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Nonverbal Requesting and Problem-Solving by Toddlers With Down Syndrome

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Abstract

The association between nonverbal requesting (as measured by the Early Social Communication Scales) and problem-solving skills (as measured by an object retrieval task) was examined in 16 toddlers who had Down syndrome, 18 toddlers with developmental disabilities of mixed etiologies, and 19 typically developing infants and toddlers. Toddlers with Down syndrome showed fewer instrumental requests than did those in the typically developing group, but equal numbers of social routine requests. Toddlers with Down syndrome also showed poorer problem-solving strategies and received more help than children in both comparison groups on the object-retrieval task. Results showed a significant association between instrumental requests and problem-solving in the Down syndrome group. Implications for strengthening problem-solving skills in Down syndrome are discussed.

Two distinct categories of gestures have been described in infant nonverbal communicative development: requests (or proto-imperatives) and joint attention (or proto-declaratives) (Bates, Benigni, Bretherton, Camaioni, & Voltera, 1979; Zinober & Martlew, 1985). Although originally conceptualized as concurrent developmental precursors to language development (Bates et al., 1979; Bates, Camaioni, & Volterra, 1975), subsequent research has suggested a developmental dissociation between nonverbal requests and nonverbal joint attention skills (Baron-Cohen, 1989; Camaioni, 1993; Rollins & Snow, 1998). *Requesting gestures* are considered instrumental, used with the intention to regulate another's behavior and complete tasks, whereas *joint attention gestures* are considered deictic, serving to direct and focus an adult's attention on an object or an event (Bates et al., 1979; Zinober & Martlew, 1985).

Researchers have suggested that these two types of gestures are early manifestations of different types of behavior. Nonverbal requesting has been linked to cause and effect thinking (Baron-Cohen, 1991; Berko-Gleason, 1993; Camaioni, 1993; Gomez, 1990), whereas nonverbal joint attention behaviors have been linked to language outcomes (Harris, Kasari, & Sigman, 1996; Tomasello, 1988; Tomasello, Mannie, & Kruger, 1986). The connection between nonverbal requesting and cause and effect thinking may be especially important in young children with Down syndrome, who show deficits in nonverbal requesting behaviors despite mental age (MA) appropriate nonverbal joint attention skills (Mundy, Kasari, Sigman, & Ruskin, 1995; Mundy, Sigman, Kasari, & Yirmiya, 1988; Wetherby, Yonclas, & Bryan, 1989; though see also Coggins, Carpenter, & Owings, 1983; Greenwald & Leonard, 1979; Smith & von Tetzchner, 1986).

Requesting deficits in Down syndrome may be related to the larger issue of deficits in problem-solving frequently described in this population (Pitcairn & Wishart, 1994; Ruskin, Mundy, Kasari, & Sigman, 1994; Wishart & Duffy, 1990). *Problem-solving* is defined here as having a goal, overcoming obstacles to that goal, implementing strategies, and evaluating the results (Bjorklund, 2000). There is evidence of attenuated cause and effect thinking (an early building block of problem-solving) in young children with Down syndrome, who show lower levels of causality pleasure and shorter sequences of goal-directed behavior during object exploration (Ruskin, Kasari, Mundy, & Sigman, 1994). Difficulties with problem-solving persist in later development in this population and have been implicated in poorer task persistence and the increased levels of help-elicitation during task completion frequently observed in children with Down syndrome (Fidler, Hepburn, Mankin, & Rogers, 2005; Kasari & Freeman, 2002; Landry & Chapieski, 1990; Pitcairn & Wishart, 1994; Ruskin et al., 1994; Vlachou & Farrell, 2000).

In typically developing infants, early problem-solving skills emerge (e.g., moving an object to get to another object) at 9 months (Bjorklund, 2000; Piaget, 1952)—the same time period when requesting behaviors emerge (Bates et al., 1979; Bates, Camaioni, & Volterra, 1975; Harding & Golinkoff, 1977). Because of the importance of role of cause and effect thinking in requesting behavior (regulating another person's behavior [cause] in order to complete a task [effect]), it may be that a larger delay in the emergence of problem-solving skills impacts the emergence of instrumental-requesting by individuals with Down syndrome.

It is important to note that although most requesting gestures are considered instrumental, used with the intention to regulate another's behavior and complete tasks, some requesting gestures are more social in nature. In particular, a child may request a type of social interaction (e.g., a turn-taking routine) from another person. Given that children with Down syndrome are able to use early nonverbal communication for social sharing purposes (i.e., joint attention), it may be interesting to consider the development of social requests, relative to instrumental requests, in children with Down syndrome in order to further discern whether the deficit relates purely to instrumental-requesting or to all requests, regardless of whether they include a social component.

To date, nonverbal requesting deficits in Down syndrome have only been described as being related to expressive language difficulties (Mundy et al., 1988; Mundy et al., 1995). To

explore the association between nonverbal requesting and problem-solving, we assessed requesting behavior (during instrumental and social routines), as measured by the Early Social Communication Scales and problem-solving skills (as measured by an object retrieval task) in young children with Down syndrome. We also considered the association between nonverbal requesting and expressive language in an attempt to replicate previous findings in this area (Mundy et al., 1988; Mundy et al., 1995).

Method

Participants

Participants were 16 toddlers with Down syndrome, 18 toddlers with developmental disabilities of mixed or nonspecific etiologies, and 19 typically developing infants and toddlers. No between-groups differences were observed for gender (see Table 1 for developmental and demographic information). An additional 2 children with Down syndrome participated in the study but were excluded from this report because they also met criteria for autism based on the Autism Diagnostic Observation Schedule–General and clinical diagnoses (by the third author). No children in any of the other groups met criteria for autism or autism spectrum disorder on these measures.

There is an ongoing debate in the study of mental retardation syndromes regarding appropriate comparison groups. The approach used here was to try to represent the population of individuals with mental retardation as a whole in the comparison group. Dykens, Hodapp, and Finucane (2000) noted that “comparisons with groups with mixed etiologies directly test whether a behavioral feature is characteristic of people with mental retardation in general or instead to the specific etiological group under study” (p. 247). Thus, a mixed group of children—such as the one used in this study—would draw from children with nonspecific (familial/environmental) mental retardation; children with other genetic syndromes; children with pre-, peri-, and postnatal injuries; and children with no identifiable etiology for their mental retardation, without overrepresentation of any one group.

The two disability groups were equated on chronological age (CA), all groups were equated on MA as measured by the Mullen Scales of Early Learning overall MA equivalent ($M = 22$ months) (see Table 1). Groups were also equated on nonverbal MA and verbal MA. This is evidence of recruitment efforts that aimed to equate disability groups not only on overall intellectual impairment, but also on language dimensions.

All children had normal vision or vision corrected to within the normal range, were mobile, and had unimpaired hand use. None of the children with Down syndrome had hearing impairments beyond those generally associated with this syndrome. All children with Down syndrome had a genetic diagnosis of trisomy 21. Within the developmental disabilities comparison group, there were 7 children with other genetic abnormalities (fragile X syndrome, velo-cardiofacial syndrome, Cochrane syndrome, partial deletion on chromosome 18, abnormalities on chromosome 15), and 11 children with developmental delays of unknown etiology.

There were no between-disability group differences in prematurity status, with 2 children with Down syndrome and 6 in the mixed developmental disabilities comparison group born before 36 weeks gestational age. No differences were observed between the two disability groups on the presence of other medical conditions. None of the typically developing children had any diagnoses or delays in development.

The two disability groups were equated on socioeconomic status (SES), although the families of typically developing children had a lower average SES, possibly because these parents were younger. No association was found between child MA and family SES in any of the groups (Down syndrome $r = -.13$; developmental disabilities, $r = .10$; typically developing, $r = -.09$). No between-group differences were observed on mother or father age in the disabilities groups; the majority of mothers and fathers had completed some college course-work. They were predominantly Caucasian. All child participants currently lived at home.

Procedure

This study was part of a larger longitudinal study of the developing profiles in autism, fragile X syndrome, and Down syndrome. Participants were recruited through university participant pools, JFK Partners University Affiliated Program, and parent support groups in the Denver Metropolitan Area (e.g., Mile High Down Syndrome Association, Fragile X Foundation). The entire study was carried out under Institution Review Board approval. Consent forms were reviewed with each family, and all questions were answered before consent was obtained and before any measures were gathered.

The test battery was administered in a laboratory visit in a standardized fashion. All examiners were masters or doctoral level clinicians with several years of clinical experience working with young children who had developmental disabilities.

Measures

Experimenters administered a battery of four developmental tests. The first was the Mullen Scales of Early Learning (Mullen, 1995). This measure, a standardized developmental test for children ages 3 months to 60 months, consists of five subscales: Gross Motor, Fine Motor, Visual Reception, Expressive Language, and Receptive Language. The Mullen Scales allows separate standard verbal and nonverbal summary scores to be constructed and demonstrates strong concurrent validity with other well-known developmental tests of motor, language, and cognitive development (Mullen, 1995). This scale was administered to all participants according to standard instructions; all administrators were trained in assessing young children with autism and other developmental disorders. Reinforcers for participants in all groups were used at times to reward cooperation and attention.

Second, we administered the Demographics Questionnaire (Hollingshead, 1975). Parents were asked about their age, SES, education level, and ethnicity. The third measure was the Early Social Communication Scales (Mundy, Sigman, & Kasari, 1990; Siebert, Hogan, & Mundy, 1982). These scales consist of a series of social-communicative presses involving interactions with an experimenter and a set of toys in a semi-structured play observation that

lasted approximately 25 minutes. It was designed to elicit examples of intentional communication in the forms of requesting and joint attention behaviors and to elicit participation with social toys and within social routines (i.e., hat, glasses, brush, tickle games, rolling a ball and/or truck back-and-forth). For our purposes, we were particularly interested in the distinction between requests that occurred in the context of playing with objects (instrumental requests) and requests that took place in the context of social routines (social requests). Instrumental requests generally involved obtaining help with objects (e.g., asking for the experimenter to wind up a toy), whereas social requests involved eliciting social responses from the examiner (e.g., eliciting more tickles in a tickle game). Behaviors were coded from videotape to create summary variables, as described in Mundy et al. (1990). Inter-rater reliabilities were assessed on 20% of tapes, and interclass correlation coefficients ranged from .82 to .93. Specific variables in these analyses are defined in Table 2.

The final measure was an object retrieval task. This task was designed to assess a child's problem-solving skills, and it involved cause and effect thinking, inhibition, and motor planning. Children participated in 15 trials of an object-retrieval task; a prize was placed under a Plexiglas box with one opening, and the child was instructed to retrieve the prize through the opening. A reward was placed inside the transparent box that was open on one side. The child was then allowed to retrieve the reward without delay. Two box sizes (small and large) were used, and the size of the box varied according to the trial. The open side of the box also varied (top, front, left, right). Trials were designed to move from the easiest (reward seen from the front view through the open side of the small box) to hardest (reward seen only through a closed side of the large box with the opening on the right or left, not directly in front of the child).

If the child became frustrated or stopped performing the task, experimenters were instructed to give help by either temporarily or permanently rotating the open side of the box toward the child to obtain a more line-of-sight view of the object. All experimenters were completely blind to the between-syndrome hypotheses of this study and used their own judgment for when to administer help within any given trial based upon a child's communicated frustration level. Reach scores assessed the accuracy of the child's reach (scored on an ordinal scale from 1 to 3, with higher scores indicating more efficient reach strategies). Help scores described the amount of help the child needed to obtain the reward (scored on a scale from 0 to 4.5, with higher scores indicating lower amounts of help). Agreement for reach scores was 89.13% overall, and agreement for help scores was 98.44%.

Results

Early Social Communication Scales Profile in Down Syndrome

As demonstrated in previous studies, toddlers with Down syndrome showed less frequent instrumental requests on the Early Social Communication Scales than did the typically developing group, $F(2, 55) = 8.39, p < .001$, but showed equivalent joint attention behaviors (see Table 3 for means and standard deviations [SDs]). Group differences in instrumental-requesting were due primarily to the fact that toddlers with Down syndrome showed significantly fewer low-level requests than did typically developing children, $F(2, 55) =$

7.46, $p < .001$. There were no significant differences between requesting in the developmental disabilities comparison group and the typically developing group.

However, a different requesting profile was found in the Down syndrome group when considering performance during the social routine components of the Early Social Communication Scales. Rather than showing fewer requesting behavior during social routines (as in the instrumental items of the Early Social Communication Scales), young children with Down syndrome showed requesting behaviors statistically equivalent to the two comparison groups in these situations (see Table 3 for means and *SDs*). In particular, children in the Down syndrome group showed marginally more frequent low-level social requests than did children in both other groups, $F(2, 52) = 3.00$, $p = .059$, and equivalent high level social requests. No differences were observed between the three groups on low-level joint attention bids or high level joint attention bids. No gender-related differences were observed for any of the joint attention and requesting dimensions in any of the groups.

Problem-Solving

A more in-depth description of the performance of the participants from the present study on the object-retrieval problem-solving task has been reported in a previous study (see Fidler et al., 2005). For the present study, we reported these data in terms of overall problem-solving (reaching) strategy and overall help administered (see Table 3 for means and *SDs*). Children with Down syndrome showed significantly poorer quality reach strategies than did those in the developmental disabilities comparison group, Brown Forsythe's $F(2, 40.89) = 7.46$, $p < .005$, and received more help from examiners to complete the task than members of the other groups, Brown Forsythe's $F(2, 16.10) = 3.99$, $p < .05$. Brown Forsythe's F was used for these analyses because the assumption of equality of variances was violated (less variance in scores was observed in the mixed comparison group and the typically developing group). No gender-related differences were observed in any of the groups.

Association Between Requesting and Problem-Solving

Within the Down syndrome group, a significant association was observed between instrumental requests on the Early Social Communication Scales and problem-solving skills (reach strategy) on the object-retrieval task, $r(14) = .59$, $p < .05$ (see Table 4 for correlation matrix). This was the case even with overall Mullen Scales standard scores partialled out, $r(13) = .59$, $p < .05$. In addition, a significant association was observed between total instrumental requests and degree of help administered (higher help scores mean *less* help received), $r(14) = .55$, $p < .05$. Again, similar effects were observed when overall Mullen Scales of Early Learning standard scores were partialled out, $r(13) = .55$, $p < .05$. No significant associations were observed between these dimensions in the other two groups, possibly because of restricted range—both comparison groups had better requesting and better reaching performances than did children in the Down syndrome group.

Yet the association between requesting and problem-solving in young children with Down syndrome seemed only to apply to instrumental-requesting behaviors. No significant associations were observed between frequency of requests during social routines and reach scores or help scores on the object-retrieval task in any of the groups.

Language—Although associations between nonverbal communication and language were not the central focus of this paper, previous researchers have described these connections, and we explored whether our data replicated previous findings in this area. A significant association was found between instrumental-requesting behavior and Mullen Scales of Early Learning expressive language scores in children with Down syndrome, $r(14) = .61, p < .05$, and a marginal association was found between instrumental-requesting and Mullen Scales receptive language, $r(14) = .48, p < .07$. No significant associations were observed between these variables in the other two groups.

A significant association was observed in the Down syndrome group between high level joint attention behaviors and both Mullen Scales of Early Learning receptive, $r(14) = .52, p < .05$, and expressive language, $r(14) = .56, p < .05$. Similar associations were observed in the typically developing group for Mullen Scales receptive, $r(17) = .57, p < .01$, and expressive language, $r(17) = .50, p < .05$. No such association was observed in the developmental disabilities comparison group. In addition, no associations were observed between Mullen Scales of Early Learning receptive and expressive language and low-level joint attention behaviors.

Discussion

In this study we replicated a syndrome-specific instrumental-requesting deficit in young children with Down syndrome (Mundy et al., 1988; Mundy et al., 1995). Children with Down syndrome in this study showed significantly fewer overall instrumental requests and low-level instrumental requests than did a group of MA-matched typically developing infants and toddlers on the Early Social Communication Scales. The MA-matched children with developmental disabilities did not exhibit significantly fewer requests than did the typically developing infants and toddlers, and they also did not show the split between joint attention and requesting behaviors observed in the Down syndrome group.

Although we replicated a deficit in nonverbal requesting in young children with Down syndrome, this deficit seemed to be specific to instrumental-requesting situations, suggesting that the deficit in requesting in individuals with Down syndrome does not result from difficulties with performing specific acts associated with requesting (eye contact or reaching), but may have to do with using those behaviors to regulate another's behavior for instrumental purposes.

A split between instrumental and social gesturing is also evidenced in the dissociation between nonverbal requesting and joint attention skills in the Down syndrome group. A pattern of the use of gestures for social means—but not for instrumental purposes—in young children with Down syndrome suggests that the profile of relative strengths in social functioning and relative deficits in problem-solving commonly reported in older children and adults with Down syndrome may already have begun to emerge in the second and third years of life.

A new finding involves the association between problem-solving performance and instrumental-requesting behavior in the Down syndrome group. This association suggests

that the deficit in requesting behavior previously reported in toddlers with Down syndrome may be a function of poor problem-solving skills, and not deficits in communication. No such association was observed between social-requesting and problem-solving.

We note several points: First, young children with Down syndrome in this study performed more poorly than the typically developing infants on lower level instrumental requests, but not higher level instrumental requests. This could be due to the developmental level of our overall sample because low-level requests were more frequent than high-level requests in all groups. In addition, previous investigators have linked requesting behaviors not to problem-solving, but to expressive language. Support for this idea is also found in the present study.

Another notable issue relates to motivational orientation in children with Down syndrome. When faced with tasks that involve problem-solving, children with Down syndrome in this sample relied on help from the experimenter rather than persisting with the task at hand. This finding may relate to a larger body of research on task persistence and higher levels of off-task behavior during task completion by individuals with Down syndrome (Landry & Chapieski, 1990; Pitcairn & Wishart, 1994; Ruskin et al., 1994). Several researchers have reported that children with Down syndrome ages 6 months to 4 years show regressions on the same testing battery across sessions (Wishart & Duffy, 1990), and investigators have noted that many of these regressions result from children's refusal to engage in tasks (Pitcairn & Wishart, 1994; Wishart & Duffy, 1990).

Findings from the present study suggest that early problem-solving interventions in Down syndrome should focus on strengthening instrumental-requesting skills. For example, it might be important for parents of children with Down syndrome to facilitate reaching toward toys that are just out of reach and subsequently respond to the child's reach by providing the child with the desired toy, in order to promote the development of early problem-solving strategies. Furthermore, teaching parents to be more responsive to early problem-solving strategies, such as reaching, may also facilitate growth in this area of known weakness in children with Down syndrome.

Several limitations to this study must be noted. First, our findings are based on small sample sizes and warrant replication. Second, the main results from this study are correlational. The reported association between instrumental-requesting and problem-solving skills in Down syndrome is based on Pearson correlation statistics. In this paper we speculate that the deficit in nonverbal requesting may be due to a larger deficit in problem-solving skills in young children with Down syndrome. However, the direction of causality may be the reverse, and poor problem-solving skills emerge as a result of deficits in requesting. These two areas of functioning may be related to a third behavioral construct that is not measured here. Although this study is a first step toward understanding the connection between these two constructs, future studies are needed to help elucidate the direction of effects in the development of these two areas of functioning.

Another important limitation relates to the reliance on Mullen scores for estimates of expressive and receptive language deficits in our sample of children with Down syndrome and other developmental disabilities. In many reports of language functioning, children with

Down syndrome show pronounced language deficits relative to nonverbal MA-matched groups (Abbeduto et al., 2001; Miller, 1999). However, no significant between-group differences were observed for verbal functioning on the Mullen Scales of Early Learning across the three groups. Many items on the receptive language subscale of the Mullen Scales include visual supports or cues, and children with Down syndrome in our sample may have been relying on those cues to answer questions effectively. Thus, the language-related findings in this study warrant replication with another more sensitive measure of language functioning. In addition, there was a great deal of variability for language-functioning measures in each group ($SDs = 5$ to 7 months), which may have contributed to the lack of significance between group differences on these dimensions as well.

Even amidst these issues, our findings suggest that children with Down syndrome show a profile of deficits in instrumental-requesting behaviors in early development, and this deficit may be related to a larger deficit in problem-solving skills. These findings should contribute to the larger base of information on the early developmental trajectory of cognition and communication in this population and can potentially be useful in intervention planning for young children with this genetic disorder.

References

- Abbeduto L, Pavetto M, Kesin E, Weissman MD, Karadottir S, O'Brien A, Cawthon S. The linguistic and cognitive profile of Down syndrome: Evidence from a comparison with fragile X syndrome. *Down Syndrome: Research & Practice*. 2001; 7:9–15.
- Baron-Cohen S. Perceptual role-taking and protodeclarative pointing in autism. *British Journal of Child Psychology and Psychiatry*. 1989; 30:285–298.
- Baron-Cohen, S. Precursors to a theory of mind: Understanding attention in others. In: Whiten, A., editor. *Natural theories of mind: Evolution, development and simulation of everyday mindreading*. Cambridge, MA: Blackwell; 1991. p. 233-251.
- Bates, E.; Benigni, L.; Bretherton, I.; Camaioni, L.; Volterra, V. *The emergence of symbols: Cognition and communication in infancy*. New York: Academic Press; 1979.
- Bates E, Camaioni L, Volterra V. The acquisition of performatives prior to speech. *Merrill-Palmer Quarterly*. 1975; 21:205–226.
- Berko Gleason, J., editor. *The development of language*. 3. New York: Macmillan; 1993.
- Bjorklund, D. *Children's thinking: Developmental function and individual differences*. Pacific Grove, CA: Brooks/Cole; 2000.
- Camaioni, L. The development of intentional communication: A re-analysis. In: Nadel, J.; Camaioni, L., editors. *New perspectives in early communicative development*. London: Routledge; 1993. p. 82-96.
- Coggins T, Carpenter R, Owings N. Examining early intentional communication in Down's syndrome and nonretarded children. *British Journal of Disorders of Communication*. 1983; 18:98–106. [PubMed: 6226307]
- Dykens, EM.; Hodapp, RM.; Fincane, B. *Genetics and mental retardation syndromes: A new look at behavior and interventions*. Baltimore: Brookes; 2000.
- Fidler DJ, Hepburn S, Mankin G, Rogers S. Praxis skills in young children with Down syndrome, other developmental disabilities, and typically developing children. *American Journal of Occupational Therapy*. 2005; 59:129–138. [PubMed: 15830612]
- Gomez, J. The emergence of intentional communication as a problem-solving strategy in the gorilla. In: Parker, S.; Gibson, K., editors. *"Language" and intelligence in monkeys and apes: Comparative developmental perspectives*. Cambridge: Cambridge University Press; 1990. p. 333-335.
- Greenwald C, Leonard L. Communicative and sensorimotor development of Down's syndrome. *American Journal of Mental Deficiency*. 1979; 11:43–79.

- Harding C, Golinkoff R. The origins of intentional vocalizations in prelinguistic infants. *Child Development*. 1977; 50:338–340.
- Harris S, Kasari C, Sigman M. Joint attention and language gains in children with Down syndrome. *American Journal on Mental Retardation*. 1996; 100:608–619. [PubMed: 8735574]
- Hollingshead, AB. Unpublished manuscript. Yale University; 1975. Manual for the four factor index of social status.
- Landry S, Chapieski L. Joint attention of six-month-old Down syndrome and pre-term infants: I. Attention to toys and mother. *American Journal on Mental Retardation*. 1990; 94:488–498. [PubMed: 2138464]
- Miller, JF. Profiles of language development in children with Down syndrome. In: Miller, J.; Leddy, M.; Leavitt, LA., editors. *Improving the communication of people with Down syndrome*. Baltimore: Brookes; 1999. p. 11-40.
- Mullen, E. *Infant Mullen Scales of Early Learning*. Circle Pines, MN: American Guidance Service; 1995.
- Mundy P, Kasari C, Sigman M, Ruskin E. Nonverbal communication and early language acquisition in children with Down syndrome and in normally developing children. *Journal of Speech and Hearing Research*. 1995; 38:157–167. [PubMed: 7537345]
- Mundy P, Sigman M, Kasari C, Yirmiya N. Nonverbal communication skills in Down syndrome children. *Child Development*. 1988; 59:235–249. [PubMed: 2963734]
- Mundy P, Sigman M, Kasari C. A longitudinal study of joint attention and language development in autistic children. *Journal of Autism and Developmental Disorders*. 1990; 20:115–128. [PubMed: 2324051]
- Piaget, J. *The origins of intelligence in children*. Basic Books; New York: 1952.
- Pitcairn T, Wishart J. Reactions of young children with Down's syndrome to an impossible task. *British Journal of Developmental Psychology*. 1994; 12:485–489.
- Rollins P, Snow C. Shared attention and grammatical development in typical children and children with autism. *Journal of Child Language*. 1998; 25:653–673. [PubMed: 10095329]
- Ruskin E, Kasari C, Mundy P, Sigman M. Attention to people and toys during social and object mastery in children with Down syndrome. *American Journal on Mental Retardation*. 1994; 99:103–111. [PubMed: 7946251]
- Ruskin E, Mundy P, Kasari C, Sigman M. Object mastery motivation of children with Down syndrome. *American Journal on Mental Retardation*. 1994; 98:499–509. [PubMed: 8148126]
- Siebert J, Hogan A, Mundy P. Assessing interactional competencies: The early social-communication scales. *Infant Mental Health Journal*. 1982; 3:244–258.
- Smith L, von Tetzchner S. Communicative, sensorimotor, and language skills of young children with Down syndrome. *American Journal of Mental Deficiency*. 1986; 91:57–66. [PubMed: 2943160]
- Tomasello M. The role of joint attentional processes in early language development. *Language Sciences*. 1988; 10:69–88.
- Tomasello M, Mannie S, Kruger A. The linguistic environment of one to two year old twins. *Developmental Psychology*. 1986; 22:169–176.
- Vlachou M, Farrell P. Object mastery motivation in pre-school children with and without disabilities. *Educational Psychology*. 2000; 20:167–176.
- Wetherby A, Yonclas D, Bryan A. Communicative profiles of preschool children with handicaps: Implications for early identification. *Journal of Speech and Hearing Disorders*. 1989; 54:148–158. [PubMed: 2523504]
- Wishart J, Duffy L. Instability of performance on cognitive tests in infants and young children with Down's syndrome. *British Journal of Educational Psychology*. 1990; 60:10–22. [PubMed: 2140516]
- Zinober B, Martlew M. Developmental changes in four types of gesture in relation to acts and vocalizations from 10 to 21 months. *British Journal of Developmental Psychology*. 1985; 3:293–306.

Table 1

Demographic and Developmental Variables

Variable	Down syndrome (<i>n</i> = 16)	Developmental disabilities (<i>n</i> = 18)	Typical (<i>n</i> = 19)	<i>F</i> or χ^2 ^a
Child CA ^b	34.25 (7.63)	33.94 (7.03)	18.42 (3.61)	29.55 ^{***}
Child gender ^c	12:4	11:7	8:11	3.94
Mullen Scales of Early Learning Overall	22.32 (6.43)	22.95 (6.41)	22.35 (5.07)	.06
Verbal MA	21.59 (7.30)	21.82 (6.94)	23.05 (6.41)	.23
Nonverbal MA	23.06 (6.08)	24.28 (6.36)	21.66 (4.13)	.98
Child ethnicity (%)				
Caucasian	87.5	72.2	84.2	2.94
Latino	6.3	11.1	5.3	
Biracial	6.3	11.1	10.5	
African American	—	5.6	—	
Mean Age in years (<i>SD</i>)				
Father	39.38 (5.62)	34.41 (13.42)	32.78 (5.26)	2.13
Mother	38.00 (4.41)	35.11 (6.98)	31.31 (5.75)	5.11 ^{**}
Education (%)				
Father				9.13
High school	—	5.9	15.8	
Some college	7.7	17.6	31.6	
College	53.8	53.8	30.5	
Masters	15.4	15.4	16.3	
Professional	23.1	23.1	21.1	
Mother				10.01
Some high school	—	—	5.3	
High school	7.7	11.8	8.2	
Some college	7.7	11.8	10.5	
College	38.5	41.2	31.6	
Masters	46.2	17.6	15.8	
Professional	—	17.6	31.6	
Mean SES ^d (<i>SD</i>)	56.69 (5.51)	53.38 (10.13)	47.07 (15.19)	2.91

^a *F*s in boldface.^b Means in months. All means are followed by *SD*s in parentheses.^c Males to females.^d Socioeconomic status.^{**} *p* < .01.^{***} *p* < .001.

Table 2

Definitions of Variables Coded in Early Social Communication Scales

Variable	Definition
Initiates request	
Low level (instrumental requests)	Use of eye gaze without any other behavior or reaches without coordinated eye gaze for the purpose of regulating the behaviors of others
High level (instrumental requests)	Points with or without coordinated eye gaze and/or gives with or without coordinated eye gaze for the purpose of regulating the behaviors of others
Initiates joint attention	
Low level	Directs adult's attention by looking at the object of interest and/or alternating gaze between object and adult
High level	Directs adult's attention by pointing and/or showing with or without coordinated eye gaze
Requests during the tickle game (social requests)	Uses an eye gaze, an extended arm, or an extended arm with eye contact to request that the examiner tickle the child within a song that establishes the tickle routine

Note. All rates for Scales of Measurement were frequency/Early Social Communication Scales duration.

Table 3Means (and *SDs*) for Requesting and Joint Attention Rates

Rates	Down syndrome	Mixed DD	Typical	F(2,52)	Partial Eta²
Requests					
Total instrumental	1.05 (.47) ^a	1.36 (.54) ^{ab}	1.86 (.71) ^b	8.39 ^{**}	.25
High instrumental	.43 (.38)	.57 (.47)	.80 (.59)	2.51	.09
Low instrumental	.61 (.33) ^a	.78 (.33) ^{ab}	1.05 (.35) ^b	7.46 ^{**}	.23
Attention					
Total joint	.94 (.55)	.81 (.71)	.74 (.42)	.53	.02
High joint	.45 (.47)	.39 (.51)	.30 (.27)	.52	.02
Low joint	.48 (.35)	.41 (.31)	.43 (.35)	.82	.01
Routine social requests					
Total	.28 (.18)	.17 (.15)	.16 (.13)	3.00 [^]	.11
Low	.17 (.19)	.07 (.10)	.08 (.12)	2.82 [^]	.10
High	.10 (.09)	2.83 (3.82)	2.37 (3.21)	.82	.01
Mullen Scales of Early Learning					
Language age					
Receptive	22.31 (8.24)	24.35 (8.56)	23.74 (6.47)	.74	.01
Expressive	20.88 (7.28)	19.29 (7.19)	22.26 (7.18)	.47	.03
Object retrieval					
Reach	2.33 (.23) ^a	2.49 (.32) ^{ab}	2.66 (.16) ^b	7.27 ^{**}	.23
Help	4.25 (.44) ^a	4.49 (.02) ^b	4.46 (.09) ^{ab}	4.60 [*]	.16

Note. Superscripts a and b connote homogeneous subsets determined via Scheffé post-hoc testing.

[^]
p < .07.

^{*}
p < .05.

^{**}
p < .01.

Table 4
Pearson Correlations Between Requesting, Reach Strategies, and Help Elicitation, and Language

Group	1	2	3	4	5	6	7
Down syndrome							
1. Total instrumental requests ^a	—	.51*	.19	.19	.17	.59*	.55*
2. Total joint attention			.09	.08	.22	.24	.32
3. Total social requests				-.41	-.43	.20	-.51*
4. Mullen Scales of Early Learning receptive language					.41	.37	.50*
5. Mullen Scales of Early Learning expressive language						.24	.31
6. Reach score							.33
7. Help score ^b							
Mixed comparison group							
1. Total instrumental requests	—	.51*	-.11	.21	.30	.02	.06
2. Total joint attention			.37	.01	-.14	-.17	-.11
3. Total social requests				-.41	-.35	.08	-.40
4. Mullen Scales of Early Learning receptive language					.75**	-.21	-.06
5. Mullen Scales of Early Learning expressive language						-.13	-.17
6. Reach score							.47
7. Help score							—
Typically developing							
1. Total instrumental requests	—	.52*	-.03	.38	.18	-.01	.33
2. Total joint attention			.11	.41	.14	-.16	-.07
3. Total social requests				-.36	-.59**	.06	-.43
4. Mullen Scales of Early Learning receptive language					.48**	.11	.36
5. Mullen Scales of Early Learning expressive language						.15	.14
6. Reach score							.47*
7. Help score							—

^aInstrument or social routine.

^bHigher scores on help mean less help was administered.

.10' > d
**
'50' < d
*

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