

REGULAR ARTICLE

Comparison of television viewing between children with autism spectrum disorder and controls

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ABSTRACT

Aim: To examine the pattern and extent of television viewing in children with autism spectrum disorder (ASD) compared with typically developing controls and those with delayed language development (DLD).

Methods: Fifty-four individuals with ASD (mean age 2.56 ± 0.66 years) and 84 controls (mean age 2.43 ± 0.81 years) were enrolled. Fifty-six individuals with DLD, who had language developmental levels similar to those with ASD, were enrolled in our previous study. Main outcome measures included onset and frequency of television viewing, in addition to the type of programme and whether a caregiver cowatched television.

Results: Those with ASD began to watch television significantly earlier than controls (6.44 ± 6.35 vs. 12.41 ± 6.00 months of age, $p \leq 0.0001^*$) and spent more time watching television than those with DLD (4.60 ± 1.91 vs. 3.05 ± 1.90 h/day, $p \leq 0.0001^*$) and controls (4.60 ± 1.91 vs. 2.06 ± 1.21 h/day, $p \leq 0.0001^*$). Those with ASD appeared to watch more adult programmes than normal controls, and they were less likely to watch television with caregivers than both control groups.

Conclusion: There is an earlier onset and higher frequency of television viewing in autistic children compared with children with typical development.

INTRODUCTION

Media has become an important environmental factor in the household that can have an impact on the daily lives of young children because they have often begun to watch television very early, by 3 months of age. In addition, more time is spent in front of the screen, with an average of approximately 3–4 h/day, more than any other leisure activity besides sleeping (1,2). This early exposure and increased amount of television viewing exceeds the recommendations by The American Academy of Pediatrics (AAP), which suggests that children ≥ 2 years of age should have < 2 h of watching television per day. In addition, parents should watch television together with their child and discuss the content and children < 2 years of age should avoid watching television (3). Thus far, there are several studies demonstrating harmful effects of media on young children, including violence (4), obesity (5,6), sleep problems (7), delayed language development (DLD) (8–10), adverse effects on cognition (11) and attention problems (12,13). Therefore, this evidence should no longer be disregarded by parents, paediatricians, teachers, entertainment industries and policy makers (1,14).

Autism spectrum disorder (ASD) is a complex group of heterogeneous neurodevelopmental disorders with significant impairments in social and communication domains in addition to restricted, repetitive and stereotyped behaviours

(15). It is an urgent public health concern in many countries. Estimates reported by the Autism and Developmental Disabilities Monitoring Network in the US show that approximately up to 110 in 10 000 children, 3–17 years of age have ASD (16). Early detection by a multidisciplinary team can lead to a better outcome for those children with ASD from comprehensive developmental and behavioural interventions (17,18). In some preschool-age children with autism, they can have unusual responses to sensory stimuli and relative strength in visual-spatial perception (19,20). Therefore, various learning interventions including the Picture Exchange Communication System and videotape modelling were developed to help those with ASD acquire functional communication spontaneously (21,22). According to parent reports, some of those with ASD demonstrated a high interest in television, videotapes and computer programmes, but the pattern and extent of media use specifically in young individuals with ASD or other neurodevelopmental disorders have rarely been studied. Additionally, little is known about how to appropriately recommend media use for caregivers of those with ASD or other neurodevelopmental disorders. We focused solely on television in this current study as its use was more widely reported when compared with music/audio, computers and video (14). Moreover, television is easily accessed by young children and widely used in the household in Thailand. To better

provide appropriate recommendations on television use for parents of children with ASD, we therefore compared television viewing habits in those with ASD with typically developing controls and those with DLD from our previous study (9).

METHODS

Study subjects

Study subjects included 54 children with ASD with a mean age of 2.56 years (SD 0.66, age range 1.5–3.83 years) and 56 children with DLD with a mean age of 2.11 years (SD 0.47, age range 1.33–3.67 years), who were seen at the developmental clinic, Division of Growth and Development, Department of Pediatrics, King Chulalongkorn Memorial Hospital, Bangkok, Thailand during September 2005 to August 2006. Eighty-four typically developing children with a mean age of 2.43 years (SD 0.81, age range 1.5–4 years), who came to the well baby clinic at King Chulalongkorn Memorial Hospital, Bangkok during the same period, were enrolled as normal controls. Those with DLD and normal controls were recruited in our previous study (9). The enrolment of typically developing controls was based on age and gender matched to those with ASD. The diagnosis of ASD was confirmed by the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revised criteria (15), followed by a developmental and behavioural paediatric team consensus discussion including all authors in addition to a psychologist, developmental and behavioural paediatric fellows, a speech and language pathologist, a physical therapist and a behavioural specialist. DLD was diagnosed based on a clinical evaluation by the multidisciplinary team mentioned above. Those with known causes of DLD including ASD, genetic syndromes, hearing loss, neurological disorders and global developmental delay were not included in the DLD group (9). The study was approved by the Institutional Review Board of King Chulalongkorn

Memorial Hospital, Faculty of Medicine, Chulalongkorn University, Bangkok.

Study protocol

After informed consent was obtained, all subjects underwent a full medical history, physical examination, and a full developmental assessment by either author (WC or CP), who are both developmental and behavioural paediatricians with expertise in ASD. The medical history covered an extensive review of prenatal, perinatal, and postnatal history, developmental milestones, developmental delay or regression, and behavioural problems, in addition to a review of systems, and medication use. Table 1 lists characteristics of those with ASD, DLD and controls. Socioeconomic background included parental age, income, education, primary caregiver, number of family members and family support (the involvement of other family members to help take care of the child). Table 2 lists parental and family characteristics of those with ASD, DLD and controls. The television viewing habits mainly focused on how early (onset) and on average how much television the subjects watched (frequency), what programmes they preferred to watch (content), and how they watched television (context) to document whether they were allowed to watch television alone or whether caregivers cowatched with them. The average time of interactive activities where caregivers jointly spent with their children each day, including helping them to brush their teeth, take a bath, get dressed, helping with toileting, listening to them about daily activities, eating with them, teaching and encouraging them to talk, playing with them, etc., and the average time caregivers talked with their children during the day, including telling stories and reading to them, were also thoroughly assessed by an in-depth interview. Table 3 illustrated comparisons of television viewing habits and time characteristics, including the average time of interactive activities and the average time caregivers talked with their children during the day,

Table 1 Characteristics of individuals with ASD compared with typically developing controls and those with DLD

Variables	ASD ^a (N = 54)	Control ^b (N = 84)	DLD ^c (N = 56)	p (a vs. b)	p (a vs. c)
Age (years) [†]	2.56 ± 0.66	2.43 ± 0.81	2.11 ± 0.47	0.093	<0.0001*
Language developmental age (years) [†]	1.29 ± 0.61	2.79 ± 1.00	1.39 ± 0.47	<0.0001*	0.193
Difference between language developmental level and CA [‡] (years) [†]	-1.22 ± 0.74	0.36 ± 0.36	-0.72 ± 0.37	<0.0001*	<0.0001*
Age at which the child can say the first meaningful word (months) [†]	21.43 ± 7.26	11.92 ± 1.92	17.38 ± 4.37	<0.0001*	0.008*
Male gender	42 (77.8%)	55 (65.5%)	46 (82.1%)	0.123	0.567
The first child	29 (53.7%)	43 (51.2%)	33 (58.9%)	0.773	0.581
Preterm (GA [§] < 37 weeks)	7 (13.0%)	8 (7.3%)	4 (7.1%)	0.257	0.309
Birth weight (g) [†]	3032.41 ± 551.06	2969.76 ± 592.62	3115.36 ± 505.51	0.535	0.412
Past medical illness	20 (37.0%)	39 (46.4%)	23 (41.1%)	0.276	0.665

*p < 0.05

[†]Data are represented as mean ± SD.

[‡]Chronological age.

[§]Gestational age.

ASD = autism spectrum disorder; DLD = delayed language development.

Table 2 Parental and family characteristics of individuals with ASD compared with typically developing controls and those with DLD

Variables	ASD ^a (N = 54)	Control ^b (N = 84)	DLD ^c (N = 56)	p (a vs. b)	p (a vs. c)
Father's age (years) [†]	36.48 ± 6.98	35.49 ± 7.11	36.57 ± 5.76	0.190	0.967
Father's income (baht/month) [†]	44 629.63 ± 73667.48	24 047.59 ± 19754.32	24 874.55 ± 30 908.10	0.083	0.035*
Father's education (higher than high school)	38 (70.4%)	49 (58.3%)	36 (64.3%)	0.153	0.497
Mother's age (years) [†]	34.26 ± 5.91	32.13 ± 5.86	32.66 ± 4.43	0.04*	0.110
Mother's income (baht/month) [†]	18 370.37 ± 67543.01	13 358.43 ± 14 203.19	15 052.73 ± 16 802.89	0.175	0.058
Mother's education (higher than high school)	39 (72.2%)	52 (61.9%)	41 (73.2%)	0.212	0.907
Primary caregiver (mother)	29 (53.7%)	49 (58.3%)	20 (35.7%)	0.592	0.058
Combined parental income (baht/month) [†]	31 500 ± 67 821.73	18 703 ± 14 964.97	19 964 ± 20 979.47	0.120	0.194
Number of family members (>4 persons)	43 (79.6%)	61 (72.6%)	45 (80.4%)	0.351	0.924
Family support	35 (64.8%)	52 (61.9%)	41 (73.2%)	0.730	0.341

*p < 0.05

[†]Data are represented as mean ± SD.

ASD = autism spectrum disorder; DLD = delayed language development.

Table 3 Television viewing habits and time characteristics of individuals with ASD compared with typically developing controls and those with DLD

Variables	ASD ^a (N = 54)	Control ^b (N = 84)	DLD ^c (N = 56)	p (a vs. b)	p (a vs. c)
Onset of TV viewing (months) [†]	6.44 ± 6.35	12.41 ± 6.00	7.22 ± 5.52	<0.0001*	0.212
Onset of TV viewing <12 months	43 (79.6%)	34 (40.5%)	39 (69.6%)	<0.0001*	0.229
Onset of TV viewing <24 months	53 (98.1%)	78 (92.9%)	56 (100%)	0.246	0.491
TV viewing/day (h) [†]	4.60 ± 1.91	2.06 ± 1.21	3.05 ± 1.90	<0.0001*	<0.0001*
TV viewing ≥2 h/day	51 (94.4%)	47 (56%)	39 (69.6%)	<0.0001*	0.001*
Viewing adult TV programme	38 (70.4%)	35 (41.7%)	34 (60.7%)	0.001*	0.287
No interaction during TV viewing	43 (79.6%)	11 (13.1%)	32 (57.1%)	<0.0001*	0.011*
Interactive time spending with the child/day (h) [†]	5.01 ± 2.37	9.06 ± 2.21	7.03 ± 3.01	<0.0001*	<0.0001*
Spending time talking with the child/day (h) [†]	2.09 ± 1.72	5.79 ± 2.24	3.62 ± 2.19	<0.0001*	<0.0001*

*p < 0.05

[†]Data are represented as mean ± SD.

ASD = autism spectrum disorder; DLD = delayed language development.

between individuals with ASD with typically developing controls, and those with DLD.

Developmental assessment included hearing screening, evaluation of joint attention and sociability, observation of play, expressive and receptive language, hyperactive, repetitive, restricted, and stereotyped behaviours in the session. Furthermore, developmental screening was performed by using Denver-II (23), which is a validated developmental screening tool widely used in Thailand. Language developmental level was determined by the age where subjects can pass those items at the 75th percentile on language developmental domain in the Denver-II.

Statistical analysis

Continuous variables were compared between subjects with ASD and the typically developing control group, and also between those with ASD, and those with DLD using either one-way analysis of variance (ANOVA) or nonparametric comparison, Mann-Whitney *U*-test, depending upon the assumption of normality and

equality of variance in each group. Categorical variables were compared by Fisher's exact test. Analysis of covariance (ANCOVA) was conducted if background variables were significantly different between the groups and potentially associated with the main outcome measures by using those variables as covariates. All statistical analyses were performed with SPSS version 18.0 (IBM, Inc, Somers, NY, USA) for Windows and all p-values reported are two-sided and the significance level is 0.05.

RESULTS

Characteristics of study subjects

There were no significant differences in background variables including chronological age, gender, birth order, pre-term birth, birth weight and past medical illness between individuals with ASD and typically developing controls (Table 1). Nor were there significant differences in parental and family characteristics between both groups of subjects (Table 2). However, mothers of individuals with ASD were

slightly older than controls' mothers. As expected, those with ASD had language developmental delay documented by developmental history and the Denver-II. Although those with DLD were significantly younger than those with ASD, the language developmental age was not significantly different from those with ASD. In addition, an average of father's income in those with DLD was significantly lower than those with ASD, but the comparison of combined parental income between these two groups did not reach a significant level.

Comparison of television viewing habits between those with ASD and typically developing controls

Individuals with ASD began to watch television prior to the development of their receptive and expressive language. Interestingly, an approximately 6-month earlier onset of television viewing was observed in those with ASD compared with typically developing controls. Most controls began to watch television after they started to speak meaningful words. Prior to 12 months of age, more individuals with ASD began to watch television compared with controls. However, before 24 months of age, both groups began to watch television earlier than the AAP recommendations. Regarding the frequency of television viewing, those with ASD appeared to spend significantly more time watching television than controls and the AAP recommendations. Those with ASD were more likely to watch adult programmes including advertisements, TV series, news, games, entertainment shows and music videos than controls. Furthermore, individuals with ASD were more likely to be allowed to watch television on their own compared with controls.

Comparison of television viewing habits between those with ASD and those with DLD

Interestingly, higher frequency of television viewing was demonstrated in those with ASD compared with those with DLD. There were significantly higher rates of watching television ≥ 2 h/day and no joint interaction during television viewing in individuals with ASD compared with those with DLD (Table 3). After adjusting for chronological age, gender, father's and mother's income, and whether the mother was a primary caregiver of the child, those with ASD appeared to spend more time watching television than those with DLD (estimated means \pm SE, 4.37 ± 0.27 vs. 3.32 ± 0.26 h/day, $F_{1,102} = 6.862$, $p = 0.01$). There was an interesting trend towards an earlier onset of television viewing in those with ASD compared with those with DLD after adjusting for the variables mentioned earlier (estimated means \pm SE, 5.72 ± 0.84 vs. 7.90 ± 0.84 months of age, $F_{1,102} = 3.01$, $p = 0.086$).

DISCUSSION

This is the first study demonstrating the pattern and extent of television viewing in individuals with ASD compared with typically developing children and those with DLD from the perspective of a developing country, where young children can be influenced by the media (9). However, our findings should be cautiously interpreted as they

demonstrated an association, not a cause-and-effect finding. Although an increased frequency of television use in those with ASD in this current study was in agreement with a study by Shane and Albert and May et al. (24,25), none of those previous studies surveyed television use in younger individuals with ASD, nor mentioned the onset of television viewing in those with ASD. There may be a combination of social and language deficits in addition to restricted and repetitive behaviours in those with ASD, risks for attention problems and abnormal regulation to arousal stimuli. Furthermore, caregivers may not successfully engage their children, so that children with ASD may occupy themselves with nonsocial activities including television viewing. An adult moderator and enriched parent-child interaction can be very critical for brain development in young children with and without ASD (26). Behavioural symptoms of ASD were more likely to emerge over time, beginning in the second half of the first year by prospectively demonstrating the slow decline in social communication behaviours, and loss of skills in those who were later diagnosed with ASD (27). Therefore, ASD symptoms may emerge at approximately 6 months of age in those with ASD in our study where social and communication deficits became problematic, reflecting why those with ASD appeared to watch television earlier than their typically developing peers. The onset of television use at approximately 6 months of age may be an indirect clue for social and/or language deficits in those who are at risk of ASD. Furthermore, potentially detrimental effects of the media mentioned in the Introduction section, which can co-occur in those with ASD should be taken into consideration. Increased attention to the screen, imitation of words and developing procedural knowledge about television's devices were observed in those with ASD (24), but how this knowledge can be pragmatically generalized in a way of social communication in the daily lives of those with ASD needs to be elucidated.

The significant weaknesses of our study included small sample sizes, the lack of standardized ASD assessments and using just an interview without another objective assessment of television viewing habits (e.g. behavioural observation in the household). However, we tried to compensate for this weakness by interviewing strictly to the protocol regardless of the groups of the subjects. Population-based studies with long-term follow-up in those with ASD and typically developing controls are needed. Moreover, short and long-term consequences of media use in those with ASD or other neurodevelopmental disorders should be further studied to better provide appropriate anticipatory guidance for parents of those with ASD, particularly the topics in terms of how to optimize benefits and potential risks from the media for their children. Future studies should also consider how beneficial effects of television viewing including imitation and prosocial behaviours can lead to developing interactive educational interventions through media, which should be more developmentally appropriate for those with ASD and ultimately modify or shape on abnormal neuronal networks in developing brains of those with ASD (28).

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