

# Parent Support of Preschool Peer Relationships in Younger Siblings of Children with Autism Spectrum Disorder

Annette Estes<sup>1,2</sup> · Jeffrey Munson<sup>3</sup> · Tanya St. John<sup>1</sup> · Stephen R. Dager<sup>4</sup> · Amy Rodda<sup>1</sup> · Kelly Botteron<sup>5</sup> · Heather Hazlett<sup>6</sup> · Robert T. Schultz<sup>7</sup> · Lonnie Zwaigenbaum<sup>8</sup> · Joseph Piven<sup>6</sup> · Michael J. Guralnick<sup>2</sup> · the IBIS network

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**Abstract** Preschool-aged siblings of children with ASD are at high-risk (HR) for ASD and related challenges, but little is known about their emerging peer competence and friendships. Parents are the main providers of peer-relationship opportunities during preschool. Understanding parental challenges supporting early peer relationships is needed for optimal peer competence and friendships in children with ASD. We describe differences in peer relationships among three groups of preschool-aged children (15 HR-ASD, 53 HR-NonASD, 40 low-risk, LR), and examine parent support activities at home and arranging community-based peer activities. Children with ASD demonstrated precursors to poor peer competence and friendship

outcomes. Parents in the HR group showed resilience in many areas, but providing peer opportunities for preschool-age children with ASD demanded significant adaptations.

**Keywords** Autism · Parent · Sibling · Peer relations · Preschool · High risk

## Introduction

Peer competence and friendships are major developmental achievements in middle-childhood that influence emotional well-being and academic abilities, and have far reaching effects into adulthood (Bagwell et al. 1998; Carneiro et al. 2007; Jones et al. 2015; Veronneau et al. 2010; Wentzel and Caldwell 1997). Peer competence refers to a child's ability to navigate complicated, real-world social interaction with peers (e.g., Howes 1987; Guralnick 1999). Peer competence reflects both a constellation of skills and the ability to develop friendships that are mutual and reciprocal relationships based on shared interests and activities. Preschool is the developmental period in which friendships typically first emerge and preschool-age peer relationships provide opportunities to develop the skills required for later peer competence (Santo et al. 2014). By school-age, children with ASD demonstrate fewer reciprocal friendships and are less accepted by peers (Rotheram-Fuller et al. 2010; Locke et al. 2010; Rowley et al. 2012; Solish et al. 2010). School-age children with ASD also demonstrate difficulties with the skills that contribute to peer competence (Bauminger et al. 2003; Kasari et al. 2011). However, much less is known about peer relationships in preschool-aged children with ASD and, as a result, the precursors of peer competence and friendships for school-aged children with ASD are not well understood.

Joseph Piven and Michael J. Guralnick are Co-Senior Authors.

✉ Annette Estes  
estesa@uw.edu

<sup>1</sup> Department of Speech and Hearing Sciences, University of Washington, Seattle, WA, USA

<sup>2</sup> Department of Psychology, University of Washington, Seattle, WA, USA

<sup>3</sup> Department of Psychiatry and Behavioral Sciences, University of Washington, Seattle, WA, USA

<sup>4</sup> Department of Radiology, University of Washington, Seattle, WA, USA

<sup>5</sup> Department of Psychiatry, Washington University, St. Louis, MO, USA

<sup>6</sup> Carolina Institute for Developmental Disabilities, Chapel Hill, NC, USA

<sup>7</sup> The Center for Autism Research, Department of Pediatrics, Children's Hospital of Pennsylvania, University of Pennsylvania, Philadelphia, PA, USA

<sup>8</sup> Department of Pediatrics, University of Alberta, Edmonton, AB, Canada

It is widely believed that preschool-aged children with ASD have difficulties with peer relationships, leading to efforts to develop interventions to improve social skills among this age-group (e.g., McConnell 2002; Whalon et al. 2015). However, relatively few empirical studies have directly investigated peer relationships, friendships, or precursors to peer competence during school-age in preschool-aged children with ASD. The studies conducted to date have all been in the preschool setting. Approximately 20% of mainstreamed preschool-age children with ASD were observed to have friends at school, and these children demonstrated increased joint attention skills and more joint engagement than the mainstreamed children with ASD without friends (Chang et al. 2016). Interestingly, when observed in a research setting, preschool-aged children with ASD demonstrated better conversational ability when paired with a friend from school than a non-friend playmate, suggesting that there may be benefits of early, preschool friendships that could extend to later development (Bauminger-Zviely et al. 2014a, b). Studies of peer relationships at home and in the community are currently lacking from the literature but are needed to obtain a more complete picture of the early peer experiences of children with ASD as the home setting may be particularly important for early peer experiences.

Parents play an important role in promoting peer competence during preschool. Parent–child interaction has demonstrated effects on later peer competence in typically developing and developmentally disabled children (Mize and Pettit 1997; Guralnick et al. 2008). Preschool-age children with ASD who are less likely to initiate social interaction with parents have poorer peer competence 1 year later and are more likely to be excluded by peers (Meek et al. 2012). Parents also provide opportunities for preschool-age children to engage with peer playmates by hosting “play dates” with peers and by supervising and facilitating peer interaction in the home (e.g., Guralnick 1999; Guralnick et al. 2003). We are not aware of any current studies of parent support activities for younger siblings in families with an older child with ASD. These parents face uniquely challenging circumstance due to raising a child with ASD as well as their younger sibling who may also present with ASD or other challenges during the preschool years (see below). Parents of preschool-age children with ASD are likely to have increased demands as compared with parents of typically developing children and may experience increased parenting-related stress and psychological distress as compared with parents of typically developing children and parents of children with other disabilities (e.g., Estes et al. 2009; Hayes and Watson 2013; McGrew and Keyes 2014; Zablotsky et al. 2013). This indirect evidence suggests parent support activities may be decreased in parents of children with ASD but it is not yet known to what

extent having an older sibling with ASD may impact parental efforts to promote early peer relationship development in younger siblings.

Younger siblings of children with ASD may be at risk for poor peer competence and friendships but no empirical studies have yet described peer relationships in this population. Younger siblings of children with ASD are at high risk for development of ASD (~20%; Ozonoff et al. 2011) and demonstrate high rates of other developmental and related conditions that impair language skills and increase challenging behavior (~25%; Messinger et al. 2013; Ozonoff et al. 2014). These types of related conditions (e.g., challenging behaviors, language impairments) are known to lead to poorer peer relationships in typically developing and developmentally delayed preschool-age populations (e.g., Andres-Roqueta et al. 2016; Guralnick 1999). Studies are needed to understand the developmental precursors to school-age friendship and peer competence deficits in preschool-aged children at high-risk for ASD in order to build more effective early intervention programs that can support the development of skills necessary to achieve these pivotal school-age milestones.

The present study, part of a multisite network investigating neurobehavioral development in ASD (Infant Brain Imaging Study, IBIS), evaluated peer relationships and parent support activities to promote peer relationships in three groups; younger siblings of children with ASD who themselves have ASD (HR-ASD), younger siblings of children with ASD who do not have ASD (HR-NonASD), and younger siblings of typically developing children (LR). Our aims were (1) to describe group differences in peer relationships among these three groups (HR-ASD, HR-NonASD, LR), and (2) examine parent support activities during home play dates and in arranging community activities with peers among these three groups.

## Methods

### Participants

Participants were part of the IBIS network with clinical sites at University of North Carolina, Childrens Hospital of Philadelphia, Washington University, and University of Washington. All participants were screened and excluded based on the following criteria; (1) known genetic conditions or syndromes, (2) significant medical or neurological conditions affecting growth, development or cognition (e.g., CNS infection, seizure disorder) or sensory impairments such as significant vision or hearing loss, (3) birth weight <2000 g and/or gestational age <36 weeks, history of significant perinatal adversity and/or exposure in-utero to neurotoxins, (4) contraindication for MRI, (5) predominant

home language other than English, (6) adopted or half siblings, (7) 1st degree relative with psychosis, schizophrenia, bipolar disorder utilizing the family interview for genetic studies (FIGS; Maxwell 1992), and (8) twins. Infants were defined as high risk (HR) if they had a sibling with a clinical diagnosis of ASD as confirmed by medical records and who currently met ASD criteria on the Social Communication Questionnaire (SCQ; Rutter et al. 2003a) and Autism Diagnostic Interview Revised (ADI-R; Rutter et al. 2003b). Participants were defined as low risk (LR) if they had only typically developing older siblings who did not meet autism screening criteria (based on the SCQ and FIGS) and had no 1st degree relative with a history of ASD or intellectual disability. Any questions regarding inclusion criteria were referred to an expert committee and a detailed log of specific decisions was kept on a central website accessible to all clinical sites.

Participants include the subset of the larger IBIS sample who, at the time of data analysis, had completed an in-person diagnostic assessment at either 24-months of age (17.6%) or at the preschool-age follow up (82.4%), and had completed a preschool-age follow-up assessment of peer relationships (68 HR siblings; HR-ASD n=15; HR-NonASD; n=53; 40 LR siblings). Outcome group classifications were based on criteria defined by the DSM-IV-TR. Children were categorized as HR-ASD if they met DSM-IV-TR criteria for autistic disorder or pervasive developmental disorder, not otherwise specified (PDD-NOS) and HR-NonASD if they did not meet DSM-IV-TR criteria for either autistic disorder or PDDNOS. LR siblings did not meet DSM-IV-TR criteria for autistic disorder or PDDNOS.

Demographic information on the sample is summarized in Table 1. There were no statistically significant differences between the groups on any demographic variable

with the exception that the HR-ASD group demonstrated lower developmental scores than the HR-NonASD and LR groups, as expected.

**Procedures**

Following screening for eligibility, participants were assessed longitudinally at up to four time points between 3 and 24 months of age at one of the four clinical sites. Assessments at each time point included in-person evaluation, phone interview, and questionnaires regarding behavioral development and neuroimaging studies conducted while asleep, as described in detail elsewhere (e.g., Wolff et al. 2014). Follow-up evaluations, conducted between 36 and 60 months of age, consisted of direct assessments using the autism diagnostic observation schedule (ADOS) and the Mullen Scales of Early Learning (MSEL). All examiners met standards for research reliability. For all participants, parent report on the autism diagnostic interview revised (ADI-R) was obtained by research reliable examiners either in person or by phone. A priori examiner training and administration and scoring reliability procedures were implemented to ensure comparability of data across sites. Each participant was assigned a clinical best estimate diagnosis according to DSM-IV-TR criteria to determine whether the child met criteria for autistic disorder or PDD-NOS. Clinical best estimates were determined by a licensed clinical psychologist or doctoral student in clinical psychology, school psychologist or masters-level psychometrist under the supervision of a licensed clinical psychologist or psychiatrist. Additionally, a senior clinical psychologist or psychiatrist reviewed each case (i.e., MSEL, Vineland, ADI-R, and ADOS scores and review of video of these assessments) to provide an independent clinical best

**Table 1** Sample characteristics by group

	HR-ASD (n=15)		HR-NonASD (n=53)		LR (n=40)		p <sup>a</sup>
	N	%	N	%	N	%	
Sex							.124
Female	2	13.3	18	34	17	42.5	
Male	13	86.7	35	66	23	57.5	
Ethnicity							.131
White	13	86.7	41	77.4	37	92.5	
Non-white	2	13.3	12	22.6	3	7.5	
	M	(SD)	M	SD	M	(SD)	
Child age	46.49	(14.70)	46.28	(11.33)	47.10	(9.30)	$\chi^2=0.64$ ns
MSEL Early Learning Composite	69.73	(18.42)	103.83	(17.58)	111.33	(14.80)	$\chi^2=31.80$ , p<.001
Maternal educ (years)	16.40	(3.22)	16.46	(2.65)	17.25	(2.55)	$\chi^2=2.56$ ns

<sup>a</sup>Fisher’s exact test for categorical variables (sex, ethnicity), nonparametric van der Waerden test for continuous variables (child age, IQ, years of maternal education)

estimate diagnosis based on the DSM. For families who were not available for an in-person preschool-age follow-up visit, questionnaires and phone interviews were collected. Nineteen participants from the HR-NonASD group were not available for in-person evaluation during the preschool-age follow-up visit. For these children, the diagnostic procedures above were used at 24 months and this information, in addition to the ADI-R at the preschool-age follow-up, was used to assign group status.

All participating families were provided with a written evaluation and information about intervention services, if needed, at each time point. Informed consent approved by each site's human subjects review board was obtained for all families.

## Measures

### *Peer Relationships and Parent Support Activities*

The Peer Social Contact Questionnaire (PSCQ) is a parent-report measure previously used in studies of children with developmental delays without ASD (Guralnick 1997) revised by the research team at the University of Washington for use with preschool-age children at high- and low-risk for ASD. The PSCQ characterizes: (1) children's peer relationships at home with up to five individual playmates from 2 to 10 years of age over the prior 3 months and (2) parental efforts to support child peer competence in the home (parent support activities), and in community-based activities.

*Peer relationships variables* obtained are (1) number of playmates (range 0–5), (2) number of times a child has hosted a play date over the prior 3 months in their own home, (3) play quality (six items). Items include: (1) “how much does your child like this playmate? (just tolerates, pretty neutral, likes, really likes)”, (2) “how much does this playmate like your child? (just tolerates, pretty neutral, likes, really likes)”, (3) “how well would you say they get along? (not very well, okay, very well)”, (4) “What is the typical tone of play? (negative, neutral, positive)”, (5) “how often are there conflicts? (frequently, occasionally, rarely)”, (6) “how disruptive are their conflicts? (ends play, major disruption, minor disruption, no disruption)”.

*Parent support activity variables* related to in-home activities are (1) difficulty arranging in-home play dates (not difficult at all, somewhat difficult, very difficult), (2) stress while monitoring play (not stressful at all, somewhat stressful, very stressful), and (3) need to directly facilitate play (little or none, occasionally, frequently). (4) Play Help addresses the question, “how much does your child need your help during play with peers?” by averaging across six items (managing emotions, understanding social rules, understanding how to play activities, getting play sessions

started, remaining involved in play, and managing conflicts). Parent support activities related to peer interaction opportunities in the community are (1) number of days in preschool or daycare, (2) number of weekly community activities (religious, sports, music, art, playgroups, other), (3) number of times per week participating in community activities.

Parents of children in the HR-ASD group responded to an additional five questions on their perspectives on the effects of ASD on their preschool-aged child's in-home and community peer play opportunities.

For all items with three possible scores, a value was assigned between 0 and 1 (e.g., 0=little or none, 0.5=occasionally, 1.0=frequently). For all items with four possible scores a value was assigned between 0 and 1 e.g., “How much does your child like this playmate? (0=just tolerates, 0.33=pretty neutral, 0.67=likes, 1=really likes).” For variables with more than one item, an average was calculated.

### *Cognitive Development*

The Mullen Scales of Early Learning (MSEL; Mullen 1995) is a standardized, normed, developmental assessment for children aged birth through 68 months. It provides an overall index of cognitive ability and delay. The early learning composite (ELC) and performance on the receptive language, expressive language, visual reception, fine motor, and gross motor subscales were assessed at each visit.

### *Autism Symptoms*

The ADOS, first and second edition (Lord et al. 2000; Lord et al. 2012) is a semi-structured play assessment of communication, social interaction, play skills and restricted interests/repetitive behavior. The ADOS or ADOS-2 was administered at 24 months and preschool-age. Module administered was based on the language skills of the child. Empirically derived, conventional scoring algorithms were utilized (Gotham et al. 2007). Algorithm scores are based on the severity and number of ASD symptoms demonstrated during the ADOS assessment.

The ADI-R (Rutter et al. 2003a) is a semi-structured interview about symptoms of ASD that was administered at 24 months and preschool-age to all parents of HR infants and all LR infants with clinical concerns. This information was used in the process of assigning a clinical best estimate diagnosis (Kim et al. 2013).

### *Challenging Behaviors*

Achenbach Child Behavior Checklist (CBCL; Achenbach 2009) is a factor analytic derived, parent-report measure

normed on a national sample of children, with the preschool version covering ages 1.5 to 5 years of age. Assessed are Total Problems, broad-band behavior problems (Internalizing behavior problems, Externalizing behavior problems), and narrow-band behavior problems (anxious/depressed, withdrawn/depressed, somatic complaints, social problems, thought problems, attention problems, rule-breaking behavior, aggressive behavior). The CBCL has excellent reliability and validity (e.g., Achenbach and Rescorla 2000).

**Statistical Analysis**

For the first aim, examining group difference in peer relationships, our primary hypotheses were for overall differences among the three groups, with lower number of playmates and poorer play quality in the HR-ASD group. We further hypothesized that the HR-NonASD group would be an intermediate group, and the LR group would have the highest number of playmate, the best play quality. For the second aim, examining group differences in parent support activities, we hypothesized increased parent support activities in the HR-ASD group with the least parent support activities in the LR group. Given the small sample size of the HR-ASD group, nonparametric van Der Waerden tests (Conover 1999) were run to examine group differences using the PMCMR package in R (Pohlert 2014). This test converts the ranks from a standard Kruskal–Wallis test to quantiles of the standard normal distribution. Statistically significant results were followed up with post-hoc comparisons between each pair of groups again using the PMCMR package. Group differences were tested overall and between each pair.

Multiple regression analyses were conducted to examine how diagnostic group and the presence or absence of peer relationships was related to child language ability and behavior problems. Diagnostic group was modeled with two variables, one in which HR-ASD was coded 1, one in which HR-NonASD was coded 1. LR was coded as 0 for

both variables. Presence or absence of peers (0 peers coded 0, 1+ peers coded 1) and their interaction were all entered as predictors in the model.

**Results**

**Peer Relationships Among HR-ASD, HR-NonASD, and LR Younger Siblings**

The HR-ASD group had statistically significantly fewer peer playmates than the HR-NonASD and LR groups [ $\chi^2(2)=13.76, p<.01$ ] and lower quality peer interactions than HR-NonASD group [ $\chi^2(2)=6.06, p<.05$ ]. The HR-NonASD group and the LR groups did not differ with regard to number of peer playmates or quality of peer interactions (See Table 2). Fifty-three percent of HR-ASD preschoolers had no playmates versus 19% of HR-NonASD and 15% of LR preschoolers.

**Parent Peer Relationship Support Activities**

There was a trend towards parents of HR-ASD children reporting greater stress while monitoring play [ $\chi^2(2)=4.55, p=.10$ ] and a greater need to directly facilitate peer play interactions [ $\chi^2(2)=5.19, p=.07$ ], pairwise comparison of HR-ASD with HR-NonASD and LR,  $p<.05$ ). HR-NonASD and LR parents did not differ statistically regarding stress while monitoring or facilitating. Similarly, parents reported children in the HR-ASD group needed more help during play with peers than children in the HR-NonASD and LR groups [ $\chi^2(2)=11.45, p<.01$ ].

With regard to community-based peer interaction opportunities, there were no statistically significant differences in the proportion of each group attending preschool or day-care (Fisher exact test,  $p=.210$ ; HR-ASD 92.9%, HR-NonASD 68.8%, LR 76.9%). However, children in the HR-ASD group were involved in fewer weekly community activities

**Table 2** Diagnostic group differences in characteristics of peer relationships

	HR-ASD (n=7)		HR-NonASD (n=43)		LR (n=34)		p (Signif pairwise diffs, $p<.05$ )
	M	(SD)	M	(SD)	M	(SD)	
Number of playmates	1.00	(1.36)	2.57	(1.73)	3.05	(1.74)	$\chi^2=13.76^{**}$ (HR+ < HR-, LR-)
Freq of play at home, past 3 mos	4.29	(5.74)	10.70	(9.13)	12.32	(10.21)	$\chi^2=5.20+$
Quality of peer interaction <sup>a</sup>	0.70	(0.15)	0.83	(0.11)	0.79	(0.12)	$\chi^2=6.06^*$ HR+ < HR-
Percentage with 1+ peer with a disability	57%		19%		12%		Fisher's exact, $p=.033$

+ $p<.10, *p<.05, **p<.01, ***p<.001$

<sup>a</sup>Mean of six items from PSCQ, each item with three or four options scored from optimal (value=0) to problematic interaction (value=1)

than LR children [ $\chi^2(2)=6.83, p < .01$ ]. Both the HR-ASD and HR-NonASD group reported participating in activities fewer times per week than the LR group [ $\chi^2(2)=6.31, p < .05$ ] (see Table 3).

**Peer Status as Predictor of Language and Challenging Behaviors**

As expected, the HR-ASD group showed poorer receptive and expressive language scores than the LR group as well as higher CBCL Externalizing and Internalizing scores.

The HR-NonASD group did not differ from the LR group in language or challenging behavior scores. The group by peer status (0 vs. 1+ peers) interaction terms in the language measures, showed that the language scores within diagnostic groups did not vary as a function of peer status. However, within the HR-ASD group, having no peers was associated with statistically significantly higher Internalizing scores and a trend toward higher externalizing scores on the CBCL, whereas the HR Non-ASD and LR groups showed no differences as a function of peer status (see Table 4).

**Table 3** Group differences in parental support of peer activities

	HR-ASD (n=7)		HR-NonASD (n=43)		LR (n=34)		p (Signif pairwise diffs, p < .05)
	M	(SD)	M	(SD)	M	(SD)	
How difficult to arrange play contacts?	0.00	(0.00)	0.08	(0.18)	0.06	(0.14)	$\chi^2=2.39$ ns
How stressful to monitor play sessions?	0.21	(0.25)	0.09	(0.15)	0.06	(0.11)	$\chi^2=4.55$ ns
How often do you directly facilitate play	0.58	(0.47)	0.23	(0.24)	0.21	(0.20)	$\chi^2=5.19+$ (HR+ > HR-, LR)
How much does your child need help during play with peers?	0.55	(0.33)	0.19	(0.14)	0.24	(0.16)	$\chi^2=11.45^{**}$ (HR+ > HR-, LR)
Community activities	(n=15)		(n=53)		(n=40)		
	M	(SD)	M	(SD)	M	(SD)	
# Days in school	4.00	(1.00)	3.70	(1.29)	3.62	(1.27)	$\chi^2=0.61$ ns
Number of weekly activities (range 0–3)	0.53	(0.74)	0.87	(1.06)	1.30	(1.14)	$\chi^2=6.83^*$ (HR+ < LR)
# Times/week participating in activities	0.67	(0.90)	1.08	(1.61)	1.62	(1.80)	$\chi^2=6.31^*$ (HR+, HR- < LR)

**Table 4** Language and challenging behavior correlates of peer status (0 vs. 1+ playmates)

	HR ASD (N=13) M (SD)	HR NonASD (N=39) M (SD)	LR (N=34) M (SD)	Multiple regression <sup>a</sup> (t values)	
				Main effect (a) NonASD (b) ASD	Interaction (Group × Peer) (c) NonASD (d) ASD
MSEL Receptive Lang T score					
0 peers	38.0 (12.9)	46.8 (6.0)	55.0 (7.8)	(a) -1.55 ns	(c) 0.48 ns
1+ peers	24.3 (6.0)	48.6 (10.3)	54.0 (11.0)	(b) -3.03**	(d) -1.76 ns
MSEL Expressive Lang T score					
0 peers	34.4 (10.0)	46.9 (10.1)	48.2 (13.1)	(a) -0.24 ns	(c) -0.01 ns
1+ peers	30.2 (11.5)	51.5 (9.8)	52.8 (9.2)	(b) -2.47*	(d) -1.24 ns
CBCL Ext raw					
0 peers	24.0 (9.7)	12.7 (6.9)	9.6 (3.0)	(a) 0.72 ns	(c) -0.40 ns
1+ peers	9.8 (10.1)	8.7 (7.4)	7.5 (7.1)	(b) 3.09**	(d) -1.98 <sup>+</sup>
CBCL Int raw					
0 peers	18.2 (10.2)	5.3 (3.5)	4.6 (2.6)	(a) 0.24 ns	(c) -0.15 ns
1+ peers	6.8 (9.6)	4.0 (4.4)	3.8 (4.0)	(b) 4.37***	(d) -2.61*

<sup>a</sup>Multiple regression predicting behavior. LR set as reference group, HR ASD and HR NonASD coded as 1. Peer=0 vs. 1+ peers coded as 0 and 1, with interaction terms of group × peers also included

<sup>+</sup>p < .10, \*p < .05, \*\*p < .01, \*\*\*p < .001

**Parental Support Experiences with Children with ASD**

Parents in the HR-ASD group responded to an additional set of questions regarding their experiences setting up in-home peer experiences for their preschool-aged child. These descriptive data provide information about additional efforts parents of preschool-aged children with ASD engage in to provide opportunities for peer interaction (see Table 5).

When parents with preschoolers with ASD tried to help establish peer relationships, the majority (92%: 38% almost always, 54% sometimes) discussed autism-related issues with parents of peers to promote better play. Of the parents who discussed autism-related issues with parents of peers, roughly one-fourth went into a lot of detail about their child’s strengths and weaknesses, one-half did not go into many details but did not minimize autism-related issues, one-fourth minimized issues to help other parents feel comfortable, and no parent reported never discussing these issues. The majority (62%) of parents found arranging play opportunities for their child at least occasionally difficult due to their child having autism. A majority of parents (77%) reported occasionally or frequently avoiding

arranging play opportunities for their child due to fear of rejection and concern that their child’s social skills were not good enough (92%). Seventy-seven percent reported that their child’s medical and educational services restricted the amount of time their child had for social opportunities with peers.

**Discussion**

This study demonstrated preschool-age children with ASD who also have an older sibling with ASD (HR-ASD) show precursors to later peer competence and friendship challenges, with fewer peer playmates, lower quality peer interactions in the home, and a higher likelihood of having no playmates than HR children without ASD and LR children. Children with ASD and challenging behaviors were at the highest risk of having no peer playmates. However, there was no evidence that language ability contributed to group differences in number of playmates. In contrast to our hypotheses, HR preschool-age children without ASD had equivalent numbers of playmates and similar quality of in-home peer interaction as LR children. Thus, early emerging

**Table 5** Parent experiences providing peer play opportunities for preschool-age children with ASD

Item	Responses	N	%
1. When trying to help your child establish a friendship with a peer, do you discuss issues related to autism with peers’ parents in order to promote better play?	a. Almost always	5	38
	b. Sometimes	7	54
	c. Never	1	8
2. If you do discuss these issues with parents to promote better play with peers, which strategy best describes your approach?	a. Go into a lot of detail about how your child’s strengths and weaknesses	3	23
	b. Not many details, but not minimizing issues either	6	46
	c. Minimize the issues to help them feel comfortable	3	23
	d. Never discuss it	1	8
3. How often have you experienced difficulty in arranging play opportunities for your child which you believe is due to your child having autism?	a. Frequently	3	23
	b. Occasionally	5	38
	c. Rarely or never	5	38
4. How often have you avoided arranging play opportunities for your child due to fear of rejection due to your child having autism?	a. Frequently	4	31
	b. Occasionally	6	46
	c. Rarely or never	3	23
5. How often have you avoided arranging play opportunities for your child due to concern that your child’s social skills are not good enough?	a. Frequently	4	31
	b. Occasionally	8	61
	c. Rarely or never	1	8
6. To what extent do the various medical and educational services your child requires restrict the amount of time your child has for social opportunities with peers?	a. Very much	5	38
	b. Somewhat	5	38
	c. Not at all	3	23
7. How satisfied are you with how the school staff help your child get along with peers?	a. Very satisfied	9	69
	b. Somewhat satisfied	2	15
	c. Not satisfied	0	
	d. Extremely dissatisfied	1	8
	e. Not in school	1	8

challenges with peer relationships in the home setting were specific to the HR-ASD group compared to the HR-Non-ASD and LR groups.

Parents of both the HR-ASD and HR-NonASD group reported many areas of resilience. Our findings revealed, contrary to our hypotheses, no evidence of difficulties with arranging play dates at this age and no statistically significantly increased stress while monitoring play dates in parents of a preschooler with ASD and an older child with ASD as compared with parents of preschoolers without ASD. This is remarkable given the difficult adaptations having two children with ASD in a family would require. On the other hand, parents of preschoolers with ASD reported a greater need to provide direct assistance during play dates. The HR-ASD group parents also reported making significant efforts in the community to promote peer competence in their preschool-age children, including discussing ASD with other parents to facilitate peer relationships, barriers to arranging play in the home due to their child's ASD and social skills, and decreased time for play dates due to time spent in intervention. In the community, the HR-ASD group was engaged in a fewer number of community activities. But, also remarkable was the fact that the HR-NonASD group did not differ from the LR group with regard to community activities. Despite having an older sibling with ASD in the family parents were able to adapt and provide a rich, positive social environment for their children. Taken together, this data suggests that despite many indicators of positive functioning, preschool-aged children with ASD are already falling behind same-aged peers with regard to opportunities for peer relationships and that their parents already need to make greater efforts to facilitate peer play in the home than HR-NonASD or LR group parents.

There were remarkably few differences in peer relationships between the HR-NonASD group and LR group. There were no child-related variables that differed between the HR-NonASD and LR groups and only one parent support variable that differed (fewer community-based peer-related activities per week). Less frequent opportunities for children in the HR-ASD and HR-NonASD to engage in community activities may in part be due to the challenge of finding accepting environments for children with ASD. Continued work on the part of community organizations is needed to create safe and welcoming experiences for children with ASD and their siblings. Our findings also suggest significant areas of strength in the HR-NonASD group, where peer relationships are not distinguishable from the LR group despite the challenges parents may face due to having an older child with ASD.

Previous research has clearly demonstrated that HR siblings who do not develop ASD may have a variety of related behavioral and developmental challenges, with up

to 30% of non-ASD HR siblings demonstrating these difficulties (Messinger et al. 2013; Charman et al. 2017). Furthermore, some HR preschool-age siblings without ASD may go on to meet criteria for ASD in school-age (Brian et al. 2016). We noted that 19% of the HR-NonASD group did not have peer playmates, but this was not statistically significantly different from the 12% of same-aged LR group without peers. The DSM-5 states that symptoms may not be evident until environmental demands outstrip the abilities of some individuals with ASD. Thus, it is possible that peer relationship challenges could emerge in this group during school age. The preschool years are a time in which same-aged peers are very accepting of one another, and preferences for one playmate over another are just emerging. Typically-developing preschoolers may demonstrate many of the same mild behavioral challenges as the HR-NonASD group. Preschool-age children may also rely less on complex language to facilitate peer interactions. However, there is evidence that later peer interactions rely on language (Sigman et al. 1999) and children with language disabilities are more likely to be isolated from peer interactions (Fujiki et al. 1999). The preschool years could be a critical time for early preventive interventions to build skills and prevent later emerging challenges. Follow-up of the children in this study is planned for school-age, and it will be important to evaluate any later-emerging peer competence and friendship challenges in the early school years. Information regarding any emerging challenges in this domain can inform the timing and content of interventions to support the positive developmental trajectories of peer competence and friendships in younger siblings of children with ASD.

This prospective high-risk sibling study has several unique strengths. There is little currently known about how preschool-aged children with ASD develop peer competence and friendships and this initial study begins to address the need for understanding the precursors to peer competence and friendship challenges seen in the school years. Even less is known about how non-autistic younger siblings of children with ASD develop in this domain. This study is the first to our knowledge to evaluate this group of children who are at-risk not only for ASD, but also for a range of other developmental challenges that may put them at risk for problems with peers. Since ascertainment was not based on behavioral symptoms or concerns about ASD or peer relationships, this may have reduced ascertainment bias that could amplify group differences. This study was also the first to assess peer relationships at home in preschool-aged children with ASD and the first to assess parent support activities. The preschool years are a time when children are increasingly likely to be exposed to peer groups through preschool or community activities, however research with other populations suggests that experiences



with peers in the home is very important for this age group. Young children under age three are often learning from parents and home-based experiences as opposed to learning in groups or school settings and the preschool years serve as a bridge to the demands of school-age.

We also note several important limitations. Foremost was the small sample size of the HR-ASD group. This limitation was amplified because over half of the sample did not have a peer playmate or host play dates in the home over the prior 3 months. Thus, for all variables related to peer relationships, additional caution is needed in interpreting the results. In addition, not all children in the HR-NonASD group were directly assessed at preschool age for ASD diagnosis and intellectual disability. Although we obtained parent-report using a gold-standard interview (ADI-R), a recent report focusing on high-risk infants who do not go on to develop ASD, followed through 36 months of age, suggests that over a quarter without a diagnosis of ASD will nonetheless demonstrate significant developmental difficulties as indexed by high levels of ASD symptoms on the ADOS or lower developmental skills on the MSEL (Ozonoff et al. 2014.) Thus, follow-up of high-risk infants into school-age is clinically indicated and may reveal additional information about peer relationships in school-age, and risk and protective factors related to this important developmental milestone in middle childhood. Future research is needed to directly assess characteristics of peer relationships and evaluate the peer relationship skills and developmental needs of young children with ASD who do not have peer play dates at home. Efforts to develop interventions for children at this very early stage of friendship and peer competence development are needed. For example, implementing strategies such as directly supporting peer play and coaching parents with effective strategies to facilitate and support peer activities, should be tested. Preschool-age children with ASD do not appear to be as far behind same-age peers in terms of friendships and peer competence as they are likely to be by school-age. Intervening earlier may lead to better outcomes as opposed to waiting until children have fallen further behind in peer-related skills and have experienced failures with early friendships (Rotheram-Fuller et al. 2010). For families with a history of ASD, earlier support and more accurate understanding of the benefits of peer play opportunities could reduce the peer play opportunity gap, and support parental efforts to provide opportunities for their children to develop peer competence, and set the stage for positive peer relationships and friendships.

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**Author contributions** AE conceived of the study, participated in its design and coordination and drafted the manuscript; JM participated in data analysis and interpretation of the data; TSJ participated in data analysis, coordination of the study and performed the measurement; SRD participated in the design and coordination of the study and reviewed early drafts of the manuscript; AR performed the measurement and participated in conceptualizing and reviewing early manuscript drafts; KB participated in design and coordination of the study; HH participated in design and coordination of the study; RTS participated in design and coordination of the study, LZ participated in design and coordination of the study; JP participated in the design and coordination of the study; MJG participated in the design of the study and helped to conceptualize the manuscript. All authors read and approved the final manuscript.

#### Compliance with Ethical Standards

**Conflict of interest** The authors declares that they have no conflicts of interests.

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