

Comparing screen viewing between children with ASD and their TD siblings in clinical population

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Abstract

Objective: The aim of this study is to compare the screen-viewing habits in a clinical sample of children with autism spectrum disorders (ASD) and their typically developed (TD) siblings.

Methods: The principal outcome for this study includes the age at which screen viewing started, duration of screen viewing and the duration of interaction with family members. A thorough clinical assessment, the Childhood Autism Rating Scale (CARS), TV viewing habit questionnaire, were used in assessment.

Results: In a total of 108 children (age range=2-17 years; mean=7.42, SD=3.28), The ASD group started screen viewing at a younger age (less than 6 months was 50.9% for ASD group and 12.7% for TD group). The mean screen viewing time of the children with ASD was higher (4.21 ± 1.21 h/day) than that of the TD children (1.90 ± 1.35 h/day), $p=0.045$, and duration of playtime with mothers significantly differed between the groups $p=0.013$.

Conclusion: ASD group has longer screen viewing time, started screen viewing at a younger age and spent less playing time with their mothers than their TD siblings. Further studies are required to investigate whether forbidding children under age of two from exposure to screen can reduce ASD incidence.

Keywords: Autism spectrum disorder, typically developed siblings, screen time, screen viewing.

1. Introduction

1.1 Autism and Early Screen exposure

There is still much considerable controversy surrounding the etiology of ASD with a noticeable changes in the etiological theories of ASD over the recent years [1]. The previous work has mainly focused on the genetics as a possible ASD etiology for several decades [2]. However, in the last decade there was a substantial interest in investigating the possible environmental factors claimed in ASD causation, namely the TV and smart screens [3].

The integrated theory of ASD was first proposed by two researchers from different backgrounds, Leonard Oestreicher, an American family physician and Rima Andaloussia, an Algerian speech therapist. Both hypothesized that ASD is caused by early and intensive screen exposure coupled with little or no social interaction [4][5].

One of the main issues explained by this theory is the aberrant way the brain connects after heavy exposure to screens in early and critical periods of

the brain development. Most of the neurogenesis occurs prenatally and the child is born with almost the adult's number of neurons [6]. What influences the changes in brain development is the increase in connectivity between neurons and not further neurogenesis. The process at which new connections (synapses) are formed between neurons are called the synaptogenesis, which will be formed in response to interaction with the environment [6]. In Oestreicher and Andaloussia's view, what happens to the child with ASD when they are exposed heavily to screens, is that most of the synapses are connected in response to the virtual (and not real) environment. All imperfection of the virtual environment will interfere badly with the normal brain development; the two dimensional people appearing on the screens, ambiguity between subjects and objects as objects appear talking and have facial features and emotional reaction of human; there is no real shapes, the child can not experience natural sounds, tastes, odours or

textures, that all children have to reach and explore during early developmental period [7].

Moreover, a child's interaction with the screens is a one way communication with no reciprocity like that with human interaction and this will form a great obstacle toward development of the social brain which depends entirely on interaction with human beings [8].

Worsley, when the child reaches the period of synaptic pruning fundamental process in neurodevelopment and synaptic connections in all children, which mostly occurs by the end of second year of life, in which the brain has to select the weak and little used synapses for pruning [9]. According to Oestreicher and Andaloussia, the brain unfortunately will select the synapses that formed in response to screen viewing in ASD children (because they use them more) and prune synapses that formed during social interaction (because they use them less). At that point, the child will be presented with regression and lose most of the learnt language and social skills around the age of two [4][5].

This is a brief illustration of the structure of the integrated theory of autism which proclaims a direct causations of screen to ASD. This hypothesis is supported by a number of pieces of evidence, including the clinical presentation and existing studies.

1.2 Clinical presentation

Clinicians who directly deal with ASD confirm a real regression state in previously established social and language skills, unlike some literature that claims the demand for social interaction increases around the age of two, resulting in an already present deficit becoming apparent [10]. On the other hand, observations by professionals confirm cured cases from ASD after only cessation of screen viewing followed by intensive social interaction and playing with them after which children no longer fit the diagnostic criteria of ASD [11][12].

1.3 Epidemiological evidence:

A number of researchers have addressed the question about the relationship between early screen viewing and subsequent development of ASD.

Preliminary work in this field was done by Waldman et al. In their paper (Does Television Cause Autism?) Waldman and his colleagues proposed a causal relationship between increased ASD diagnosis and early TV exposure. The variables used in this study are rates of precipitation and TV cable subscription in three states. These two variables appear to correlate positively with the time spent on TV viewing by children below the age of two and the increased rate of ASD diagnosis in the same states between 1972 and 1992. [13]

ASD and TV have received much attention in the last ten years. Since 2012 there has been a rapid rise in the number of studies conducted in different countries.

From Thailand, Chonchayia et al, in a comparative study, revealed that children with ASD were viewed TV at a younger age ($M = 6.44$ months compared to $M = 12.41$ months), and spent more time (4.6 hr. compared to 2.06 hr. per day) and absence of interaction with other family members (79.6 compared to 13.1%) than the control groups (Typically developing peers and children with language delay) [14]

Another case control from Turkey comparing TV viewing habits between ASD and four other diagnostic groups by two child and adolescent psychiatrists. Abdurrahman and his colleague demonstrated that the highest percentage of children who started watching TV before 12 months (56.7%) were ASD. There is also a significant difference ($p = 0.003$) between ASD group and other groups regarding total time spent in playing and interaction with siblings [15].

A recent study from China, conducted by Dong et al. compared the screen time of 101 children with ASD and 57 typically developing (TD) children. The study showed that the children with ASD were exposed to screens for longer duration than that of the TD peer (3.34 hr. vs. 0.91 hr. per day). There is also a positive relation between screen time, younger age of exposure and the severity of ASD symptoms [16].

Many other studies from different countries Qatar [17] Bucharest [18] USA [19] Romania [20] UAE [21] have reported a positive correlation between early screen exposure and subsequent diagnosis of ASD.

All those study obviously support the correlation and some of them give some credit to the proposed causal link sharp increase in the prevalence rate of ASD concomitantly with the increase the availability of screens for children.

Our knowledge of the relationship between ASD and early intensive screen exposure is largely based on limited data. The aim of the research was thus to examine the screen viewing habits in children with ASD and their TD siblings. We choose TD siblings [22] risk of the risk of younger siblings developing an autism spectrum disorder is 14 times higher if an older sibling has ASD [23].

2. Methodes

Participants

A total 108 children were subdivided into ASD group (n=55) with a mean age of (mean=6.95, SD=2.99), age range (2-16) and control group (n=53) with a mean age of (mean=7.89, SD=3.88), age range (2-17) consists of typically developed (TD) sibling. Participants from Emam Alhussain and other private centres for autism in Babylon province were called to take part in this study to form an ASD group from December 2020 to April 2021. The control group consists of siblings of ASD group to whom CARS and clinical examination approved them not having any developmental disorder.

Maternal average age at time of delivery of ASD children was 28.6 years (SD=5.52; range=18–42), at time of delivery of TD children was 28.4 years (SD=4.37; range=20–38) years. While that of fathers was 33.01 years (SD=6.97; range=20–52) at time of delivery of ASD children and 33.11 years (SD=5.) at the time of delivery of TD children. Parental education was also obtained and was approximately similar. 46 fathers and 45 mothers are college or higher education graduates.

Ethical approval for this project was granted by the Ethics Committee of Jaber Ibn Hayyan Medical University. Parents of child participants were made aware of the project approval and gave full consent for their child's participation.

Procedure

The sociodemographic data for the participants was obtained. Questions like age of both parents at time of delivery of ASD and TD children; parental education; working mothers or not; child's rank among offspring; age at which the child said his first meaningful word and preterm labour are completed by the parents.

After informed consents are obtained, a thorough clinical assessment of both ASD and TD children were done by both child and adolescent psychiatrist and pediatrician including full medical history, general physical examination and developmental assessment. Medical history includes prenatal, natal and postnatal history, drug history, developmental history and any developmental delay. Expressive and receptive language, stereotyped behaviors exhibited by the child; beside the observation of the child playing manner, and social reactivity during child's presence in the examination room are all assessed for both group. The diagnostic criteria in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM- 5) were used to prove the diagnosis of ASD group [24].

Screen viewing habits questionnaire and diagnostic assessments

The study used the essential methodological steps utilized by Chonchaiya et al.[12] to measure screen viewing habits. The screen viewing habits consisted of: duration, the time spent by the children viewing screens and the context: whether they watched screen without interruption by a periods of play with parents or siblings, beside the age at which they start watching screens. We added a type of screen to the survey, whether TV, mobile phone or tablets. In this study, we compared screen viewing habits for the ASD group against their typically developed TD siblings.

Childhood Autism Rating Scale CARS

Is one of the available and widely used tests in ASD diagnosis and assessment of the severity. A trained clinician can give an ASD diagnosis and differentiate them from those with other developmental disabilities based on direct behavioral observation of the child according to the 15 scale items. The total score can obtained is 60, and ASD diagnosis comes at score of 30 or less [25]

Statistical analyses

In this study, one-way analysis of variance (ANOVA) or nonparametric comparison (Kruskal–Wallis test) was carried out for the analysis of continuous data depending upon the homogeneity of variance and the normality assumption.

The categorical variables were compared using the chi-square test. Statistical Package SPSS Statistics for Windows, Version 26.0 (Armonk, NY: IBM Corp) was used for statistical analysis; p values <0.05 were considered significant, and all values reported were two-sided.

3. Results

Participant's characteristics

There were differences in age and gender between the ASD and TD groups. The children in the ASD group were younger (6.94 ± 2.99 years), while the age range for TD (7.89 ± 3.9 years). The gender also differed between the groups, male/female proportion for the ASD group (M/F: 46 / 9) significantly differ from the ratio of TD group (M/F: 27 / 25). Other participant's characteristics like rank of the child between siblings, preterm

labour and first meaningful world appear in Table 1.

Screen viewing habits

The age at which children started screen viewing differs significantly between groups ($p=0.009$). The ASD group started TV viewing at a younger age than the TD sibling group. Screen viewing onset at age less than 6 months was 28 (50.9%) for ASD group and 7 (12.7%) for TD group.

The mean screen viewing time of the children with ASD was approximately 4.21 ± 1.21 h/day; compared with the screen time of the TD children was only 1.90 ± 1.35 h/day, $p=0.045$. The interaction while viewing the screen was significantly different between the groups, $p=0.045$, no interaction was 74.5% for ASD group, while was 5.5% for TD group.

Total time spent in interaction with other family members is also questioned. The most significant was duration spent during interaction with the mother $p=0.013$.

The family characteristics for both group are illustrated in table 1 and screen viewing habits in table 2.

Table1. Participant's characteristics

Variables (Mean /SD)	ASD (n=55)	TD (n=53)	P
Age Year	6.94 (2.99)	7.89 (3.9)	0.483
Gender (M/F)	46 / 9	27 / 25	0.052
Rank			0.856
First	21 38.2%	11 20.0%	
In the middle	17 30.9%	29 52.7%	
last	17 30.9%	13 23.6%	
Preterm (GA ≤ 37 weeks)	6 (10.9%)	3 (5.5%)	0.085
First meaningful word before the first year			0.183
1-2 year	19 (34.5%)	31 (56.4)	
after the second birthday	15 (27.3%)	16 (29.1%)	
never speak	13 (23.6%)	6 (10.9%)	
	8 (14.5%)	0	

Table 2. screen viewing habits

Variables (Mean/SD)	ASD (n=55)	TD (n=53)	p
TV viewing onset			0.093

TV viewing, onset <6 months	28 50.9%	7 12.7%	
TV viewing, onset 6- 12 months	13 23.6%	16 29.1%	
TV viewing, onset 12-24 months	12 21.8%	20 36.4%	
TV viewing, onset >24 months	2 3.6%	10 18.2%	
No interaction during TV viewing	74.5%	5.5%	0.048
Screen time	4.21 ± 1.21	1.90 ± 1.35	0.045
Play time with mother			0.013
2≤ h/day	44 80%	19 34.2%	
>2 h/ day	11 20%	34 65.8%	
Play time with father			401
2≤ h/day	50 90.9%	2 61.6%	
>2 h/ day	5 9.1%	1 38.4%	
Play time with siblings			068
2≤ h/day	50 90.9%	2 43%	
>2 h/ day	5 9.1%	1 57%	

which states that children with ASD have less interaction time with their primary caregiver, which is most likely the mother, and are engaged in screen viewing most of their time, missing a great opportunity for learning and social interactions [4][5].

Our local experience from Iraq is in good agreement with previous findings in the literature. Before the American Invasion to Iraq in 2003, only two local TV channels were available to be viewed as stellates were forbidden and the time given for children programs was only 30-60 minute per day. After 2003, stellates became available in most Iraqis houses, hence, children programs became more accessible.[29] This is correlated positively with the diagnosis of more and more cases of ASD and subsequent increase in number of autism treatment centres in Iraq to raise from only one centre in the Capital Baghdad in 2003 to almost more than 20 centres in 2019 in the same city [30].

The last questions in the questionnaire were whether you want to tell us additional information, most of the parents respond by no other information. Others report their view that screens make the child less sociable and the child only repeats what he has learnt from the screen.

Conclusion

Our work has led us to conclude that screen viewing time is longer than that of typically developed siblings and associated with less interactive activities with other family members. Moreover, the ASD group started screen viewing

4. Discussion

This study is carried out to compare screen viewing habits between ASD and TD siblings in a sample of clinical population in Iraq. To the best of our knowledge, this is the first study to compare screen viewing between children with ASD and their TD siblings.

Results of Our study are consistent with previous findings [12][13] [26]. The total time spent in screen viewing for the ASD group was significantly more than that in the TD group. The mean screen time of the children with ASD was approximately 4.21 ± 1.21 h/day; compared with the screen time of the TD children was only 1.90 ± 1.35 h/day.

We found that most of the participants including TD viewed screens before the age of 2 years, which is clearly against recommendations of many leading institutions [27]. This matches with the finding that young children have been exposed to screens for longer duration than children before in a couple of decades [28]. Thus we look for other indicators in viewing habits like interaction with other family members during screen viewing which differ significantly between groups, $p=0.048$ and total playing time spent by the child with other family members.

Interestingly, there were no significant differences in playing time with father and sibling. However, TD siblings spent more time playing with their mothers than ASD, $p=0.013$. This finding is consistent with the integrated theory of ASD,

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- at a younger age and spent less playing time with their mothers than their TD siblings. The small sample size and lack of standardized tools in Arabic language like ADOS are the main limitations of this study. Taken together, we need more effort to raise parental awareness on the vital role of parent-child interactions in brain development and the negative effects of screen exposure during the early and critical years of a child's life. Further studies are required to investigate whether forbidding children under age of two from exposure to screen can reduce ASD incidence.
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