New Trends in Psychology

The Effects of Audio-Visual Stimuli in the Development of Autism Spectrum Disorders in Children Aged between 6 And 30 Months

Valentina Nicoleta Tănăsache[1]

Abstract: The earliest identifiable findings in autism indicate that the autistic brain develops differently from the typical brain in the first year of life. Studies suggest that autism has an environmental component that contributes to causation. Studies have shown an association between ASD and increased childhood TV or smartphone screen exposure, suggesting childhood AV exposure as a possible contributing cause of ASD. Infants are attracted to the salience of AV materials, but lack the experience to recognize them as socially relevant stimuli. The research presents a developmental model of autism in which exposure to screen-based AV in infants fosters non-social sensory processing specialization in the brain. Through a process of neuroplasticity, the autistic infant develops skills that are driven by AV viewing. This model explains atypical face and speech processing, as well as the preference for AV synchrony over biological motion in ASD. Researchers studying autism causation have largely ignored childhood AV exposure as a potential contributing factor. This study calls for awareness of the association between early screen viewing and ASD.

Keywords: autism; audio-visual stimuli; children; autism spectrum disorders; M-CHAT-R/F

1. Introduction

Autism spectrum disorder (ASD) begins early in life and is characterized by deficits in social interaction, communication, and restrictive and repetitive patterns of behavior.

[1] Student, 3rd year, Faculty of Behavioural and Applied Sciences, specialization Psychology, Danubius University of Galati, Romania, Address: 3 Galați Blvd., Galati 800654, Romania, Tel: +40372361102, Fax: +40372361290, Coresponding author: taly_tuka@yahoo.com.

Recent analysis of the cause of ASD has implicated both an environmental and genetic component. Previous studies have estimated very high genetic risk in autism. More recent studies, however, indicate that autism is a combination of genetic and environmental factors, with environmental factors accounting for at least 50% of ASD risk.

The current literature reveals interest in environmental factors and their potential causal impact on ASD through interference with neuronal synchronization and epigenetic regulation.

The baby's brain undergoes an extraordinary increase in volume of 1% per day in the early postnatal period. Johnson suggests that the relatively late development of the human brain compared to other mammals allows for a much greater effect of experience on development. Studies of intensive early intervention for ASD have shown marked improvement

in some children so that the developmental anomaly is almost undetectable.

Atypical ASD findings appear after a short period of typical development. Eye fixation has been studied at 2-6 months of age in infants and found that eye fixation is normal, but decreases from 2 to 6 months in those who develop ASD.

Infants later diagnosed with ASD were found to have comparable responses to typicals in the development of frequency of looking at faces, social smiles, and vocalizations at 6 months of age, but in significantly decreased trajectories of these indices over time

There is evidence that in the infant who develops ASD, the brain is not enlarged early, but becomes larger than typical by 12 months of age. There appears to be hyperconnectivity of the ASD brain found in electroencephalography studies of 14-month-old infants watching videos, as well as in functional magnetic resonance imaging studies

Environmental factors show an increase in the availability and exposure of audiovisual materials since the 1980s, with much greater consumption in the 1990s and 2000s, corresponding to the increase

TSA There has been an explosion of viewing opportunities for infants over the past 25 years, which parallels the rise of autism.

There is significant evidence that many infants are exposed to AV screen material during infancy, despite the American Academy of Pediatrics' 1999 statement to avoid television viewing during the first two years of life.

The Kaiser Family Foundation found in 2003 that 68% of children watched just over 2 hours, 43% watched daily, and 26% had a TV in their bedroom. Additionally, 36% of households reported having the TV on almost all the time, while 2/3 had the TV on at least half the time, even if "no one is watching" In addition to TV and video, infants they may be exposed to other AV screen stimuli that their parents or siblings are watching such as video games, computer, tablet or smart phone. In 2013, a study found that 38% of children under 2 used a mobile device

Infants are drawn to watching AV materials, which give us a naïve child with no social relevance. Through a process of neuroplasticity, AV screen exposure causes the specialization of brain pathways that process audio and visual stimuli in a non-social manner. These specialized sensory pathways interfere with attention to social stimuli and disrupt the development of social brain specialization. Lack of attention to the caregiver and the social scene contribute to the delay in global development. The model explains many of the atypical neurological findings in ASD. Many of the programs directed by children are vibrantly animated with colors and sounds designed to appeal to the developing ones. Young children are attracted to the importance of television and video materials. Frank et al. found that the visual fixation preference in typical 3-month-old infants is driven by luminance and motion that overrides the preference for fixation on faces. The vulnerable infant's attention is withdrawn from healthy social interactionsto TV, computer screens and electronic toys. Infants do not recognize AV screen stimuli as socially relevant.

Due to the lack of real-life social interaction and limited multisensory, the audiovisual world (AVW) is quite different compared to the real world (AW). Typical older children and adults may understand AVW in humanistic terms as they have and have developed the typical brain pathways in which they process the world as social relation and speech.

However, the screens do not provide socially reciprocal reward, such as a returned smile or eye contact, because you are looking into the eyes of the projected individual but without opportunities for joint attention, turn-taking, or the complexity of social engagement. A naive baby watching a screen sees a face that does not respond to the baby's smiles. Electronic toys with lights and sounds can have a similar effect to the screen, consisting of acute non-social sensory stimulation. We hypothesize that the

newborn does not have the social processing capacity to recognize social relevance in these types of exposures. It is not until 9 months of age, according to Frank et al., that the average infant prefers to attend to video faces over the salience provided by light and motion.

The occipital (visual) cortex is the brain region most active for developing connectivity in the first postnatal months, while higher order, more frontal brain regions are more slowly developed

An association of autism with television has been reported. They found that those with autism on average started viewing by 6 months of age compared to those without autism who on average started viewing at 12 months of age. In addition, it has been observed that some children with autism may be unable to communicate in a social sense, but can recite every word from several children's videos.

Language delay is common in those with ASD. Research has also shown an association between children's viewing of DVDs/videos and impaired language development Chonchaiya and Pruksananonda found that those children who started watching TV before 12 months and watched more than 2 hours/day were six times more likely to develop language delay

Christakis et al. studied children from 2 months to 4 years of age and found that each hour of audible television was associated with a significant reduction in both adult and infant vocalizations.

One might suggest that language delay in this scenario may result from low exposure to interactive spoken language. Kuhl et al. demonstrated that language learning in infants occurs with socially motivated interpersonal interaction, but not with audiovisual recordings Screen-based AV exposure is highlighted as a potential causative factor in ASD.

2. Objectives and Hypotheses

2.1. Objectives

Parents seem to be unaware of studies linking screen time to autism.

The top categories of parental beliefs in the causative factors of ASD include genetics, brain structure, God's will, vaccine toxins, and environmental pollution.

Unfortunately, childhood AV exposure is probably the causative agent that has been overlooked.

This research wants to sound the alarm, and help parents understand the negative impact of audio-visual stimuli on the neurological and psychological development of young children.

2.2. Hypotheses

As the infant's brain becomes wired to respond more to the demands of audio and visual stimulation the infant's behavior is changed to pay more attention to these primary sensory stimuli and less attention to other environmental exposures such as faces, social scenes and the processes that would develop higher levels of thought. The more the child is exposed to visual and auditory stimuli until the age of two, the greater the language delay.

2.3. Procedure

This research aims to study the effect of exposure to visual and auditory stimuli of children aged between 6 and 30 months on the development of autism spectrum disorders.

Two samples of children were chosen, totaling a total of 128 subjects. In the first sample there are children from the middle group from state nurseries no. 1 and 2 in Galati, children aged between 16 and 30 months, in this sample there are a number of 100 children, all these children received audio-visual stimuli at young ages. In the second sample there are children of the same age as those in the first sample, from the same environment and who go to the same nurseries in Galati. These children did not receive audio-visual stimuli at a young age or received them occasionally.

The M-CHAT-R/F test was used as a tool.

The Modified Checklist for Autism in Toddlers, Revised, (Robins, Fein, & Barton, 2009), hereafter referred to as the M-CHAT-R/F is a tool for screening to identify children at risk of having autism spectrum disorders, addressed to parents, which consists of two parts.

The M-CHAT-R can be administered and scored in a single meeting with the child and can be used by specialists or other professionals to assess risk for the presence of autism spectrum disorder (ASD).

The main goal of the M-CHAT-R is to maximize sensitivity, which means detecting as many cases of ASD as possible. Therefore, there is a high false-positive rate, meaning that not all children who score at risk will be diagnosed with ASD.

To address this aspect, follow-up questions (M-CHAT-R / F) were developed. The test has a dichotomous Yes/No scoring. The M-CHAT-R can be used and scored as part of a routine child check-up, but it can also be used by specialists and professionals to determine the risk of ASD. The main purpose of the M-CHAT-R is to detect as many cases of ASD as possible.

M-CHAT-R™

Vă rugăm să răspundeți la aceste întrebări despre copilul dumneavoastră. Gândiți-vă cum se comportă de obicei copilul dumneavoastră. Dacă l-ați văzut pe copilul dvs. că manifestă comportamentul de câteva ori, dar el sau ea nu îl manifestă de obicei, atunci vă rugăm să răspundeți **nu**. Vă rugăm să încercuiți **da** sau **nu** la fiecare întrebare. Vă mulțumim!

1.	Dacă arătați spre un obiect din cameră, copilul dvs. se uită la acel obiect? (De exemplu, dacă arătați o jucărie sau un animal, copilul dumneavoastră se uită la acea jucărie sau animal?)	Da	Nu
2.	V-ați întrebat vreodată dacă copilul dumneavoastră este surd?	Da	Nu
3.	Se preface copilul dumneavoastră că se joacă (joc simbolic)? (De exemplu, se preface că bea dintr-o cană de jucărie, se preface că vorbește la telefon, se preface că hrănește o păpușă sau o jucărie de pluș?)	Da	Nu
4.	Îi place copilului dvs. să se cațăre pe diferite obiecte? (De exemplu: pe mobilă, pe echipamentele din parc sau pe scări)	Da	Nu
5.	Prezintă copilul dvs. mișcări inadecvate ale degetelor în apropierea ochilor? (De exemplu, își flutură mâinile aproape de ochi?)	Da	Nu
6.	Arată copilul dvs. cu degetul atunci când vrea ceva sau cere ajutor? (De exemplu, arată spre mâncare sau spre o jucărie la care nu poate ajunge?)	Da	Nu
7.	Indică copilul dvs. cu un deget ceva interesant? (De exemplu, vă arată un avion pe cer sau un camion pe șosea?)	Da	Nu
8.	Este copilul dvs. interesat de alți copii? (De exemplu, se uită la alți copii, le zâmbește sau merge la ei?)	Da	Nu
9.	Vă arată copilul dvs. lucruri aducându-le sau arătându-le pentru a le vedea dvs? Nu doar pentru a solicita ajutor, dar și pentru a le împărtăși cu dvs. (De exemplu, vă arată o floare, un animal de pluș sau un camion de jucărie?)	Da	Nu
10.	Răspunde copilul dvs. când îl/o strigați pe nume? (De exemplu, se uită sus, vorbește sau gângurește, se oprește dintr-o activitate începută atunci când își aude numele?)	Da	Nu
11.	Când îi zâmbiți, copilul dvs. vă zâmbește înapoi?	Da	Nu
12.	Se supără copilul dvs. când aude zgomote familiare? (De exemplu, țipă sau plânge când aude zgomotul produs de un aspirator sau un sunet puternic?)	Da	Nu
13.	Umblă copilul dvs.?	Da	Nu
14.	Prezintă contact vizual copilul dvs. cu dumneavoastră atunci când îi vorbiți, vă jucați cu el/ea sau când îl/o îmbrățișați?	Da	Nu
15.	Încearcă copilul dvs. să imite ce faceți dvs.? (De exemplu, face cu mâna „Pa!", bate din palme, imită sunetele amuzante pe care le faceți dvs?)	Da	Nu
16.	Dacă întoarceți capul pentru a privi ceva, se uită copilul dvs. în jur la ce vă uitați dvs.?	Da	Nu
17.	Încearcă să vă facă să îl/o priviți? (De exemplu, se uită la dvs. pentru a primi încurajări, spune "Uite!" sau "Uită-te la mine!"?)	Da	Nu
18.	Înțelege copilul dvs. când îi spuneți să facă ceva? (De exemplu, dacă nu indicați, poate copilul dvs. să înțeleagă comanda „Pune cartea pe scaun!" sau „Adu-mi pătura!"	Da	Nu
19.	Dacă se întâmplă ceva nou, copilul dvs. se uită la fața dvs. ca să afle ce simțiți? (De exemplu, dacă copilul aude un zgomot ciudat, sau vede o jucărie nouă, se va uită la fața dvs.?)	Da	Nu
20.	Îi plac copilului dvs. activitățile ce presupun mișcare? (De exemplu, îi place să fie legănat/legănată pe genunchii dvs.?)	Da	Nu

2.4. Result

Children rated as a percentage of the first sample	Score	Interpretation
52%	**0-2**	**low risk**
34%	**3-7**	**medium risk**
14%	**8-20**	**increased ris**

Percentage rated children from the second sample	Score	Interpretation
85%	**0-2**	**low risk**
15%	**3-7**	**medium risk**
0%	**8-20**	**increased risk**

Interpretation of scores

Low risk - if the child's age is less than 24 months, it is recommended to repeat the administration of the screening after the age of 2 years. No other action is necessary in this regard, except in the case of detecting the risk of ASD.

Medium risk - Follow-Up (second stage of M-CHAT-R/F) is applied to obtain information about responses at risk of ASD. If the M-CHAT-R/F score remains 2, the child has a positive score. If the Follow-Up score is between 0-1, the child scored negatively. In the case of the study, all children who were at medium risk scored positively.

High risk - avoid follow-up and refer to diagnostic assessment and eligibility assessment for rapid intervention.

3. Conclusions

With the introduction of color, larger screens, improved sound, children's programs and opportunities for repeat viewing, exposure intensified. Previously, many researchers had thought that the increase in autism might have been due to differences in diagnostic criteria over time or possibly to over-reporting. Many believed that genetic factors were mostly responsible and that autism was determined before birth. Recently, we have seen a lot of new information suggesting that autism is a postnatal neurodevelopment. It is a disorder of real increasing prevalence, which, in addition to genetic factors, has a significant environmental component. We now know that brain structure changes in the first year of life and correlates with later diagnosis of autism.

AV processing pathways compete with the preference for social processing and biological movement, negatively affecting the development of the social brain and higher cognitive pathways. Genetic factors, social environment, degree of AV exposure and early intervention likely determine the final neurological and clinical outcome, explaining the varied spectrum of ASD.

Television and video have previously been suggested as contributing to ASD by distracting from caregiver-child eye contact and social interaction.

4. Limits of Research

The most obvious limitation of this model is that there is evidence showing an association but not a causal relationship between AV screen exposure and ASD.

In addition, we suggested that recent evidence of typical development in the first few months of life, before atypical neurological and functional findings in ASD, suggests that an external factor affects the aberrant trajectory. An alternative theory is that development is predetermined in utero and that the changes in response to social factors that begin to manifest in the first year of life in ASD are primarily the result of genetic factors.

Investigative studies

We know that childhood TV time is associated with autism, but we don't know to what extent this exposure contributes to the development of autism. Could this association to

is it due to people who already have ASD and gravitate towards screen stimuli?

Although this study shows an association, further studies are needed to better understand the relationship between childhood screen exposure and ASD and to understand the extent to which a causal relationship may exist.

4.1. Further Recommended Research

What studies are needed to determine whether exposure to AV materials contributes to the development of ASD and how much exposure is harmful? Siblings of children with ASD have a significantly higher risk of developing ASD [19,20]. The authors suggest that sibling studies of ASD include parental documentation of children's

audiovisual viewing data that could be prospectively analyzed for ASD outcome. Also of interest would be a prospective multicenter study of developing infant siblings with ASD in which willing families of study participants attempt to eliminate or significantly reduce audiovisual exposure from birth for a two-year period. Parents in the study group and the control group would document the extent of the infants' media exposure. In addition, we would like to see a therapeutic trial in children with a recent diagnosis of ASD. This study would evaluate the therapeutic impact of eliminating AV screen exposure in addition to early intervention compared to early intervention alone and we would follow the outcome.

5. Discussions

Childhood AV screen exposure as a potential contributor to autism has significant implications. Parents naturally like to protect their children. However, screens are ubiquitous in many societies. Parents probably don't know about the association between ASD and TV exposure. Research has yet to answer many questions about the impact of social and non-social experiences on the young child's brain in terms of ASD, beyond knowing that increased AV exposure and exposure at a younger age are associated with autism and language delay. We hope that awareness of this model will encourage research that will answer these questions and, in turn, empower parents to make decisions based on scientific findings. Currently, as reflected in the puzzle piece as symbol of autism, ASD is full of mystery and parents feel confused and helpless when faced with questions about autism.

References

*** (2011). Council on Communications and Media, Brown A. *Media use by children younger than 2 years. Pediatrics*;128(5), pp. 1040–1045. http://dx.doi.org/10.1542/peds.2011-1753.

*** (2013). *V. Zero to Eight Children's Media Use in America* 2013. CommonSense Media. Fall.

Johnson, MH. (2001). *Functional brain development in humans*. Nat Rev Neurosci, 20, pp. 475–83.

Kuhl, PK.; Tsao, FM. & Liu, HM. (2003). *Foreign-language experience in childhood: effects of short-term exposure and social interaction on phonetic learning*. Proc Natl Acad Sci USA,100(15): pp. 9096–9101. http://dx.doi.org/10.1073/pnas.1532872100.

McEachin, JJ.; Smith, T. & Lovaas OI. (1993). Long-term outcome for children with autism who received early intensive behavioral treatment. *Am J Ment Retard*; 97(4): pp. 359–372.

Orekhova, EV.; Elsabbagh, M.; Jones, EJ.; Dawson, G.; Charman, T.; Johnson, MH, et al. (2014). EEG hyper-connectivity in high-risk infants is associated with later autism. *J Neurodev Disord*;6(1):40. http://dx.doi.org/10.1186/1866-1955-6-40.

Rideout, VJ.; Vandewater, EA. & Wartella, EA. (2003). *Kaiser family foundation zero to six: electronic media in the lives of infants, toddlers and preschoolers.* Fall.

Sallows, GO. & Graupner TD. (2005). Intensive behavioral treatment for children with autism: four-year outcome and predictors. *Am J Ment Retard*;110(6), pp. 417–38

Schumann, CM.; Bloss, CS.; Barnes, CC.; Wideman, GM.; Carper, RA.; Akshoomoff, N. et al. (2010). Longitudinal MRI study of cortical development through early childhood in autism. *J Neurosci,* 30(12), pp. 4419–4427. http://dx.doi.org/10.1523/jneurosci.5714-09.2010.

Shen, MD.; Nordahl, CW.; Young, GS.; Wootton-Gorges, SL.; Lee, A.; Liston, SE. et al. (2013). *Early brain enlargement and elevated extra-axial fluid in infants who develop autism spectrum disorder. Brain* 2013;136(9), pp. 2825–2835. http://dx.doi.org/ 10.1093/brain/awt166.