

An Investigation of the Imitation Skills in Children with Autism Spectrum Disorder and their Association with Receptive-Expressive Language Development



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SUMMARY

Aims: This study aimed to compare imitation skills in children with autism spectrum disorder, and age-matched typically developing children and children with developmental delay, as well as to examine the association between imitation skills, and receptive and expressive language development in children with autism spectrum disorder.

Materials and Methods: Imitation skills in children with autism spectrum disorder (n = 18), and age-matched children with developmental delay (n = 15) and typically developing children (n = 16) were assessed using the Motor Imitation Scale and Imitation Battery, and the differences in mean imitation scores between the groups were examined. Receptive language and expressive language development in the children with autism spectrum disorder were assessed using the Turkish Communicative Development Inventory (TCDI), and their association with imitation scores was explored.

Results: The children with autism spectrum disorder had significantly lower imitation scores than the children with developmental delay and typically developing children; however, there wasn't a significant difference in imitation scores between the children with developmental delay and typically developing children. A significant association between imitation scores, and receptive and expressive language development was observed in the children with autism spectrum disorder.

Conclusion: The present findings indicate that deficient imitation skills are a distinctive feature of children with autism spectrum disorder and that imitation skills play a crucial role in children's language development.

Keywords: Autistic spectrum disorder, imitation skills, language development, motor imitation

INTRODUCTION

Mutual imitation is one the first means of communication between infant and parent (Quill 2002; Dawson and Galbert 1986); however, social use of imitation during infancy and early childhood is related to development of more complicated social communication skills (Ingersoll 2008). Acquisition of imitation skills during the early period of development was reported to be a necessity for speaking and communication (Owens 2001, Turan ve Kaysılı 2005).

With regard to the developmental progress, subsequent to imitation of babies by parents, imitation skills in the infant

that start with expression of interest and motor reactions develop and diversify. During the first year of life infants continue to change from motor and vocal imitation to their own sensual imitation repertoire. At age 1 year imitation of object use and social behavior begins as pretending. By age 2 years children can exhibit consecutive motor behaviors, the behaviors that they cannot see, and delayed imitation behaviors (Quill 2002).

It is known that in accordance with their typically developing peers' children with autism exhibit relatively limited imitation behavior (Lord 1993). Studies have shown that children

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with autism disorder have a lower level of imitation skills than typically developing children (Rogers, et al. 2003; Dawson et al. 1999; Caharman et al. 1997; Stone et al. 1997) and age-matched children with developmental delay (Rogers et al. 2003; Dawson et al. 1999; Stone et al. 1997). It is thought that the problems with motor imitation observed in autistic children are one of the primary factors that negatively affect the establishment of social relationships and the learning process (Dawson and Galbert 1986).

Research has shown that children with autism disorder have difficulty imitating behaviors with and without objects (Stone et al. 1997), pretending (Libby et al. 1997), and imitating facial expressions (Loveland et al. 1994). In contrast to Libby et al.'s (1997) study, in which autistic children were observed to have limitations pretending, Warreyn et al. (2005) did not observe a difference in imitations of symbolic play between children with autistic disorder and typically developing peers, suggesting that perhaps this was because they evaluated the children in a structured environment. Ingersoll and Gergans (2007) also supported this, suggesting that imitation skills in children with autism are more limited in their natural environment than in a structured environment.

It is known that development of imitation skills during the early developmental period is an important component of cognitive, social, and language development. Many studies have examined the relationship between imitation skills and other developmental domains in autistic children. It was reported that imitation skills are associated with play (Ingersoll and Schreibman 2006; Stone et al. 1997), joint attention (Rogers et al. 2003; Carpenter et al. 2002), and language development (Stone et al. 1997). These studies all show that as compared their typically developing peers of the same age, children with autism exhibit more limited imitation behavior in all related domains, including imitation of behaviors with and without an object, imitation of gestures, facial expressions, and vocalizations, and imitation of meaningful and meaningless objects.

Relational studies report that sub-dimensions of imitation skills are related to receptive and expressive language, gestures, play, and joint attention. As such limitations in children with autism during the period of imitation development are correlated with more complicated behaviors and development, including language and play, development of imitation skills requires more comprehensive study. Additionally, to the best of our knowledge no comparative studies on imitation skills in autistic children, and those with developmental delay and typically developing children have been conducted in Turkey. As such, the present study aimed to compare imitation skills in children with autistic spectrum disorder, and age-matched children with developmental delay and typically developing children, as well as to analyze the association between imita-

tion skills, and receptive and expressive language development in children with autistic spectrum disorder.

MATERIALS and METHODS

Participants

The study participants were selected via purposive sampling. In all, 3 special education and rehabilitation centers in Ankara, Turkey were contacted, and children aged 2-6 years that were diagnosed as autistic spectrum disorder or developmental delay, and whose parents agreed to participate in the study were assessed. As such, the study included 18 children with autistic spectrum disorder (14 boys and 4 girls aged 2-5 years) and 15 with developmental delay (12 boys and 3 girls aged 2-5 years) from 3 special education and rehabilitation centers and pediatric psychiatry departments at state hospitals, and 16 typically developing children (9 boys and 7 girls aged 2-7 years) attending a family health care center regularly. In order to make sure that the children participating in the study were at the same developmental stage their parents were administered the Ankara Developmental Screening Inventory (ADSI), and then the groups were matched accordingly. As the Motor Imitation Scale (MIS) and Imitation Battery (IB) assess such motor tasks as walking a toy dog on a table, clapping hands, and touching ears, in addition to diagnosing autistic spectrum disorder, children with delayed motor development were not included in the sample group. Based on parents' and teachers' reports, children that did not walk before age 15 months were excluded from the study due to the possibility of delayed motor development.

Means of evaluation and administration

The ADSI was used to determine and match the participants' developmental stage. The MIS and IB were used to compare imitation skills between groups, and the relationship between imitation skills and language development in the autism group was assessed using the Turkish Communicative Development Inventory (TCDI). During the process of administering the evaluation tools, administrations of special education and rehabilitation centers were contacted to have approval, and were asked to refer the volunteer parents to the practitioner.

All the assessment tools were administered by the authors in a similar manner for each participant. First, the ADSI was administered to each mother, and then in the individual education room, the MIS and IB were consecutively administered to each participant. Finally, only the mothers of the children with autism were administered the TCDI. This application was carried out for typically developing children in an isolated room in the health care center they are registered to, while in the individual education room in special education

and rehabilitation centers they attend, for children diagnosed with autistic spectrum disorder and delayed development. All the scales were administered during a single session.

Study scales

Ankara Developmental Screening Inventory (ADSI) (Ankara Gelişim Tarama Envanteri-AGTE).

ADSI is used to assess children aged 0-6 years based on information obtained from the mother (Sezgin et al. 2004; Erol et al. 1993,). The scale's 154 items are answered with yes, no, or I don't know. The scale is comprised of 4 sub-domains: language/cogniton; fine motor skills; gross motor skills; social skills.

2. Motor Imitation Scale (MIS)

The MIS (Stone et al. 1997) consists of 16 items (8 imitation behaviors with an object and 8 without an object). In the present study the scale was administered on a table in a game-like fashion. After each item has been implemented by the practitioner, a response is expected from the child by telling "do it like this" or "do the same thing that I do without describing the act. Three trials are performed for each item. Each correct response receives 2 points, a partially performed response receives 1 point, and no response or an incorrect response receives no points, as does a delayed correct response.

3. Imitation Battery (IB)

The IB (Rogers et al. 2003) includes 16 imitation tasks, 8 of which are object/movement imitations and 8 of which are oral/motor imitations. Of the oral/motor imitation movements, 4 are vocalization imitations and 4 are word imitation tasks. Imitation skills are evaluated based on 3 trials and are scored, as follows: correct response (2 points), partially correct response (1 point), and incorrect response (0 points). In the present study only the oral/motor imitation scores were used.

4. Turkish Communicative Development Inventory (TCDI) (Türkçe İletişim Davranışları Gelişimi Envanteri-TİGE)

The TCDI was adaptation of MacArthur-Bates Communicative Development Inventory (MB-CDI, Fenson et al. 1993) into Turkish (Aksu-Koç et al. 2008). MB-CDI a standardized scale first developed in English and adapted in a number of languages is designed to assess the language development of infants between 08-30 months. TCDI was prepared in accordance with the unique structure of Turkish; adaptation to Turkish, validity and reliability study was performed. The TCDI-I scale is used to evaluate communication behaviors (gestures) and vocabulary in children aged 8-16 months (based on parental responses), and the TCDI-II scale evaluates vocabulary and language skills in children aged 16-36 months.

Statistical evaluation

Statistical analysis was performed using SPSS v.15.0 for Windows. In addition to use of descriptive statistical methods (mean $\pm$ SD), in order to match the developmental stage of the groups and to compare imitation scores between groups one-way ANOVA was used, and when the variables were not homogenic Dunnett's-C post-hoc test was used. Spearman's rank order correlation coefficient was used to examine the relationship between imitation scores and receptive expressive language development, because the data were not normally distributed. The level of statistical significance was set at $P < 0.05$.

RESULTS

Developmental features of the participants

ADSI was used to match the participants according to their developmental stage. The difference between the mean ADSI score in the autism group ($X = 107.89$), and developmental delay group ($X = 109.13$) and typically developing group was determined based on one-way ANOVA, but the difference between groups was not significant (Table 1). Mean age in the typically developing group ($X = 107.38$) was lower than that in the developmental delay group ($X = 109.13$).

Comparison of imitation skills in the autism group, and typically developing and developmental delay groups

The mean development score differed significantly between the 3 groups. Post hoc analysis showed that the overall mean development score in the autism group ($X = 18.39$) was significantly lower than that in both the typically developing ($X = 29.38$) and developmental delay ($X = 27.47$) groups. Although the mean imitation score in the developmental delay group was lower than that in the typically developing group, the difference was not significant. Table 2 shows the results of one-way ANOVA and post hoc analysis.

Table 1. ADSI ANOVA results

Resource of the variable	Sum of Squares	SD	Mean of squares	F	P
Sum of Inter-group and Intra-group	25.229 5981.261 6006.490	2 46 48	12.614 130.027	0.097	0.908

Table 2. MIS total imitation score ANOVA results

Resource of the variable	Sum of Squares	SD	Mean of squares	F	P	Significant Difference
Sum of Inter-group and Intra-group	25.229 5981.261 6006.490	2 46 48	12.614 130.027	0.097	0.908	DD-ASD, TD-ASD

$P < 0.05$

DD: Delayed development; ASD: autistic spectrum disorder; TD: typically developing.

Table 3. The association between total imitation scores and receptive-expressive language scores in the children with autistic spectrum disorder

Values	n	r	P
Imitation-Receptive Language	18	0.868	0.000
Imitation-Expressive Language	18	0.744	0.000

P < 0.05

Imitation with objects and physical behavior imitation scores were obtained using the MIS, and oral/motor imitation scores were obtained using the IB; raw scores were converted into t points, which showed that the children with autistic spectrum disorder had the highest motor imitation skills score ($X = 43.772$), imitation with object score ($X = 43.058$), and physical behavior imitation score ($X = 42.919$). Moreover, in the autism group the mean meaningless imitation score ($X = 46.921$) was higher than the mean meaningful imitation score ($X = 44.1609$).

The association between imitation scores and receptive-expressive language scores in the autism group

Data concerning the association between imitation scores and receptive-expressive language skills in the autism group were analyzed using Spearman's rank order correlation coefficient, which showed that there was a positive correlation between the total imitation score and receptive-expressive language score (Table 3).

DISCUSSION and CONCLUSION

At the end of the present study it was observed that the mean developmental stage of the typically developing children was lower than that of the children with developmental delay. This result might have been due to the fact that chronological age in the typically developing group was lower than that in the developmental delay group. In order to match the 3 groups in terms of developmental stage, for the typically developing children the younger age group was selected. Moreover, a significant difference in developmental stage between the 3 groups was not observed, indicating that the groups were successfully matched according to developmental stage.

There was a significant difference in imitation scores in the present study; scores in the autism group were lower than those in the typically developing and developmental delay groups. These findings support those of earlier studies on imitation in typically developing children (Rogers et al. 2003; Caharman et al. 1997; Stone et al. 1997) and children with developmental delay (Rogers et al. 2003; Charman et al. 1997; Stone et al. 1997). Considering these findings, it seems that children with autistic spectrum disorder exhibit some deficiencies in imitation skills, as compared to the typically developing children and children with developmental delay; and it could be proposed that these deficiencies have a distinguishing feature for

recognizing autistic children from other diagnostic groups. It has been reported in the literature that children with autistic spectrum disorder have limited imitation skills and children having imitation skills only exhibit imitation behavior, and have difficulty in imitating by understanding (Quill 2002; Libby et. al. 1997).

In the present study imitation skills in children with autistic spectrum disorder were evaluated via a structured process conducted on a table. Earlier studies reported that children with autistic spectrum disorder have more difficulty with spontaneous imitation tasks than with structured imitation tasks (Ingersoll 2008; McDuffie et al. 2007). In the researches to be conducted in the future, the investigation of spontaneous imitation use of autistic children with structured imitation use, and comparative analysis of relations with the other developmental areas will provide essential information to the experts.

Previous research on imitation skills in children with autistic spectrum disorder classified imitation types as imitation with objects (significant and insignificant behaviors with objects), imitation without objects, and gesture imitations (Rogers et al. 2003; Stone et al. 1997). In the present study's autism group scores for the 3 types of imitation were similar, and the oral/motor imitation score was higher than the imitation with objects and physical movements' imitation scores. In terms of imitation with objects, the mean meaningless object imitation skills score was higher than the mean meaningful object imitation skills score. In contrast, Stone et al. (1997) reported that children with autistic spectrum disorder have more difficulty with physical movement imitation than with imitation with objects and that deficits in insignificant behaviors were more severe than the observed deficits in significant imitation behaviors.

The present study observed that there was a strong positive relationship between imitation scores and receptive-expressive language scores in the autism group. Charman et al. (2003) noted that imitation with objects skills in children with autistic spectrum disorder are related to the development of receptive-expressive language; whereas Stone et al. (1997) observed that movement without objects imitation skills were associated with expressive language. In addition, other studies suggest that imitation skills are important predictors of expressive language development, along with gestures and non-verbal cognitive proficiency (Luyster et al. 2008), that joint attention and immediate imitation skills in autistic children aged 3-4 years are associated with language skills, and that playing with toys and delayed imitation skills are an essential predictor of communication development in children aged 4-6 years (Toth et al. 2006). When considering that shared imitation play facilitates positive non-verbal interaction between adults and children (Quill 2002), and that imitation is an early form of communication between parent and

infant (Dawson and Galbert 1986) the importance of imitation skills in the early stages of communication development becomes obvious. All the earlier studies mentioned indicate that there is a significant relationship between imitation and language development in autistic children; in other words, imitation skills in autistic children are vitally important for the development of language and communication.

The present study has some limitations. The study included children with autistic spectrum disorder and children with developmental delay that received special education and rehabilitation. Because of that, it might be possible that they had already had imitation training. Another limitation is the small study sample included. Lastly, the study is limited because it investigated general imitation scores and expressive language scores, but did not include imitation types in this process.

To the best of our knowledge the present study is the first to compare imitation skills in children with autistic spectrum disorder, and children with developmental delay and typically developing children, and to examine the relationship between language development and imitation skills in Turkey. The children with autistic spectrum disorder had imitation skills limitations, and their imitation skills were associated with receptive-expressive language. It is known that use of imitation in infancy and early childhood is associated with the development of more complicated social communication, and that children with autistic spectrum disorder have deficient imitation skills (Ingersoll 2008). As such, additional descriptive, relational, and longitudinal research is necessary to further clarify the role of imitation skills in children with autistic spectrum disorder.

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