

Gestures in Prelinguistic Turkish children with Autism, Down Syndrome, and Typically Developing Children*

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Abstract

The purpose of this study was to examine gesture use in Turkish children with autism, Down syndrome, and typically developing children. Participants included 30 children in three groups: Ten children with Down syndrome, ten children with autism between 24–60 months of age, and ten typically developing children between 12–18 months of age. Principal Caregiver-child and researcher-child interactions were video-recorded in this descriptive study. Significant group differences were found for total gesture use, communicative functions, and types of gestures. Results revealed significant differences for gestures within the category of behavior regulation between the groups. The typically developing children used gestures more frequently than other groups. The lowest frequency of gesture use have been found for children with autism. It was found that children with autism have more difficulties in gesture use within the category of Social interaction and joint attention than Down syndrome and typically developing groups. Children with Down syndrome have become more successful in the use of these gestures than other two groups. It was found that researcher-child interaction provides more information about the frequency of gestures than parent-child interaction. The differences between groups are discussed in terms of the communicative functions of gestures.

Key Words

Prelinguistic Communication, Gesture Development, Autism, Down Syndrome.

Prior to the use of language in children, prelinguistic communicative skills develop. Prelinguistic development occurs in the first 18 months of life in typically developing babies. During this period, children first learn the basic rules of communication. Intentional communication, which is agreed to be one of the important stages of the prelinguistic period, is a major predictor of language development. Wetherby and Rodriguez (1992) argued that intentional communication behavior could be used in the assessment of communicative development. One of the ways in which communicative

intent is conveyed during the prelinguistic period is the use of gestures.

Bruner (1981) indicated that three communicative functions appeared in the first three years of life: behavior regulation, social interaction and joint attention. Moreover, this taxonomy is used in the classification of gestures in terms of function and intent (Wetherby, Cain, Yonclas, & Walker, 1998). According to Bruner, behavior regulation involves actions used to regulate the behavior of another person in order to obtain a particular result. Regulative behavior is the earliest behavior to emerge in the development of typically developing children (Carpenter, Nagell, Tomasello, Butterworth, & Moore, 1998; Crais, Douglas, & Campbell, 2004).

Behavior regulation and social interaction gestures develop prior to joint attention gestures (Crais et al., 2004). Joint attention, which is another communicative function, is defined as the simultaneous concentration of two or more persons on the same external thing (Baldwin, 1995). Tomasello (1995)

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pointed out that joint attention is more complex than simply two people looking at the same object. The use of eye contact and compromise-based gestures by babies to create joint attention with others on an object or event develops in stages. Joint attention encompasses initiation and response. Joint attention initiation is defined as the initiation of behavior having communicative intent used to direct the attention of another person to an object, event or communicative behavior (Murray et al., 2008). This joint attention behavior includes the use of eye contact, pointing, and the use of gesture to share interest or an object with another. Joint attention response is defined as the joint attention response of the other person (Mundy, 1995).

Iverson and Thal (1998) divide gestures into two main categories – deictic and representational. Deictic gestures are used to point or call attention to an object or event (Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979). Deictic gestures such as raising the hands to be picked up or pushing to refuse have been reported to occur between 7-9 months at the earliest (Carpenter et al., 1998; Crais et al., 2004). Deictic gestures are grouped into contact and distal gestures (Bates et al., 1979). Touch gestures are those appearing at an early age that require touch between the child, object and the primary caretaker, such as giving a toy or pushing a toy back to the adult (Crais, 2006). Distal gestures, on the other hand, are gestures that do not require touching the object or the caretaker, such as pointing and waving the hand, which emerge between 10-12 months. Representational gestures, which are the second main kind of gestures, are gestures that form the basis for an object/event and designate a semantic connection between them. Representational gestures are seen around the 12th month and emerge after the appearance of deictic gestures (Acredolo & Goodwyn, 1988; Bates et al., 1979; Crais et al., 2004). Some researchers have emphasized the significance of referential communicative gestures, such as showing, pointing or giving, associated with vocabulary acquisition, which provide a potential predictor of later language competence (Thal & Bates, 1988; Thal & Tobias 1992). Mundy, Sigman and Kasari (1994) reported a positive association between joint attention and language development in children with autism as in children with typical development.

A sequence in the appearance of communicative intentions similar to that which occurs in typically developing children has been seen in children with Down's syndrome (Franco & Wishart, 1995;

Rondal, 2004). While the joint attention skills of Down's syndrome children are not at the same developmental level as typically developing children, their development of joint attention initiation and the joint attention response elicited from others approximates it (Sigman & Ruskin, 1999). When developmental age of children with Down's syndrome is taken as the basis, their skill in using gestures is even greater than typically developing children at the same level (Singer-Harris, Bellugi, & Bates, 1997).

The factors having the greatest impact on the ability of children to live independent lives are communicative and linguistic difficulties (Landa, 2007). During the prelinguistic period, autistic children have trouble in understanding and using designation clues used in communication (Baron-Cohen, Baldwin, & Crowson, 1997). The use of eye contact, pointing to an object and following an event or object pointed out by others is significantly different from children who are developmentally delayed (Kasari, Freeman, & Paparella, 2001; Wimpory, Hobson, Williams, & Nash, 2000). In conclusion, it has been seen that compared to typically developing children there are hurdles for children with autism in the appearance and use of gestures.

Although Turkish mother-child interaction behaviors have been investigated in some studies, no study has been found on gestures in prelinguistic Turkish children with autism and down syndrome. Topbaş, Maviş and Erbaş (2003) have been evaluated the intentional communicative behaviors of typically developing children and children with delayed language development. It was found in that study typically developing children were used joint attention behaviors more frequently whereas children with delayed language were used behaviors in the category of behavior regulation and social interaction.

Purpose

The purpose of this study is to compare the skills of children with Down's syndrome and typically developing children in the using gestures. Accordingly, the following questions have been addressed:

1. Is there a difference in the number of gestures used by children with autism, Down's syndrome, and typically developing children?
2. Is there any different in the kinds and frequency of the use of gestures in terms of behavior regulation, social interaction and joint attention in

children with autism, Down's syndrome, and typically developing children?

3. What is the distribution of gestures used by children with autism, Down's syndrome, and typically developing children, and does this distribution vary according to group?

Method

Research Group

The research group consisted of a total of 30 children between the ages of 24-60 months and their families. They included 10 children with autism and 10 with Down's syndrome attending the Independent Autistic Children Education Center and in Special Education and Rehabilitation Centers operating under the auspices of the Ministry of Education in Ankara and Isparta, and 10 typically developing children. The basic criterion for selection of children as participants in the research group was that they could use a maximum of ten words. Another criterion was that children with autism and Down's syndrome had only a single disability.

Children diagnosed with autism and Down's syndrome were obtained from state hospitals and Guidance and Research Centers for inclusion in the research group and then matched according to developmental age scores on Gazi Early Childhood Development Assessment (Baykan, Temel, Ersoy, Avci, & Turla, 2002). Based on the results of the Gazi Early Childhood Development Assessment Tool (GECDAT) and information obtained from families, children free of developmental problems were included in the typically developing children group. GECDAT was also given to the children with autism and Down's syndrome included in the research group, with their general developmental age levels determined accordingly. GECDAT results show that the average developmental age was 24.5 months for autistic children, 22 months for children with Down's syndrome, and 15.5 months for typically developing children.

Data Collection Instruments and Implementation

Principal Caregiver-Child Interaction (PCCI):

All parents in the study group were asked to play with their children in a free-play setting for 15 minutes and told "to play with toys as if at home." The observation form that was used to code observed behavior during the PCCI, which used standard materials, was developed by the researcher, mak-

ing use of relevant studies in the field on gesture development (Colgan et al., 2006; Crais, Watson, & Baranek., 2009; Flenthrope & Brady, 2010). The first 5 minutes of the 15-minute recording that was designed to get parents and child accustomed to the setting was left out of the analysis.

Researcher-Child Interaction (RCI): Thinking that certain gestures in RCI could only be used in a very limited way, it was decided to employ constructed activities. Adaptations were made by the researcher of certain transactions designed to encourage the use of gestures according to various communicative functions by using the way they are described in the literature (Charman, 1997; Osterling, Dawson, & Munson, 2002; Clifford, Young, & Williamson, 2007; Flenthrope, 2008; Murray et al., 2008). The interactions between the researcher and the child during these transactions in the playroom at school were video recorded for 25 minutes.

In 6 of the 7 transactions used in the *PCCI*, by utilizing standard materials and instructions, the goal was the use of various gestures to initiate and continue social interaction, initiate and respond to joint attention, request an object and action, indicate desire and object rejection. Various activities were organized to get the child to initiate and respond to joint attention. These included, for example, the adult holding netting containing balloons in the air and waving it, shooting bubbles with a bubble gun, taking a toy animal figurine out of a bag, placing a coloring book between the child and the adult, and providing instructions concerning the person, object or event in the book. Within the same activities, such situations as placing the bubble gun in an inaccessible place and then afterward putting its cap on and giving it to the child, giving the child chocolate or candy with an unpleasant taste and then later putting it inside a tightly closed jar and placing it in front of the child were used to elicit gestures of wanting and refusing in the children.

The final transaction of *RCI* was the free-play context in which standard materials were used. In the *RCI* context, the adult played with the child, taking into his interests, and offered simple games in which the child could chose participate.

Data Analysis

An observation form developed by the first researcher to code all gestures used by the children during *RCI* and *PCCI* was used. In order for a behavior to be designated as a communicative gesture

the following criteria had to be met: a) the gesture be directed toward the other person and b) the gesture serve the function of social interaction, behavior regulation or joint attention communication (Shumway & Wetherby, 2009). In the final stage of the analysis, deictic and representational gestures were defined in three categories of communicative function.

Inter-Observer Reliability: A special education teacher working in the area of early childhood special education was chosen to assess inter-observer reliability. The independent observer was first informed about “recording” and then was asked to watch the PCCI and RCI observation sessions of the subjects in the research group.

It has been accepted that 80% coefficients are acceptable agreement and 90% coefficients indicate excellent agreement (Kırcaali-İftar & Tekin, 1997). The inter-observer reliability coefficients obtained were 88% for autistic children, 90% for children with Down's syndrome and 92% for typically developing children.

Results

Single Factor Variance Analysis (ANOVA) was used to determine the statistical significance between groups in the frequency of use of gestures by children with autism and Down's syndrome and typically developing children according to communicative function, and the Tukey HSD multiple comparison test was used to determine the source of difference.

Total Number of Gestures

The means and standard deviations of the total number of gestures indicated that the greatest number of gestures used by children with Down's syndrome ($X=56.8$), followed by typically developing children ($X=46.4$) and those with autism ($X=29.7$). Significant differences were found between the total number of gestures in each group ($F(2,27)=14.07, p=.000$). It was found that the difference was the result of the total number of gestures in autistic children being lower than in children with Down's syndrome and in typically developing children.

Communicative Functions

Examining the means of communicative functions, it can be seen that, apart from behavior regulation, there are differences between the groups. The

number of gestures having a behavior regulation function was similar in the three groups. Moreover, the gesture most used by children with autism, Down's syndrome and typically developing children to request an object was *reaching for the object* (respectively, $X=5.1$; $X=2.7$ and $X=4.6$). However, the mean use of the *pointing to the object* gesture for requesting an object was lower in autistic children ($X=0.3$) than in children with Down's syndrome ($X=2.5$) and typically developing ones ($X=1.5$). Autistic children used the gesture *pushing the object with the hand* to refuse an object more frequently than the other two groups of children (respectively, $X=2.4$, $X=0.7$, $X=1.0$). It was found out that there was no significant difference in the total use of behavior regulation gestures between the groups ($F(2,27)=0.079, p=.924$).

The mean gesture use of the three groups according to behavior regulation, social interaction, joint attention initiation and joint initiation response functions are shown in Table 2. The least use of gestures having a social interaction function was seen in the autism group, while the greatest use was seen in the Down's syndrome group. It is interesting, too, that in all three groups, the most frequency used gesture was *performing an action that represented the function of the object* (respectively, $X=4.1$, $X=9.7$ and $X=7.1$). Gestures indicating *excitement/accomplishment*, which are in the social interaction category, were not used at all by the autistic children, while children with Down's syndrome ($X=2.0$) used them more often than typically developing children ($X=0.9$). Similarly, gestures such as *shrugging of the shoulders and opening of the hands to indicate “all gone” and “where”* were not used at all in the autism group, and were used more by the children with Down's syndrome than by the typically developing ones (respectively, $X=1.4$, $X=0.4$). The difference in the frequency of the use of social interaction gestures between the groups was statistically significant ($F(2,27)=22.231, p=.000$). The Tukey HSD test, which was used to find the source of difference between the groups, showed that difference resulted from social interaction gestures being used more by children with Down's syndrome than children in the other two groups and more by typically developing children than in autistic children.

In the social interaction category, the use of gestures having the functions of joint attention initiation and response was the lowest in children with autism and while close to that of typically developing children, the greatest in the Down's syndrome group.

In the joint attention initiation function category, the most frequently used gesture types vary according to groups. Children with autism mostly used *giving an object* ($X=0.8$), children with Down's syndrome most often used *pointing to an object/event* ($X= 3$) and typically developing children most frequently used *showing an object* ($X= 2.4$). It is noteworthy that while *pointing to an object/event to obtain information* was the most frequently used gesture, it was used very little by the children with autism ($X= 0.3$). There was a statistically significant difference between the groups in the frequency of the use of joint attention initiation gestures ($F(2,27) = 4.009, p= .030$). Moreover, according to the results of the Tukey HSD test, used to detect the sources of difference, the difference between the Down's syndrome and autism groups was significant. Difference is due to the fact that the use of joint attention gestures by Down's syndrome children was approximately four times greater than the autistic children.

In the joint attention response category, children with autism and Down's syndrome and typically developing children used *looking at an object pointed to by the adult* the most frequently (respectively, $X= 6, X= 7.2$ and $X= 6.1$). There was no significant difference found between the groups with respect to the total use of joint attention response gestures ($F(2,27) = 1.119, p= .34$).

Types of Gestures

When the types of gestures used are examined for the three groups, significant differences were found in the use of deictic and representational gestures. Moreover, the mean use of deictic gestures in the three groups was higher than that of representational gestures. The significant differences between the groups stemmed from the use of deictic gestures by children with Down's syndrome ($F(2,27) = 3.98, p= .031$). It was seen that the use of representational gestures occurred the least in the autism group and the most in the Down's syndrome group, and that the difference between the groups was significant ($F(2,27)=18.19, p=.000$). The reason for the differentiation between the groups with respect to the use of representational gestures was the greater use of these gestures by Down's syndrome children compared to the other two groups, and their more frequent use by typically developing children compared to children with autism.

Discussion

This study found out that the three groups, consisting of children with autism, those with Down's syndrome, and typically developing children varied in the kinds of gestures used. The difference between the groups with respect to total number of gestures used significant, with autistic children using gestures less often than those with Down's syndrome or typically developing. The conclusion of studies in the literature comparing the prelinguistic communication skills of children with autism with other groups supports this finding (Shumway & Wetherby, 2009; Wetherby, Watt, Morgan, & Shumway, 2007). In various studies, when Down's syndrome children are compared according to developmental levels, their ability to use gestures were the same or even greater than that demonstrated by typically developing children (Capirci, Caselli, Iverson, Pizzuto, & Volterra, 2002; Franco & Wishart, 1995; Singer et al., 1997).

When the use of gestures is examined in terms of communicative function, it is seen that there was no difference between the groups with respect to behavior regulation and joint attention response functions. However, the inter-group difference for social interaction and joint attention initiation functions was significant. In addition, the behavior regulation function was used at similar rates in the three groups in this study. The absence of an inter-group difference can be accounted for by the fact that it is the earliest and most easily acquired function in children with delayed development (Wetherby, 1986).

Moreover, it is worth noting that among the three groups in this study, the mean frequency of the use of the gesture *reaching for an object* to request it in the autism and typically developing groups is close. Stone, Ousley, Yoder, Hogan and Hepburn's (1997) study, too, found that the level of non-verbal request indicating behavior, such as reaching for an object, in autistic children was close to that of typically developing children.

It was seen that the mean use of *pointing to an object*, another gesture used to request an object, in autistic children was lower than those in the other two groups. Similarly, Osterling and Dawson (1994) found that, compared to others, autistic children used such behavior as looking at and showing an object to someone else and pointing out the location of an object to another person less than typically developing children.

The gesture *pushing away an object with the hand* to refuse, which falls within the behavior regulation category, was used more in the autistic children group than by the other two groups. It was thought that the possible reason for this was that some parents of autistic children insisted that their children play with a particular toy or that autistic children insisted on playing with a particular toy and the adult wanted to replace it with another. It was found that the inter-group difference with respect to gesture use having a social interaction function was significant and that this difference stemmed from children with Down's syndrome using social interaction gestures more often than either of the other two groups and typically developing children using them more than children with autism. This supports the finding in the literature that persons with Down's syndrome perform better in pragmatic language use than in other linguistic areas (Abbeduto, Warren, & Conners, 2007).

The autistic children in this study had difficulty in using the gestures of social interaction. Because there are studies showing that the use of social interaction gestures by autistic children is less than both typically developing and developmentally delayed children, inadequacy in the development of social interaction gestures has been cited as being a diagnostic feature of autism (Colgan et al., 2006; Schumway & Wetherby, 2009). The use of gestures having a social interaction function requires establishing eye contact with the adult and the ability to initiate and maintain the interaction involved in looking. Considering that inadequacy in initiating and maintaining social interaction is one of the distinguishing characteristics of children with autism, that their performance with regard to using gestures having a social interaction function is low is not an unexpected result (Greenspan, 1992; Zwaigenbaum et al., 2005).

Moreover, in the use of gestures initiating joint attention, which is part of the function of joint attention, inter-group difference was significant and resulted from children with Down's syndrome using these gestures more often than children with autism. Sigman and Ruskin (1999) stated that, similar to what was found in this study, the development in children with Down's syndrome of the ability to initiate joint attention and respond to the initiation of joint attention by others was close to a normal level of development. Autistic children, on the other hand, had serious difficulties in joint attention and it was found that the extent of joint attention capabilities was an important predictor

of language development (Charman et al., 1997; Charman et al., 2003; Mundy et al., 1994; Shumway & Wetherby, 2009). In this study, autistic children used the gesture "giving an object" to initiate joint attention the most, while children with Down's syndrome used the gesture "pointing to an object/event." Kasari et al. (2001) stated that considering that showing and pointing gestures used in initiating and responding to joint attention were exhibited through eye contact.

No significant inter-group differences were found in the use of gestures to respond to joint attention, which is part of the joint attention function. It has been shown in the literature that autistic children have deficiencies in the ability to use gestures to initiate joint attention as well as to respond to such initiation (Baron-Cohen, Baldwin, & Crowson, 1997; Dawson, Meltzoff, Osterling, & Brown, 1998; Sigman, Mundy, Sherman, & Ungerer, 1986). In this study, although there was no significant difference, the group using joint attention response gestures the least was the autism group, while the group using them the most was the Down's syndrome group. Moreover, in the three groups, the gesture most frequently used for joint attention response was "looking at the object/toy pointed to by the adult." It is possible that this similarity stems from the structured basis of researcher-child interaction, in which this gesture was the one used the most.

In this study, kind of gestures used by autistic, Down's syndrome and typically developing children were also examined. It was found that the group using deictic and representational gestures the least was the autism group, while the group using it the most was the Down's syndrome group. In a study by Shumway and Wetherby (2009), autistic children were found to be developmentally delayed in the use of deictic gestures and used them less than typically developing children. In addition, Wetherby, Prizant and Hutchinson (1998) demonstrated that autistic children were both qualitatively and quantitatively restricted in their use of gestures and that they had difficulty in using representational gestures. The findings with regards to gesture types in this study were similar to those in the literature in that autistic children experienced difficulties in acquiring the representational and cooperative aspects of communication.

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