

Effect of Media Exposure on Social Development in Children

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Abstract

Purpose. The prevalence of autism spectrum disorder in children, who show problems in social development, is increasing rapidly. If children watch media at an early age, they lose the time to interact with their parents and will not be able to play creatively, which can have a negative impact on social development. This study was performed to evaluate the association of media exposure with social developmental delay. **Methods.** The sample consisted of 96 patients with social developmental delay who visited the developmental disorder clinic from July 2013 to April 2019. The control group included 101 children who visited our developmental clinic with normal developmental screening test results during the same period. The data were collected using self-reported questionnaires with questions regarding media exposure time, content, background media or foreground media, the age of first exposure, and media exposure with or without parents. **Results.** In regard to media exposure time, 63.5% of the social developmental delay patients were exposed to media for more than 2 hours a day compared to 18.8% of the control group ($P < .001$, [OR]=8.12). In the risk factor analysis of media exposure on social development, male gender, media exposure before 2 years of age, exposure for more than 2 hours, and exposure alone without parents were statistically significant. **Conclusion.** Media exposure was a significant risk factor for social developmental delay.

Keywords

media exposure, social development, autism spectrum disorder (ASD)

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Introduction

Currently, with the development of media devices such as smartphones and built-in DVDs, more children than any previous generation have been exposed to media for long periods at very early ages, including 90% of children before the age of two.¹⁻³ The prevalence of autism spectrum disorder (ASD), in which children have problems with social development, is also increasing rapidly.⁴ Many studies on the media exposure of children have been conducted, but debate continues about the effects of media on neurocognitive development such as social, language, and cognitive development in preschool children, especially before the age of two.^{3,5-8}

Exposure to media at an early age can have a negative impact on social development due to the loss of time to communicate and interact with parents and play creatively.¹ Media is known to negatively affect the development of children even if they are exposed to media their parents are watching in the background. It has been

suggested that watching media programs before 2 years of age has a negative effect on early brain development due to infants' limited memory, attention, and cognition.⁹ Others have argued that viewing high-quality educational programs with caregivers can help development. However, the American Academy of Pediatrics (AAP) does not recommend media exposure before the age of two.¹

ASD is characterized by verbal and nonverbal communication, social deficits, limited interests, and stereotypic behavior in early childhood. ASD is known to be caused mainly by the interaction of genetic factors and environmental influences. In 2000, the prevalence of

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Table 1. Abstracted Media Exposure Questionnaire.

- Did your child frequently be exposed to media such as TV, smartphone, and computer before 24 months of age?
- How many hours a day did you show your child the media?
[30 minutes or less/1 hour to 2 hours/3 hours to 4 hours/5 to 7 hours/1/2 days (about 12 hours)/All day (24 hours)]
- When your child in contact with the media,
 1. I watched it with my child
 2. My child watched it alone
- What kind of program?(Learning English/Animation/Song and dance/Fairytale)
- Why did you show your child the media?
 1. As the family watched the media, the children naturally exposed to it as well..
 2. Media was shown for the purpose of calming the child
 3. The child was exposed to the media due to the circumstances of the caregiver such as health problem, both parents working etc.
 4. Media was shown for educational purposes.
- How to contact media (indirect and direct exposure)? (foreground media/background media)
- Where did your child mostly watch media at home?
 1. Child room 2. Living room 3. Kitchen 4. Others

ASD in 8-year-old children was 1 per 150 children in the United States, but in 2014 it increased rapidly to 1 per 59 children.¹⁰ Although there is a possibility that the prevalence rate increased as the diagnostic criteria widened and awareness of the disease increased, other causes may have contributed to the actual increase in the incidence rate.

Media exposure can lead to the loss of time for parental interaction and creative play necessary for social development¹⁰ and forming new network processes that hinder social development, which may induce ASD-like symptoms.¹¹ Research on the influence of media exposure before the age of 2 is limited, and many studies have reported results on the relationship between media exposure and language and social development, obesity, and sleep problems, but the causal relationship is not clear.^{11,12} Recently, as the use of smartphones increases, young infants are exposed more easily and for a long time. Due to the built-in artificial intelligence(AI) function, they are repeatedly exposed to similar contents, which can negatively affect especially social development.

Therefore, this study aimed to evaluate the effect of digital media exposure including TV, video, and smartphone on social development.

Methods

Three hundred thirty-nine patients visited our clinic for developmental delay from July 1, 2013, to March 31, 2019. Among the patients, delays in motor and specific language development were excluded, and 125 patients showed social development delay. Of these, 29 were excluded because they did not answer the media exposure questionnaire.

The remaining 96 patients underwent comprehensive developmental tests including the childhood autism rating scale (CARS), the modified checklist for autism in toddlers (M-CHAT), the autism behavior checklist (ABC) test, Korean-Bayley scales of infant and toddler development-II, and language development tests such as the sequenced language scale for infants (SESLI), and preschool receptive-expressive language scale (PRES). Through analysis of these tests and interviews recorded with caregivers by pediatric neurologists and psychologists, the patients who showed poor social development included the social development delay group. This group included a provisional diagnosis of ASD (26 patients) and patients with impairment of reciprocal social communication and social interaction who did not fully meet the diagnostic criteria for ASD as a clinical diagnosis with poor social development (70 patients). In the same period, 101 patients with normal findings in the Korean Developmental Screening Test for Infants and Children (K-DST) were used as controls.

During the outpatient visits of these patients, media exposure questionnaires (Table 1) were used for caregivers to investigate the age of onset of media exposure, exposure time, exposure programs, exposure type (foreground exposure or background exposure), exposure location, and whether the caregiver was present during the exposure. During the same period, the same questionnaire survey was administered to children who showed normal findings in the Korean Developmental Screening Test conducted when visiting the hospital for regular health checkups.

Statistical Analyses were performed using SPSS-Version 22 (IBM, Armonk, NY, USA)21.0. The *t*-test was used for continuous variables, the chi-squared test was used for non-continuous variables, and logistic

Table 2. Clinical Characteristics of Social Developmental Delay (SDD) Patients and Control Group.

	SDD patients	Control	P-value
Number	96	101	
Mean age (months)	33.52 ± 9.7	36.44 ± 17.4	NS
Sex (M:F)	2.6:1	1.2:1	.018
Bayley scales			
MDI	116.20 ± 17.61		
PDI	85.59 ± 16.38		
CARS score	25.23 ± 5.61		
M-CHAT score	7.24 ± 4.19		
ABC score	36.59 ± 20.33		

Abbreviations: SDD, social developmental delay; MDI, mental developmental index; PDI, psychomotor developmental index; CARS, childhood autism rating scale; M-CHAT, modified checklist for autism in toddlers; ABC, autism behavior checklist.

regression analysis was used for risk factors for language development delay. A *P*-value value of .05 or less was considered statistically significant.

Results

Clinical Characteristics of Patients in the Social Developmental Delay Group and Control Group (Age, Gender Distribution, and Education of Parents)

There were 96 patients in the social developmental delay group and 101 patients in the control group. The average age was 33.52 months (range 15–63 months) and 36.44 months (6–84 months), respectively. The male-to-female ratio was 2.6 to 1 in the social developmental delay group, which had significantly more males. The mean mental developmental index (MDI) and psychomotor developmental index (PD) of the Korean-Bayley scales of infant and toddler development-II were 116.20 ± 17.61 and 85.59 ± 16.38, respectively. Childhood autism rating scale (CARS), the modified checklist for autism in toddlers (M-CHAT), the autism behavior checklist (ABC) test for social development evaluation in patients were 25.23 ± 5.16 and 7.24 ± 4.19, 36.59 ± 20.33 respectively (Table 2).

Age at Onset of Media Exposure

The majority of the children in the social developmental delay group (95.8%) were exposed to media before 2 years of age, which is not recommended by the AAP. The proportion of children exposed in the control group was 59.4% (Figure 1).

Media Exposure Time

In the comparison of media exposure time, the exposure time was significantly longer in the group with social developmental delay group compared to the control group. In the comparison of media exposure time of more than 2 hours, 63.6% of the delayed social development group had significantly more exposure than 18.8% of the control group.

Whether Children Are Accompanied by Caregivers When Exposed to Media

At the time of media exposure, 77.1% of the social developmental delay group and 38.6% of the normal group watched media alone without parental supervision (Figure 2).

Exposure Program

In the comparison of viewing program types, educational programs such as English education and fairytale programs were higher in the control group than in the social developmental delay group.

Media Exposure Reason

The reasons for exposure to the media were soothing children (26.5%) and reasons related to depression, health, and both parents working (55%) in the social developmental delay group, which were significantly higher than 7.4% and 41.3%, respectively, in the control group (Figure 3).

Exposure Type (Foreground or Background Exposure)

The media exposure type was classified into foreground exposure and background exposure. In the patient group, foreground exposure was 55.4% and background exposure 44.6%, and in the control group, foreground exposure was 58.3% and background exposure 41.7%, and there was no statistically significant difference

Exposure Location

The exposure places were classified into children's room, living room, kitchen, and others, and the living room was the highest at 89.1% for the control group and 82.3% for the patient group, respectively, and there was no statistically significant difference between the 2 groups.

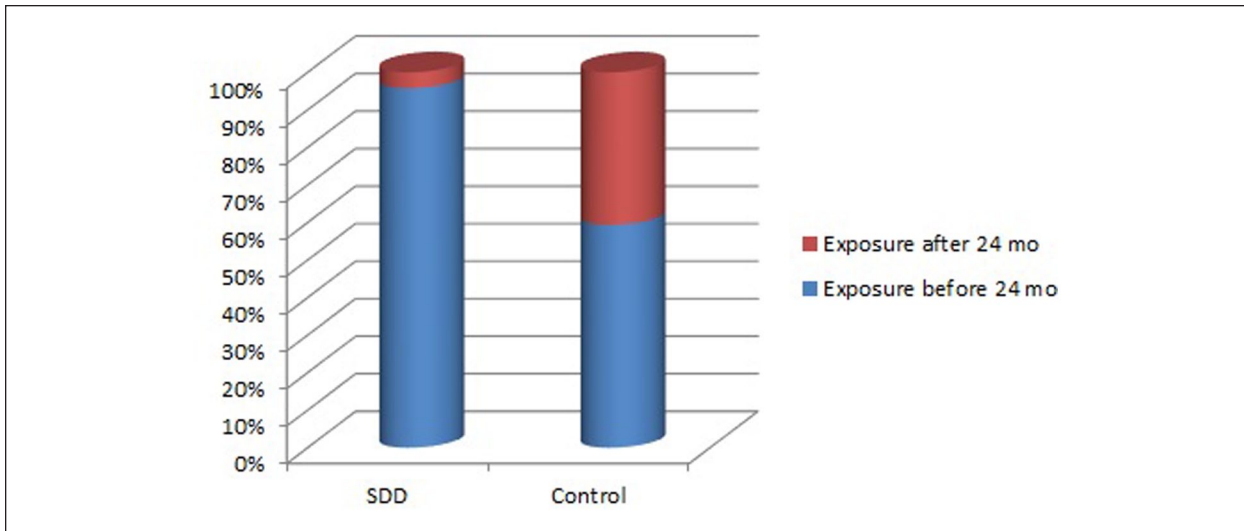


Figure 1. Comparison of media exposure before 24 months between social developmental delay and control group.

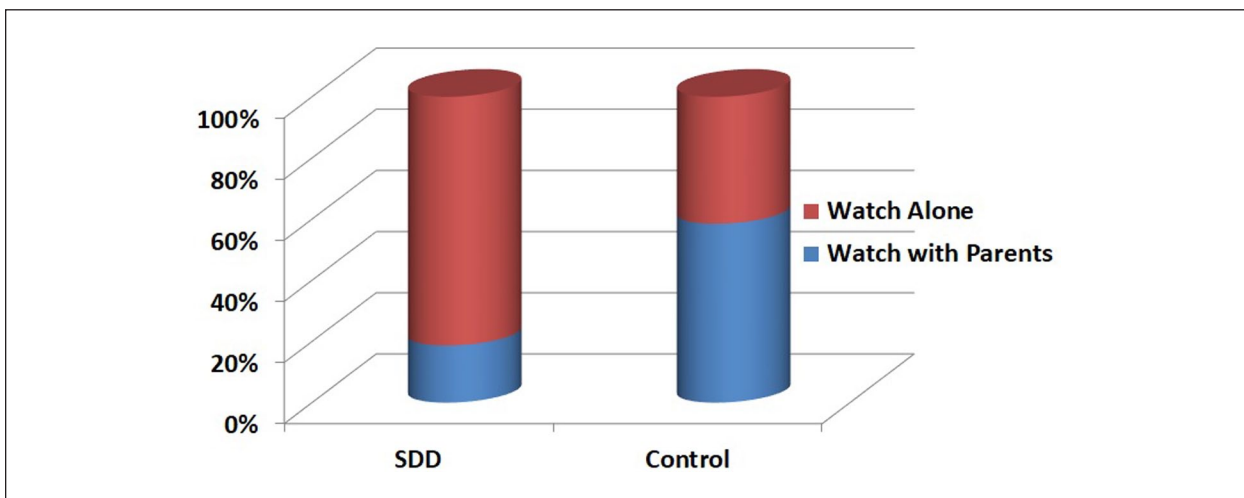


Figure 2. Comparison of media exposure with parents or alone between social developmental delay and Control group.

Risk Factors for Social Developmental Delay

In the analysis of the risk factors of media exposure that influenced social development, male gender (odds ratio [OR]=5.61), media exposure before 2 years old (OR=14.63), exposure over 2 hours (OR=8.12), and exposure alone without a parent (OR=6.15) were statistically significant (Table 3).

Discussion

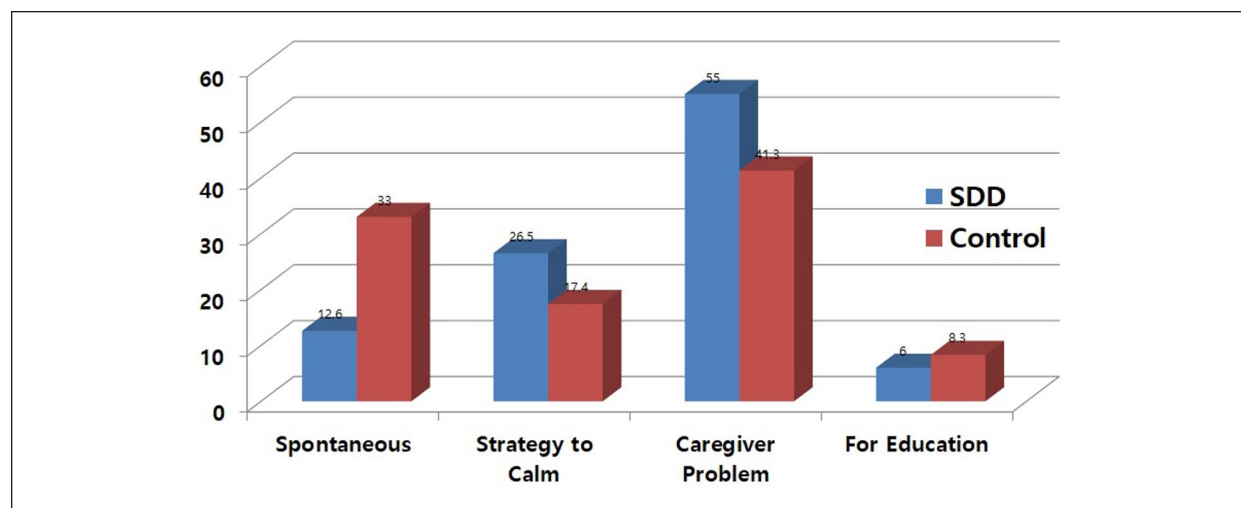
Recently, with the rapid development of various media devices, especially smartphones, it has become common for infants and toddlers to be exposed to media for long periods at a very early age.^{2,3} Although there is debate

about the relationship between media exposure and the neurodevelopment of children, it is known that media exposure is mainly comprised of visual stimuli at this age and has negative effects, especially before the age of 2 because it is still difficult for this age children to understand the media contents. There have been reports that media exposure is related to delays in language development.^{9,13-15}

Studies using functional magnetic resonance imaging showed that interaction with humans activated brain development in children much more than media exposure because it mainly stimulated the visual cortex without stimulating cognitive processes.^{13,14} It has been suggested that media exposure could hinder brain development related to social development and create

Table 3. Risk Variables of Social Developmental Delay (SDD) Patients and Control Group.

	SDD patients N=96	Control N=101	P-value	Odds ratio	95% CI
Male sex	69 (71.9%)	45 (44.5%)	<.001	5.61	1.35-2.32
Early media exposure (<24 months)	92 (95.8%)	60 (59.4%)	.03	14.63	2.35-84.72
Exposure time per day (≥ 2 hours)	61 (63.5%)	19 (18.8%)	<.001	8.12	2.64-24.93
Type of media exposure (foreground)	56 (58.3%)	56 (55.4%)	.69	0.319	0.93-1.091
Exposure to media alone	74 (77.1%)	39 (38.6%)	.01	6.15	2.02-18.69

**Figure 3.** Reason to allow media exposure.

a new brain pathway that leads to further immersion in the media.¹⁶

Thus, as the prevalence of ASD, which is associated with problems with social development, is rapidly increasing, the negative effects on media exposure and social development need to be investigated.⁴

This study found that patients with delayed social development were more frequently exposed to media for more than 2 hours a day and had early media exposure before 24 months compared to normal development children. It also showed that letting children watch media alone without interaction with their caregivers could have a negative impact on social development.

Some studies have shown that watching educational and quality programs by children over 2 years of age improved their social and language skills and helped them prepare to go to school.

Accordingly, parents are highly interested in education using videos. In contrast, other studies reported that exposure to media during the early childhood period affected obesity, sleep patterns, and aggressive and distracting behavior.¹² However, studies on children younger than 2 years of age are insufficient, and in particular, there have been rare studies showing a clear relationship

between cognitive and emotional development in children.¹⁷ According to the recommendation of the AAP, media viewing should be restricted in children under the age of two.¹⁸ In a recent study, the relationship between media exposure, play, and reading interaction with caregivers at 12 months, and autism spectrum symptom scores evaluated by the M-CHAT test at 2 years of age was evaluated. According to the results, the M-CHAT scores were higher from media exposure and less interaction with caregivers through play and reading.¹¹ In this study, only media exposure and M-CHAT scores were compared. However, our study targeted a group of patients with social developmental delay diagnosed by a clinician using various evaluation tools such as Bayley scales, CARS, M-CHAT, and ABC test. The relationship between media exposure and social development was evaluated in these patients group compared to the normal development group.

In our study, most of the social developmental delay group (95.8%) were exposed to media before 2 years of age, which was significantly higher than that of the control group at 59.4%. In this study, patients with social developmental delay had significantly longer exposure times than the control group. In the comparison of the

media exposure time of more than 2 hours, 63.5% of the social development delay group had over 2 hours compared to 18.8% of the control group.

The reason why patients with social developmental delay are exposed to the media for longer periods earlier than the control group may be presumed from the lack of sociality, the characteristics of diseases that seek visual stimulation, and the repetitive play function of the artificial intelligence (AI) built into the media device.¹⁹ On the other hand, there is a possibility that the increase in smartphone exposure and AI functions adversely affects the social development of young children who have only risk factors for ASD, which may have acted as a cause of the onset of ASD. Although 50% to 80% of the causes of ASD have been identified as genetic causes,²⁰ it is known that various perinatal and demographic factors interact with genetic factors to cause ASD.²¹⁻²³ The possibility that media exposure is one of the environmental causes of ASD cannot be ruled out.

AAP recommends that children watch media programs under their parent's supervision and suggests that they do not watch media in bedrooms or sleeping places.^{18,24-26} According to a previous study, 60% of patients with language delays watched TV alone and were 8.47 times more likely to have language delays than those who interacted with their parents. This may be related to the neglectful parenting style seen in caregivers with psychiatric conditions such as depression.^{24,27} This study also showed that more children in the group of patients who were allowed to watch alone had delayed social development (77.1%) compared to the control group (38.6%). Thus, watching media alone has a higher probability of delaying social development compared to watching media with a caregiver. In the comparison of the types of exposure programs in this study, educational programs such as English education and fairytales were more common in the control group than in the social developmental delay group. The mother's educational background was significantly lower in the social developmental delay group than in the control group.

There have been reports that the caregivers of patients with ASD had a positive view of media use and used it for the purpose of soothing children.²⁸ The reason for the media exposure of children in the social developmental delay group in our study was to soothe children (26.5%) and related to the caregiver's depression, health, and both parents working (55%), which were significantly higher proportions than those of the control group at 7.4% and 41.3%, respectively. In the social developmental delay group, media was used more often to keep the child quiet rather than for educational purposes and to secure housework time than in the control group. It is difficult for parents to nurture a child with a developmental delay

because they commonly have inattentive, hyperactive behavior. Because of this, media exposure tends to more increase in these children, and this has the potential to negatively affect social development.

It is known that not only direct viewing of media but also exposure to the background media negatively affects children's social development.²⁹ However, in our study, there was no difference in the degree of direct and indirect exposure between the 2 groups.

In the analysis of risk factors of media exposure with logistic regression on social development, male gender, media exposure before 2 years old, exposure for more than 2 hours, and exposure alone without parents were significant risk factors.

The limitations of this study were, first, it may be difficult to generalize the results of this study because not many patients participated in the study. Second, the questionnaire responses depended upon the caregiver's memory, which could create bias in the collected data.

Conclusion

In conclusion, this study retrospectively compared children diagnosed with social development delay and a control group. The results showed that exposure to media before the age of 2 and exposure for 2 hours or longer may have a negative effect on social development. Watching alone by the patient without a caregiver could have a worse effect on social development than watching media with the parents.

Future large-scale prospective studies in which more patients are followed for a longer time may reveal the causal relationship between social developmental delay and media exposure.

Author Contributions

The authors confirm contribution to the paper as follows:

Study conception and design: Sung Koo Kim

Funding acquisition: Sung Koo Kim

Investigation: Sung Koo Kim, Dasom Wi, Kyung Mi Kim

Writing: Sung Koo Kim, Dasom Wi

All authors reviewed the results and approved the final version of the manuscript.

Declaration of Conflicting Interests

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Ethical Approval/Patients consent

This study was approved by the Institutional Review Board of Hallym University Dongtan Sacred Heart Hospital (Approved number: 2021-03-003-001).

Informed Consent

Informed consent was waived due to the retrospective nature of the study.

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