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REVIEW ARTICLE

Use of electronic screens as a sign of early autism: an integrative review

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Abstract

The autism spectrum disorder (ASD) consists in psychological and behavioral changes that usually manifest in the first years of life as difficulties in communication and learning. This condition is still not completely understood, existing difficulties in establishing possible risk factors. This integrative review aims to analyze the data available till this moment not only about the plausibility of the excessive exposition to electronic screens as a trigger for the emergence of ASD, but also their effect in the gravity of the symptoms found and the potential of utilizing the time of exposition to screens as an early sign for autism. A search was conducted in the platforms National Library of Medicine (PubMed) and Biblioteca Virtual de Saúde Brasil (BVS), considering the descriptors "children", "autism" and "screen time". Include in this study were studies published between 2013 and 2023; in the languages Portuguese and English; of free access which were classified as: cohort studies; transversal studies; systematic review; prognostic studies; etiological studies; diagnostic studies; observational studies; qualitative studies; experimental studies; pré/post test quasi-experimental studies; quantitative research. Articles without clear information source and not from the theme of this study were excluded, resulting in the selection of 23 articles. After analysis it was observed that the exposition to electronic screens in children has ties to the emergence of symptoms similar to autism. In conclusion, it is important to analyze how factors in the daily life of families can affect the development of children so better conducts can be defined.

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INTRODUCTION

Autism spectrum disorder (ASD) is a neurodevelopmental condition characterized by difficulties in communication and social interaction, as well as the presence of repetitive or restricted behaviors and/or interests[1]. The spectrum of autism is vast, ranging from individuals considered highly functional, whose symptoms may go unnoticed for several decades, to those with severe manifestations that significantly hinder social interaction[2].

The prevalence of ASD has increased since it gained notoriety in the medical and academic communities. In the United States of America (USA) in 2000, the ratio was one child on the spectrum for every 150 children with typical development; by 2023, this ratio had shifted to 1 child on the spectrum for every 36 children with typical development, marking an increase of 316% in the number of cases[3].

While the symptomatology of ASD is well elucidated, its pathophysiology and possible triggering factors remain poorly understood. Recently, a correlation has been observed between extensive exposure to electronic screens and alterations in the expected linguistic and social development patterns in typical children. Consequently, a new term has emerged: virtual autism, a subclassification that focuses on the circumstances surrounding the onset of symptoms in children[4].

There is still no consensus on the plausibility of a new subclassification of autism based on exposure to electronic screens[4]. Therefore, this integrative review aims to analyze the connection between excessive exposure to electronic screens and the emergence of autism spectrum disorder, the effects of screen exposure on the severity of symptoms, and the potential use of screen exposure time as a warning sign for autism.

METHODOLOGY

This retrospective, qualitative, and cross-sectional study was conducted through an integrative literature review. The National Library of Medicine (PubMed) and BVS databases were searched for articles. The searches were performed using the descriptors “autism”, “children”, and “screen time”, along with the Boolean operator “AND”. The review followed these steps: definition of the subject; selection of inclusion and eligibility parameters; definition of inclusion and exclusion criteria; analysis of the publications in the databases; data analysis; presentation of results. The study included articles published in the last ten years (2013-2023) in either Portuguese or English that were available free of charge. It included cohort, cross-sectional, prognostic, etiology, diagnostic, observational, qualitative, experimental studies, quasi-experimental pre-/post-test studies, quantitative research papers, and systematic reviews. Articles without a clear theoretical basis, articles that did not address the relationship between childhood autism and the time of exposure to electronic screens, and articles outside the subject of interest were excluded.

RESULTS

The search found 359 articles and studies. Of these, 181 were from the PubMed database, and 178 were from the BVS database. Twenty-two articles from the PubMED database and 23 from the BVS database met the inclusion criteria; 22 were excluded because they were available in both databases (Figure 1).

Of the 23 studies included in this review, five were cross-sectional reviews, three were cohort studies, three were quantitative research papers, two were etiology studies, two were diagnostic studies, two were observational studies, two were systematic reviews, one was a prognostic study, one was a qualitative study, one was an experimental study, and one was a pre/post-test quasi-experimental study (Table 1).

Of the 23 articles analyzed, 19 found a direct relationship between a greater number of hours spent on electronic screens and increased severity of autism symptoms or autism-like symptoms (Table 1). Eighteen of the 19 articles indicated that autistic children, on average, use electronic devices for more hours compared to typically developing children. Three of these 18 articles reported a significant decrease in parent-child interactions as device usage increased; one established a causal relationship between exposure to electronic screens and the emergence of autism-like symptoms; and another found no differences between classic autism and autism that was preceded or induced by screen exposure. Seven articles identified more pronounced changes in their populations. Six of these seven articles noted a decline in linguistic and social skills; one described a deterioration in academic skills; and another reported the emergence of hyperactivity-like symptoms. Three articles found that boys had more screen exposure and a more significant worsening of symptoms compared to girls, while only one article noted this phenomenon, focusing on girls. Three articles indicated that autistic children, particularly in their early months and years, show a greater affinity for visually stimulating images, resulting in longer visual fixation durations. One article observed that lower vitamin D levels in autistic children were associated with less outdoor time.

DISCUSSION

Four of the 23 selected articles did not find a direct relationship between exposure to electronic screens and the emergence or worsening of autism-like symptoms, suggesting a strong correlation between early exposure to screens and the increased prevalence of autism. This factor supports the theory examined in this article. The relationship between screen exposure and autism is a topic of great debate within the medical community. Still, evidence of this connection has been present since the 1990s, when the number of autism cases coincidentally increased alongside the rise of televisions and other screen devices as standard items in middle and lower-middle-class homes[5].

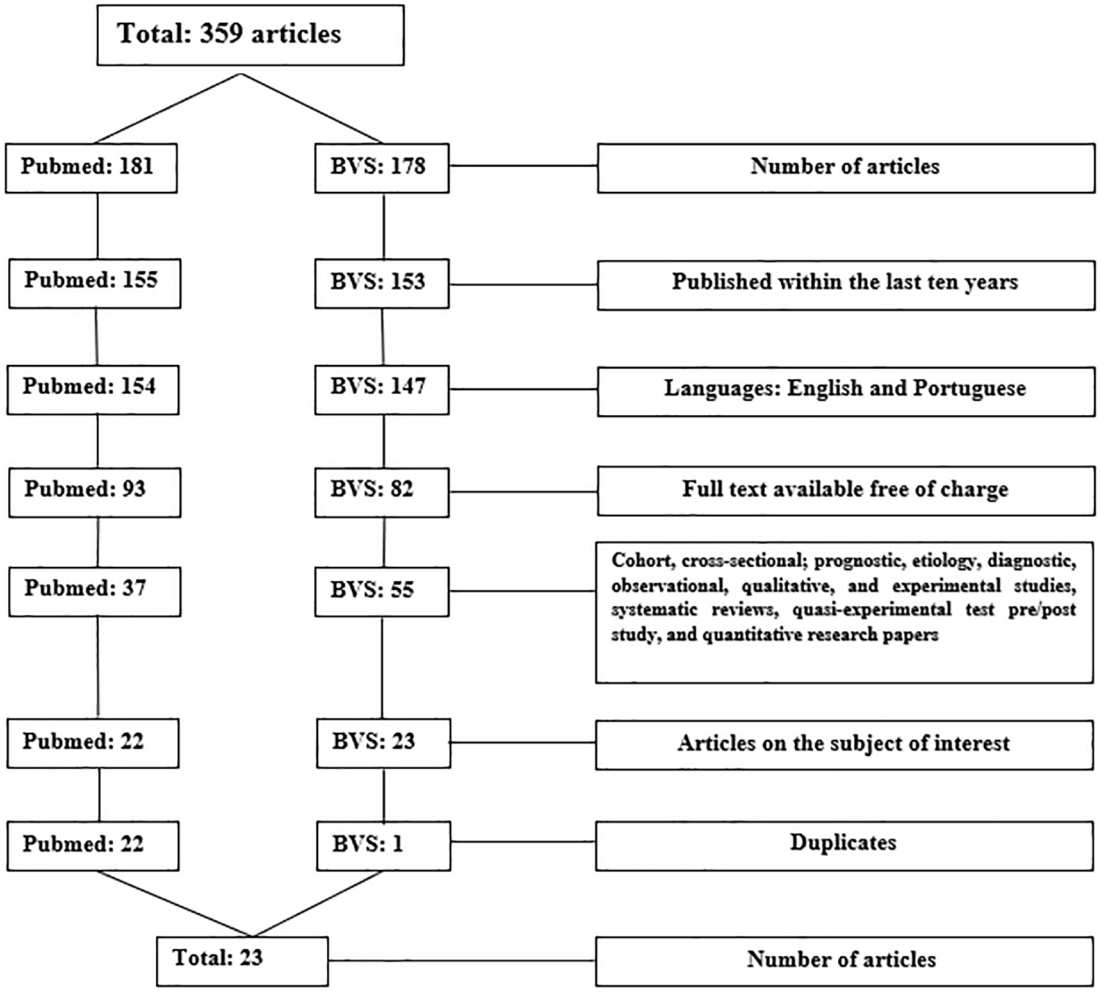


Figure 1. Inclusion of the articles found on PubMed and BVS.

However, exposure to screens is not the only relevant factor identified. The findings regarding the decrease in interactions between parents and children raise questions about the actual cause of the symptoms[6]. The increased time spent on screens may merely act as a catalyst for the onset of a concealed process of parental neglect, in which the child fails to develop linguistic and social skills due to a lack of necessity, or even due to the resulting worsening of nutritional status typically associated with less time spent outdoors, such as drops in vitamin D levels[7]. Primary and secondary effects result from increased screen time, supporting the initial hypothesis that exposure to screens may be linked to the emergence of autism.

Supporting the hypothesis of this study, the difference in involvement between the sexes was another significant factor, with three[8-10] of four articles reporting a more pronounced condition in boys. The findings indicated that boys spend more hours in front of screens from the early years of life and are more severely affected by screen time than girls. One article described a discrepant finding, with girls spending more time in front of a screen, without a related worsening in symptoms[11].

As we sought to explain the pathophysiology underlying the phenomena observed above, we noted that three articles described greater visual fixation on images and videos with more intense visual stimulation. This phenomenon is considered normal for children between two and six months of age, typically decreasing progressively in intensity as they grow older. However, autistic children generally do not exhibit this decrease, and this preference is maintained at ages when increased interest in language and speech functions is expected[5]. It is theorized that such children, especially those under six months, show marked neuroplasticity, with their neural structure easily influenced by external factors. Thus, premature exposure to electronic screens may remodel the neural network in ways that prioritize the development

Table 1. Description of articles according to the year of publication, type of study, population size, age range, and main conclusions.

Author	Year	Number of children enrolled and age	Study type	Main conclusions
Sarfraz et al.	2023	----------	Systematic Review	The number of hours spent using electronic screens during the first year of life was directly proportional to the emergence of autism-like symptoms, with a decrease in symptoms as screen time was reduced.
Must et al.	2023	n=1.116 (9 – 10 years)	Prognostic study	Compared to children with typical development, autistic boys had 26% more hours of screen exposure, while autistic girls had 50% more hours of screen exposure.
Takahashi et al.	2023	n=437 (24 – 40 months)	Cohort study	The authors found that most children were exposed to more than four hours of electronic screens per day, with the severity of autism symptoms directly proportional to the hours of exposure. Preferring screens may be an early sign of autism.
Dong et al.	2023	n=496 (0 – 17 years)	Quantitative research	Children with autism are often exposed to electronic screens at a younger age than typically developing children. Their parents tend to use screens as either rewards or as disciplinary punishments.
Suleman et al.	2023	n= 200 (3 – 5 years)	Cross-sectional study	Typical children exhibited symptoms resembling autism when exposed to more than one hour of electronic screens each day. (Causal)
Dong et al.	2023	n= 382 (0 – 5 years)	Cross-sectional study	There was a direct proportional relationship between the time of exposure to electronic screens, decreased vitamin D levels, and delays in the development of language, hearing, physical, and social skills.
Sadeghi et al.	2023	n=68 (16-36 months)	Cross-sectional study	The increase in the time spent on electronic screens was directly proportional to the decrease in the number of parent-child interactions and the severity of autism-like symptoms.
Kushima et al.	2022	n=84.030 (1 – 3 years)	Cohort study	Children under three years of age who had more than two hours per day of exposure to screens exhibited higher rates of autism diagnoses, with a stronger correlation found in boys. This association was less pronounced in individuals aged three or older.
Venker et al.	2022	n=41 (41 – 48 months)	Experimental study	Autistic children displayed a stronger preference for images with higher visual stimulation compared to typically developing children.
Reza et al	2022	n=45 (22 – 48 months)	Cross-sectional study	There were no differences in symptoms between individuals with classic autism and those with autism resulting from prolonged exposure to electronic screens.
Khoo et al.	2022	n=28 (3-12 years)	Quasi-experimental pre/ post-test study	Initially, over 50% of autistic children had more than two hours of screen time each day. Those who managed to reduce their average daily screen time to less than two hours showed improvements in their academic and social skills.
Alrahili et al.	2021	n=308 (4 – 6 years)	Cross-sectional study	Children aged 4 to 6 years who had more than three hours of daily exposure to electronic screens showed more symptoms of autism compared to those with less than three hours of exposure, with the emergence of symptoms being more pronounced in boys.
Dong et al.	2021	n=193 (17 – 76 months)	Etiology study	Approximately 40% of children were exposed to electronic screens for more than two hours each day. Autism-like symptoms increased inversely with age, with the primary symptom being delayed language skills.

Dong et al.	2021	n=101 (22 – 56 months)	Diagnostic study	On average, children with autism spend 2.4 hours more in front of electronic screens than typically developing children. Screen time is directly proportional to the severity of autism-like symptoms.
Cardy et al.	2021	n=344 (0 – 17 years)	Quantitative research paper	Screen time for autistic children was significantly higher than that for typical children. In males, autism-like symptoms worsened directly in proportion to the number of hours of exposure to electronic screens.
Fridberg et al.	2021	n=3227 (2 – 12 years)	Observational study	Autistic children spending more than two hours in front of a screen per day showed delayed development of language skills when compared to autistic children spending less than 40 minutes in front of an electronic screen.
Kaliukovich et al.	2021	n=161 (6 – 17 years)	Etiology study.	Autistic children exhibited greater fixation on images with intense visual stimulation compared to typical children.
Frankel et al.	2020	n=2152 (0 – 42 months)	Cohort study	Screen time before the first year of life is linked to a higher prevalence of autism-like symptoms and a lower frequency of parent-child interactions.
Hill et al.	2020	n=120 (36 months)	Observational study	No significant difference was observed in screen time hours between autistic and typical children. Increased exposure correlated with declining language skill development.
Holmes et al.	2019	n=322 (0 – 17 years)	Quantitative research paper	On average, children have access to at least four electronic devices. There is a direct correlation between language difficulties and the time spent watching videos on these devices.
Stiller et al.	2019	n=327 (0 – 17 years)	Qualitative study	Parents of autistic children tend to use screens more frequently as a mediator to facilitate interactions than parents of typically developing children.
Hermawati et al.	2018	n= 9 (44 – 78 months)	Diagnostic study	A significant decrease in the number of parent-child interactions was observed with increasing screen time. Hyperactivity symptoms emerged in children exposed to more than three hours of screen time each day.
Heffler & Oestreicher	2016	----------	Systematic review	Exposure to electronic screens in children with significant neuroplasticity may result in delays in the development of neural regions responsible for linguistic and social skills.

of visually stimulated functions, to the detriment of social and communicative functions. Interestingly, this same neuroplasticity allows early interventions to reverse the situation when applied on time[5]. These findings may provide a more detailed explanation and support the theory analyzed in this study.

The next question revolves around the possible differences between classic autism, as accepted by the medical community, and a new type of autism induced by electronic visual stimulation. The symptoms of individuals diagnosed with autism and children who became symptomatic after excessive exposure to electronic screens were not different[12]. However, understanding the circumstances surrounding the initial onset of symptoms may be important when defining potential treatment, since cases linked to excessive exposure to screens tend to respond well to reduced screen time, as observed in a study carried out in the United States of America where, after parental reeducation, children who reduced their time in front of screens to less than two hours per day showed improvements in social and academic skills[13].

Other data supporting the hypothesis of a correlation between symptom severity and screen time were found when analyzing the limit point at which exposure to electronic screens ceases to be a leisure activity and becomes harmful to the child's health (called the H point in this study). Of the nine[8,9,13-19] articles that established time limits for symptom worsening, six[8,13-17] described a range between two and three hours of daily exposure, two[8,9] indicated four hours of daily screen time, and one[19] prescribed one hour of screen time per day. To further understand the meaning of this data, one should consider the age groups analyzed in each of the studies (Table 2). Unfortunately, we could not establish a definitive H

Table 2. The time point at which exposure to an electronic screen becomes harmful for different age groups.

Author	Year	Number of children and age group	Point H
Takahashi et al.	2023	n=437 (24 – 40 months)	4 hours per day.
Suleman et al.	2023	n= 200 (3 – 5 years)	1 hour per day.
Kushima et al.	2022	n=84.030 (1 – 3 anos)	2 hours per day.
Khoo et al.	2022	n=28 (3-12 years)	2 hours per day.
Alrahili et al.	2021	n=308 (4 – 6 years)	4 hours per day.
Dong et al.	2021	n=193 (17 – 76 months)	2 hours per day.
Dong et al.	2021	n=101 (22 – 56 months)	2,4 hours per day.
Fridberg et al.	2021	n=3227 (2 – 12 years)	2 hours per day.
Hermawati et al.	2018	n= 9 (44 – 78 months)	3 hours per day.

point by looking at these data alone. However, a trend among studies indicates that the maximum screen time should be two hours a day, which most national and international pediatric societies recommend.

On average, children have access to at least four devices with screens[20]. Parents appear to allow access to so many devices because they believe it enhances their connection with their children[21], further supporting the hypothesis raised in this article.

Despite the above findings, a definitive causal link has not been fully established. There are strong correlations between the number of hours of exposure to electronic screens and the emergence of autism-like symptoms. These findings agree with the Brazilian Society of Pediatrics, which states that screen exposure should be limited to one hour for children between the ages of two and five and completely avoided for children under two years old[22].

FINAL CONSIDERATIONS

The number of cases of autism has grown exponentially over the years. Yet, it remains uncertain whether this increase is due to heightened social awareness of the condition, resulting in more diagnoses, or if an external factor is leading to a rise in the incidence and prevalence of autism spectrum disorder. This study examined the possibility that this factor is associated with technological and behavioral changes in families' daily lives, finding, for the most part, arguments in favor of the correlation between the duration of exposure to electronic screens in early childhood and the emergence of symptoms similar to autism. We concluded that, whether directly through chemical changes in a child's brain due to greater neuroplasticity or indirectly through reduced stimulation for socialization, the early introduction of electronic screens in children poses more risks than potential benefits. In 2019, the Brazilian Society of Pediatrics published a consensus statement on the relationship between children and electronic devices[22]. Extensive studies on autism spectrum disorder have not established[23,24-30] specific guidelines for addressing and managing these cases, which would greatly assist pediatricians on a global level. Reducing exposure to electronic screens is the most critical intervention for potential instances of autism linked to electronic screens, since studies covered in this review found significant improvements in the socialization and academic performance of children being investigated for autism after screen time was limited to less than two hours per day. It is also essential to provide children with more social stimuli than visual ones and encourage high-quality family time (play, conversations, general interactions) to promote the development of social skills. Although these apply to every child, they are especially relevant for those with suspected autism. Future guidelines for autism spectrum disorder should consider these findings.

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