discussion

The findings of this review highlight the complex relationship between digital media use and children's neurodevelopment, behavior, mental health, and language outcomes. Across studies, excessive or developmentally inappropriate screen exposure was consistently associated with a range of adverse outcomes, though the magnitude and nature of these effects varied by age, type of content, family context, and child characteristics. Taken together, the evidence suggests that different types of screen use lead to different outcomes for children. Its impact depends heavily on what children are watching, how they are engaging with media, and under what circumstances screen use occurs.

During the COVID-19 pandemic, digital media use increased markedly across age groups, driven by the closure of schools and childcare centers, disruptions to family routines, and heightened stress within households. Although these increases were understandable and at times necessary for maintaining educational continuity, social contact, and emotional regulation, they nonetheless amplified existing screen-related risks. Notably, children from socioeconomically disadvantaged or minority backgrounds demonstrated greater increases in total screen exposure, suggesting that pandemic-related inequalities may have disproportionately influenced media use patterns. These findings underscore the need for policies and supports that reduce disparities in digital access, parental workload, and caregiving strain.

Evidence related to neurodevelopmental disorders indicates that prolonged early screen exposure may contribute to delays in cognitive, language, and social development. However, causality remains difficult to establish, particularly given that children with emerging ASD symptoms or higher genetic susceptibility to ADHD may be more drawn to screens. This bidirectional relationship emphasizes the importance of considering both environmental and biological mechanisms when interpreting findings. Interestingly, content type emerged as an important factor. Fast-paced educational and cartoon videos were linked to increased ADHD risk, whereas interactive media involving social participation did not show these associations. This distinction suggests that media experiences that promote social exchange and cognitive engagement may be less harmful or potentially even protective compared to passive, rapidly stimulating content.

Behavioral findings were similarly nuanced. Excessive screen use, especially video gaming, was strongly associated with conduct problems, hyperactivity, and reduced prosocial behavior. At the same time, moderate use of communication-based platforms, such as messaging or social networking services, was linked to improved peer relationships. These outcomes highlight that screen time should not be conceptualized solely in terms of quantity. The behavioral implications differ substantially depending on the social or cognitive demands of specific media activities.

Language development emerged as a particularly sensitive domain. Evidence consistently showed that high screen exposure was associated with fewer adult–child conversational turns, reduced child vocalizations, and worsened auditory processing skills. The concept of "technoference" provides a compelling explanation: parental digital engagement competes with opportunities for verbal interaction and responsive caregiving, both of which are foundational for early language learning. Despite these converging findings, several limitations warrant consideration. Many studies relied on parent-reported screen time, which may underestimate actual use. Cross-sectional designs further limit causal inference, and cultural differences in parenting practices may affect the generalizability of research results. In addition, rapid technological change means that children's media environments evolve faster than research can fully capture.

Overall, the results of this review point to several key implications for practice and policy. First, guidance for families should emphasize not only reducing excessive screen time but also supporting high-quality, interactive media experiences and encouraging parent–child co-engagement (Karani et al., 2022) Second, interventions should prioritize maintaining language-rich environments, limiting background television, and promoting responsive caregiving. Finally, future research should adopt longitudinal and experimental designs, incorporate objective measures of screen exposure, and explore individual differences in susceptibility to screen-related risks.

Conclusions

Excessive or developmentally inappropriate screen exposure in children was consistently associated with adverse effects, including delayed cognitive and language development, increased behavioral difficulties, and reduced quality of parent–child interaction. The consequences of screen use are not uniform; they depend on factors such as the child's age, the type and content of media consumed, the context in which screens are used, and individual vulnerabilities, including genetic predispositions. The findings emphasize the need for parent-focused interventions that encourage approaches such as setting screen-free times, implementing parental monitoring and time limits, and promoting alternative activities to foster balanced media habits from early childhood.

However, future large-scale, long-term studies are needed to better understand the impact of screen exposure on children. Future studies should differentiate between types of digital content, and account for family, cultural, and biological influences. While digital media can provide valuable educational and social benefits, excessive or poorly regulated screen use may pose significant risks to children's neurodevelopmental, behavioral, and language outcomes. A balanced, evidence-based approach to digital media use, guided by developmental principles and family needs, is essential for supporting healthy development in an increasingly digital world.

Funding Statement: This research did not receive any funding.
Conflict of Interest Statement: The authors declare no potential conflict of interest.

REFERENCES

1. Abdelnour, E., Jansen, M. O., & Gold, J. A. (2022). ADHD Diagnostic Trends: Increased Recognition or Overdiagnosis? *Missouri Medicine*, *119*(5), 467–473.
2. Anitha, F. S., Narasimhan, U., Janakiraman, A., Janakarajan, N., & Tamilselvan, P. (2021). Association of digital media exposure and addiction with child development and behavior. *Industrial Psychiatry Journal*, *30*(2), 265–271. https://doi.org/10.4103/ipj.ipj_157_20
3. Arundell, L., Veitch, J., Sahlqvist, S., Uddin, R., Ridgers, N. D., Salmon, J., Timperio, A., & Parker, K. (2021). Changes in Families' Leisure, Educational/Work and Social Screen Time Behaviours before and during COVID-19 in Australia: Findings from the Our Life at Home Study. *International Journal of Environmental Research and Public Health*, *18*(21), 11335. https://doi.org/10.3390/ijerph182111335
4. Balton, S., Uys, K., & Alant, E. (2019). Family-based activity settings of children in a low-income African context. *African Journal of Disability*, *8*. https://doi.org/10.4102/ajod.v8i0.364
5. Beamish, N., Fisher, J., & Rowe, H. (2019). Parents' use of mobile computing devices, caregiving and the social and emotional development of children: a systematic review of the evidence. *Australasian Psychiatry*, *27*(2), 132–143. https://doi.org/10.1177/1039856218789764
6. Bergmann, C., Dimitrova, N., Alaslani, K., Almohammadi, A., Alroqi, H., Aussems, S., Barokova, M., Davies, C., Gonzalez-Gomez, N., Gibson, S. P., Havron, N., Horowitz-Kraus, T., Kanero, J., Kartushina, N., Keller, C., Mayor, J., Mundry, R., Shinskey, J., & Mani, N. (2022). Young children's screen time during the first COVID-19 lockdown in 12 countries. *Scientific Reports*, *12*(1). https://doi.org/10.1038/s41598-022-05840-5
7. Brushe, M. E., Haag, D. G., Melhuish, E. C., Reilly, S., & Gregory, T. (2024). Screen Time and Parent-Child Talk When Children Are Aged 12 to 36 Months. *JAMA Pediatrics*, *178*(4), 369–375. https://doi.org/10.1001/jamapediatrics.2023.6790
8. Brushe, M. E., Lynch, J., Reilly, S., Melhuish, E., Mittinty, M. N., & Brinkman, S. A. (2021). The education word gap emerges by 18 months: findings from an Australian prospective study. *BMC Pediatrics*, *21*(1), 247. https://doi.org/10.1186/s12887-021-02712-1
9. Brushe, M. E., Lynch, J. W., Reilly, S., Melhuish, E., & Brinkman, S. A. (2020). How many words are Australian children hearing in the first year of life? *BMC Pediatrics*, *20*(1), 52. https://doi.org/10.1186/s12887-020-1946-0
10. Cai, C., Ran, Q., Lu, M., Song, C., & Jiang, Z. (2025). Leisure Screen Time and the Risk of Six Neurodevelopmental Disorders: A Two-Sample Mendelian Randomization Study. *Brain and Behavior*, *15*(9). https://doi.org/10.1002/brb3.70884

11. Chan, D. K.-L. (2024). Balancing screen time: Insights and impact on preschool children. *Annals of the Academy of Medicine, Singapore*, *53*(7), 402–404. https://doi.org/10.47102/annals-acadmedsg.2024172
12. Copeland, W. E., Wolke, D., Shanahan, L., & Costello, E. J. (2015). Adult Functional Outcomes of Common Childhood Psychiatric Problems. *JAMA Psychiatry*, *72*(9), 892. https://doi.org/10.1001/jamapsychiatry.2015.0730
13. Ferjan Ramírez, N., Lytle, S. R., Fish, M., & Kuhl, P. K. (2019). Parent coaching at 6 and 10 months improves language outcomes at 14 months: A randomized controlled trial. *Developmental Science*, *22*(3). https://doi.org/10.1111/desc.12762
14. Fitzpatrick, C., Almeida, M. L., Harvey, E., Garon-Carrier, G., Berrigan, F., & Asbridge, M. (2022). An examination of bedtime media and excessive screen time by Canadian preschoolers during the COVID-19 pandemic. *BMC Pediatrics*, *22*(1). https://doi.org/10.1186/s12887-022-03280-8
15. Francés, L., Quintero, J., Fernández, A., Ruiz, A., Caules, J., Fillon, G., Hervás, A., & Soler, C. V. (2022). Current state of knowledge on the prevalence of neurodevelopmental disorders in childhood according to the DSM-5: a systematic review in accordance with the PRISMA criteria. *Child and Adolescent Psychiatry and Mental Health*, *16*(1), 27. https://doi.org/10.1186/s13034-022-00462-1
16. Gilkerson, J., Richards, J. A., Warren, S. F., Montgomery, J. K., Greenwood, C. R., Kimbrough Oller, D., Hansen, J. H. L., & Paul, T. D. (2017). Mapping the Early Language Environment Using All-Day Recordings and Automated Analysis. *American Journal of Speech-Language Pathology*, *26*(2), 248–265. https://doi.org/10.1044/2016_AJSLP-15-0169
17. Hartshorne, J. K., Huang, Y. T., Lucio Paredes, P. M., Oppenheimer, K., Robbins, P. T., & Velasco, M. D. (2021). Screen time as an index of family distress. *Current Research in Behavioral Sciences*, *2*. https://doi.org/10.1016/j.crbeha.2021.100023
18. Hedderson, M. M., Bekelman, T. A., Li, M., Knapp, E. A., Palmore, M., Dong, Y., Elliott, A. J., Friedman, C., Galarce, M., Gilbert-Diamond, D., Glueck, D., Hockett, C. W., Lucchini, M., McDonald, J., Sauder, K., Zhu, Y., Karagas, M. R., Dabelea, D., & Ferrara, A. (2023). Trends in Screen Time Use among Children during the COVID-19 Pandemic, July 2019 Through August 2021. *JAMA Network Open*, *6*(2), E2256157. https://doi.org/10.1001/jamanetworkopen.2022.56157
19. Heffler, K. F., Sienko, D. M., Subedi, K., McCann, K. A., & Bennett, D. S. (2020). Association of Early-Life Social and Digital Media Experiences With Development of Autism Spectrum Disorder-Like Symptoms. *JAMA Pediatrics*, *174*(7), 690–696. https://doi.org/10.1001/jamapediatrics.2020.0230
20. Hirota, T., & King, B. H. (2023). Autism Spectrum Disorder: A Review. *JAMA*, *329*(2), 157–168. https://doi.org/10.1001/jama.2022.23661
21. Kalin, N. H. (2020). Childhood and Adolescent Neurodevelopmental Disorders. *American Journal of Psychiatry*, *177*(9), 792–794. https://doi.org/10.1176/appi.ajp.2020.20071046
22. Karani, N. F., Sher, J., & Mophosho, M. (2022). The influence of screen time on children's language development: A scoping review. *South African Journal of Communication Disorders*, *69*(1). https://doi.org/10.4102/sajcd.v69i1.825
23. Knitter, B., & Zemp, M. (2020). Digital Family Life: A Systematic Review of the Impact of Parental Smartphone Use on Parent-Child Interactions. *Digital Psychology*, *1*(1), 29–43. https://doi.org/10.24989/dp.v1i1.1809
24. Kostyrka-Allchorne, K., Cooper, N. R., Gossmann, A. M., Barber, K. J., & Simpson, A. (2017). Differential effects of film on preschool children's behaviour dependent on editing pace. *Acta Paediatrica*, *106*(5), 831–836. https://doi.org/10.1111/apa.13770
25. Kushima, M., Kojima, R., Shinohara, R., Horiuchi, S., Otawa, S., Ooka, T., Akiyama, Y., Miyake, K., Yokomichi, H., & Yamagata, Z. (2022). Association between Screen Time Exposure in Children at 1 Year of Age and Autism Spectrum Disorder at 3 Years of Age: The Japan Environment and Children's Study. *JAMA Pediatrics*, *176*(4), 384–391. https://doi.org/10.1001/jamapediatrics.2021.5778
26. Li, C., Cheng, G., Sha, T., Cheng, W., & Yan, Y. (2020). The Relationships between Screen Use and Health Indicators among Infants, Toddlers, and Preschoolers: A Meta-Analysis and Systematic Review. *International Journal of Environmental Research and Public Health*, *17*(19), 7324. https://doi.org/10.3390/ijerph17197324
27. Li, Y. (2024). Children's development in the digital age: impact of technology, family, and pandemic on education and well-being. *Early Child Development and Care*, *194*(13–14), 1245–1250. https://doi.org/10.1080/03004430.2024.2440687
28. Maenner, M. J., Warren, Z., Williams, A. R., Amoakohene, E., Bakian, A. V, Bilder, D. A., Durkin, M. S., Fitzgerald, R. T., Furnier, S. M., Hughes, M. M., Ladd-Acosta, C. M., McArthur, D., Pas, E. T., Salinas, A., Vehorn, A., Williams, S., Esler, A., Grzybowski, A., Hall-Lande, J., … Shaw, K. A. (2023). Prevalence and Characteristics of Autism Spectrum Disorder Among Children Aged 8 Years - Autism and Developmental Disabilities Monitoring Network, 11 Sites, United States, 2020. *Morbidity and Mortality Weekly Report. Surveillance Summaries (Washington, D.C. : 2002)*, *72*(2), 1–14. https://doi.org/10.15585/mmwr.ss7202a1
29. Marriage, J. E., Keshavarzi, M., & Moore, B. C. J. (2024). An association between auditory responsiveness of children and duration of entertainment screen time in the early years of life. *International Journal of Audiology*, *63*(9), 731–737. https://doi.org/10.1080/14992027.2023.2260097
30. Massaroni, V., Delle Donne, V., Marra, C., Arcangeli, V., & Chieffo, D. P. R. (2024). The Relationship between Language and Technology: How Screen Time Affects Language Development in Early Life—A Systematic Review. In *Brain Sciences* (Vol. 14, Issue 1). Multidisciplinary Digital Publishing Institute (MDPI). https://doi.org/10.3390/brainsci14010027

31. McDaniel, B. T., & Radesky, J. S. (2018). Technoference: Parent Distraction With Technology and Associations With Child Behavior Problems. *Child Development*, *89*(1), 100–109. https://doi.org/10.1111/cdev.12822
32. NATHANSON, A. I. (1999). Identifying and Explaining the Relationship Between Parental Mediation and Children's Aggression. *Communication Research*, *26*(2), 124–143. https://doi.org/10.1177/009365099026002002
33. Oswald, T. K., Rumbold, A. R., Kedzior, S. G. E., & Moore, V. M. (2020). Psychological impacts of "screen time" and "green time" for children and adolescents: A systematic scoping review. *PLOS ONE*, *15*(9), e0237725. https://doi.org/10.1371/journal.pone.0237725
34. Panjeti-Madan, V. N., & Ranganathan, P. (2023). Impact of Screen Time on Children's Development: Cognitive, Language, Physical, and Social and Emotional Domains. *Multimodal Technologies and Interaction*, *7*(5), 52. https://doi.org/10.3390/mti7050052
35. Peng, X., Xue, Y., Dong, H., Ma, C., Jia, F., & Du, L. (2024). A study of the effects of screen exposure on the neuropsychological development in children with autism spectrum disorders based on ScreenQ. *BMC Pediatrics*, *24*(1). https://doi.org/10.1186/s12887-024-04814-y
36. Ponti, M., Bélanger, S., Grimes, R., Heard, J., Johnson, M., Moreau, E., Norris, M., Shaw, A., Stanwick, R., Van Lankveld, J., & Williams, R. (2017). Screen time and young children: Promoting health and development in a digital world. *Paediatrics & Child Health*, *22*(8), 461–468. https://doi.org/10.1093/pch/pxx123
37. Sadr-Salek, S., Costa, A. P., & Steffgen, G. (2023). Psychological Treatments for Hyperactivity and Impulsivity in Children with ADHD: A Narrative Review. *Children*, *10*(10), 1613. https://doi.org/10.3390/children10101613
38. Sarfraz, S., Shlaghya, G., Narayana, S. H., Mushtaq, U., Shaman Ameen, B., Nie, C., Nechi, D., Mazhar, I. J., Yasir, M., & Arcia Franchini, A. P. (2023). Early Screen-Time Exposure and Its Association With Risk of Developing Autism Spectrum Disorder: A Systematic Review. *Cureus*. https://doi.org/10.7759/cureus.42292
39. Song, Y., Li, L., Xu, Y., Pan, G., Tao, F., & Ren, L. (2020). Associations between screen time, negative life events, and emotional and behavioral problems among Chinese children and adolescents. *Journal of Affective Disorders*, *264*, 506–512. https://doi.org/10.1016/j.jad.2019.11.082
40. Strouse, G. A., O'Doherty, K., & Troseth, G. L. (2013). Effective coviewing: Preschoolers' learning from video after a dialogic questioning intervention. *Developmental Psychology*, *49*(12), 2368–2382. https://doi.org/10.1037/a0032463
41. Suchert, V., Pedersen, A., Hanewinkel, R., & Isensee, B. (2017). Relationship between attention-deficit/hyperactivity disorder and sedentary behavior in adolescence: a cross-sectional study. *Attention Deficit and Hyperactivity Disorders*, *9*(4), 213–218. https://doi.org/10.1007/s12402-017-0229-6
42. Sugiyama, M., Tsuchiya, K. J., Okubo, Y., Rahman, M. S., Uchiyama, S., Harada, T., Iwabuchi, T., Okumura, A., Nakayasu, C., Amma, Y., Suzuki, H., Takahashi, N., Kinsella-Kammerer, B., Nomura, Y., Itoh, H., & Nishimura, T. (2023). Outdoor Play as a Mitigating Factor in the Association between Screen Time for Young Children and Neurodevelopmental Outcomes. *JAMA Pediatrics*, *177*(3), 303–310. https://doi.org/10.1001/jamapediatrics.2022.5356
43. Takahashi, N., Tsuchiya, K. J., Okumura, A., Harada, T., Iwabuchi, T., Rahman, M. S., Kuwabara, H., Nomura, Y., & Nishimura, T. (2023). The association between screen time and genetic risks for neurodevelopmental disorders in children. *Psychiatry Research*, *327*. https://doi.org/10.1016/j.psychres.2023.115395
44. Tamura, N., Yamazaki, K., Miyashita, C., Ikeda, A., Ajmal, A., Suyama, S., Hikage, T., Omiya, M., Mizuta, M., & Kishi, R. (2025). Association between children's intended screen time use and behavior problems in Japan: the Hokkaido Study on Environmental and Children's Health. *Environmental Health and Preventive Medicine*, *30*, 82. https://doi.org/10.1265/ehpm.25-00110
45. Tandon, P. S., Zhou, C., Johnson, A. M., Gonzalez, E. S., & Kroshus, E. (2021). Association of Children's Physical Activity and Screen Time With Mental Health During the COVID-19 Pandemic. *JAMA Network Open*, *4*(10), e2127892. https://doi.org/10.1001/jamanetworkopen.2021.27892
46. Valkenburg, P. M., Krcmar, M., Peeters, A. L., & Marseille, N. M. (1999). Developing a scale to assess three styles of television mediation: "Instructive mediation," "restrictive mediation," and "social coviewing." *Journal of Broadcasting & Electronic Media*, *43*(1), 52–66. https://doi.org/10.1080/08838159909364474
47. Votsi, I. C., & Koutelidakis, A. (2025). How Screen Time Affects Greek Schoolchildren's Eating Habits and Functional Food Consumption?—A Cross-Sectional Study. *Nutrients* , *17*(8). https://doi.org/10.3390/nu17081311
48. Wu, J. B., Yang, Y., Zhou, Q., Li, J., Yang, W. K., Yin, X., Qiu, S. Y., Zhang, J., Meng, M., Guo, Y., Chen, J. H., & Chen, Z. (2025). The relationship between screen time, screen content for children aged 1-3, and the risk of ADHD in preschools. *PLoS ONE*, *20*(4 April). https://doi.org/10.1371/journal.pone.0312654
49. Yasuda, Y., Matsumoto, J., Miura, K., Hasegawa, N., & Hashimoto, R. (2023). Genetics of autism spectrum disorders and future direction. *Journal of Human Genetics*, *68*(3), 193–197. https://doi.org/10.1038/s10038-022-01076-3
50. Zhou, Y., Jiang, X., Wang, R., Guo, B., Cai, J., Gu, Y., & Pei, J. (2023). The relationship between screen time and attention deficit/hyperactivity disorder in Chinese preschool children under the multichild policy: a cross-sectional survey. *BMC Pediatrics*, *23*(1), 361. https://doi.org/10.1186/s12887-023-04130-x