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Impacts of Sibling Relations on Sociality, Communication, and Autism Severity in Children with Autism Spectrum Disorder: A Retrospective Analysis

ABSTRACT

Objective: This study investigated the differences in sociality, communication, and autism severity in children with autism spectrum disorder (ASD) according to the presence or absence of siblings, the number of siblings, the order of birth, and the sex of sibling.

Methods: We included 71 children with autism spectrum disorder who visited University Hospital as outpatients. We compared the communication and socialization scores using the Korean Version of the Vineland Adaptive Behavior Scale, second edition (K-VABS II); social interaction, communication, and language using the autism diagnostic interview-revised (ADI-R); and the total score of the Korean-Childhood Autism Rating Scale 2 (K-CARS 2) according to the presence or absence of siblings, the number of siblings, the order of birth and the sex of sibling. Data were evaluated with independent *t*-tests and analysis of variance (ANOVA) tests.

Results: The patient's average age was 48.8 ± 13.6 months. There was a significant difference in the total score of K-CARS-2 according to the sex of siblings. The male sibling group was 34.36 ± 6.11 and the female sibling group was 30.29 ± 6.41 points, respectively.

Conclusion: This result indicates that the quality of sibling interactions in families with a child with ASD may play a significant role in reducing ASD severity and improving the quality of sibling interactions, rather than the number of siblings alone affecting the social interactions of children with ASD.

Keywords: Autism spectrum disorder, children, siblings, social interaction

Introduction

Children begin to pay attention to others in early childhood through facial gaze, eye contact, and joint attention, and attempt to interact by communicating non-verbally or verbally to elicit other persons' attention or behavior.[1] The interaction experience during this period enables the development of cognitive and language skills as well as the acquisition of social knowledge and skills, laying the foundation for future self-identity and meaningful social relationships.[2] Children spend most of their time with their parents and siblings, and socialize under the continuous interest and guidance of their family members.[3] The relationships between parents and siblings provide children with different experiences of social relationships, while the relationships between children and their siblings provide an experience of peer relationships, which are horizontal and can continuously affect their respective lives. In contrast, the relationships with parents allow children to experience vertical relationships that are formed through protection and dependence.[4] Siblings spend time playing with each other, and become interactive objects such as teachers, and competitors. Sibling relationships form the basis for perception and belonging to peers and others and promote children's cognitive, emotional, and social development.[5-7] Thus, interest has been aroused regarding how siblings affect children's development. Studies have identified some variables that affect sibling relationships, including the presence or absence of siblings, order of birth, and the sex of siblings.[6,8-10]

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Studies claim that the presence of siblings has a positive effect on children's development have reported that children with siblings have fewer psychosocial internalization or externalization problems than those without siblings.[11-13] The birth order reportedly affects early childhood development, and opinions on this include the traditional birth order theory[14,15] and social learning theory.[16,17] Traditional birth order theory focuses on limited resources in the family, arguing that limited family resources, such as parents' time, interests, books, and toys should be used separately among siblings. On the other hand, social learning theory focuses on the developmental benefits of subordinated children, who benefit from positive sibling relationships, play, and guidance with other siblings, and allow older children to become role models for socialization. Siblings learn by responding to, imitating, and observing each other's behaviors, attitudes, and beliefs and can gain problem-solving skills, sharing, and learning opportunities to think from others' perspectives from early childhood.[17] Regarding the sex of siblings, one study found a sex effect, with female siblings showing more affection and positive behaviors such as empathy and intimacy involvement with sibling.[8-10]

Studies have been conducted on how sibling relationships affect development, even in children with developmental disabilities. Among these studies, examinations of the impact of these variables on different developmental domains in children with autism spectrum disorder (ASD) have also has been conducted but fairly limited.[3,4,11-16] Autism spectrum disorder shows atypical characteristics concerning the quantity and quality of social relationships and interaction[11] Some studies have reported that the presence of siblings has a positive impact on the social functioning of children with ASD.[18,19] Children with ASD can have more opportunities to interact with their siblings during playtime than with their parents[8-10,17,20] and be exposed to social behavior modeling through proper play with siblings[21] and acquire social skills.[22] As a result, social play skills are improved and generalized to other areas,[23,24] indicating better imitation skills[4] and social communication behaviors.[25] In a study on the relationship between the presence or absence of siblings and the severity of ASD, children with ASD and their siblings had fewer social communication defects, and in the regression model, having senior siblings was associated with fewer social communication disorders.[26] However, until now, very few studies have examined how various variables, including the order of birth, the number of siblings, and the sex of siblings, simultaneously affect the sociality, communication, and autism severity in children with ASD.[19]

MAIN POINTS

- *There was no significant difference in the communication and social domains of K-VABS II; ADI-R social interaction, communication, and language; and the total score of K-CARS 2 in children with ASD, according to the presence or absence of siblings, number of siblings, and sibling ranking. However, there was a significant difference in the CARS score depending on the sex of the siblings.*
- *Our findings suggest that in families with a child with ASD, the quality of sibling interactions may have a more significant impact on reducing ASD severity and enhancing sibling relationships, compared to the influence of merely the number of siblings involved on the child's social interactions.*

So, in this study, we aimed to identify how the variables affect the early development of children with ASD and to examine how they differ in sociality and communication, ASD severity, which are greatly affected by their interactions with siblings. The result would extend previous research on the role that typically developing siblings of children with ASD play in their sibling's development. Differences in detailed areas, such as sociality and communication skills during early development owing to the presence or absence of siblings, the number of siblings, and the sex of siblings, and the birth order of children with ASD, would be revealed using the Korean Version of the Vineland Adaptive Behavior Scale, second edition (K-VABS II) and Autism Diagnostic Interview-Revised (ADI-R), while the overall severity of ASD would be revealed using the Korean-Childhood Autism Rating Scale 2 (K-CARS-2). To our knowledge, this is the first study to directly compare how these variables affect the sociality, communication, and ASD severity of children with ASD divided into groups according to the presence or absence of siblings, the number of siblings, and the sex of siblings, and birth order of children. The study hypothesized that their autism severity and adaptive skills will differ owing to the presence or absence of siblings, the number of siblings, and the sex of siblings, and birth order of children with ASD.

Methods

Research Participants and Data Collection

We retrospectively analyzed the medical records of children with ASD who visited a hospital for diagnosis and treatment. We included preschool children aged <6 years who were diagnosed with ASD from January 1, 2020, to December 31, 2020, according to the diagnostic criteria of the American Psychiatric Association's Diagnostic and statistical manual, fifth edition and excluded children who did not perform the K-CARS 2, ADI-R, and K-VABS II from the study. On the day of the psychological examination, information concerning the presence or absence of siblings, the number of siblings, and the sex of siblings, and birth order of children was collected from the parents. The K-CARS 2, ADI-R, and K-VABS II were used. This study was reviewed and approved by the Clinical Research Ethics Committee of P University Hospital (approval number: 05-2021-241), and the medical records were analyzed retrospectively.

Measuring Tools

CARS-2: The CARS is a behavioral evaluation scale developed by Schopler et al[27] It consists of 15 questions and is evaluated based on direct observation, parental reporting, and record review. It consists of a 7-point scale ranging from 1 (normal behavior) to 4 points (severe abnormal behavior), and the rating is conducted by an expert trained in autism. A total score of ≥30 points indicates risk of autism; scores of 30-36.5 points and ≥37 points indicate moderate and high risks of developing autism, respectively.

The CARS-2 was also developed and divided into the same CARS standard version (CARS-2-ST) as the original CARS and a high-functioning version (CARS-2-HF) for children aged >6 years. The internal agreement (Cronbach's α) of CARS-2-ST and CARS-2-HF is high, at 0.93 and 0.96, respectively. Lee, Yoon, and Shin[28] conducted a standardized Korean version of the K-CARS-2 using 341 clinical and non-clinical samples (145 and 65 patients with standard and

high-functioning autism) in individuals aged 6-36 years. The internal consistency of K-CARS-2-ST and K-CARS-2-HF showed high reliability (Cronbach's $\alpha = 0.77$ and $\alpha = 0.96$, respectively). Kwon et al[26] conducted an additional study to confirm the appropriate division point of the K-CARS-2 and found that 28 points lower than the division point (30 points) used in the existing CARS were more appropriate in Korea.

K-VABS-II: The K-VABS II is a standardized measure of the VARS-II developed by Sparrow et al[29] and Hwang Soon-taek.[30] It can be applied to children and adults aged 0-89 years, and each question is evaluated with 0, 1, and 2 points (433 questions in total). It is organized into 4 sub-domains: communication (i.e., "listening to instructions," "naming at least 10 objects"), daily living skills (i.e., "self-feeding with a spoon without spilling," "talking to a familiar person on the telephone"), socialization (i.e., "showing desire to please others," "playing cooperatively with one or more children for up to 5 min"), and motor skills (i.e., "running smoothly without falling," "unwrapping small objects"), each of which yields a standard score (mean, 100, SD, 15 points). In the area of maladaptive behaviors related to emotions and behavior, there are sub-areas of internalization and externalization. Higher VABS scores reflect better functioning. Statistical analysis proved good split-half reliability ($r = .79 \sim .97$) and test–retest reliability ($r = .89$) of the K-Vineland-II.

K-ADI-R: The ADI-R, developed by Rutter et al[31] and the K-ADI-R standardized by Park et al,[32] is based on the main caregiver's behavior in 3 key symptom domains included in the ASD diagnostic criteria. Each question consists of 0 points for no maladjustment, 1 point for some maladjustment, 2 points for significant maladjustment, 10 points for social interaction, 8 points for communication, and 3 points for restricted and repetitive behavior and interest. A higher score indicates a more severe degree of autism. The domains can be divided into the current qualitative abnormalities of social interaction, communication qualitative abnormalities, and restricted, repetitive patterns of behavior. As regards inter-rater reliability, intra-class correlation coefficients of greater than 0.80 were obtained for all 3 domains of K-ADI-R.

Data Processing and Analysis Method

The data collected in this study were analyzed using SPSS 27.0 (IBM Corp., Armonk, NY, USA). First, descriptive statistical analysis was conducted to determine the demographic background and general characteristics of the study participants. Second, to verify the research problem, an independent sample t-test was conducted using the total points of K-VABS II of children with ASD as dependent variables and communication and social abnormalities among the 4 main areas of K-VABS II and ADI-R. Changes in the number of siblings, 2 main areas of the K-VABS II, 2 sub-areas of the ADI-R, and the total points of the K-CARS 2 were confirmed using 1-way analysis of variance (ANOVA).

Results

General Characteristics of Study Participants, Characteristics of Parent Factors, and Symptom Factors

Of the 71 children, 49 (69%) were boys and 22 (31%) were girls (mean age, 48.8 ± 13.6 months). There were 43 children with siblings (54.4%) and 28 (45.6%) without siblings; 34 (47.9%) had 1 sibling and 9 (12.7%) had 2 siblings. Of the children with siblings, 23 (53.5%), 15 (34.8%), and 5 (11.7%) were the first, second, and third children in order, respectively.

Table 1. Characteristics of Study Participants

Projects	(n = 71)	(%=100)
Sex (N, %)		
Male	49	69
Female	22	31
Presence of sibling		
Yes	43	60.6
No	28	39.4
Total sibling		
1	28	39.4
2	34	47.9
3	9	12.7
Birth rank		
First	23	53.5
Second	15	34.8
Third	5	11.7
Mean age (months)	48.8	SD = 13.6
K-VABS-II communication	59.5	12.3
K-VABS-II socialization	56.8	10.3
ADI-R A reciprocal social interaction	20.0	7.4
ADI-R B communication and language	11.6	4.0
K-CARS 2	33.0	6.2

K-VABS-II, the communication and socialization scores using the Korean Version of the Vineland Adaptive Behavior Scale, second edition; ADI-R, the autism diagnostic interview-revised; K-CARS 2, the Korean-Childhood Autism Rating Scale 2.

Among the main areas of K-VABS II, the average communication and socialization scores were 59.5 ± 12.3 and 56.8 ± 10.3 points, respectively. Using the ADI-R, the mean scores of social interaction quality and communication quality were 20.0 ± 7.4 and 11.6 ± 4.0 points, respectively (Table 1).

Differences in K-VABS II's Main Area, ADI-R's Sub-Area, and K-CARS 2's Total Score by Number of Siblings, Sibling Presence, Birth Order, and the Sex of Siblings

Difference Depending on the Number of Siblings: To determine whether there was a significant difference in the domains of the K-VABS II and ADI-R, and the total score of CARS-2 according to the number of siblings in children with ASD, children with ASD were divided into those being the only child, having 1 sibling, and having 2 siblings, using an independent variable; ANOVA was conducted using the domains of K-VABS II and ADI-R, and the total score of CARS-2 as dependent variables.

Using the K-VABS II, the mean communication scores were 60.61 ± 10.30, 58.97 ± 13.72, and 57.67 ± 13.21 points in the groups without, with 1, and with 2 siblings, respectively; the mean socialization scores were 56.89 ± 10.60, 56.97 ± 10.83, and 55.56 ± 7.97 points, respectively ($P > .05$).

Using the ADI-R, the mean scores of reciprocal social interaction were 20.24 ± 7.37, 18.97 ± 8.05, and 23.33 ± 2.65 points in the groups without, with 1, and with 2 siblings, respectively; the scores of communication and language were 11.79 ± 4.35, 10.94 ± 4.03, and 13.33 ± 2.24

Table 2. Differences in VARS-II, ADI-R, and CARS Depending on the Number of Siblings

	Only Child (N = 28)	One Sibling (N = 34)	Two Siblings (N = 9)	*F*	*P*
K-Vineland-II communication	60.61 (SD = 10.30)	58.97 (SD = 13.72)	57.67 (SD = 13.21)	0.24	.787
K-Vineland-II socialization	56.89 (SD = 10.60)	56.97 (SD = 10.83)	55.56 (SD = 7.97)	0.07	.933
ADI-R reciprocal social interaction	20.24 (SD = 7.37)	18.97 (SD = 8.05)	23.33 (SD = 2.65)	1.28	.285
ADI-R Communication and language	11.79 (SD = 4.35)	10.94 (SD = 4.03)	13.33 (SD = 2.24)	1.34	.269
K-CARS	34.11 (SD = 5.92)	31.91 (SD = 6.98)	33.94 (SD = 3.63)	1.06	.354

SD, Standard Deviation.

points, respectively. The average K-CARS-2 scores were 34.11 ± 5.92, 31.91 ± 6.98, and 33.94 ± 3.63 points, respectively ($P > .05$) (Table 2).

Difference Between Siblings

To determine whether there was a significant difference in the domains of the K-VABS II and ADI-R and the total score of CARS2 depending on the presence or absence of siblings, children with ASD were divided into with sibling and without sibling, which were the independent variables. ANOVA was conducted using the domains of K-VABS II and ADI-R, and the total score of CARS-2 as dependent variables.

Among the main domains of the K-VABS II, the mean communication score was 58.70 ± 13.47 points in the group with siblings and 60.61 ± 10.30 points in the group without siblings. The mean socialization score was 56.67 ± 10.23 points in the group with siblings and 56.89 ± 10.60 points in the group without siblings ($P > .05$). Among the ADI-R domains, reciprocal social interaction was 19.88 ± 7.45 points in the group with siblings and 20.25 ± 7.37 points in the group without siblings. The mean communication and language score was 11.44 ± 3.83 points in the group with siblings, and the group without siblings did not show a significant difference ($P > .05$). The mean K-CARS 2 score was 32.34 ± 6.44 points in the group with siblings and 34.11 ± 5.92 points in the group without siblings ($P > .05$) (Table 3).

Differences Depending on the Birth Order

To determine whether there was a significant difference in the domains of the K-VABS II and ADI-R, and the total score of CARS-2 depending on the birth order of siblings in children with ASD, we examined 43 children, excluding 28 children who had no siblings. Children with ASD were divided into first-child, second-child, and third-child groups, which were the independent variables. ANOVA was conducted using the domains of K-VABS II and ADI-R and the total score of CARS-2 as dependent variables.

Among the main areas of K-VABS II, the mean communication scores were 56.65 ± 14.39, 63.60 ± 11.82, and 53.40 ± 11.24 points, in the first-child, second-child, and third-child groups, respectively; the corresponding socialization scores were 54.70 ± 9.47, 61.07 ± 10.78, and 52.60 ± 9.04 points, respectively ($P > .05$).

Among the ADI-R sub-areas, the mean reciprocal social interaction scores were 20.57 ± 7.10, 17.40 ± 8.38, and 24.20 ± 3.11 points in the first-child, second-child, and third-child groups, respectively; the corresponding communication and language scores were 12.04 ± 3.25, 9.67 ± 4.40, and 14.00 ± 2.45 points, respectively. In the domain of communication and language, there was a significant difference in ANOVA, but the result was not significant in Scheffe's post hoc analysis. The mean K-CARS 2 scores were 33.30 ± 5.78, 29.83 ± 7.40, and 35.40 ± 4.35 points, respectively ($P > .05$) (Table 4).

Differences Depending on the Sex of Siblings

We analyzed 42 people, excluding 1 who had both male and female siblings. To determine whether there was a significant difference in the domains of the K-VABS II and ADI-R, and the total score of CARS-2 depending on the sex of siblings in children with ASD, children with ASD were divided into the children with male siblings and female siblings, which were the independent variables. Analysis of Variance was conducted using the domains of K-VABS II and ADI-R and the total score of CARS-2 as dependent variables.

Among the main areas of K-VABS II, the mean communication scores were 57.38 ± 15.47 and 60.19 ± 11.67 points, in the male sibling and female sibling groups, respectively; the corresponding socialization

Table 3. Differences in the Main Area of VARS-II, the Lower Area of ADI-R, and the Total Score of CARS According to the Presence or Absence of Sibling

	With Brothers (n = 43)	Without Bother (n = 28)	*t*	*P*
K-Vineland-II communication	58.70 (SD = 13.47)	60.61 (SD = 10.30)	0.638	.526
K-Vineland-II socialization	56.67 (SD = 10.23)	56.89 (SD = 10.60)	0.087	.931
ADI-R Reciprocal social interaction	19.88 (SD = 7.45)	20.25 (SD = 7.37)	0.203	.839
ADI-R communication and language	11.44 (SD = 3.83)	11.79 (SD = 4.35)	0.350	.727
K-CARS	32.34 (SD = 6.44)	34.11 (SD = 5.92)	1.168	.247

Table 4. Differences in VARS-II, ADI-R, and CARS Depending on Birth Order

	First (N = 23)	Second (N = 15)	Third (N = 5)	*F*	*P*
K-Vineland-II communication	56.65 (SD = 14.39)	63.60 (SD = 11.82)	53.40 (SD = 11.24)	1.70	.195
K-Vineland-II socialization	54.70 (SD = 9.47)	61.07 (SD = 10.78)	52.60 (SD = 9.04)	2.35	.108
ADI-R reciprocal social interaction	20.57 (SD = 7.10)	17.40 (SD = 8.38)	24.20 (SD = 3.11)	1.84	.172
ADI-R communication and language	12.04 (SD = 3.25)	9.67 (SD = 4.40)	14.00 (SD = 2.45)	3.34	.045
K-CARS	33.30 (SD = 5.78)	29.83 (SD = 7.40)	35.40 (SD = 4.35)	2.05	.141

Table 5. Differences in VARS-II, ADI-R, and CARS Depending on the Sex of the Sibling

	Male (n = 21)	Female (n = 21)	*t*	*P*
K-Vineland-II communication	57.38 (SD = 15.47)	60.19 (SD = 11.67)	0.664	.511
K-Vineland-II socialization	55.48 (SD = 10.57)	57.90 (SD = 10.23)	0.756	.454
ADI-R Reciprocal social interaction	21.05 (SD = 6.96)	18.48 (SD = 7.95)	1.12	.271
ADI-R communication and language	11.76 (SD = 2.93)	11.00 (SD = 4.65)	0.635	.529
K-CARS	34.36 (SD = 6.11)	30.29 (SD = 6.41)	2.11	.041

scores were 55.48 ± 10.57 and 57.90 ± 10.23 points, respectively ($P > .05$).

Among the ADI-R sub-areas, the mean reciprocal social interaction scores were 21.05 ± 6.96 and 18.48 ± 7.95 points in the male sibling and female sibling groups, respectively; the corresponding communication and language scores were 11.76 ± 2.93 and 11.00 ± 4.65 points, respectively (no significant difference). However, there was a significant difference in the mean K-CARS 2 scores ($P < .05$). Male sibling group was 34.36 ± 6.11 and the female sibling was 30.29 ± 6.41 points, respectively (Table 5).

Discussion

In this study, we conducted a retrospective analysis of 71 children diagnosed with ASD at P University Children's Hospital to determine whether there were differences in the sociality and communication domains that were greatly affected by interaction, depending on the presence or absence of siblings, number of siblings, birth order, and the sex of siblings. The result is that there was no significant difference in the communication and social domains of K-VABS II; ADI-R social interaction, communication, and language; and the total score of K-CARS 2 in children with ASD, according to the presence or absence of siblings, number of siblings, and sibling ranking. However, there was a significant difference in the CARS score depending on the sex of the siblings. This result means that sibling interactions in families with a child with ASD could improve ASD severity and the quality of interaction with siblings, rather than simply the number of siblings interacting affecting the social interaction of children with ASD.

These findings are in accordance with previous research that found an association between the sex of the sibling and the quality of the relationship with the sibling with ASD. In the general population, there is a sex effect, with female siblings showing more positive behaviors such as empathy and involvement with the TD sibling.[8] Girls tend to report more affection and intimacy in their sibling relationships than boys.[9,10] Similarly, TD female siblings participated more in interactive activities with their adult siblings with ASD compared to male siblings.[33] Even in the case of ASD children, when the older sibling was a girl, positive responses were more frequent than when the older sibling was a boy.[34] The current study's finding extended previous research on the role that the sex of TD siblings of children with ASD play in their sibling's development. The current study's finding extended from the results of previous research, showing that girls have more interaction, to the conclusion that female siblings could even improve the severity of ASD. This means that only natural structural changes that increase the number of objects with whom ASD children can interact, such as increase in the number of family members, do not affect the severity of ASD.

Active intervention in children with ASD is necessary from the early stages of life, but intervention is often delayed, although many parents are aware of the differences among their children. According to a special education survey released by the National Institute of Education in 2020, the main reason for the delay in diagnosis, even after identifying a disability in ASD, is that 47.6% believe their children will improve on their own as they grow up. In a study of infants and toddlers with ASD aged 1-3 years,[35] the mean age at diagnosis was 24.9 months, a difference of approximately 6 months, despite 18.8 months and 83.3% of cases being recognized before 24 months. This means that while early detection and treatment are carried out quickly for childhood diseases, in cases of ASD, unlike other diseases, treatment is often delayed due to the parents' false belief that the child's condition will improve as he or she grows up.

This false belief can have fatal consequences on their prognosis. Many studies have reported that early intervention has a positive effect on the development of children with ASD.[36,37] In a study of 18- to -30-month-old infants with ASD with >25 hours of intervention per week for >2 years, reduced autism characteristics and improvements in cognitive function, receptive language, and adaptive behavior were observed.[36] For this reason, a previous study promoted the connectivity of complex neural networks.[38] Therefore, the delay in the timing of therapeutic intervention can be considered an act of wasting an important amount of time that can positively change the child's future for infants and toddlers with the most active neuroplasticity.

Based on the aforementioned, early intervention should be actively implemented in children with ASD, but the reality is that 15-25 hours of intervention per week, which is recommended for ASD treatment, is economically and physically impossible only with teaching-oriented classes conducted by external institutions. Therefore, as an alternative, family-centered interventions should be actively attempted in children with ASD. Previous studies have shown that siblings are more likely to maintain and generalize intervention results than parents or adults participating in interventions[39] and that siblings can act as more effective mediators by providing emotional stability.[18,25] Interventions implemented in unstructured and natural environments, such as homes, can further improve, maintain, and generalize social interactions.[40-44]

Conclusion

The study has important clinical applications, as it suggests that the quality of sibling interactions in families with a child with ASD may play a significant role in reducing ASD severity and improving sibling relationships, rather than the number of siblings alone influencing the social interactions of children with ASD. As revealed in this study, natural contact with siblings alone could not improve the severity of ASD in children with ASD, but different results can be obtained depending on the sex of siblings. So, it is recommended to involve female siblings in intervention plans for children with ASD.

Additionally, parents may be instructed on how to create better and more efficient interactions between their ASD and non-ASD children based on the way female siblings interact. To this end, it is necessary to further study the specific characteristics of female siblings to improve the ASD severity of children with ASD in future studies.

Limitation

This study had some limitations. First, it included outpatients with ASD at a university hospital. Therefore, the findings could not be generalized. Second, the quality of the relationship between siblings and children was not considered. Third, this study only showed the state at a specific point in time. Fourth, although there may be differences in social interaction between siblings depending on age differences, we did not take this into account. Fifth, even though parents can have a significant impact on interactions between siblings, we did not apply any indication to parents. Sixth, small sample sizes in subgroups may lead to limited statistical power and potentially biased results. Therefore, follow-up studies should be conducted to collect more types of data on the relationships between parents, siblings, and children and contribute to planning individualized interventions according to children with sociality, communication, and overall ASD life cycle through long-term follow-up.

Availability of Data and Materials: *Data to support the findings of this study are available upon reasonable request from the corresponding author.*

Ethics Committee Approval: *This study was approved by the Ethics Committee of Pusan National University Yangsan Hospital (approval number: 05-2021-241; date: Oct 21, 2021).*

Informed Consent: *Due to the retrospective nature of the study, an informed consent form was not required.*

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