

Friendship in High-functioning Children with Autism Spectrum Disorder: Mixed and Non-mixed Dyads

Nirit Bauminger · Marjorie Solomon · Anat Aviezer · Kelly Heung · John Brown · Sally J. Rogers

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Abstract Friendships containing a child with autism and a friend with typical development (“mixed” friendships, $n = 26$) and those of children with autism and a friend with a disability (“non-mixed,” $n = 16$) were contrasted with friendships of typically developing subjects and their friends ($n = 31$). Measures included dyadic interaction samples, and interview and questionnaire data from subjects, friends, and parents. Mixed friendship interactions resembled typical friendships. Participants in mixed friendships were more responsive to one another, had stronger receptive language skills, exhibited greater positive social orientation and cohesion, and demonstrated more complex coordinated play than in the non-mixed dyads. Exposure to typical peers appears to have significant effects on friendship behaviors.

Keywords High-functioning children with ASD · Asperger syndrome · Friendship · Social-emotional functioning

Introduction

Friendship is a close, intimate, affective tie between children based on (1) reciprocal and stable (6 months and longer) social interactions with a peer (e.g., Dunn 1993; Hartup 1992; Howes 1983, 1988; Parker and Gottman

1989) and (2) on children’s companionship capabilities (e.g., Howes 1996). Three basic functions—Companionship, intimacy-trust, and affection—were found to be crucial criteria distinguishing friends from non-friends among older children during preadolescence and adolescence (e.g., Buhrmester 1990; Parker and Gottman 1989). The formation and maintenance of a satisfactory friendship is an interpersonal achievement built upon a foundation of interpersonal skills (e.g., the child ability’s to form affective bonding) and social cognitive skills (e.g., perspective taking—Theory of mind) (e.g., Burgess et al. 2006; Newcomb and Bagwell 1996; Parker et al. 1995; Rose and Asher 2000).

Research indicates a link between the quality of the parent-child attachment (secure/insecure) and the child’s friendships with peers; namely, securely attached children are able to form more harmonious, intimate, and responsive friendships compared to insecure children (e.g., Berlin and Cassidy 1999; Bowlby 1973; Grossmann et al. 1999; Lieberman et al. 1999; Park and Waters 1989; Sroufe and Fleeson 1986; Youngblade and Belsky 1992). What is learned in the context of the parent-child attachment relationship is thought to be generalized to certain types of other relationships, such as peer friendships (Bowlby 1973; Sroufe and Fleeson 1986). The characteristics of trust and intimacy that typify secure attachment in child-parent relationships set the base for the evolvment and expectations of similar qualities within friendship (Booth-LAforce et al. 2005; Schneider et al. 2001). Secure children also learn to interact in a cooperative and synchronous manner within the parent-child relationship, which can then be generalized to relations with peers (Youngblade and Belsky 1992). Furthermore, secure (versus insecure) children will be more capable of exploring their social environment, resulting in higher levels of social engagement with peers,

N. Bauminger (✉) · A. Aviezer
School of Education, Bar-Ilan University, Ramat-Gan 52900,
Israel
e-mail: bauminn@mail.biu.ac.il

M. Solomon · K. Heung · J. Brown · S. J. Rogers
Mind Institute, University of California at Davis, Sacramento,
CA, USA

which in turn enable them to build and foster their social skills. Indeed secure children versus insecure children found to be better liked by peers and to receive more positive behavior from peers (Jacobson and Wille 1986; LaFreniere and Sroufe 1985). Summarizing, security of attachment appears to be related to the child's overall social competency with peers as well as with his friendship qualities.

Friendship in children with autism spectrum disorder (ASD) is a neglected area of research, despite extensive clinical and theoretical speculation about its feasibility. Clinical evaluation virtually always identifies problems with reciprocal friendships with same age peers in children with ASD (APA 2000). Theoretical views of the core deficits in ASD also predict major difficulties in friendship, either due to difficulties in understanding other people's thoughts, desires, and feelings (i.e., theory of mind deficits) and/or due to lack of the basic ability to experience relationship-based emotions, leading to difficulties in developing affective closeness and intimacy (Hobson 1993, 2002, 2005; Kanner 1943; Tager-Flusberg 2001; Waterhouse and Fein 1997; Wimpory et al. 2000). Parents' reports have also demonstrated that friendship is indeed a rare phenomenon in children with ASD compared to those with typical development (e.g., Church et al. 2000; Howlin et al. 2004; Koning and Magill-Evans 2001; Orsmond et al. 2004). However, researchers have documented that high-functioning children with autism spectrum disorder (HFASD) in middle childhood and adolescence often have at least one friend, particularly for children with less impaired social interaction capabilities (e.g., Bauminger and Kasari 2000; Bauminger and Shulman 2003; Koning and Magill-Evans 2001; Orsmond et al. 2004). Furthermore, loneliness was reported in the absence of friendship in high-functioning children during preadolescence and adolescence (e.g., Bauminger and Kasari 2000). Nevertheless, except for the understanding that friendship is rare in ASD, we know little about its nature (e.g., characteristics, behavioral manifestations and friendship dyadic qualities). More specifically, we know little about differences in friendship as a result of whether the friend also has an ASD or is typically developing. The role of the partner in friendship is especially significant considering that many children with HFASD attend public schools and are in mainstream classrooms, resulting in many daily opportunities to interact with typical age-mates (Grenot-Scheyer et al. 1998).

Sigman and Ruskin (1999) have provided partial answers to questions about the influence of typically developing children on the social interaction of children with ASD. In their study, typical children were found to make social bids to children with autism. Children with ASD exposed to typical peers on the playground were

found to engage in a higher level of social interaction, and in less frequent non-social play than children who had no such exposure (differences remained after controlling for language differences). This finding, however, is inconclusive, because the children's higher social involvement may correspond more with their level of functioning than with their exposure to typically developing children's social strengths and characteristics.

Bauminger et al. (2003) examined differences in social interaction of children with HFASD interacting with a typical peer and with a peer with HFASD. Overall, a higher frequency of social initiations and responses were directed toward typical peers versus non-typical peers, specifically in behaviors such as physical proximity, functional communication and combination of eye contact and a smile. It should be noted that, although a clear overall effect was found for children's tendency to interact with typical peers compared to those with HFASD, group differences between these two types of interactions were not statistically significant for the majority of specific behaviors tested (e.g., eye contact, smile with no eye contact, sharing), highlighting their similar frequency in social interactions.

Differences between mixed (HFASD and typical peer) and non-mixed (HFASD and a peer with a disability) friendships have been tested in one study, which was based on parental (mainly mothers') reports (Bauminger and Shulman 2003). Fourteen mothers of children with HFASD described their children's friendship (mean CA = 10.45; $SD = 2.57$), range: 8.25–17.10, years/months). Seven mothers reported that their child with HFASD has a friend with a disability and seven mothers identified a friend with a typical development, thus the sample was equally divided between mixed and non-mixed friendships ($n = 7$, in each group, 50%). Descriptive analysis of mother's reports of their children's friendship depicted several commonalities between mixed and non-mixed friendships. Both lasted for similar duration (19.6 months, for non-mixed and 23.7 months for mixed); and involved friends of the same gender (except for one dyad in each friendship type) and a similar age (except for three children in non-mixed, two had older friends and one had a younger friend; and two children in mixed who had younger friends). Mothers were also asked to describe the types of activities in which their HFASD children and their friends were jointly involved. The most frequent joint activity reported by mothers for non-mixed friendship was playing board games ($n = 6$, 85.7%). Talking together (also by phone) was reported for three children (42.8%). Playing on the computer and watching video and/or TV was each reported for two children (28.5%). Playing pretend play or ball games each appeared only once. For the HFASD children in mixed friendship, the most common activity identified by mothers

was watching video and/or TV together ($n = 5$, 71.4%). Four children in mixed friendship played on the computer (57.14%), and two pairs (28.5%), each played board games, ate together, and played ball games. In sum, HFASD children and their friends in non-mixed friendship mainly played board games, whereas, children with HFASD and their friends in mixed pairs tended to watch video and/or TV and play on the computer.

Altogether, several similarities and differences have been found between mixed and non-mixed dyads in HFASD. However, our knowledge of these two friendship types is still very limited due to the fact that two studies have examined social interaction and not friendship, and the one study that examined friendship was based solely on maternal reports and not on observation of children's interactions with their friends. A major aim of current study was to explore the nature of friendship in mixed and non-mixed friendships through direct observation of HFASD children's interactions with their friends. We also compared these two friendship types to typical friendships to demonstrate how similar or different these two friendship types are to normative typical friendships. Support of hypotheses concerning differences between mixed friendships and typical friendships (friendships between two children with typical development) were found in Siperstein et al. (1997), including children with learning difficulties. Based on reciprocal nomination ("kid you like and consider to be a friend" or express preference as playmate); Siperstein et al. examined differences in the quality of interaction between mixed (a child with typical development and a child with learning difficulties) and normative friendships (two children with typical development), while children were engaged in a non-competitive play task. Mixed friendships were marked by limited collaboration and shared decision making, a low level of cooperative play and shared laughter, and an asymmetrical, hierarchical division of roles versus typical friendships.

The second aim of the current study was to explore developmental and social-emotional characteristics of children with HFASD in mixed and non-mixed friendships. Individual differences in friendship for children with ASD have not been examined, thus literature describing characteristics considered important for friendship formation in general may guide our thinking regarding HFASD children who form a friendship with a typical peer. First, based on the literature on typical development, similarities in gender, age, and developmental level of play (the likes-attract hypothesis, choosing a friend that is similar to self, e.g., Farmer and Farmer 1996), were believed to be important factors in friendship development (Gottman and Parker 1986; Hartup and Sancilio 1986). Second, data on children with disabilities (not specifically autism) have shown that the more able the child is in terms of social skills and

overall developmental level (e.g., more extroverted, more assertive, more expressive, more verbal, higher IQ scores), the greater was the child's likelihood of having friendships (e.g., Buysse 1993; Field 1984; Siperstein and Bak 1989; Strain 1984). Third, based on data from autism research, variables that relate to peer engagement or friendship including cognitive abilities (Hauck et al. 1995; Sigman and Ruskin 1999), emotional understanding (e.g., Hauck et al. 1995); language abilities (Sigman and Ruskin 1999); and better social interaction skills (Orsmond et al. 2004) may be important. Less severe ASD symptoms and higher cognitive capabilities have been also found to predict secure attachment in children with ASD (Rutgers et al. 2004). Security of attachment is linked with more mature friendship qualities as well as with overall social competency with peers (e.g., Booth-LaForce et al. 2005). Thus, it may be that children with HFASD who are secure attached to their caregivers will be more likely to form friendships with typical peers (mixed friendships) compared with insecure children with HFASD. Since friendship with a typical peer is probably requires higher social competency (in adjusting to the social competency level of the child with typical development) compared with friendship with another child with HFASD. In addition, friendships are reciprocal in nature, and thus require a set of complex and comprehensive reciprocal capabilities such as consideration for and awareness of the other child's emotions, desires, intentions, and thoughts—Theory of mind capabilities (ToM) (Asher et al. 1996). Thus, better ToM skills are also considered important characteristics of friendship (Lemerise and Arsenio 2000). In sum, based on the literature just described, it may be that children with HFASD with higher language capabilities, and more mature social-emotional functioning, including ToM, security of attachment and emotional understanding will be more likely to have a typical peer as a friend.

The current study has two overall aims. First, it investigates differences and similarities in mixed HFASD friendships, non-mixed HFASD friendships and friendship of children with typical development in terms of friendship characteristics; observed friendship manifestations (i.e., behaviors, verbalizations, and affects), and observed dyadic components. Second it examines differences within the HFASD group between child characteristics in mixed and non-mixed friendship in terms of developmental (CA, VIQ, and ADI-R subscale) and social-emotional characteristics (attachment, ToM, and affective recognition). We hypothesized there would be several similarities between mixed and non-mixed HFASD friendship with respect to duration, and partner's age and gender. However, based on data from peer interaction studies, we predicted more complicated social behaviors, such as sharing, coordinated play and social conversation in mixed versus non-mixed

friendship dyads. In a like manner, we predicted more mature developmental and social-emotional functioning for target children in mixed friendships versus target children in non-mixed friendships. Differences between mixed, non-mixed HFASD friendship and friendship of children with typical development have not yet been well studied in ASD and, thus no hypotheses are offered.

Methods

Participants

Current study participants were involved in a larger binational project focusing on the examination of social relationships in HFASD. The larger project included a group of HFASD and a control group of typically developing children, matched for chronological age (CA), Verbal IQ (VIQ), gender and mother's education. Due to our focus in differences between mixed and non-mixed friendship in autism, two mothers from the HFASD larger study group could not identify the type of friend (typical or disabled), thus, we took these two children out of current study sample. Based on our matching criteria (e.g., CA, VIQ, gender, and mother education) and based on the fact that we required the control group to be formed with friendship between two children with typical development, we also took out seven typically developing children, who had disabled friends. Altogether, 146 children and their friends participated in the study. Target children ($n = 42$, two-girls) were HFASD children from two nations ($n = 23$, Israel, $n = 19$, USA) and children with typical development (TYP) ($n = 31$, two-girls; 21 = Israel, $n = 10$, USA). The other 73 children were the target children's friends (see below).

Inclusion criteria were: (1) CA between 8 and 12 years; (2) a VIQ of 80 or above; (3) normative reading comprehension level based on the reading subtest of the Wide Range Achievement Test 3 (WRAT 3 Wilkinson 1993) for the USA sample and on the *Ma'akav* (Shany et al. 2003) for the Israeli sample; and (4) an identified friend of at least 6 months that included spending time together outside school time (based initially on mother report and later, during data collection, verified by the target child and his friend).

HFASD Groups

Diagnostic criteria for the HFASD children in Israel included prior clinical diagnosis based on the *DSM-IV*; American Psychiatric Association (1994) and a verification of clinical diagnosis by the Autism Diagnostic Interview-

Revised (ADI-R; Lord et al. 1994). Diagnostic criteria for the HFASD children in the USA were based on the ADI-R (Lord et al. 1994) and on the Autism Diagnostic Observation Schedule-Generic (ADOS-G; Lord et al. 1999). Altogether, participants in Israel included nine (39%) children with HF autism and fourteen (61%) children with Asperger syndrome. The USA sample included seven HF children with autism (31.5%) and 13 (68.5%) with Asperger Syndrome. In the USA, on the ADOS-G, all children met criteria for either autistic disorder ($n = 11$) or ASD ($n = 9$). The two national HFASD groups were matched according to gender (one girl in each national group; VIQs ($M = 105.96$, $SD = 9.96$, Israel; $M = 105.95$, $SD = 16.31$, USA); and maternal education ($M = 4.74$, $SD = 0.96$, Israel; $M = 5.00$, $SD = 0.76$, USA), Univariate ANOVAS were non-significant for site differences in VIQ and maternal education.

The primary distinction between HF autism and Asperger pertained to the presence of significant language delay before the age of 3 years. The decision to include children with autism and those with AS was based on the shared social characteristics for both populations, during middle childhood (see, for example, Frith 2004; Krasny et al. 2003; Macintosh and Dissanyake 2004; Paul 2003; Solomon et al. 2004).

Mixed and Non-Mixed Dyads

We divided the overall ($n = 42$) HFASD group into two main groups according to whether the friend was a child with typical development (mixed friendship) or whether the friend had a disability (non-mixed friendship). Sixty-two percent of the HFASD group formed the mixed friendship group ($n = 26$) and 38% ($n = 16$) of the overall HFASD group formed the non-mixed friendship group.

Friends' Selection

We used a multidimensional system to define friendship in current study for the HFASD and TYP groups. The first step was at the recruitment stage: A short phone interview was performed with the mother verifying that her child has mutual friendship for at least 6 months. We then asked the mother questions such as: If her child expresses preference for the selected friend, if they like playing, or spending time together, if they meet at home in addition to school, if her child talks about this friendship at home or expresses affection for that specific child. The second stage was at the point of data collection. After completion of the observation on children interaction, each child was assigned to a different room for completion of other measures that were

not the focus of current study. However, at that time we asked the two children if they are friends, for how long, if they like each other, what they usually do together when they meet, what they talk about when they meet, and how they feel when they are with each other. Through this process we verified mother selection of her child's friend. One pair at the Israeli sample was dropped out from our data due to a seemingly contradiction between mother and child/friend report.

Friends of HFASD

Each target HFASD child participated in the study with an identified friend, comprising 42 friends altogether. Friends in the mixed friendship group included: 17 boys, 9 girls, mean CA = 117.57 months ($SD = 17.67$; range = 86–145). Friends in the non-mixed friendship group included: 15 boys, 1 girl, mean CA = 113.12 months ($SD = 14.06$; range = 96–144). Most of the friends were HFASD ($n = 11$, 69%), four friends had ADD (25%) and one (6%) had mild CP, they all studied in regular education classes with no specific teaching assistant. Overall, in both friendship types (mixed-non-mixed) the majority of children had friends in their own age range (within 1 year), except for two pairs in the mixed dyads (in one pair the child with HFASD was older than his friend and in the other pair the child with HFASD was younger than his friend); and three pairs in the non-mixed dyads, in all three pairs the child with HFASD was older than his friend.

TYP Groups

The HFASD groups were matched to TYP groups from each nation on maternal education, VIQ (based on Peabody Picture Vocabulary Test—PPVT; Dunn and Dunn 1997), CA, and gender (see Table 1). The two national TYP groups were matched according to gender (one girl in each national group; VIQs ($M = 111.86$, $SD = 5.83$, Israel; $M = 108.78$, $SD = 11.86$, USA); and maternal education ($M = 4.55$, $SD = 1.35$, Israel; $M = 5.00$, $SD = 1.22$, USA), Univariate ANOVAS were non-significant for site differences in VIQ and maternal education.

Friends of TYP

The friends of the TYP participants included: 28 boys, 3 girls, mean CA = 121.58 months ($SD = 17.15$; range = 89–144). Overall, the majority of children had friends in their own age range (within 1 year), except for two dyads,

for one pair, target child was older than his friend and in the second pair target child was younger than his friend.

Measures

The current study utilized a multidimensional assessment battery including: Observation of children's interactions with their friend during two experimental scenarios (construction and drawing); self-reports to assess attachment; semi-structured tasks to evaluate ToM and affective recognition; and an interview with the target child's mother to obtain general information about her child's friendship. A short interview with target child and his friend was also conducted to verify their friendship.

Measures: Friendship Observation

Two Friendship Experimental Scenarios: Construction Game and Drawing

Children (ASD and TYP) were invited to come to the laboratory with an identified friend. Each dyad was observed and videotaped during a 40-min session while participating in two different non-competitive tasks: The "construction game" scenario and the "drawing" scenario. The construction game scenario followed Siperstein et al. (1997) procedure for the assessment of behavioral manifestations of friendship during task performance. This procedure was successful in differentiating friendship behaviors in children with and without learning disabilities (Siperstein et al. 1997). In this scenario, children were provided with a non-competitive construction game—Discovery Toys' Super Marbleworks® Raceway Construction Set. Children were instructed to construct a shared design (a marble maze) while using ramps, connectors, funnels, and tunnels. After completion, children could roll the marbles down and through the maze.

To assess a longer duration of interaction and to provide the children with a less structured activity option, a drawing scenario was also included. In this scenario, children were given a box of colored markers, magazines, scissors, glue, and stencils and a large blank sheet of paper. As in the construction scenario, children were asked to draw a shared design. Order of administration of the construction game and shared drawing scenarios was counterbalanced for all study participants.

Children's videotaped interactions with their friend were assessed using two coding scales to tap target children's friendship manifestations and dyadic components. These two scales and coding procedure are fully described in details in (N. Bauminger et al., unpublished data). Thus,

Table 1 Means and standard deviations for developmental and social-emotional characteristics of target HFASD children in mixed, non-mixed friendship and children with typical development

	HFASD					
	Mixed (<i>n</i> = 26)		Non-mixed (<i>n</i> = 16)		Typical (<i>n</i> = 31)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
CA (month) ^a	121.96	14.27	118.81	16.88	124.48	15.15
Verbal IQ ^b	110.23	11.53	99.00	12.64	110.93	8.02
Mother ed. ^c	4.68	0.94	5.12	0.72	4.69	1.31
ADI-S	17.84	4.08	19.19	4.30		
ADI-C	14.60	4.57	14.69	4.25		
ADI-B	6.12	2.45	5.25	1.80		
Attachment	46.30	6.16	45.12	7.34		
<i>Affective recognition</i> ^d						
Basic	75.29	20.91	81.80	17.25		
Complex	73.06	20.65	80.11	13.54		

^a CA, VIQ and Mother education between the overall HFASD group and TYP, ns

^b Verbal IQ scores are based on the Peabody Picture Vocabulary Test

^c Mother's education was calculated on a six-point scale (1 = <8th grade; 2 = some high school; 3 = high school with diploma; 4 = some college; 5 = college degree (e.g., BA); 6 = graduate degree (e.g., masters or above)

^d Affective recognition is calculated in percentages

we will only briefly focus on the main coding category in current paper.

Observed Friendship Manifestations in Target Children

The first scale, the Friendship Observation Scale (FOS) (Bauminger et al. 2005), was an interactional coding system designed to assess minute-by-minute and global evaluations of manifestations of friendship in the target child, including behaviors, verbalizations, and affects identified as indicators of friendship by previous research (e.g., Asher et al. 1996). The FOS was adapted from the procedure used by Siperstein et al. (1997) to assess friendship manifestations during a construction game among children with and without learning disabilities. The FOS (see Appendix for details) included two main scales: (1) positive social interaction; and (2) global evaluation scale.

1. *Positive social interaction scale.* This scale comprised 21 indices in seven main categories: (a) *goal-directed behavior* (e.g., cooperative task oriented behaviors); (b) *sharing behaviors* (e.g., experiences, emotions); (c) *pro-social behavior* (e.g., comforting, helping); (d) *conversation* (e.g., small talk, negotiation); (e) *non-verbal interaction* (e.g., eye gaze and a smile); (f) *affect* (e.g., shared laughter, positive affect); and (g) *play* (parallel, social, and coordinated play and unoccupied). This last scale was utilized only for the construction game scenario, because the drawing scenario was not a shared game, but a

shared activity. The presence of each friendship index in each of the seven categories was assessed once per minute during a total of 40 min of observation time. The number of observations in which a friendship index was detected was summed separately for each of the seven categories. Thus, a higher score in a particular category indicated a higher quantity of positive social interactions for that category. **Coding.** Two blind observers were trained to code the positive social interaction indices using videotapes of friendship dyads that were not associated with the current project. An inter-observer agreement level of 90% or higher was obtained for all items on the final scale. Coders then worked independently, checking ongoing inter-rater reliability by jointly coding 25% of the sample, randomly selected between the HFASD and TYP groups, obtaining mean agreement level on the seven main categories of the FOS positive scale of 93% (range: 84–100%). Then each of them coded the remaining sample, randomly selected between groups and across nations.

2. *Global evaluation scale.* This scale included a global evaluation of the target child's friendship manifestation during the whole scenario (construction game and drawing), in five main categories. Three of these categories (reported here) were coded for the target child only, and the other two categories were coded for the dyad together (reported below, in the section on dyadic relationships). The FOS's global evaluation target child scale included: (a) *Role-related behaviors*, rated on a seven-point scale ranging from *Child follows peer* (1) to *Child makes major*

decisions throughout activity (7); (b) *Conversational flow*, evaluated child's speech according to its fluency, intonation, rhythm, and expressivity, rated on a six-point scale ranging from poor fluency, intonation, rhythm and expressiveness (1) to high conversational flow scores (6); and (c) *Social conversation*: Assessed the to and fro use of words and phrases in social conversation, rated on a three-point scale ranging from *No social conversation at all* (1) to *Child is able to continue a social conversation and develop it pertaining to what was said* (3). **Coding.** At the end of their minute-by-minute coding for the positive social interaction scale, the same two coders evaluated the global scale, following the same training procedure as described above. They obtained an agreement level of at least 90% for the shared 25% videotapes on each of the global FOS categories.

Observed Dyadic Components. Two instruments were used to assess dyadic components during this study's construction game and shared drawing scenarios: the Dyadic Relationships Q-Set and the aforementioned FOS-dyadic scale.

1. Dyadic Relationships Q-Set (DRQ). The 55-item DRQ (Park and Waters 1989) was used to evaluate dyadic behavioral dimensions. These 55 items were sorted in a fixed distribution into seven piles, with a 5-7-9-13-9-7-5 distribution. The seven piles, in forced-choice format, ranged from *Least characteristic behavior* (pile 1) to *Most characteristic behavior* (pile 7) for each dyad. A score for an item equaled the pile in which it was placed (e.g., an item in pile 3 received a score of 3). The 55 items were grouped into the following seven *dyadic relationship dimensions*, which described the quality of interactions among friends: *Positive social orientation* (e.g., "partners express enjoyment at playing together"); *cohesiveness* (e.g., "when one partner moves away, the other moves in coordination"); *harmony* (e.g., "offers and suggestions guide dyadic play"); *responsiveness* (e.g., "partners endorse each other's attitudes and activity preferences"); *coordinated play* (e.g., "partners work together to produce more complex or organized play than either would engage in alone"); *control* (e.g., partners grab and take things from each other"); and *self-disclosure* (e.g., "partners share secrets"). The self-disclosure dimension in the current study rarely emerged; therefore, we removed it from our analyses. **Coding.** Agreement between two observers is tested by correlating the observers' scores, where sorters are variables and items are cases (Waters and Deane 1985). Two new blind coders to group status were trained to code the DRQ on videotapes of friendship dyads not associated with the current project, with an (*r*) ranging between 0.70 and 0.90. These two coders coded all the videotapes, and the mean of the two observer scores was used as the variable of interest.

2. FOS dyadic categories of global evaluation scale. The FOS global evaluation—Dyadic scale, included two categories: (a) *Shared fun*, rated on a three-point scale: *Not having fun at all* (1), *Working on the task equaled the social interaction in importance* (2), and *Social interaction was more important than the task* (3); (b) *Affective closeness*, rated on a five-point scale ranging from *Very few or no signs of closeness* to *Very close and intimate friendship* (5).

Measures: Self-report

Child's Attachment Measure

To tap children's attachment quality, we utilized the Kerns Security Scale (KSS) (Kerns et al. 1996, 2001), the most widely used self-report for children in middle childhood that provides a continuum of security scores among individuals. This scale was also successfully implemented with children with learning disability (Bauminger and Kimhikin, in press). The frequency and intensity of attachment behaviors decline across childhood, and the child's perception of parents' availability becomes a more salient characteristic of attachment in middle childhood; thus, self-reports seem more apt to tap attachment quality in this age group. KSS items are intended to reflect those aspects of attachment (e.g., availability, reliance) that are thought to reflect security of attachment in the middle childhood years.

The KSS is a 15-item, forced-choice, self-report measure that was designed to evaluate children's perceptions of security in mother-child and father-child relationships in middle childhood. Items on the security scale tap the following: (a) The degree to which children believe a particular attachment figure is responsive and available (e.g., whether a child worries that a parent will not be there when needed); (b) The children's tendency to rely on the attachment figure in times of stress (e.g., whether a child goes to the parent when upset); and (c) children's reported ease and interest in communicating with the attachment figure (e.g., whether a child likes to tell a parent what she or he is thinking and feeling). Items are rated on a four-point scale using Harter's (1982) "Some kids...Other kids..." format. For example: "Some kids find it easy to trust their mom BUT other kids are not sure if they can trust their mom;" "Some kids feel like their mom really understands them BUT other kids feel like their mom does not really understand them." Children are asked to indicate which statement is more characteristic of them and then indicate whether this statement is really true for them or somewhat true. Scores across items are summed so that children receive a score on a continuous dimension of

security, with higher scores indicating more secure attachment. Also, Kerns et al. (1996) have suggested a cut-off score of 45 for the differentiation of secure and insecure attachment style. A score of 45 and below reflects an insecure attachment style, whereas a score above 45 reflects a secure attachment style.

The KSS has good internal consistency for mother-child and for father-child security perceptions (Cronbach alpha of 0.79 and 0.87, respectively), and a high test-retest correlation over a short time interval, $r(30) = 0.75$, indicating stability in children's perceptions of security over a short period of time (Kerns et al. 1996, 2001). Efforts to validate the instrument have examined how children's security scores are related to concurrently administered projective measures of attachment. Child security scores have been significantly correlated with ratings derived from the Separation Anxiety Test (SAT, Resnick 1993), a projective interview that taps children's state of mind with respect to attachment. Security scores were related to both the ratings and classifications from the SAT; for example, children who reported greater security to mother were less dismissing and had more coherent discourse during the SAT interview (Contreras et al. 2000; Kerns et al. 2000). In a different study, children's security scores were significantly related to secure classifications and ratings obtained from an attachment-doll interview measure (Granot and Mayseless 2001). In the current study, we used the Hebrew version of the KSS (Granot and Mayseless 2001) for mother-child relationships, Cronbach α coefficients = 0.70

Measures: Semi-structured Tasks

Theory of Mind-second Order False-belief Attribution Task

The Perner and Wimmer (1985) "ice-cream van story" was implemented in the current study to assess second order false-belief attribution. It is a widely used task to assess ToM-second order capabilities. The story assesses child's recognition (belief questions) and understanding (justification question) of false belief about another's mental state. The story starts when John and Mary are in the park and see an ice-cream man coming to the park. John wants to buy an ice-cream, but does not have money. The ice-cream man tells John that he can go home and get money, because he is planning to stay in the park all afternoon. Then John goes home to get money. Now, the ice-cream man changes his mind and decides to go and sell ice-cream in the school. Mary knows about that and she also knows that John could not know that (e.g., John already went home). In his way to the school the ice-cream man passes John's house. John sees him talk to him and learns that the ice-cream man goes to school to sell ice-cream. Mary at

that time was still in the park, thus could not know that they have met. Then Mary is looking for John in his house and his mother tells Mary that John has gone to buy an ice-cream. The *belief* question: "Where does Mary think that John has gone to buy an ice-cream?" is coded for pass-a score of 1 ("the park") or fail-a score of 0 (any answer but the park). The *justification* question ("why?") is coded for three levels: (a) Belief-location (a score of 1): Reflected the initial location of the ice-cream man (e.g., "because the ice-cream was *at the park* in the beginning of the story; (b) belief-information (a score of 2): Responses that included information that was nested within a belief (e.g., "Mary *heard* that John and the ice cream man were suppose to meet at the park; and (c) belief-belief (a score of 3): The highest level of attribution in which the child is able to articulate the other child's thinking process (e.g., Mary still *thinks* that *John thinks* the ice-cream man is in the park") (based on Perner and Wimmer).

Emotional Recognition

The Affective Matching Measure (Bauminger et al. 2005; adaptation of Feshbach 1993) assessed children's ability to recognize emotions from their social context. The child was shown 12 different pictures depicting social scenarios of eight different emotions: One picture for each of the four basic emotions (happiness, sadness, anger, and fear) and two different pictures for each of the four complex emotions (embarrassment, loneliness, guilt, and pride). In each picture, one of the figures (a child) was presented without facial expression; therefore, the picture's social context provided the clues for participants' identification of the appropriate emotion. Children's answers were coded according to: Accuracy of emotion identification: 0 for incorrect identification (e.g., sad instead of happy); 1 for an emotion with the same hedonic tone (e.g., angry instead of sad); 2 for correct identification.

Two coders coded 40% of children's answers on the ToM and Emotion recognition measures, randomly selected between mixed and non-mixed dyad and obtained 100% interrater agreement on the justification and accuracy.

Measures: Mother Interview

Mother Interview

Based on a friendship interview with the target child's mothers, we obtained information on the friend's disability status ("does XXX have any disability? if yes, can you define disability type?"), on friendship duration

(in months) (“how long have the children been friends, in months”), friend’s frequency of meetings (“how often does your child and his friend meet after school”), calculated on an eight-point scale where *Meeting less than once a week* received a score of 1, and 2–8 represented meeting frequency during the week (i.e., 2 = once a week; 3 = twice a week, up to 8 = seven times a week); and a general evaluation of the mother of friendship’s stability (“is this friendship stable and continuous or unstable?”), calculated on a two-point scale, one for non-stable friendship, two for stable friendship.

Other Measures

Reading tests. Because some of the measures involved questionnaires, we administered reading tests to assure that children had sufficient reading ability to complete the forms. The American children completed the reading subtest of the Wide Range Achievement Test 3 (WRAT 3 Reading; Wilkinson 1993) Israeli children completed the *Ma’akav* (Shany et al. 2003). Each is a standardized measure of decoding and comprehension with national norms and acceptable psychometric properties. All children who participated in the study passed the tests, validating their adequate reading capabilities.

Peabody Picture Vocabulary Test Third Edition (PPVT-III; Dunn and Dunn 1997). We administered the PPVT to all target children in their native language in order to have a brief assessment of children’s verbal language ability. The PPVT is a well standardized, widely used assessment with strong psychometric properties. Scores correlate very highly with multiple other measures of general language ability and cognitive ability (Sattler 1988).

Procedure

Data collection was identical in both national sites. Families and children were recruited from past research studies, schools, autism associations and mailers. A very detailed study protocol was composed that included written instructions for the study measures and experimental scenario performance. All data coding procedures were executed in Israel and included coders who were fluent in both Hebrew and English. After obtaining written parental consent for participation, we advised parents about the research by telephone, and we arranged meetings for families. We interviewed the mother by phone about her child’s friendship. We requested that her child’s friendship be of at least 6 months’ duration and include spontaneous meetings between the friends outside school time. We also obtained permission and informed consent from each

friend’s parents and each target child’s parents, as well as consent from all the children. Research data were collected in each PI’s laboratory, one in the MIND Institute at UC Davis (Rogers), and the other at the School of Education, Bar-Ilan University (Bauminger).

The research session included the target child, his/her friend, and the target child’s mother. First, we executed the experimental friendship scenarios, counterbalanced between construction and drawing. Next, we assigned each child (target child and friend) to separate rooms for completion of the attachment, ToM and affective recognition measure. Inasmuch as this study comprised part of a larger study, the current participants completed several questionnaires and tasks beyond the focus of the current report; however, the order of study measures was counterbalanced for all subjects. We implemented a broader assessment battery with the target child and a short friendship interview with the friend (verifying friendship reciprocity with the friend). While children were performing the construction and drawing scenario, the target child’s mother was completing questionnaires (e.g., demographic) and the short friendship interview.

Results

Preliminary Analyses

In order to strengthen our theoretical decision to combine our clinical sample comprised of children with HF autism and children with Asperger syndrome (AS) into one HF/AS sample, we executed 2 (mixed-non-mixed) X 2 (HF/AS) Multivariate (MANOVAs) and Univariate (ANOVAs) analyses of variance for all our study measures, including the: FOS: positive, play and global subscales; DRQ: Positive social orientation, harmony, cohesiveness, responsiveness, coordinated play and control; friendship characteristics including friendship duration and frequency of meetings; Target child’s CA; VIQ; ADI; attachment and emotion recognition. Our results did not reveal significant main effect for HF/AS or for the interaction of mixed-non-mixed X HF/AS for any of these measures. Additional Chi Square analyses for the examination of differences between HF/AS for TOM and for stability of friendship revealed non-significant results. Thus, all of our following analyses regarded the two clinical samples as a unified sample.

Our second preliminary examination included nationality (USA/Israel) differences for all study measures. This examination yielded very few significant differences that included: Frequency of meetings in friendship characteristics; Affective closeness during construction on the FOS global dyadic scale; and on four of the DRQ subscales, including: Positive social orientation, cohesiveness,

harmony, and control. Thus, for these variables we performed a 2 (friendship type: Mixed-non-mixed) X 2 (nationality) analyses. For all other study measures we combined the two nations into one sample.

Throughout the results section we provided η^2 -values to indicate effect size, η^2 of 0.06 and below is considered low; η^2 between 0.06 and 0.10 is considered as medium effect size and η^2 of 0.11 and above is considered as high effect size.

Friendship Type Differences in Individual Child and Friendship Characteristics

This section reports results about *friendship type* (mixed and non-mixed dyads) differences in individual child characteristics involving the target HFASD child's developmental (CA, VIQ, ADI-R) and social-emotional (attachment style, affective recognition, and ToM) characteristics. The second section examines group differences (HFASD: Mixed and non-mixed, and TYP) on: (a) Friendship characteristics: Duration, frequency of meetings and stability; (b) observed friendship manifestations (focusing on target child's behavior while interacting with friend); and (c) observed dyadic components (focusing on the dyad).

Individual HFASD Child Characteristics in Mixed and Non-mixed Friendship

Results of the ANOVAs for the examination of *friendship type* (mixed, non-mixed) differences in CA ($F(1,40) = 0.42, p > 0.05, \eta^2 = 0.01$) and VIQ were significant only for VIQ [$F(1,40) = 8.73, p < 0.01, \eta^2 = 0.18$]. Target children in mixed dyads had higher scores than those in non-mixed dyads. Results of the MANOVA for the examination of friendship type differences on autism symptom severity using ADI-R yielded non-significant effect [$F(3,37) = 0.34, p > 0.05, \eta^2 = 0.08$] (mean and SDs are reported in Table 1).

Next, we examined friendship type and target child's social-emotional characteristics: Attachment, Affective Recognition and ToM. First we examined differences on the continuous *security of attachment* score using ANOVA on the child's KSS attachment scale score. Friendship type effect was non-significant [$F(1,40) = 0.31, p > 0.05, \eta^2 = 0.00$]. Children in both mixed and non-mixed friendships revealed similar levels of security of attachment (see Table 1), with mean scores above the cut-off score of 45, indicating secure attachment characteristics according to the KSS (Kerns et al. 1996). Second, the MANOVA that was calculated for the examination of

children's capabilities in *emotional recognition* (basic/complex) was not significant [$F(2,38) = 0.38, p > 0.05, \eta^2 = 0.05$]. Children in both friendship type groups revealed similar (high) level of affective recognition for basic and complex emotions (see Table 1). Third, 65% (17 children of 26) of the children in the mixed friendship passed the *belief* questions on the *ToM-false belief test*, compared to 44% (7 of 16) of the children in the non-mixed group, Chi-Square analyses was non-significant [$\chi^2(1,42) = 1.89, p > 0.05$]. Non-significant difference between HFASD in mixed and non-mixed dyads found also for the justification question [$\chi^2(3,42) = 4.95, p < 0.05$].

Between Group Differences: HFASD: Mixed and Non-mixed and Typical Friendships

Characteristics of the Friendship: Frequency, Duration and Stability

The 3 (group: HFASD-mixed, HFASD-non-mixed, typical friendship) X 2 (nation) MANOVA for differences in characteristics of friendship (friendship duration, frequency of meetings) was significant for group effect, [$F(4,66) = 5.27, p < 0.001, \eta^2 = 0.14$] and for nationality effect [$F(2,66) = 4.42, p < 0.05, \eta^2 = 0.09$]. Univariate ANOVA for group differences was significant for both frequency [$F(2,67) = 7.71, p < 0.001, \eta^2 = 0.19$] and duration, [$F(2,67) = 3.99, p < 0.05, \eta^2 = 0.11$]. The examination of group differences in frequency using Scheffe post hoc analyses test yielded a significant difference between the two clinical groups and the TYP group. Children in the TYP group had more *frequent meetings* with their friends ($M = 2.64, SD = 1.05$) than children in the HFASD mixed ($M = 1.81, SD = 1.02$) and non-mixed ($M = 1.50, SD = 0.89$) groups. Scheffe post hoc analyses for group differences in *duration* yielded significant differences only between the HFASD non-mixed group and the TYP group, with TYP friendship revealing longer duration ($M = 53.19, SD = 37.90$) compared to non-mixed friendship ($M = 27.56, SD = 0.2164$). Univariate ANOVA for nationality differences was significant only for frequency of meetings [$F(1,67) = 4.42, p < 0.05, \eta^2 = 0.06$] with children in the Israeli sample meeting more frequently with their friends ($M = 2.36, SD = 1.05$) than children in the USA sample ($M = 1.69, SD = 1.07$). Friendship *stability* (one-non-stable, two-stable) also differed between the three groups, with higher percentages of dyads in the mixed group revealing stable friendship versus the non-mixed group (92.3%, $n = 24$; 62.5%, $n = 10$, respectively, Fisher exact test, $p < 0.05$); and differences in stability between the TYP and non-mixed group approached significance (87%, $n = 27$; 62.5%, $n = 10$, respectively,

Fisher exact test, $p = 0.06$). Differences in stability between the TYP and mixed friendship group were non-significant.

Observed Friendship Behaviors in the Target Children

Friendship behaviors during the construction game and the shared drawing scenarios (based on the FOS) involved two main aspects: (a) Minute-by-minute positive social interactions; and (b) global evaluations of child's role in the interaction (leader or follower) and of child's conversational capabilities (flow and social conversation). In addition, only for the construction scenario, we examined (c) children's play skills.

1. Positive social interactions. A 3 (group: Mixed, non-mixed, TYP) \times 2 (scenario type: Construction game/drawing) MANOVA with repeated measures on scenario, was computed to examine group differences on the following positive social interaction categories (based on the FOS): Goal-directed behaviors; sharing, prosocial behaviors; conversation skills; non-verbal positive interaction; and positive affect. The MANOVA results were significant for group, $[F(6,64) = 5.53, p < 0.001, \eta^2 = 0.34]$ but not for the interactions group \times scenario. Univariate ANOVAs for group differences were significant for all behaviors but conversation. As can be seen in Table 2, Post Hoc Scheffe analyses demonstrated lower functioning for the non-mixed group compared with children in the TYP group on goal oriented capabilities, sharing, non-verbal positive interaction, and positive affect. The mixed friendship group was higher compared with the non-mixed on goal oriented behaviors and on positive affect and did not differ from the TYP group on any of the positive social interaction scale.

2. Play scale. Group differences for the target children's play skills (parallel, social, coordinated, and unoccupied) during construction only were examined by using MANOVA. Results yielded a significant group type effect, $F(4, 67) = 10.63, p < 0.001, \eta^2 = 0.39$. Univariate ANOVAs yielded significant differences on parallel play and coordinated play. Post Hoc Scheffe analyses revealed that target children in mixed friendship and in the TYP group revealed less parallel play and more coordinated play compared with target children in non-mixed friendships. In addition, the TYP group demonstrated the highest level of coordinated play among the three groups (see Table 2).

3. Global evaluations of role and conversation. A 3 \times 2 MANOVA with scenario as the repeated measure, computed for group, and scenario differences in the FOS global evaluations of the target children's role and conversation skills yielded only significant group effect, $F(3,68) = 6.39, p < 0.001, \eta^2 = 0.22$. Univariate ANOVAs were

significant for both conversational skills (flow and social). Post Hoc analyses, with Scheffe correction, yielded significant group difference for conversational flow, with target children in the TYP group revealing the most flexible conversational style, followed by target children in the mixed friendship group, with children in the non-mixed revealing the lowest level of conversational flow. For social conversation significant group differences were found only between target children in the TYP group and target children in the non-mixed group, with the former outperforming the later (see Table 2).

Observed Dyadic Components in Construction and Drawing Scenarios

1. Dyadic Relationship Dimensions-DRQ. A 3 (group) \times 2 (nation) \times 2 (scenario type) MANOVA with, scenario as the repeated measure, was calculated to examine differences in group, nation and scenario for the six dyadic relationship dimensions of the DRQ (positive social orientation, cohesiveness, harmony, responsiveness, coordinated play, and control). The MANOVA was significant for group, $F(6, 54) = 4.54, p < 0.001, \eta^2 = 0.37$, for nationality $F(6, 54) = 10.35, p < 0.001, \eta^2 = 0.370$ and for the scenario \times group interaction, $F(6, 54) = 3.45, p < 0.001, \eta^2 = 0.27$.

As can be seen in Table 3, Univariate ANOVAs showed a significant group effect on all of the DRQ dimensions. Post Hoc analyses with Scheffe correction, yielded higher dyadic qualities in the mixed and the TYP dyads compared with the non-mixed dyads on positive social orientation; cohesiveness; responsiveness; and coordinated play. On harmony both mixed and non-mixed dyads function lower compared with TYP dyads. Also, non-mixed dyads revealed higher level of conflict in their relationships compared only with the TYP dyads (F -values, mean and SD s are presented in Table 3).

Univariate ANOVAs to examine nationality differences found significant effects for all the DRQ subscales but responsiveness and coordinated play: Positive social orientation $[F(1,59) = 5.37, p < 0.05, \eta^2 = 0.08]$; cohesiveness $[F(1,59) = 18.33, p < 0.001, \eta^2 = 0.24]$; harmony $F(1,59) = 11.27, p < 0.001, \eta^2 = 0.16$; and control $F(1,59) = 10.03, p < 0.05, \eta^2 = 0.14]$. Compared with children in the Israeli sample, children in the USA sample revealed higher levels of positive social orientation ($M = 5.10, SD = 0.76$, USA; $M = 4.74, SD = 0.66$, Israel) and harmony ($M = 5.32, SD = 0.74$, USA; $M = 4.80, SD = 0.62$, Israel) and lower levels of cohesiveness ($M = 3.89, SD = 0.90$, USA; $M = 4.59, SD = 0.56$) and control ($M = 2.06, SD = 0.46$, USA; $M = 2.36, SD = 0.58$).

Table 2 Means and standard deviations for group differences in friendship manifestations (*FOS*)

	¹ Mixed (<i>n</i> = 26)		² Non-mixed (<i>n</i> = 16)		³ TYP (<i>n</i> = 31)		Group dif.		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i> (2,69)	η^2	Scheffe
Positive social interaction ^a									
Goal	12.89	4.34	10.07	5.01	15.15	3.76	10.88***	0.24	1 = 3 > 2
Sharing	4.42	3.46	3.58	2.61	6.03	3.31	5.23**	0.13	2 < 3
Prosocial	1.45	1.58	1.23	2.10	0.63	1.04	3.69*	0.09	ns
Non-verbal	6.43	3.99	5.66	3.43	8.51	4.12	4.70*	0.12	2 < 3
Conversation	4.48	4.74	2.78	2.61	3.57	2.68	1.37	0.04	ns
Positive affect	6.02	4.78	3.09	3.22	7.97	4.64	8.74***	0.20	2 < 1 = 3
Global evaluation ^a									
Role	2.95	1.06	3.32	0.70	3.34	0.76	2.01	0.05	ns
Conversation flow	3.34	1.36	2.37	1.24	4.31	1.09	14.67***	0.30	1,2 < 3, 1 > 2
Social conversation	2.02	0.93	1.50	0.52	2.35	0.54	8.12***	0.19	2 < 3
Play ^a									
Parallel	2.57	2.98	10.43	6.14	0.48	1.12	42.83***	0.56	1 = 3 < 2
Social	1.75	3.40	0.59	0.88	0.62	2.06	1.57	0.04	ns
Coordinated	10.46	6.12	5.18	5.75	15.95	4.97	17.43***	0.34	1,3 > 2, 1 < 3
Unoccupied	0.31	0.83	0.44	0.73	0.00	0.00	2.41	0.06	ns

Several *SDs* were higher than their means; therefore, an additional non-parametric Mann–Whitney test for independent samples was performed for these cases, which mirrored the ANOVA results

^a Positive social interaction and play = *F*(2, 66); Global evaluation = *F*(2,67)

* *p* < 0.05

** *p* < 0.01

*** *p* < 0.001

^{1,2,3} The number of groups in the scheffe

Table 3 Means and standard deviations for group differences in dyadic relationship dimensions (*DRQ*)

Dyadic relationship		<i>HFASD</i>		³ TYP	<i>F</i> (2,66)	Scheffe
Q-set dimension		¹ Mixed	² Non-mixed		Group η^2	
Positive social orientation	<i>M</i>	4.93	4.16	5.14	11.23***	1 = 3 > 2
	<i>SD</i>	0.61	1.17	0.57	0.27	
Cohesiveness	<i>M</i>	4.40	3.71	4.55	6.30**	1 = 3 > 2
	<i>SD</i>	0.91	1.04	0.71	0.17	
Harmony	<i>M</i>	4.86	4.54	5.30	6.62**	1 = 2 < 3
	<i>SD</i>	0.69	1.15	0.64	0.17	
Coordinated play	<i>M</i>	3.56	2.59	3.96	18.02***	1 = 3 > 2
	<i>SD</i>	0.86	0.84	0.68	0.37	
Responsiveness	<i>M</i>	5.15	4.19	5.44	25.93***	1 = 3 > 2
	<i>SD</i>	0.52	1.07	0.42	0.46	
Control	<i>M</i>	2.28	2.57	2.07	4.15*	2 > 3
	<i>SD</i>	0.53	0.91	0.51	0.12	

* *p* < 0.05

** *p* < 0.01

*** *p* < 0.001

^{1,2,3} The number of groups in the scheffe

Univariate ANOVAs to examine the interaction of group \times scenario found significant effects for: Harmony, responsiveness; and coordinated play. Simple effect tests demonstrated significant scenario effects in the non-mixed friendships, for coordinated play [$F(1,12) = 5.32$, $p < 0.05$, $\eta^2 = 0.31$] and a tendency for significance in responsiveness [$F(1,12) = 4.40$, $p = 0.058$, $\eta^2 = 0.27$], with children in the non-mixed group demonstrating higher levels of coordinated play and responsiveness during the construction scenario ($M = 2.96$, $SD = 0.72$; $M = 4.57$, $SD = 0.83$, respectively) versus the drawing ($M = 2.24$, $SD = 0.97$; $M = 3.82$, $SD = 1.30$, respectively). A significant scenario effect for responsiveness also was found in the mixed group [$F(1,22) = 7.74$, $p < 0.01$, $\eta^2 = 0.26$] but in the opposite direction. Higher levels of responsiveness appeared in this group during the drawing scenario compared with the construction scenario ($M = 5.33$, $SD = 0.44$; $M = 4.97$, $SD = 0.61$, respectively). None of the scenario effects were significant for the TYP group.

2. Global Friendship Evaluation of Shared Fun and Affective Closeness. A $3 \times 2 \times 2$ MANOVA with repeated measures was executed to examine group, nation and scenario differences for the dyadic FOS global evaluations of the shared fun and affective closeness categories. Results of the MANOVA yielded significant group effect, $F(4, 66) = 4.26$, $p = 0.01$, $\eta^2 = 0.11$ and nationality effect ($2, 66) = 8.23$, $p = 0.001$, $\eta^2 = 0.20$. Univariate analyses to examine group differences were significant for shared fun, $F(1,67) = 8.13$, $p < 0.001$, $\eta^2 = 0.19$; and closeness, $F(1,67) = 8.85$, $p < 0.001$, $\eta^2 = 0.21$. Post Hoc analyses with Scheffe correction demonstrated higher levels of shared fun and of closeness in the mixed ($M = 1.92$, $SD = 0.89$; $M = 2.96$, $SD = 1.32$, respectively) and the TYP ($M = 2.20$, $SD = 0.67$; $M = 3.32$, $SD = 1.08$, respectively) dyads compared with the non-mixed dyads ($M = 1.31$, $SD = 0.58$; $M = 2.20$, $SD = 1.10$, respectively, $p < 0.05$ for mixed and non-mixed and $p < 0.001$ for non-mixed and TYP on the fun and closeness categories).

Univariate analyses to examine nationality differences were significant only for closeness, $F(1,67) = 6.10$, $p < 0.05$, $\eta^2 = 0.08$. Children in the USA sample revealed higher levels of closeness in their dyads ($M = 3.17$, $SD = 1.41$) compared with children in the Israeli sample ($M = 2.75$, $SD = 1.24$).

Controlling for VIQ

Target HFASD children in mixed and non-mixed dyads differed in VIQ. Therefore, we repeated the examination of friendship type differences controlling for VIQ by using multivariate analysis of covariance (MANCOVA) followed by univariate analysis of covariance (ANCOVA) for

friendship manifestations (positive social interaction, global scale and play) and *observed dyadic components* (dyadic relationship dimensions-DRQ and FOS global evaluation of shared fun and closeness).

Friendship Manifestations

Contrary to former analyses, results of the MANCOVA for friendship type (mixed-non mixed) differences in positive social interaction was not significant, thus we have not followed up with ANCOVAs. Conversely, results of the MANCOVA for friendship type differences in global evaluation of role and conversation skills (flow and social) resembled the MANOVA results; however, ANCOVA yielded different results for role taking and social conversation. We obtained significant friendship type differences after controlling for VIQ for role taking [$F(1,37) = 3.96$, $p < 0.05$, $\eta^2 = 0.10$] but not for social conversation [$F(1,37) = 2.26$, $p > 0.05$, $\eta^2 = 0.06$]. Children in the mixed friendship group revealed less leadership and a similar level of social conversation as children in the non-mixed dyads after controlling for VIQ differences. Results of the MANCOVA for friendship type differences in the play scale resembled the MANOVA results; however, ANCOVA for coordinated play only approached significance [$F(1,36) = 3.69$, $p = 0.06$, $\eta^2 = 0.09$].

Dyadic Component

Controlling for VIQ deleted significant friendship type differences for two variables in the dyadic FOS global evaluations: Shared fun and affective closeness. Results for the DRQ mirrored former analyses when VIQ was covaried.

Discussion

The current study had two main goals: (a) To describe the nature (characteristics, manifestations and qualities) of mixed and non-mixed friendships in children with HFASD in comparison with friendships between typically developing children, and (b) to describe differences within the HFASD group between child characteristics in mixed and non-mixed friendship. We hypothesized there would be more complex interactions in mixed friendships than non-mixed friendships and more mature developmental and social-emotional capabilities in target children with HFASD in mixed friendship versus non-mixed.

The characteristics of the mixed friendships themselves differed significantly from the non-mixed friendships on

many of the variables measured. Mixed friendships were found to be more durable and stable, and to exhibit higher levels of goal oriented social behaviors and positive affect. Friends in mixed dyads were more responsive to one another; showed higher levels of positive social orientation and cohesion, and, demonstrated a more complex level of coordinated play than those in non-mixed dyads. In addition, partners in mixed friendships had more fun together and appeared closer to each other than members of non-mixed dyads (this however, were reduced after controlling for VIQ). Thus, many aspects of the dyads differed.

In terms of individual child characteristics, however, the children with HFASD in the two groups were much more similar than different. They exhibited comparable severity of autism symptoms, and chronological ages. They also did not differ with respect to the social-emotional characteristics, including ToM, affective recognition and attachment to parents. Both groups of HFASD children showed relatively high scores in these domains. The only area in which there were differences between the HFASD groups involved receptive language ability. Here, target children in mixed friendships had significantly higher scores than target children in non-mixed friendships.

We also compared these two friendship types to typical friendships to investigate whether characteristics of the two friendship types present in HFASD children were similar to those observed in friendships between children with typical development. Here we found that mixed dyads involving a child with HFASD were similar on many of the observational measures collected to dyads involving only typically developing children. More specifically, mixed dyads differed significantly from non-mixed dyads, but not dyads consisting of typically developing children, on the amount of goal directed activity, sharing, positive affect, and parallel play they engaged in. Neither HFASD group differed from typical dyads with respect to the amount of prosocial behaviors, conversation, social play or time unoccupied they displayed.

The development and maintenance of friendship requires significant interpersonal interest and ability, regardless of its type (mixed or non-mixed). Given this research, perhaps it is not surprising that all the children in the current study, which required having at least one friend, had achieved a relatively high level of social competence. They had high scores on attachment security. It is well documented in the literature that security of attachment is related with higher friendship qualities (e.g., Berlin and Cassidy 1999; Bowlby 1973; Grossmann et al. 1999; Lieberman et al. 1999; Park and Waters 1989; Sroufe and Fleeson 1986; Youngblade and Belsky 1992). Friendship's reciprocal nature requires consideration and awareness of other child's mental states (ToM capabilities like; reading others' emotions, thoughts, desires and intentions). Thus, it

is not surprising that ToM capabilities in both groups also were similar. In like manner, emotional knowledge is important for social functioning (Obradovic et al. 2006), and in preadolescence the knowledge of complex emotions is specifically important due to the fact that children in this age strives to avoid being embarrassed by their peer group by learning displays rules of emotions (Parker and Gottman 1989). Here as well following typical development, HFASD children in both groups revealed good recognition knowledge of both basic and complex emotions.

There are few empirical studies of individual differences in social-emotional functioning or capacity to form friendships within the population of children with HFASD. It is possible that HFASD children who form friendships (either with a typical child or with a child with a disability) have relatively higher overall social-emotional capabilities, compared with HFASD children who do not have friends. It is also possible that children who came to our laboratory with a chosen friend with a disability have also a friend with typical development. Future studies would do well then, to test this assumption by comparing children within the spectrum who form friendship to children who do not have friends as well as differences of the nature of friendship within the same child while playing with a friend with a disability versus playing with a friend with a typical development.

This study raises the important clinically and educationally relevant possibility that exposure to typically developing peers enhances the social development of pre-adolescent children with HFASD. In this study, mixed friendships were found to be more responsive, cohesive, and to exhibit higher levels of positive social orientation and more complex levels of play (coordinated play) than non-mixed dyads. This finding may imply a benefit for having a typical peer as a friend, in terms of the quality of the dyadic interaction. Having a typical peer as a friend was related to having a more complex and responsive interaction within friendship. It may be that the interaction over time (transaction) with a typical peer during their friendship enforces the HFASD child to develop more complex social-emotional capabilities. It may also be that the HFASD child uses the typical peer as a role model for learning normative social behaviors.

However, it seems premature to draw this conclusion based exclusively on the current study's findings. While HFASD children in mixed dyads "looked better" and were not significantly different from other HFASD children with respect to the aspects of cognitive social, and emotional functioning that we assessed, the possibility remains that the HFASD children still differed in some systematic way. For example studies of typically and atypically developing children have found that personality (Fordham and Stevenson-Hinde 1999; Shiner and Caspi 2003), self-esteem

(Azmitia 2001), aspects of executive functioning and attention (Hay et al. 2004), levels of co-morbid psychopathology (Deater-Deckard 2001; Hay et al. 2004), and emotion regulation (Eisenberg et al. 2000), as well as parent characteristics including levels of social support and networks (Cook et al. 2002; Bost 1995; Melson et al. 1993) also play a role in children's abilities to form friendships.

Additional studies in this area clearly are warranted. Such research should compare longitudinal effects of mixed and non-mixed dyads on social competence development to see if the positive behaviors of HFASD children in these dyads generalize to other social settings in the present and in the future. Furthermore, it will be important to examine longitudinal effects of both mixed and non-mixed friendships on well-being and life satisfaction in individuals with HFASD.

Future research also should delve into the role of language in social competence in children with HFASD. Target children in mixed friendship outperformed children in non-mixed friendship on VIQ and differences between mixed and non-mixed friendship (mainly in friendship manifestations) were significantly reduced after controlling for VIQ. There has been little systematic study of the relationship between different domains of social competence in general their relationship with verbal abilities in children and adolescents (Miller et al. 2006; Saarni 1999) or adults (Lopes et al. 2005). One candidate hypothesis is that children with HFASD and stronger verbal abilities are better able to augment inferences about emotions with verbal information and that this could lead to more accurate emotion perception and better abilities to relate with peers (Miller et al. 2006). Another possibility is that children in preadolescence gossip a lot with their friends as a way to relate. Thus, mixed friendship may resemble normative friendship due to its emphasis on verbal capabilities (Parker and Gottman 1989). Investigations related to language also have the potential to improve pragmatic speech and language interventions by refining understanding of how specific verbal skills facilitate social functioning. It is important to note though that, current groups of participants were matched according to verbal performance based on the PPVT (Dunn and Dunn 1997). Results from this test correlate strongly with overall measures of both intelligence and language comprehension (Sattler 1988); however, future studies do well to include a more comprehensive examination of cognitive and language functioning.

One difference that stood out between the two friendships type (after controlling for VIQ) involved opportunities to take leadership in the friendship activity. Children with ASD in mixed friendships had less leadership opportunities than those in non-mixed friendship, after controlling for VIQ differences. An important

characteristic of friendship is the egalitarian style of exchange, in which children maintain a balance in the degree to which each partner assumes dominant or subordinate roles, such as leader and follower (Brody et al. 1982). It seems that children in mixed friendships have fewer opportunities to initiate suggestions and to lead the interaction, and this may reflect their continuing difficulties with the pragmatics of communication. In the non-mixed dyads, we assume the partners are more similar in their social-communicative and pragmatic abilities, since both children have ASD. This supports the clinical observation that it is important not to dismiss the positive benefits of non-mixed friendships for children with HFASD. These relationships may be easier to engineer and sustain throughout development. Clinical observation suggests that non-mixed relationships are very important for learning skills and promoting self-esteem. In fact social skills groups with only HFASD children and adults have reported improvements in both skills and emotional functioning (Solomon et al. 2004).

Finally, these findings have some implications for intervention and inclusion. A main benefit of inclusion in mainstream activities for children with ASD is that they will be exposed to normative social behavior and to normative peers. Given that the target children in mixed and non-mixed friendships were similar on many of the developmental as well as social-emotional variables that we measured, we assume that what leads to mixed or non-mixed friendships may have more with external factors such as exposure and access to typical peers and parental or teacher mediation, rather than intrinsic characteristics of the HFASD child. However, despite similar social-emotional characteristics, typical friends do greatly influence the quality of the dyadic interaction, perhaps by scaffolding the interaction and thus allowing a higher level of social engagement for the child with autism. Mixed dyads outperformed non-mixed dyads in many of the dyadic qualities that have been tested, even after controlling for VIQ differences. This finding supports the positive effects of ongoing friendships and social interactions with typical peers for children with ASD. However, we also found in those dyads that there was less opportunity for the child with autism to take a leadership role in the activities, and it may suggest some imbalance of power in the mixed friendship dyads. This may indicate a need for interventionists to attend to the balance of interactions in inclusive settings, and assure that children with autism have balanced opportunities to lead as well as follow, especially when interacting with typical peers. Also, it is important to note that even if mixed friendships are more similar to typical friendships, differences between these two friendship types still exist on dimensions such as frequency of contact, coordinated play and flexibility in conversation. Thus, even

if friendships with typically developing peers are an important framework for growth in social skills, there may also be negative aspects that should be further explored.

A second implication for intervention concerns the finding that those ASD children in mixed friendships had stronger receptive language abilities. This finding may be highlighting a relationship between language ability and peer competence. If so, it indicates the need for autism education and intervention approaches to target language skills, even in HFASD children who have considerable strengths in language. The fact that an ability is a relative strength in a child with autism does not indicate that the skill does not need further intervention. Given the importance of language functioning in educational success and social success, any impairment in language structure, function, or semantics should be a focus of intervention in children with autism.

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Appendix

The Friendship Observation Scale (FOS) (Bauminger et al. 2005).

Definitions of Observed Friendship Manifestations of Target Child

- I. Positive social interaction: The child exhibits verbal and non-verbal social behaviors, verbalizations, and affects that lead to an effective friendship with peers; behaviors that serve to start or maintain social interaction, coded minute-by-minute in seven categories:
 1. Goal-related behavior:
 - a. Cooperative skills: Cooperative behaviors directly related to performance of task (construction, drawing), such as suggesting an action, providing or asking for information, or describing an action.
 2. Sharing behavior: Behaviors aiming to share inner world (e.g., experiences, emotions, interest) with partner.
 - a. Sharing experiences: Child tells friend about an experience or asks friend about his/her experiences (e.g., “What did you do over the weekend?”).
 - b. Sharing emotions and pleasure: Child shares emotions or pleasure with friend (e.g., “It’s fun, isn’t it?”) or asks about his/her emotions (e.g., “Are you having fun?”).
 - c. Showing and directing attention: Child directs friend’s attention to toys or objects in which child is interested (“Look at this” with or without eye gaze and/or pointing).
3. Prosocial behavior: Behaviors reflecting caring for another and closeness.
 - a. Affection: Child expresses affection toward friend, either verbally (“You’re nice,” “I like you”) or non-verbally (e.g., hugs, touches).
 - b. Caring and empathy: Child expresses concern toward friend (“Are you ok?”) or shows awareness/understanding of friend’s feelings (“It looks to me like you are upset now”).
 - c. Comforting and encouragement: Child directs spontaneous unprompted gesture, touch, or vocalization toward friend who is hurt in an attempt to help him/her feel better; or child contributes to the development of the activity by giving support and/or encouragement to friend (e.g., “You are doing great ...keep it up...”).
 - d. Help: Child offers or receives help from friend.
 - e. Compromise: Child reaches compromise as a result of shared discussion with friend (e.g., “OK, you convinced me; we will include dolphins in this drawing too”).
4. Behavior related to conversational profile: Behaviors reflecting quality of conversation between children.
 - a. Small talk, silly talk, or gossip: While performing task, child makes conversation about something that is not task-related.
 - b. Persuasion and negotiations: Child induces friend to do something through reasoning or argument, or tries to reach agreement by discussion (e.g., “If you’ll give me this red piece that I need, I’ll give you the long tube and you could make your side higher for the marbles”).
 - c. Talk reflecting interest in friend: Child expresses interest in friend, excluding friend’s emotions (e.g., “What’s your favorite hobby?”).
5. Non-verbal behavior:
 - a. Eye contact: Child looks into eyes of friend.
 - b. Eye contact combined with smile: Child looks at and smiles toward friend.
 - c. Looking toward friend: The child looks at friend (not maintaining eye contact) during activity and while talking/listening to friend, as a way of expressing interest in friend or friend’s activity.
6. Affect: Emotions expressed during interactions
 - a. Positive: Child shows positive emotion like laughter.

- b. Shared laughter: Child is involved in shared laughter with friend due to same incident, and shows playfulness.
7. Play (only for construction scenario): Behaviors reflecting quality of play with friend.
 - a. Parallel play: Child plays separately from friend but within the same proximity and with the same type of activity, with and without looking at friend.
 - b. Simple social play: Child is involved in simple play with friend, including taking turns, sharing object, physical games, but not cooperative play.
 - c. Collaborative-cooperative play: Child plays jointly in coordination with friend.
 - d. Unoccupied: Child is not occupied with task or anything else, but may look at target materials (marble game/drawing utensils).
- IIa Global individual child evaluation: Behaviors reflecting coder's general evaluation over entire interaction, coded only for the target child, in three categories:
- Role-related behaviors: Estimation of child's role pattern (leader, follower) during interaction, on a range between *Child follows peer* (1) and *Child makes major decisions throughout activities* (7).
 - Conversational flow (speech): Estimation of appropriate fluency, intonation, rhythm, and expressivity in child's speech, coded on a six-point scale ranging from poor fluency, intonation, rhythm, and expressivity (1) to complete, appropriate conversational flow scores (6).
 - Conversational skills: Estimation of to and fro usage of words and phrases in social conversation on a three-point scale: *No social conversation at all during entire activity time except task-related talk* (1); *Very limited conversation, one or two turns, where child is either initiator or responder* (2); and *Child continues social conversation and develops it pertaining to what friend said* (3).

Definitions of Observed Dyadic Components

- IIb Global dyadic evaluation: Behaviors that reflect a general evaluation of the coder over the entire interaction, coded with regard to both children participating in the interaction, in two categories:
- Emotional bonding, affective closeness: Estimation of level of closeness reflected between children during the interaction, based on shared look, shared laughter or smile, reflection of affection (hugs), or verbalizations reflecting closeness, on a scale ranging from low (1) to high (5).
 - Shared fun/enjoyment in interaction: Estimation of how much fun children experienced just from

being together, where task was less important than social interaction between friends, on a scale ranging from low (1) to high (3).

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