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Research Article

The Impact of Technology Use on Social and Cognitive Development of Children with Autism

*[1]Maria Bernardina E. Diomampo, [1]Melinda F. Marquez

About Article

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About Author

[1] University of Perpetual Help System DALTA, Las Piñas City, Philippines

Contact @ Melinda F. Marquez
melindamarquez49@yahoo.com

ABSTRACT

This study examines the impact of screen time on the cognitive and social development of children with autism spectrum disorder (ASD) in the elementary years, focusing on technology use at Selma Elementary School, Smithfield, North Carolina, during the 2024-2025 school year. The research involved special education (SPED) teachers working with children diagnosed with ASD. A descriptive design was employed to collect data, revealing key trends in student demographics and development. Sixty-two were boys aged 8-10 years and Forty-eight have Level 1 autism severity. These students exhibited a 10-15 minute attention span and averaged 3-4 hours of daily screen time. Teachers unanimously agreed that exposure to educational, recreational, and therapeutic technology promotes cognitive development in children with autism. Additionally, they believed that technology enhances social development, particularly in communication, peer interactions, and emotional regulation. Statistical analysis indicated significant differences in the effects of technology on cognitive and social development, with variations based on age, sex, autism severity, attention span, and screen time. However, no significant correlation was found between screen time, attention span, or autism severity with cognitive and social outcomes, suggesting a weak relationship. In conclusion, the study highlights the role of technology in supporting the development of children with ASD and advocates for further research and targeted interventions to optimize its use in special education.

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1. INTRODUCTION

Children with Autism Spectrum Disorder (ASD) have increasingly become a focal point in Human-Computer Interaction (HCI) research, which explores the role of technology in behavior analysis, assistive technologies, education, social skills, treatment, and well-being. However, many technologies reflect the normative expectations of neurotypical culture, often viewing Autism as a deficiency in need of "repair" rather than focusing on the unique needs and desires of children with Autism (Spiel *et al.*, 2019). As emphasized by the United Nations and the Convention on the Rights of Children with Disabilities, every child, including those with disabilities, has the right to quality education and development. This includes ensuring that children with ASD receive appropriate and relevant educational interventions (Mangonon, 2023). With an emphasis on helping children with impairments, including those with ASD, the Philippine Department of Education (DepEd) has underlined the value of inclusive and accessible education for all students.

In this regard, children with ASD are being supported in special education settings through the use of assistive technologies, such as interactive multimedia and educational software. Although there may be advantages to this technology, excessive screen time and its effects on the social and cognitive development of autistic children are causes for concern. Research indicates that screen time may affect social interaction, communication, and sensory processing in children with ASD, making it difficult for teachers to decide on the right amount of screen exposure (Dong *et al.*, 2021). This research aims to investigate how technology, precisely screen time, influences the cognitive and social development of children with ASD to provide evidence-based recommendations for its use in special education.

1.1. Statement of the Problem

1. What is the impact of technology use on cognitive development of children with autism with respect to type of screen exposure based on the SPED teacher's observation in terms of Educational content, Recreational content, and, Therapeutic content?

2. What is the utilization of technology use on social development of children with autism based on the SPED teacher's observation in terms of Communication, Peer Interaction; and, Emotional Regulation?

3. Is there a significant difference in the impact of technology use on cognitive development of children with autism with respect to type of screen exposure when grouped according to demographic background of the learner with autism handled by the SPED teacher?

4. Is there a significant difference in the impact of technology use on social development of children with autism when grouped according to demographic background of the learner with autism handled by the SPED teacher?

5. Is there a significant relationship between the screen time, attention span, and level of autism and impact of technology use on cognitive and social development of children with autism?

2. LITERATURE REVIEW

2.1. Screen Time and Children with Autism

Evidence related to screen time and its effects on children with Autism Spectrum Disorder (ASD) also presents beneficial as well as adverse effects. According to Stiller *et al.* (2019), screen media are part of the daily routine of children, with ASD children demonstrating a specific dependency on television for health. Still, because of the possible dangerous ramifications, its implementation must be kept under tight controls. ASD is a neurodevelopmental disorder with an impact on social interaction, and its earlier occurrence frequently demands intervention strategies such as restricting the use of screens (De Luca *et al.*, 2019). Madigan *et al.* (2020) emphasized the importance of limiting screen usage and selecting high-quality content, including instructional programs, to improve developmental outcomes for kids with ASD.

Westby (2020) emphasized the dual nature of screen media, showing that while digital gadgets like iPads provide inexpensive communication tools, excessive screen time can have negative consequences. Charlton *et al.* (2020) demonstrated the therapeutic potential of interactive technology by describing how live animation and avatars can improve social skills in kids with ASD. Heffler *et al.* (2022) established that screen time reduction can improve social interactions and reduce symptoms of ASD and supported parental intervention in controlling screen exposure.

Dong *et al.* (2021) also established a negative correlation between children's screen time and their social and cognitive growth with ASD, an indicator of risk factors like excessive exposure to screens and parental control. Muppalla *et al.* (2023) also discussed the impact of screen use on social, emotional, and cognitive development. High media exposure might lead to inadequate executive functioning, language delay, and emotional disturbances. Dy *et al.* (2023) further suggested that high screen time, notably more than two hours, has adverse effects on young children's language development, and co-viewing with parents may reduce such effects.

In summary, educationally, children with ASD can gain from screen time, but careless or excessive use can hinder development, particularly in language, social skills, and emotion regulation. To prevent the adverse effects of screen time, proper measures such as co-viewing and restriction of screen time must be employed. More research is needed to acknowledge the entirety of these effects and to develop evidence-based guidelines for screen use among children with ASD.

2.2. Impact of Technology Use on the Cognitive Development of Children

The influence of technology on children's development has been observed in many areas, including cognitive, language, physical, and social-emotional development (Panjeti-Madan & Ranganathan, 2023). Technology is an integral part of children's lives and affects academic and social behavior, but screen time needs to be regulated to ensure equitable development.

Pediatric guidelines require strict on-screen use restrictions, and most children less than five years old fail to adhere to them, thereby requiring enhanced family assistance (McArthur *et al.*, 2022).

Mobile technology has proved promising to support children with autism spectrum disorder (ASD), providing effective intervention through apps and virtual reality for improving

social and cognitive abilities (Leung *et al.*, 2021; Zhao *et al.*, 2022). Moreover, assistive technology such as Squizzy, which is specifically for children with ASD, has facilitated therapists and parents in maximizing the therapy sessions (Purnama *et al.*, 2021). Educational platforms tailored to children with intellectual disabilities have also proven effective by focusing on user perception and accessibility (Castro *et al.*, 2024).

Inclusion in recreational activities is crucial in developing children with special needs, providing emotional, physical, and social benefits (Fadare *et al.*, 2023). Furthermore, innovative technologies such as social robots and computerized cognitive games are being explored to aid children with ASD in social interactions and cognitive development (McBride, 2020; Rezayi *et al.*, 2023). Music therapy, too, has demonstrated positive impacts on motor and social skills in children with autism (Ragone *et al.*, 2021).

Expensive cost and time issues hinder the practice of Applied Behavior Analysis (ABA) therapy and create pressure to create less expensive, at-home learning programs for ASD kids to fill treatment gaps (Chistol *et al.*, 2023). Overall, these studies validate the role played by technology in promoting children's progress, especially kids with special needs.

2.3. Impact of Technology Use on the Social Development of Children

Samonte *et al.* (2020) emphasize that while one percent of the global population is diagnosed with Autism, over one million Filipinos are affected. However, no official statistics on autism prevalence exist in the Philippines. Their study focuses on designing a Filipino-based mobile Augmentative and Alternative Communication (AAC) and Picture Exchange Communication System (PECS) intervention. This tool integrates Tagalog, Filipino culture, and English, incorporating Text-to-Speech technology to fill the gap in existing systems, which mainly reflect Western languages and cultures. The goal is to provide Filipino autistic children with culturally appropriate assistive tools.

Chen *et al.* (2022) examine the application of Virtual Reality (VR) technology to enhance the social skills of children with autism spectrum disorder (ASD). Their literature review of VR interventions indicates that the technologies, particularly laptop-based VR devices, advance social communication, interaction, and cognition, most notably in older children with ASD. The study advocates for single-participant VR formats for better outcomes in these interventions.

Shatner *et al.* (2023) assess the use of Snapchat for peer-mediated therapies aimed at improving social interactions in Saudi Arabian students with ASD. Their findings demonstrate the cross-cultural relevance and feasibility of social media-based therapy for people with ASD, as the intervention significantly positively impacted social communication and interpersonal interactions.

Using story-based discussion, present "Amy," a virtual conversational companion, to help youngsters with ASD become more socially and emotionally competent. The chatbot receives positive feedback from parents and kids, pointing to its potential to enhance social-emotional learning and its relevance to children's emotional needs (Gagan *et al.*, 2023).

Menear and Ernest (2020) examine the physical activity levels of children with ASD and find that they have lower levels of physical activity and higher levels of sedentary behavior compared to their neurotypical counterparts. The research indicates that tailored physical activity programs may reduce these differences and enhance physical health outcomes for children with ASD.

Cardy *et al.* (2021) review the effect of screen time among children with ASD, emphasizing guilt and social isolation concerns of the parents. Screen time has the potential to enhance loss of contact, intensify social difficulties in children with ASD, and warrant revised screen time guidelines that focus on these children's requirements.

Mostajo *et al.* (2023) evaluate a multimedia-based intervention to promote the adaptive and social skills of students with ASD. Teachers reported that the intervention had the potential to greatly enhance students' attention, task competence, and interest, with favorable perceptions for teachers with different levels of teaching experience.

Samonte *et al.* (2024) explore the challenges of caring for individuals with ASD in the Philippines, noting the high costs and limited technological integration. Their study introduces an innovative system that uses Augmented Reality (AR) and computer vision to assist caregivers by recognizing and displaying emotions in real-time, improving the care process for individuals with ASD.

3. METHODOLOGY

3.1. Research Design

The study employed a descriptive quantitative research design, which, as explained by Mishra and Alok (2022), aims to explain circumstances as they exist at a given time through surveys and fact-finding investigations. Descriptive research uses various techniques, including surveys, comparative, and correlational methods. As Huang *et al.* (2023) note, a quantitative approach is ideal for analyzing large data sets and testing hypotheses through accurate measurements, making it suitable for studies that predict and explain solutions. This approach is often used to measure attitudes, behaviors, and variables in a way that allows for generalizable conclusions (Mohajan, 2020). The study focused on how screen time and technology affect the social and cognitive development of children with Autism, utilizing a 4-point Likert scale questionnaire to gather quantitative data for statistical analysis and identify trends in responses (Vale, 2023).

3.2. Population and Sampling

The study used purposive sampling to select respondents from special education teachers in public elementary schools in Smithfield, North Carolina, who handle learners with autism.

3.3. Respondents of the Study

The study involved 75 special education teachers in Selma Elementary School Smithfield, North Carolina, who handled an Autism learner.

3.4. Data Gathering Procedure

The researcher conducted a research study at Selma Elementary

School in North Carolina, distributing validated questionnaires to autistic children. After obtaining permission from the principal, the questionnaires were distributed and completed within a week. The data was analyzed using SPSS, and conclusions and recommendations were drawn. The study aimed to develop an intervention program utilizing technology to improve social and cognitive development in autistic children.

3.5. Statistical Treatment

The study used weighted mean and Chi-Square tests to analyze the impact of technology usage on the cognitive and social development of children with Autism. The weighted mean method considered various types of screen exposure, such as educational, recreational, and therapeutic content. The Chi-Square test was used to determine if there were significant differences in the effects of technology use on cognitive growth and social development, considering demographic characteristics of the learners. Pearson's correlation coefficient (r) was used to test the hypothesis that screen time and Autism severity might be correlated with cognitive and social development. Standard deviation was calculated to assess the variability in the data points. The study aimed to quantify the relationships between technology usage and developmental outcomes for children with Autism and determine if these varied based on content type and demographic background.

3.6. Ethical Considerations

The researcher adhered to ethical practices throughout the study, including obtaining permission from the School Administration, providing clear information to potential respondents, obtaining consent letters, and maintaining anonymity and confidentiality. They took precautions to avoid biases and ethical concerns, and addressed any concerns promptly. Adequate citation and referencing were also practiced to ensure academic integrity.

4. RESULTS AND DISCUSSION

Table 1. Composite Table on the Impact of Technology Use on the Cognitive Development of Children with Autism concerning Type of Screen Exposure based on the SPED Teacher's Observation in terms of Educational Content, Recreational Content, and Therapeutic Content

	Mean	Std. Deviation	Verbal Interpretation
Educational content	3.37	0.17	Agree
Recreational content	3.56	0.23	Strongly Agree
Therapeutic content	3.55	0.20	Strongly Agree
Impact of Technology Use on Cognitive Development of Children with Autism	3.50	0.13	Strongly Agree

The assessment of teacher-respondents indicated that the type of screen exposure influenced the cognitive development of children with autism. Specifically, recreational content (WM=3.56) and therapeutic content (WM=3.55) were rated as having a strong positive impact, while educational content (WM=3.37) was deemed somewhat less influential but still beneficial. With an overall mean of 3.50 and a standard deviation of 0.20, the findings show that technology use positively impacts the cognitive development of children with autism, especially when carefully selected content is used. The positive effect of recreational and therapy content implies that technology is able to give encouraging and engaging learning spaces which make autistic kids more intelligent.

These findings are supported by current studies highlighting the role of tailored content for children with autism. Gagan *et al.*'s (2023) review underscores the potential of context-sensitive, personalized technology in treating autism, particularly chatbots, to aid children in managing emotions and engaging in social communication. Furthermore, Chen *et al.*'s research from 2022 shown how well virtual reality (VR) technology may improve social skills, indicating that children with autism can learn socio-emotional abilities far better in immersive digital environments.

For improved social and cognitive benefits, Westby's (2020) research on choosing suitable digital media for kids with autism highlights the significance of striking a balance between screen time and content type.

This perspective is also supported by Menear and Ernest (2020), who found that children with autism tend to engage more in sedentary activities such as screen time and that the nature of screen use—whether recreational, educational, or therapeutic—plays a role in shaping their developmental outcomes. Their research highlighted that the impact of screen time on autistic children's social and cognitive abilities depends more on the quality of the content than on its quantity.

The research suggests that personalized digital content can enhance the cognitive and social development of children with autism, but excessive screen time can be detrimental.

Table 2. Composite Table on the Impact of Technology Use on Social Development of Children with Autism Based on the SPED Teacher's Observation in terms of Communication, Peer Interaction, and Emotional Regulation

	Mean	Std. Deviation	Verbal Interpretation
Communication	3.59	0.31	Strongly Agree
Peer interaction	3.59	0.23	Strongly Agree
Emotional regulation	3.65	0.25	Strongly Agree
Impact of Technology Use on Social Development of Children with Autism	3.61	0.19	Strongly Agree

The research indicates a very high agreement among SPED teachers on the effects of technology in enhancing the social development of autistic children. The teachers highly agreed that technology-enhanced communication (WM=3.59), interaction with peers (WM=3.59), and emotional regulation (WM=3.65), with an overall mean of 3.61 and a standard deviation of 0.19. These findings suggest that social skills, such as communication, interaction with peers, and control of emotions, are greatly enhanced by technology.

Dechsling *et al.* (2021) ascertained that virtual reality contexts not only develop peer relationships but also enhance emotional control by providing children with autism an opportunity to rehearse social interactions in a controlled, immersed environment. In the same way, Syriopoulou-Delli and Eleni (2021) proved the essential function of augmentative and alternative communication (AAC) systems in assisting children with autism in developing communication skills, bridging communication impairments. Also, Chaidi and Drigas (2023) highlighted the benefits of personalized digital media and interactive video games that enhance better communication and peer relationships, enabling children with autism to acquire essential social skills.

Additionally, Mostajo *et al.* (2023) verified that multimedia-based interventions enhanced social and adaptive skills, while Gagan *et al.* (2023) and Shater *et al.* (2023) investigated the ways technologies such as chatbots and social media platforms enhanced social communication and peer interactions.

Table 3. Test of Significant Differences in the Impact of Technology Use on Cognitive Development of Children with Autism Concerning Type of Screen Exposure when Grouped According to Demographic Background of the Learner with Autism

	t	df	Sig. (2-tailed)	Decision	Remark
AGE - Impact of Technology Use on Cognitive Development of Children with Autism	-15.739	74	0.000	Reject	Significant
SEX - Impact of Technology Use on Cognitive Development of Children with Autism	-40.548	74	0.000	Reject	Significant
SEVERITY OF AUTISM - Impact of Technology Use on Cognitive Development of Children with Autism	-26.578	74	0.000	Reject	Significant
ATTENTION SPAN - Impact of Technology Use on Cognitive Development of Children with Autism	-13.628	74	0.000	Reject	Significant
SCREEN TIME PER DAY - Impact of Technology Use on Cognitive Development of Children with Autism	-27.907	74	0.000	Reject	Significant

The research highlights substantial variations in the effect of technology on the cognitive development of children with autism, depending on demographic characteristics such as age, gender, severity of autism, attention span, and daily screen time. Personalized intervention and screen time management are necessary to prevent overstimulation and disruption of cognitive development in autistic children, as the usefulness of technology differs depending on individual and context difficulties.

The findings are consistent with Madigan *et al.* (2020), who highlighted the necessity of selecting high-quality educational programs and restricting the use of screens. In addition, more research has established that autistic children can undergo significant differences in their cognitive function based on the nature of their screen time.

In addition, Baranek *et al.* (2022) identified that specially designed digital interventions, specifically interventions aimed at social communication, positively affected the skill of interacting with peers and self-regulating feelings among children with autism. This identifies a specific need for person-centered controlled technology usage to maximize developmental performance among children with autism.

Table 4. Test of Significant Difference in the Impact of Technology Use on Social Development of Children with Autism when Grouped According to Demographic Background of the Learner with Autism

	t	df	Sig. (2-tailed)	Decision	Remark
AGE - Impact of Technology Use on Social Development of Children with Autism	-16.531	74	0.000	Reject	Significant
SEX - Impact of Technology Use on Social Development of Children with Autism	-40.484	74	0.000	Reject	Significant
SEVERITY OF AUTISM - Impact of Technology Use on Social Development of Children with Autism	-27.179	74	0.000	Reject	Significant
ATTENTION SPAN - Impact of Technology Use on Social Development of Children with Autism	-14.765	74	0.000	Reject	Significant
SCREEN TIME PER DAY - Impact of Technology Use on Social Development of Children with Autism	-28.018	74	0.000	Reject	Significant

Based on factors like age, sex, autism severity, attention span, and daily screen time, the findings show notable variations in the effects of technology use on the social development of kids with autism. By rejecting the null hypothesis, it is confirmed that these individual and demographic characteristics influence how successful technology is. Differences also bring out the need for personalized, tailored interventions in attention span and severity of autism. The findings emphasize the need to strike a balance in the use of screens to optimize positive social effects and minimize negative impacts.

These results concur with Heffler *et al.* (2022), who reported concerns about the possible impact of early screen media exposure on delays in development, particularly among children with ASD. Their results indicated that reducing screen time significantly lowered parental stress and primary autistic symptoms, with a call for additional research into screen time regulation to improve social interaction among children with ASD.

Table 5. Test of Significant Relationship Between the Screen Time, Attention Span, and Severity of Autism and the Impact of Technology Use on Cognitive and Social Development of Children with Autism

		Cognitive Development	Social Development
Severity of Autism	Pearson Correlation	0.087	0.005
	Sig. (2-tailed)	0.458	0.965
	N	75	75
Attention Span	Pearson Correlation	-0.073	0.015
	Sig. (2-tailed)	0.533	0.900
	N	75	75
Screen time per day	Pearson Correlation	0.053	-0.068
	Sig. (2-tailed)	0.653	0.561
	N	75	75

***. Correlation is significant at the 0.01 level (2-tailed).*

Accepting the null hypotheses suggests no significant relationships between screen time, attention span, severity of autism, and the impact of technology on the cognitive and social development of children with autism. The poor correlations suggest that these characteristics have little bearing on the consequences of technology use, suggesting that other elements—like the kind, context, and quality of technology—have a more significant impact on developmental outcomes. This emphasizes that technology interventions must be improved rather than focusing only on changing screen time or other variables. It is crucial to keep track of such factors to prevent such issues as overstimulation or apathy.

Several studies have explored the impact of screen time and technology on the cognitive and social development of children with autism, highlighting the importance of a balanced approach. Heffler (2023) noted that excessive screen time, particularly when children use screens alone, can hinder development, particularly in terms of social engagement, potentially leading to social withdrawal. This aligns with the concerns raised by Dy *et al.* (2023), who emphasized the importance of limiting screen time, especially in early infancy, to prevent developmental delays. Additionally, Shemy *et al.* (2024) found that augmented reality-based language learning can be beneficial for children with autism, suggesting that the quality and type of technology used plays a critical role in developmental outcomes.

These studies underscore that it is not just the amount of screen time that matters, but the context and type of technology. The findings emphasize the need to balance screen use and ensure that technology interventions are purposeful and well-managed to avoid overstimulation or apathy. Therefore, technology interventions should be carefully monitored to maximize their benefits for children with autism, focusing not just on reducing screen time but on improving the quality and relevance of the technology used.

5. CONCLUSIONS

The study highlights key findings about using technology for the cognitive and social development of children with autism in special education. Most learners are male, aged 8-10 years, with Level 1 autism severity, a 10-15 minute attention span, and 3-4 hours of daily screen time. The research shows that technology impacts cognitive and social development, with strong teacher agreement on the significance of educational, recreational, and therapeutic content. The research does identify weak correlations between attention span, time spent on screens, and the severity of autism and cognitive and social development. It implies that other elements—such as the caliber and kind of technology—are more crucial. The results highlight the significance of individualized, balanced technology use and customized interventions for the growth of students with autism. recommendations include selecting appropriate content, customizing technology based on individual needs, and designing interventions that focus on the quality of technology use rather than screen time adjustments alone. Further research is encouraged to address gaps in the current understanding of the use of technology for autism in special education.

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