

Home-Based Peer Social Networks of Young Children With Down Syndrome: A Developmental Perspective

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Abstract

Numerous dimensions of the peer social networks of children with Down syndrome were examined within a developmental framework. Results revealed that for many key measures, particularly involvement in play, linkages to other settings, and control of play, children with Down syndrome have less well-developed peer networks even in comparison to a mental age matched group of typically developing children. This suggests both an absence of any social advantage in the peer context for children with Down syndrome and the existence of unusual difficulties that may be traced to underlying problems in peer-related social competence. The need for future observational studies of peer interactions for this group of children was emphasized.

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The social networks of young typically developing children gradually expand to include increasing numbers of peers throughout the preschool years. The contexts for these relationships vary considerably and include informal contacts with individual children in home or community settings as well as contacts that occur in more structured activities, such as organized playgroups, preschools, or child care. Parents eagerly support the formation of these peer social networks (Ladd & Pettit, 2002) and attach considerable importance to their young child's emerging relationships with their peers (Mize, Pettit, & Brown, 1995). It is usually within these peer social networks that young children form preferences for and establish regular contact with one or more children, thereby forming early friendships characterized by varying degrees of reciprocity, mutuality, and shared affect (Rubin, Coplan, Chen, Buskirk, & Wojslawowicz, 2005). The emergence of these peer networks constitutes an important index of children's social integration within their communities and provides opportunities for children to further develop their social skills (Newcomb & Bagwell, 1995, 1996).

Mothers of young children with developmental (cognitive) delays also attach considerable importance to and actively help establish their children's peer social networks (Booth, 1999; Guralnick, Connor, & Hammond, 1995). Nevertheless, even when considering contacts with peers that occur in home settings, the peer social networks of young children with developmental delays are more limited than those of similar age typically developing children (Guralnick, 1997; Lewis, Feiring, & Brooks-Gunn, 1988; Stoneman, Brody, Davis, & Crapps, 1988). Although many factors are at work, including negative attitudes towards individuals with disabilities, these peer social network limitations appear to be related to the unusual and pervasive peer social competence difficulties exhibited by this group of children (see Guralnick, Hammond, Connor, & Neville, 2006). In fact, evidence suggests that children with delays exhibit difficulties in peer competence even beyond those that would be expected based on their cognitive levels (Guralnick, 1999a, 1999b).

As a subgroup of children with delays, children with Down syndrome also appear to

experience many limitations with respect to their peer social networks throughout the early childhood and elementary years. In general, social contacts with peers for children with Down syndrome are relatively infrequent, only a small number of children are able to form true friendships, and many children express high levels of loneliness, often choosing to play alone (Byrne, Cunningham, & Sloper, 1988; Carr, 1995; Dykens & Kasari, 1997; Freeman & Kasari, 2002; Guralnick, 2002; Howell, Hauser-Cram, & Kersh, 2007; Sinson & Wetherick, 1981; Sloper, Turner, Knussen, & Cunningham, 1990). In part, this circumstance is likely due to the fact that children with Down syndrome share many of the same peer social competence difficulties evident for other groups of children with developmental delays (Iarocci, Yager, Rombough, & McLaughlin, 2008; Wishart, 2007). Nevertheless, the available evidence regarding the limited peer social networks of children with Down syndrome is based primarily on longitudinal studies that followed cohorts of children over time as well as analyses of shorter term social interactions or social contact patterns with playmates in home, school, and community activities. Comparisons with typically developing children similar in chronological age (CA) or typically developing younger children matched on relevant characteristics, especially with respect to home-based contacts, have only occasionally been included in the studies noted above.

This is an important omission because a full understanding of the peer social networks of children with Down syndrome can only be achieved by consideration of a developmental perspective. In fact, all aspects of children's peer social networks, including both the frequency and the quality of the relationships occurring within those networks, are sensitive to and, in many ways, constrained by children's own levels of development, especially cognition (Brownell, 1986; Howes, 1987). Consequently, the peer social networks of children with Down syndrome evaluated in most previous work may represent a pattern that is entirely consistent with their developmental levels. If not, then detailed information regarding the nature and characteristics of any departures from developmental (and CA) expectations can identify children's strengths as well as provide a framework for the design of interventions focusing on highly vulnerable areas.

In this connection, despite likely peer competence difficulties, evidence noted above suggesting

peer social network limitations for children with Down syndrome is somewhat surprising. This is due to a variety of reasons, including findings indicating that mothers of children with Down syndrome may feel less stigmatized and be more eager to participate in community activities than mothers of children with other delays because Down syndrome is so well-recognized and understood (see Seltzer & Ryff, 1994). In fact, parents of children with Down syndrome are highly supportive of their child's participation in inclusive settings, both during early childhood and the school years (Freeman, Alkin, & Kasari, 1999; Guralnick, 2002). It is also the case that children with Down syndrome appear to exhibit a general orientation toward the social aspects of their environment, and interest in engaging in social interaction is clearly evident in their behavior in laboratory situations (see Kasari & Hodapp, 1996). This general social orientation is supported by studies of parent perceptions because researchers have found that parents of children with Down syndrome rate their child's social development as a strength relative to other aspects of their adaptive behavior (Loveland & Kelley, 1991) and see their children as quite sociable even as they move to school age (Carr, 1995; Hornby, 1995). To be sure, a positive social orientation may not translate to more frequent and higher quality of play with peers because this is a complex process (Guralnick, 1999a). Nevertheless, these circumstances suggest that the peer social networks of children with Down syndrome may well be more advanced than other aspects of their development.

Accordingly, to examine these various alternative patterns from a developmental perspective, in this study we compared numerous dimensions of the peer social networks of young children with Down syndrome with the networks of typically developing children matched on CA and typically developing children matched on developmental level (MA-match). Play with peers in the home of the child with Down syndrome was emphasized because this requires a substantial level of commitment by the playmate and family and affords an opportunity for the mother of the child with Down syndrome to observe and support the children's play. Consequently, reports by mothers based on observations of these peer play activities constitute the primary data for this study.

Except for additional measures specific to children with Down syndrome, identical information was obtained from all three groups in the

study (Down syndrome, CA-match, MA-match). In particular, children's regular playmates in their home and neighborhood were first identified by mothers to yield measures of peer social network contacts (e.g., network size, frequency of play) and linkages within the network (e.g., school/home connections with playmates, how children initially met). In addition, information with respect to the characteristics of the playmates in each focal child's social network was obtained including their CA, gender, and whether they had any special needs. Mothers also rated the quality of children's play for each identified focal child/playmate dyad (positive features as well as conflicts) and the relative degree of control of play activities exerted by the focal child and playmate. This issue of control of play is especially relevant for children with Down syndrome because many children can be expected to have substantial numbers of CA playmates as part of their social network (Freeman & Kasari, 2002; Guralnick, 2002). This circumstance in which a considerable discrepancy exists between a dyad's CA and MA has important implications for social learning and friendship formation (Hartup & Stevens, 1997; Rubin et al., 2005).

Finally, of special interest was an assessment of the extent of involvement of mothers and the activities required to help create and maintain their child's peer social network. Accordingly, for each of the three groups, mothers responded to questions regarding the extent to which they arranged their child's play with a playmate at their home and the difficulty doing so. In addition, because the quality of a dyad's play can be influenced by parents, measures of the extent to which mothers needed to assist their child with respect to important aspects of play, such as managing conflicts and initiating and maintaining play activities, were also obtained.

Method

Participants

Young children with Down syndrome were recruited through contact with local Down syndrome parent groups, public schools, state agencies, and early intervention centers in a large metropolitan community. Participating groups distributed announcements describing an opportunity to participate in a research project designed to learn more about how having Down syndrome affects children's peer interactions and social

involvement. Parents who were interested in participating in the study contacted project staff directly. To be included in the sample, a child with Down syndrome had to meet the following criteria: (a) be between the ages of 54 and 83 months, (b) have a karyotype that confirmed that the child's diagnosis was due to trisomy 21, (c) obtain a Full Scale IQ (FSIQ) that equated to an MA of 2.5 years and above on the Stanford-Binet Intelligence Scales, Fifth Edition—SB5 (Roid, 2003), and (d) have a primary female caregiver (minimum of a 6-month relationship because mothers were our primary informants). If the child had a diagnosis of pervasive developmental disorder, if English was not their primary language, or if they had unusual sensory or motor problems, he or she was not included in the study. Of the 30 children with Down syndrome who met all four criteria, 27 completed the entire study.

Two comparison groups of typically developing children ($n = 27$ in each group) were recruited by sending similar study announcements to parents of children enrolled in child care centers and public schools. Parents who were interested in participating were asked to contact study staff directly and underwent qualifying testing to create two groups of typically developing children who were matched on a case-by-case basis to the children with Down syndrome. One group was matched on the basis of CA to the children with Down syndrome and the other group, on the basis of MA. To be included as a CA-match for each child with Down syndrome, the typically developing child had to meet the following criteria: (a) have a similar CA (± 3 months at the time of testing) to that of the child with Down syndrome to be matched; (b) be the same gender as the child with Down syndrome; (c) obtain an FSIQ between 90 and 130 on the SB5, and (d) have a primary female caregiver (minimum of a 6-month relationship). These inclusion requirements were similar for the MA-match for each child with Down syndrome (e.g., same gender), except that the typically developing child's MA (based on the FSIQ from the SB5) had to be within ± 3 months of the child with Down syndrome at the time of testing. Although family demographics were not used as matching variables, these variables were monitored for equivalence and adjustments made if necessary in the participant selection process. Typically developing children were excluded if they had any known developmental difficulties, a *behavior problem*

defined as obtaining a total behavior problem score in the borderline clinical range or higher ($T \geq 65$ on preschool version and $T \geq 60$ on the school-age version) on the Child Behavior Checklist–CBCL (Achenbach & Rescorla, 2000, 2001), a major uncorrected sensory or motor problem, or a primary language other than English.

For all 81 participants, mothers were asked about their child's ethnicity, grade in school (preschool, kindergarten, first grade), and siblings. In addition to child demographic information, standard demographic information about the family (marital status, ethnicity, educational and occupational status, and income) was gathered via self-reports from mothers. We used the Hollingshead Four Factor Index of Social Status (Hollingshead, 1975) to calculate a measure of family social status (range 8 to 66; see Table 1 for descriptive characteristics).

Child Developmental Characteristics

Children in all three groups were evaluated by a psychologist with extensive prior experience working with young children with developmental delays and typically developing children. The SB5 was administered to assess children's intellectual development. The FSIQ was of primary interest as was the MA score that was used to establish the match between younger typically developing children and children with Down syndrome. To evaluate children's language development, we employed the Preschool Language Scale–Fourth Edition (Zimmerman, Steiner, & Pond, 2002). Scores for the Auditory Comprehension, Expressive Communication, and Total Language scales were converted to standard scores for analysis. We also calculated a Total Language age equivalent score. Finally, to obtain an estimate of children's adaptive functioning, trained interviewers administered the Vineland Adaptive Behavior Scales–VABS (Sparrow, Balla, & Cicchetti, 1984) Survey Form to each mother (or primary female caregiver). Standard scores and age equivalents were obtained in each of four domains, but only the Communication, Socialization, and Total Adaptive Behavior scores were used to compare the three groups.

Behavior Problems

Mothers' assessments of their child's behavior problems were obtained using the preschool and school-age forms of the CBCL. Ratings were based on the mothers' observations over the

previous 2 months on the preschool form (1.5 to 5 years), and the past 6 months on the school-age form (6 to 18 years). Mothers of a child with Down syndrome and an MA below 6 years were asked to complete the CA-appropriate form of the CBCL. On each form mothers rated the frequency of different behavior problems using a 3-point scale: 0 = not true (as far as you know); 1 = somewhat or sometimes true; 2 = very true or often true. Higher scores indicate greater perceived behavior problems. Internalizing, Externalizing, and Total Problem Scores (T scores) were used for analyses.

General Social Skills

Mothers were asked to complete the parent form of the Social Skills Rating System–SSRS (Gresham & Elliott, 1990) to obtain ratings of their child's general social functioning. On the SSRS–Parent Version (Preschool Level or Elementary Level), the occurrence of particular social skills were rated using a 3-point scale with respect to how often the child's mother saw the skill demonstrated by her son/daughter (0 = never, 1 = sometimes, 2 = very often). Additionally, mothers rated how important each social skill was for their child's development using a 3-point scale (0 = not important, 1 = important, 2 = critical). The particular level completed (Preschool or Elementary) was based on the child's current program placement. Mothers' responses were summed across all items to obtain a total raw score that was converted to a single standardized score used for analysis.

Peer Social Networks in the Home

In order to examine children's peer social networks in their home, we asked mothers to complete the Social Contact Questionnaire, a revised and expanded version of a previous questionnaire that has been used extensively with children who have developmental delays (Guralnick, 1997, 2002). To maximize the clarity of the questions and the accuracy of the responses, we reviewed the questionnaire with the mother following its completion, and any corrections or additions were made at that time.

The Social Contact Questionnaire consists of items focusing on five major areas of interest. First, this measure provides information with respect to each focal child's social contacts with playmates in their home or community. Based on their child's contacts in the past 3 months,

mothers were asked to identify those children whom their child played with regularly (at least once in the last 3 months) outside of school, daycare, or scheduled group activities. Individual playmates identified could range between 2 and 10 years of age, and relatives living outside the home could be included. A maximum of 5 playmates could be identified. Additional information included the frequency with which each playmate played in the mother's home with her child in the preceding 3 months and the average playtime (hours).

The second set of questions allowed us to obtain information with respect to linkages between the focal child and playmates. Items focused on school/home connections (playmate in focal child's school or child care), how the children came to know one another (categories: cousin, neighbor, classmates, parent's friend's child, other), and proximity to one another (categories: walking distance, up to 15-min drive, more than 15-min drive). Third, specific characteristics of each playmate identified by the focal child's mother were identified. These included each playmate's CA, gender, and whether they had any special needs (e.g., Down syndrome, other developmental delay).

The fourth set of questions on the Social Contact Questionnaire focused on the quality of the relationship between the focal child and each of the playmates identified. Mothers used 3- or 4-point scales to note the following (ranges in parentheses): (a) how well they get along (*not very well* to *very well*); (b) typical level of excitement (*calm* to *very excited*); (c) frequency of conflicts (*rarely* to *frequently*); (d) level of disruption due to conflicts (*no disruption* to *ends play*); (e) level of involvement with one another during play (don't stay close or interact much to a lot of interaction); and (f) who controls the play (all categories: my child, playmate, both, adult). Specific categories and rating scale values for each of these and other items can be found in the appropriate tables in the *Results* section.

The final set of questions addressed the extent to which mothers arranged and assisted their child to maximize play involvement and quality of play when the playmate plays with their child at the focal child's home. To determine arranging, we asked mothers to note the percentage of time they arranged playdates and the percentage of playdates arranged by their child. Mothers were then asked to rate how difficult it was to arrange those contacts (range: *not difficult at all* to *very difficult*). Mothers also rated the specific types of assistance required

when facilitating play. Specifically, for each dyad, mothers rated the frequency (all categories: little or none, occasionally, frequently) with which they needed to directly facilitate play by helping their child with (a) managing emotions, (b) managing conflicts, (c) getting the play session started, (d) remaining involved, (e) understanding social rules (such as turn-taking), and (f) understanding how to engage in specific play activities.

Procedure

Subsequent to Institutional Review Board approval, a series of 27 triads were formed beginning with the identification of a child with Down syndrome. For mothers of children with Down syndrome who indicated interest, interviewers used a phone screen to describe the study and make a general determination of the likelihood that the child would qualify based on the exclusion and inclusion criteria noted earlier. In the phone screen, interviewers asked mothers about their child's primary language, gender, and any special motor or sensory problems and to confirm their child's karyotype. After completing the phone screen successfully, we sent consent forms and the mother and child were scheduled for testing at the university laboratory. Once a child with Down syndrome met all criteria, typically developing children were recruited to achieve CA and MA matches and complete the triad. Procedures similar to those used with the child who had Down syndrome to obtain measures were then followed.

Results

Child and Family Characteristics

Comparisons among the three groups were first made for all of the child and family characteristics measures (see Table 1). As indicated in the table, the three groups were matched successfully in accordance with the experimental design. Specifically, following significant ANOVAs for CA, $F(2, 78) = 185.9, p < .001$, partial $\eta^2 = .83$, and MA, $F(2, 78) = 269.5, p < .001$, partial $\eta^2 = .87$, we conducted pair-wise comparisons, which indicated that children with Down syndrome were closely matched to the appropriate group of typically developing children (CA-match) on the basis of CA, $t(52) = .10, p = .96, d = .01$, and to the group of younger typically developing children (MA-match) on the basis of MA, $t(52) = .80, p = .41, d = .23$. These pair-wise measures of the

Home-based peer social networks

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Table 1. Child and Family Characteristics by Group

Measure	Down syndrome		MA-match		CA-match	
	Mean/%	SD	Mean/%	SD	Mean/%	SD
Child demographics						
Age (years)	5.62	.60	3.21	.35	5.61	.60
Gender (% male)	48.15		48.15		48.15	
Ethnicity (% Caucasian) ^a	81.48		81.48		85.19	
Family demographics						
Family social status ^b	49.00	11.00	56.58	7.74	55.89	6.74
Mother's age (years)	39.12	5.88	36.98	3.88	39.17	5.32
Marital status (% partnered)	96.30		100.00		96.30	
Grade in school						
Preschool/child care (%)	51.85		100.00		44.44	
Kindergarten (%)	48.15		.00		44.44	
First grade (%)	.00		.00		11.11	
Child developmental characteristics						
Full Scale IQ ^c	60.59 ^X	10.10	108.52 ^Y	8.08	111.30 ^Y	7.57
MA ^c (years)	3.37 ^X	.50	3.48 ^X	.40	6.23 ^Y	.62
Auditory Comprehension ^d (standard score)	60.07 ^X	10.60	118.96 ^Y	8.91	116.96 ^Y	9.64
Expressive Communication ^d (standard score)	55.70 ^X	8.11	122.59 ^Y	12.74	118.89 ^Y	11.30
Total Language ^d (standard score)	55.67 ^X	8.18	122.93 ^Y	10.79	120.04 ^Y	9.74
Total Language ^d (age equivalent, months)	36.19 ^X	7.97	51.63 ^Y	7.27	79.81 ^Z	4.13
VABS Adaptive Behavior Composite ^e (standard score)	64.19 ^X	10.82	116.00 ^Y	11.78	109.78 ^Z	9.74
VABS ^e Communication (standard score)	63.56 ^X	12.22	116.22 ^Y	9.43	111.74 ^Y	11.41
VABS Communication (age equivalent, months) ^e	36.00 ^X	11.26	50.93 ^Y	6.13	79.44 ^Z	11.87
VABS Socialization (standard score)	81.15 ^X	10.17	115.44 ^Y	11.57	104.59 ^Z	7.56
VABS Socialization ^e (age equivalent, months)	50.37 ^X	10.89	52.04 ^X	8.46	74.41 ^Y	10.39
Behavior problems						
CBCL ^f Total Behavior Problems (T-score)	51.63 ^X	9.16	44.15 ^Y	8.77	45.59 ^Y	8.51
CBCL Internalizing (T-score)	49.78 ^X	9.24	42.74 ^Y	8.92	46.56 ^{X,Y}	10.12
CBCL Externalizing (T-score)	50.56 ^X	9.05	45.07 ^X	8.93	45.78 ^X	9.68
General social skills						
SSRS ^g (standard scores)	82.52 ^X	10.60	98.41 ^Y	13.71	106.70 ^Z	13.32

Note. $n = 27$ per group; all ANOVAs were statistically significant except for the Child Behavior Checklist (CBCL) Externalizing; for child developmental characteristics, groups differing significantly from one another, $p < .05$, have different superscripts: x, y, and z.

^aHispanic, 2.5%; Asian, 8.6%; Native American, 1.2%. ^bHollingshead Four-Factor Index of Social Status. ^cStanford-Binet Intelligence Scale (5th ed.). ^dPreschool Language Scale (4th ed.). ^eVineland Adaptive Behavior Scales. ^fChild Behavior Checklist. ^gSocial Skills Rating System.

absence of differences give us considerable confidence that our groups were well-matched (Frick, 1995; Mervis, 2004). Moreover, the MAs and CAs of the two typically developing groups did differ significantly from one another as expected: CA, $t(52) = 18.0, p < .001, d = 5.0$, and MA, $t(52) = 19.4, p < .001, d = 5.38$. Of importance, the three groups did not differ significantly on any of the family demographic or other child demographic measures noted in Table 1. Finally, with respect to school placement, all the children in the MA-match group were enrolled in preschool programs, whereas children in the Down syndrome and CA-match groups were enrolled equally between preschool and kindergarten programs, overall $\chi^2(4, N = 81) = 26.1, p < .001$.

Based on children's developmental status and CA, with minor exceptions, expected differences and similarities among the three groups were obtained for the cognitive and language measures as well as for all other child developmental characteristics. ANOVAs or MANOVAs were first conducted followed by pair-wise comparisons. Outcomes of these analyses are presented in Table 1, with groups having the same superscript (x, y, or z) indicating no statistically significant differences. Groups with different superscripts indicate statistically significant differences, $p < .05$. (Detailed information for each analysis can be obtained by contacting the first author.)

Peer Social Contacts

Table 2 provides descriptive statistics for the three peer social contact measures. An ANOVA for network size (mother-identified regular playmates, maximum of 5 children) produced a significant group effect, $F(2, 78) = 5.2, p < .01$, partial $\eta^2 = .12$. Follow-up tests revealed that the Down syndrome group had a significantly smaller network size than did the CA-match group, $t(52) = 3.0, p < .01, d = .84$, but neither of the other two comparisons were significant. Of note, 4 mothers of children with Down syndrome were unable to identify a single playmate. The second peer social contact measure, the frequency with which playmates played in mother's home in the previous 3 months, also differed significantly among the groups, $F(2, 74) = 4.4, p < .05$, partial $\eta^2 = .11$. In this instance, the frequency of play of the MA-match group was significantly lower than the CA-match group, $t(52) = 2.6, p < .05, d = .73$, but the

other two comparisons did not differ significantly from one another. Finally, pairwise comparisons following a significant ANOVA, $F(2, 74) = 3.8, p < .05$, partial $\eta^2 = .09$, for the average playtime measure revealed that children with Down syndrome were similar, but were not significantly different from the MA-match group, but both of these groups played for shorter periods of time than the CA-match group (Down syndrome/CA-match, $t(48) = 2.3, p < .05, d = .68$; MA-match/CA-match, $t(52) = 2.2, p < .05, d = .60$).

Linkages

Children can know one another through a variety of means, including the fact that they are relatives or classmates or because they live in proximity to one another. Table 2 presents descriptive statistics for relevant measures, referred to as *linkages*. For these measures it was important to account for the fact that the number of identified playmates could differ for focal children. Consequently, we calculated the percentage of focal children who identified playmates in each possible category (e.g., cousins, walking distance) at least once. Therefore, totals could exceed 100%. Separate ANOVAs revealed that only the classmates measure produced a significant group effect, $F(2, 74) = 5.3, p < .01$, partial $\eta^2 = .13$, with Down syndrome children having the lowest score: Down syndrome/MA-match, $t(48) = 2.0, p < .05, d = .59$; Down syndrome/CA-match, $t(48) = 3.3, p < .01, d = .96$; the MA-match/CA-match was not significant. Specifically, only approximately one third of the children with Down syndrome knew any of their playmates as a result of being classmates, whereas this was the case for nearly two thirds and over three quarters of the MA-match and CA-match groups, respectively. Moreover, the school/home connection measure with respect to whether identified playmates were also currently in the focal child's school was generally consistent with this finding, $F(2, 74) = 3.3, p < .05$, partial $\eta^2 = .08$. A smaller percentage of identified playmates were currently in the school program of the Down syndrome group in comparison to the CA-match group, $t(48) = 2.6, p < .05, d = .75$, but not the MA-match group. The two typically developing groups also did not differ significantly from one another. However, the ANOVA for the child care measure for school/home connections did not produce a significant group effect. Finally, ANOVAs carried

Table 2. Peer Social Contacts, Linkages, and Characteristics of Playmates in Peer Social Networks by Group

Measure	Down syndrome		MA-match		CA-match	
	Mean/%	SD	Mean/%	SD	Mean/%	SD
Peer social contacts						
Network size	2.85	1.66	3.52	1.19	4.04	1.16
Played in mother's home (frequency)	3.34	2.30	2.61	1.92	5.09	4.46
Average playtime (hours)	2.04	1.12	2.27	.58	2.72	.92
Linkages						
How know each other (%) ^a						
Cousins	34.78		40.74		18.52	
Neighbors	30.43		37.04		55.56	
Classmates	34.78		62.96		77.78	
Parent's friend's child	69.57		62.96		59.26	
Other	30.43		29.63		11.11	
School/home connections						
In your child's school (% yes)	39.13		55.56		74.07	
In your child's child care (% yes)	8.70		14.81		11.11	
Proximity to one another ^a						
Walking distance	39.13		44.44		55.56	
Up to 15-min drive	69.57		85.19		81.48	
More than 15-min drive	65.22		59.26		48.15	
Characteristics of playmates						
Age of playmates (years)	4.85	1.18	3.59	.87	5.55	.78
Proportion younger	.61	.41	.30	.34	.26	.29
Playmates special needs ^a						
None	91.30		100.00		100.00	
Don't know	4.35		3.70		14.81	
Down syndrome	26.09		.00		3.70	
Other developmental delay	.00		.00		.00	
Speech or language delay	21.74		7.41		22.22	
Other	.00		.00		7.41	
Gender of playmates (proportion)	.45	.33	.38	.33	.60	.37

Note. For children with Down syndrome, $n = 23$ for all measures except network size; $ns = 27$ for the MA- and CA-match groups.

^aPercentage categorized at least once for identified playmates for each focal child; total can exceed 100%.

out for the three proximity measures also did not produce a significant group effect.

Characteristics of Playmates

The CAs of the focal children's playmates produced an interesting pattern with a significant group effect, ANOVA $F(2, 74) = 30.0, p < .001$, partial $\eta^2 = .45$. Follow-up comparisons revealed that, as expected, CA-match focal children had

playmates who were older than either the MA-match, $t(52) = 8.8, p < .001, d = 2.43$, or Down syndrome-match, $t(48) = 2.5, p < .05, d = .72$, groups. Moreover, children in the Down syndrome group occupied an intermediate position because their playmates were older than the those in the MA-match group, $t(48) = 4.4, p < .001, d = 1.26$. To examine the range or distribution of playmates' ages more closely for each group, we

calculated a proportion younger measure. Specifically, a playmate was considered to be younger if that playmate's CA was 90% or less than that of the focal child. For each focal child, the proportion of identified playmates classified as younger was then determined (range = 0 to 1) and averaged for each group. An ANOVA for this measure produced a significant group effect, $F(2, 74) = 7.5, p < .01$, partial $\eta^2 = .17$. As seen in Table 2, the mean proportion of playmates classified as younger was .61 for children with Down syndrome, while this proportion was approximately half that value for the two typically developing groups. Follow-up comparisons confirmed that the CA- and MA-match groups did not differ significantly from one another, but they each differed significantly from the Down syndrome group, $t(48) = 3.0, p < .01, d = .85$ and $t(48) = 3.5, p < .001, d = 1.01$, respectively. Although relatively few children identified playmates with special needs (see below), the same results were obtained when these children were excluded from the analyses.

As expected, virtually all focal children from the two typically developing groups had identified playmates who were also typically developing (see Table 2; data represent percentage of categories identified at least once for each focal child within a group). However, children with Down syndrome did have more playmates with special needs, most notably other children with Down syndrome or with speech or language delay (Down syndrome, $n = 13$; MA-match, $n = 2$; CA-match, $n = 8$). Finally, identified playmates for most focal children were similar with respect to gender. However, an ANOVA using proportion of male playmates identified did produce a significant effect for group, $F(2, 74) = 2.6, p < .05$, partial $\eta^2 = .07$. Follow-up tests indicated that the only significant difference was between the two typically developing groups, $t(52) = 2.02, p < .05, d = .61$.

Quality of Play

Based on observations of their child's play with playmates in their home, mothers rated the quality of that play along the five dimensions shown in Table 3. A MANOVA produced a significant effect, $F(2, 140) = 3.33, p < .001$. Separate ANOVAs were then carried out for each of the five measures, with significant group effects obtained only for the how well they get along, $F(2, 74) = 4.4, p < .05$, partial $\eta^2 = .11$, and level of involvement in play, $F(2, 74) = 13.2, p < .001$,

partial $\eta^2 = .26$, measures. Follow-up comparisons indicated that the children in the CA-match group played more amicably than did the children in the MA-match, $t(52) = 2.7, p < .01, d = .76$, or Down syndrome, $t(48) = 2.6, p < .05, d = .74$, groups. The latter two groups did not differ significantly from one another. However, the level of involvement measure produced an entirely different pattern. Follow-up comparisons indicated that all three groups differed significantly from one another: CA-match/MA-match, $t(52) = 2.8, p < .01, d = .78$; CA-match/Down syndrome, $t(48) = 5.2, p < .001, d = 1.50$; MA-match/Down syndrome, $t(48) = 2.4, p < .05, d = .69$. For this measure, the Down syndrome group was the least involved with their playmates during play, the MA-match group had an intermediate level of involvement, and the CA-match group had the highest level of involvement with playmates.

An important dimension of the quality of dyadic play is the degree of balance or equality of interactions that exists between playmates. This dimension was indexed by mother's ratings of which child was in control of the play activity (focal child, both, or playmate). To create a measure of degree of control of play, we assigned a score of 1 to dyads in which the focal child was rated as in control, a 2 when both were rated as in control, and a 3 when the playmate was rated to be in control. These scores were then averaged for each focal child. Therefore, higher scores indicate less control of play by the focal child. An ANOVA revealed a significant group effect, $F(2, 74) = 11.7, p < .001$, partial $\eta^2 = .24$ (see Table 3). Follow-up comparisons indicated that the children in the Down syndrome group had less control than did either the MA-match group, $t(48) = 3.60, p < .001, d = 1.05$, or the CA-match group, $t(48) = 4.50, p < .001, d = 1.29$. The two typically developing groups did not differ significantly from one another.

Table 4, which provides a more detailed perspective of the control measure, presents percentages summed over each group for the three levels of control exerted by each dyad (focal child, both, playmate). An overall analysis produced a statistically significant effect, $\chi^2(4, N = 27) = 38.67, p < .001$. We then calculated an adjusted residual, which is a standardized measure equivalent to a Z score (see Table 4). As such, absolute adjusted residual values in Table 4 greater than 1.96 indicate that a particular cell significantly contributed, $p < .05$, to the overall

Table 3. Quality of the Play and Control Measures for Dyads by Group in Home Setting

Quality of play and control	Down syndrome		MA-match		CA-match	
	Mean	SD	Mean	SD	Mean	SD
How well get along ^a	1.38	.31	1.35	.24	1.19	.20
Typical level of excitement ^b	1.90	.33	1.77	.31	1.88	.40
Frequency of conflicts ^c	2.38	.38	2.27	.47	2.36	.32
Disruption due to conflicts ^d	3.09	.61	3.01	.47	3.14	.35
Level of involvement in play ^e	1.67	.36	1.43	.34	1.19	.30
Control of play ^f	2.42	.40	2.04	.33	1.97	.31

Note. For children with Down syndrome, $n = 23$; $ns = 27$ for the MA- and CA-match groups.

^a1 = very well, 2 = okay, 3 = not very well. ^b1 = very excited, 2 = active, 3 = calm. ^c1 = frequently, 2 = occasionally, 3 = rarely. ^d1 = ends play, 2 = major disruption, 3 = minor disruption, 4 = no disruption. ^e1 = a lot of interaction, 2 = stay close but don't interact much, 3 = don't stay close or interact much. ^fScoring: 1 = focal child in control, 2 = both children in control, 3 = playmate in control (one child with Down syndrome was lost to the analysis due to the fact that the adult was judged to be in control of play).

significance of the measures in the table. The sign for each value indicates that the cell was either over- or underrepresented. As can be seen, based on this analysis, the playmate was far more likely to be in control of play for children in the Down syndrome group in comparison to children in the two typically developing groups. In contrast, mothers rated that both children were in control for the Down syndrome group only approximately 40% of the time. This pattern is quite different from that of the two typically developing groups, in which both children in nearly 70% of the dyads were judged to be in control.

For the Down syndrome group only, we then examined how dyads in which both children were rated in control (42.7%) differed in comparison to dyads in which the playmate was in control (50.7%). In this exploratory analysis, because the dyads in the two groups did not constitute independent observations, we employed the Generalized Estimating Equation method for analysis; this approach can accommodate the lack of independence by modeling correlations within participants (Zeger & Liang, 1986). We then conducted separate analyses for each of the five

quality of play measures. Results revealed that when both children were judged to be in control in comparison to when the playmate was judged to be in control, they got along better, $\chi^2(1, N = 70) = 6.04, p < .05, d = 4.91$. However, they had more frequent conflicts, $\chi^2(1, N = 70) = 4.01, p < .05, d = 4.0$, and these conflicts were more disruptive of play, $\chi^2(1, N = 70) = 4.12, p < .05, d = 4.06$. Also based on Generalized Estimating Equation analyses, these differences were not associated with key characteristics of either the child with Down syndrome (FSIQ, Preschool Language Scale–Fourth Edition Total Language, SSRS, or CBCL Total Behavioral Problems) or the playmate (special needs, CA differences, same gender).

Mother Support of Play

To evaluate the role of mothers in supporting their child's peer social network, we asked mothers to rate the extent to which they arranged playdates for their child and the difficulty doing so. Mothers also rated the extent of assistance they provided their child to foster child-child play during play at their home (see Table 5). For

Table 4. Control Exerted by Focal Child in Dyadic Play by Group

Group	Child in control					
	Focal		Both		Playmate	
	%	Adj. residual	%	Adj. residual	%	Adj. residual
Down syndrome	6.7	-1.8	42.7	-4.2	50.7	6.1
MA-match	13.7	.4	67.4	1.2	18.9	-1.6
CA-match	15.6	1.2	72.5	2.7	11.9	-4.0

Table 5. Mother Arranging and Assisting in Play by Group in Home Setting

Measure	Down syndrome		MA-match		CA-match	
	Mean/%	SD	Mean/%	SD	Mean/%	SD
Arrange						
Time playdates arranged by you (%)	52.78	30.17	59.22	23.82	46.72	28.02
Time playdates arranged by your child (%)	11.80	25.01	4.25	7.16	20.70	24.22
How difficult to arrange contacts ^a	2.91	.25	2.75	.32	2.92	.19
Assistance^b						
Managing emotions	2.61	.45	2.44	.40	2.49	.37
Managing conflicts	2.26	.40	2.04	.45	2.26	.36
Getting play started	2.50	.49	2.72	.43	2.83	.29
Remaining involved	2.44	.44	2.66	.38	2.80	.24
Understanding social rules	2.16	.44	2.13	.57	2.55	.39
Understanding how to play	2.18	.53	2.60	.37	2.80	.28

^a1 = very difficult, 2 = somewhat difficult, 3 = not difficult at all. ^b1 = frequently, 2 = occasionally, 3 = little or none.

the arranging measures, we used a MANOVA, which produced a significant group effect, $F(2, 144) = 2.44, p < .05$. Separate ANOVAs carried out for each of the three arranging measures yielded significant effects for percentage of playdates arranged by your child, $F(2, 74) = 4.5, p < .05$, partial $\eta^2 = .11$, and the difficulty arranging these contacts, $F(2, 74) = 3.7, p < .05$, partial $\eta^2 = .09$, but not percentage of time that mothers themselves arranged playdates. Follow-up comparisons indicated that children in the CA-match group arranged playdates more than did children in the MA-match group, $t(52) = 3.4, p < .01, d = .94$, but none of the other comparisons were significant. For the measure how difficult to arrange, the MA-match group was the one experiencing the most problems, but differed significantly only from the CA-match group, $t(52) = 2.4, p < .05, d = .68$. The other two comparisons did not produce significant differences.

For the mother assistance measures, a MANOVA produced a significant group effect, $F(12, 138) = 4.78, p < .001$, partial $\eta^2 = .29$. Separate ANOVAs revealed significant effects for four of the six measures: (a) getting play started, $F(2, 74) = 4.2, p < .05$, partial $\eta^2 = .10$; (b) remaining involved, $F(2, 74) = 6.2, p < .01$, partial $\eta^2 = .14$; (c) understanding social rules, $F(2, 74) = 6.5, p < .01$, partial $\eta^2 = .15$; and (d) understanding how to play, $F(2, 74) = 15.8, p < .001$, partial $\eta^2 = .30$. For the getting play started measure, follow-up comparisons indicated that children in the Down syndrome group required more frequent assistance

from their mothers than did those in the CA-match group, $t(48) = 3.0, p < .01, d = .86$, but no statistically significant differences were detected for the other two comparisons. Mothers in the Down syndrome group also indicated that they needed to help their children more frequently to remain involved than did those in the CA-match group, $t(48) = 3.7, p < .001, d = 1.06$. Again, neither of the other two comparisons produced statistically significant effects. For help understanding social rules, follow-up comparisons indicated no significant difference between the Down syndrome group and the MA-match group, but that the CA-match group needed less help than did either of the other two groups: MA-match, $t(52) = 3.2, p < .01, d = .88$; Down syndrome, $t(48) = 3.3, p < .01, d = .96$. Finally, for the understanding how to play measure, follow-up comparisons indicated that the Down syndrome group required more assistance than both the MA-match group, $t(48) = 3.3, p < .01, d = .95$, and the CA-match group, $t(48) = 5.4, p < .001, d = 1.55$. In addition, the CA-match group needed less assistance from mothers than did the MA-match group, $t(52) = 2.3, p < .05, d = .64$.

Discussion

In this study, we examined the peer social networks of young children with Down syndrome, focusing on measures of peer social contacts, linkages, quality of play, degree of control of play, and the characteristics of the

playmates identified. The primary purpose was to determine whether the presumed social orientation and other factors associated with children with Down syndrome created any developmental advantage with respect to their peer social networks. To accomplish this, we evaluated the peer social networks of children with Down syndrome within a developmental framework by including comparison groups of carefully matched typically developing children similar in CA (CA-match) and in MA (MA-match).

Based on maternal reports, our results did not indicate any advantage for children with Down syndrome for any of our peer social network measures. Children with Down syndrome were similar to the MA-match group on some measures but, as expected, were always at a disadvantage when differences were found in comparison to the CA-match group. Differences occurring between the two typically developing groups (e.g., average playtime, frequency played with playmate at home, level of involvement in play) were in the expected developmental sequence. Occasionally, all three groups received similar ratings (e.g., excitement level in play). However, and of most significance, when differences were obtained between children with Down syndrome and the MA-match group, the children with Down syndrome were always found to have more limited peer social networks. Specifically, in comparison to children in the MA-match group, children with Down syndrome had less well-developed linkages between settings with playmates, less involvement with playmates during play, and exerted less control of that play. With respect to network size, 15% of mothers of children with Down syndrome were unable to identify a single regular playmate for their child.

Of note, limitations with respect to these important dimensions of children's peer social networks were apparent even though children with Down syndrome had, on average, over 2 more years of experience with and opportunities to develop their peer social networks in comparison to the MA-match group. The limited linkages across settings in comparison to the other groups also contributed to a likely absence of truly close relationships. Indeed, there was far less involvement in play with playmates for children who had Down syndrome. This lower level of participation in dyadic play occurred even in what appeared to be ideal conditions (i.e., with regular playmates at their own home). The general absence of frequent

or disruptive conflicts may reflect this high comfort level. Taken together, although many factors are likely to be involved (e.g., time constraints due to participation in various therapies, despite a positive social orientation and other supportive circumstances), a major contributor to these peer social network limitations may well be underlying peer-related social competence difficulties. This concern is evident for the larger group of children with developmental delays and may well apply to children with Down syndrome (Guralnick, 2002; Wishart, 2007). Contemporary models suggest that many processes governing peer competence may be affected, including executive functioning and related higher order processes, emotion regulation, and knowledge components regarding play scripts and social roles (Guralnick, 1999a; Yeates et al., 2007). Future work, including observational studies carried out within a developmental framework, is needed to more directly examine all aspects of the peer-related social competence of children with Down syndrome.

Despite these peer social network limitations, based on age equivalent scores on the VABS, mothers of children with Down syndrome rated their child as having highly similar socialization skills to those of children in the MA-match group. This relative strength on the socialization dimension, particularly in contrast to communication levels, has been routinely reported (see Kasari & Hodapp, 1996). Nevertheless, the finding that the peer social networks of children with Down syndrome are, for many dimensions, not even as well-developed as those of children in the MA-match group is inconsistent with a perceived relative strength in the domain of socialization. This may be understood by the fact that the Vineland Socialization subscale consists of items representing more general aspects of children's social development (e.g., "plays very simple interaction games with others" or "shows interest in children or peers rather than sibling"). Items such as these tend to reflect more of a social orientation rather than the levels of peer competence required for in-depth (e.g., linkages) or higher quality (e.g., level of involvement) relationships with peers.

The characteristics of children's playmates constituting focal children's peer social networks, such as their developmental status, were of special interest because playmate characteristics can influence the quality and possible developmental

value of children's relationships. Most apparent was the fact that identified playmates were primarily typically developing even for children in the Down syndrome group. With respect to CA, a higher proportion of playmates of children with Down syndrome were younger in comparison to the playmates of the children in the MA- or CA-match groups.

Even with younger playmates, the MA discrepancy between children with Down syndrome and their playmates, the vast majority of whom were typically developing, likely influenced the extent to which the child was in control of the play. Specifically, in contrast to the typically developing groups, in which both children were judged to be in control in most instances (approximately 70% of the time), this was the case only less than half the time for children with Down syndrome. Yet, even for dyads involving children with Down syndrome, the fact is that both children were in control a reasonable proportion of the time (42.7%). This finding is important because it suggests that, despite substantial overall differences in MAs between the children in these dyads, a balance appears to exist in terms of social exchanges for many of the dyads. In fact, only 4 children with Down syndrome never had a play experience in which both children were judged to be in control. This balance is compatible with social interaction patterns likely to foster important aspects of children's peer-related social competence (Hartup, 1996). Moreover, there appear to be other types of advantages for children with Down syndrome as well as other children with peer-competence difficulties for interactions occurring when the playmate is in control with respect to the initiation and organization of play (see Freeman & Kasari, 2002). In this connection, our exploratory findings indicate that whether the playmate or both children were in control in dyads involving children with Down syndrome was unrelated to the quality of play, to the characteristics of children with Down syndrome (e.g., cognition or language level), or to playmate characteristics (e.g., age discrepancy). Perhaps other characteristics of the children or the dyad not measured in this study, such as similarity of interests or assertiveness, will be useful in predicting the level of control exerted by specific play partners in dyadic situations.

Finally, the mothers' role was evaluated based on measures of mothers arranging playdates and

the extent to which they assisted their child to play productively. For arranging, mothers in all three groups arranged playdates about half the time themselves, and only children in the CA-match group arranged playdates on their own in any substantial way. Importantly, mothers in all groups reported that they did not find it very difficult to arrange contacts for these playdates, although mothers of children in the MA-match group found it more difficult to do so than did mothers in the CA-match group. Even though 15% of mothers of children with Down syndrome did not arrange regular playdates at all, those who did were able to achieve frequencies of home visits for playmates similar to those of mothers of children in the two typically developing groups.

For the measures related to the extent of assistance provided by mothers, most differences occurred for comparisons between the Down syndrome and CA-match groups. In all instances, mothers of children with Down syndrome reported that they needed to do more to support their child's play with a playmate. However, mothers' reports of assistance were highly similar to the MA-match group for virtually all measures (e.g., help getting play started, help remaining involved). This finding may represent once again mothers' perceptions of their child's social development as a relative strength, thereby not requiring unusual levels of support on their part. Alternatively, it may be due to differing expectations about their role in supporting play with peers given the CA of their child. The fact that the children were regular playmates also may have contributed to mothers' willingness to allow play to occur with relatively little assistance. In contrast, for more cognitive aspects of play, as indicated by the understanding how to play measure, mothers of children with Down syndrome did report that, in comparison to the MA-match group, more assistance was needed. Future observational work should focus not only on the extent of assistance needed but the specific strategies employed by mothers as well. Additional measures of the type and complexity of play engaged in by the dyads would also provide useful information with respect to understanding mothers' support of their child's play.

In summary, many aspects of the peer social networks of children with Down syndrome, particularly their level of involvement in play with peers, linkages to other settings, and control of play were less well-developed even in compar-

ison to an MA-match group of typically developing younger children. Concerns with regard to network size were also noted. Consequently, our findings suggest not only an absence of any social advantage for children with Down syndrome in this realm of peer relationships but also the possibility that these children exhibit unusual peer social network difficulties. Future observational studies within a developmental framework are needed to identify any characteristic patterns of peer relationships for this group of children. Our findings further suggest that an important direction for this work would be to examine factors that most directly influence the ability of children with Down syndrome to maintain play with peers. This information will not only contribute to a better understanding of the peer-related social competence of children with Down syndrome, but also to the peer social network concerns identified in this study.

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