

Social involvement of children with autism spectrum disorders in elementary school classrooms

Erin Rotheram-Fuller,¹ Connie Kasari,² Brandt Chamberlain,³ and Jill Locke²

¹Temple University, Philadelphia, USA; ²University of California, Los Angeles, USA; ³Pasadena Child Development Associates, Pasadena, CA, USA

Background: Children with autism spectrum disorders (ASD) are increasingly included in general education classrooms in an effort to improve their social involvement. **Methods:** Seventy-nine children with ASD and 79 randomly selected, gender-matched peers (88.6% male) in 75 early (K–1), middle (2nd–3rd), and late (4th–5th) elementary classrooms across 30 schools completed social network surveys examining each child's reciprocal friendships, peer rejection, acceptance, and social involvement. **Results:** Across grade levels, peers less frequently reciprocated friendships with children with ASD than students in the matched sample. While children with ASD were not more likely to be rejected by peers, they were less accepted and had fewer reciprocal friendships than matched peers at each grade level. Although 48.1% of children with ASD were involved in the social networks of their classrooms, children with ASD were more likely to be isolated or peripheral to social relationships within the classroom across all grade levels, and this difference is even more dramatic in later elementary grades. **Conclusions:** In inclusive classrooms, children with ASD are only involved in peers' social relationships about half of the time, and appear to be even less connected with increasing grade level. Promoting children with ASD's skills in popular activities to share with peers in early childhood may be a key preventive intervention to protect social relationships in late elementary school grades. **Keywords:** Autism, social involvement, inclusive education, social networks. **Abbreviation:** SNC: social network centrality.

Both parent requests and legislative mandates have increased the number of children with autism spectrum disorders (ASD) included in general education classrooms, regardless of their developmental readiness or environmental adaptations (Fuchs & Fuchs, 1994; Kasari, Freeman, Bauminger, & Alkin, 1999). By definition, children with ASD have difficulties with social relationships at all ages and functioning levels, including failures in effective communication, sharing enjoyment and interest, and emotional reciprocity (American Psychological Association, 2000). Given these specific social challenges, many parents of children with ASD have advocated integrating these children into general education classrooms to improve children's social functioning as well as expose them to the traditional curriculum (Gallagher et al., 2000; Hunt & Goetz, 1997; Kasari, Freeman, Bauminger, & Alkin, 1999; Ryndak, Downing, Jacqueline, & Morrison, 1995). However, it is unclear how effective inclusion has been at socially integrating children with ASD into the social structure of typical classrooms, and none have looked at differences in social involvement across grade levels. Our goal was to examine the patterns of social involvement of children with ASD in inclusive classrooms from kindergarten to fifth grade relative to a matched sample of typical peers to evaluate the social involvement of both groups across grade levels.

The benefits of social relationships are well documented among typically developing children. Having friends has been shown to be associated with pro-social skills (Gest, Graham-Bermann, & Hartup, 2001; Ladd & Troop-Gordon, 2005), as well as increased academic achievement, reduced school dropout, and reduced risk of later adjustment problems (Brendgen, Wanner, Morin, & Vitaro, 2005; Farmer et al., 2008; Middleton, Zollinger, & Keene, 1986). Increased social interactions among children have also been shown to improve social play behavior as well as language skills (Wolfberg & Schuler, 1993; Rogers, 2000).

Early reports on inclusive classrooms have been encouraging, showing that children with ASD who are included in typical classrooms show improvements in their social initiations, and the ability to generalize learned social skills in school (Carr & Darcy, 1990; Harrower & Dunlap, 2001). In inclusive classrooms, typical peers can be social role models, encouraging the maintenance and generalization of social skills that are often not achieved when using an adult role model in a clinical intervention (Carr & Darcy, 1990; Roeyers, 1996; Shearer, Kohler, Buchan, & McCullough, 1996).

The efficacy of inclusion alone on the social development of children with ASD is not entirely clear. Some parents report their child's inclusive experience as characterized by peer acceptance, and even being able to form meaningful friendships with their non-disabled classmates (Ryndak et al., 1995;

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Staub et al., 1994). However, other studies have shown inclusion to be insufficient to truly integrate children with ASD into the social networks of their typical peers (Burack, Root, & Zigler, 1997; Chamberlain et al., 2007), and may even be to their social detriment (MacMillan, Gresham, & Forness, 1996; Ochs, Kremer-Sadlik, Solomon, & Sirota, 2001; Sale & Carey, 1995). For older children and adolescents, especially, inclusion alone does not predict the presence of a reciprocal social relationship (Orsmond, Krauss, & Seltzer, 2004). It is unclear, however, whether differences seen across studies are a result of children's level of social involvement, or an artifact of measurement practices. Parent and teacher reports are indirect, as they may not be privy to children's activities and associations at school (especially play time). Thus, aggregated student reports were used in this study to get cross-validated impressions from multiple students on the social structure of each classroom.

There are substantial shifts within social relationships throughout elementary school. Children at the kindergarten level are more accepting of differences than their elementary school counterparts, and often associate with peers of all types, based primarily on proximity in the same classroom (Rubin, Chen, Coplan, & Buskirk, 2005; Rubin et al., 1983). Friendships in late elementary school, however, begin to show more companionship with peers than in earlier grades, as children develop feelings of intimacy through self-disclosure as well as play activities (Freeman & Kasari, 2002; Rubin et al., 2005). The size of friendship groups also increases with grade in elementary school (grades 1–4), peaks during the middle school years, and then declines in adolescence (beginning in 8th grade; Berndt & Hoyle, 1985; Neckerman, 2006; Rubin et al., 2005). However, these developmental shifts in friendships remain unexplored among children with ASD.

Children with ASD show a desire for friendships (Bauminger & Kasari, 2000), but remain at an increased risk of social problems in regular classroom settings. High-functioning children with ASD in included classroom settings are more often neglected and rejected than their typical classmates (Ochs et al., 2001), as well as having fewer friendships, poorer friendship quality with their friends, and more loneliness at school compared to their typical peers (Bauminger & Kasari, 2000). These children initiate interactions less often with peers, are less proximal and engaged with peers, show more non-social behaviors, and are more often rated as having poor social behaviors by their teachers (Koegel, Koegel, Frea, & Fredeen, 2001; McConnell, 2000). Additionally, children with ASD have been shown to be less accepted by peers and are viewed as less central members of their classroom social structure as compared to typical classmates (Chamberlain et al., 2007). Despite delays in

developmental shifts in social involvement for children with ASD, these changes are important to explore in manners similar to the literature on typically developing populations. Including information on the age and grade of participants throughout research studies is critical, and studies that group children across grades looking at social involvement should be interpreted with caution.

Based on this existing literature, we hypothesized that children with ASD may be able to form and maintain social relationships at earlier grades, but have more trouble with these relationships in later elementary school. Thus, we studied differences in the social involvement of children both with and without autism at different grade levels. Each child's friendships, levels of peer acceptance and rejection, and position within the classroom social networks (e.g., centrality) were examined.

Methods

Families of children with ASD were recruited from participating local area schools, as well as self-referrals based on outreach activities and community agencies. Families wishing to participate were asked to contact the study investigator and provide written informed consent.

Schools and classrooms. Voluntary informed consent for participation was obtained from the principals of 30 schools, 79 parents of children with ASD and 1063 parents of typical peers in 75 classrooms in the greater Los Angeles County area. Child assent was also required from all participating children; both children with ASD and typical peers ($n = 1,142$). As study measures assessed classroom level social networks, participating students reported on all classroom peers. Therefore, an additional 1,106 peers whose families did not sign consent were anonymously coded as 'other peers' within the classroom, but did not complete study measures. Class sizes averaged 30.08 students ($sd = 14.36$), with a minimum of 50% of children in each classroom participating to ensure reliability of data. Only four classrooms contained two children with ASD, whereas all other classrooms contained one. No other information was obtained about the diagnostic status of any other children in the classroom. Classrooms were grouped into three levels of elementary school: 1) early: kindergarten and 1st grade ($n = 19$ classrooms, $n = 20$ children with ASD; 456 typical peers); 2) middle: 2nd and 3rd grade ($n = 36$ classrooms, $n = 38$ children with ASD, $n = 853$ typical peers; and 3) late: 4th–5th grade ($n = 20$ classrooms; $n = 21$ children with ASD, $n = 860$ typical peers).

Once data was collected from all children within these classrooms, we randomly selected one gender-matched participating peer from within the same classroom of each child with ASD to be included in the comparison group. This resulted in a matched sample of 79 typical peers: 20 in early elementary; 38 in middle elementary; and 21 in late elementary classrooms.

Child participants. For each grade grouping, children with ASD were overwhelmingly male (88.6%; $n = 70$), and diverse in ethnicity, with 38.0% Caucasian, 19.0% Latino, 13.9% Asian, 5.1% African American, and 6.3% of other ethnicities. Overall, the average age of children with ASD was 8.11 years ($sd = 1.57$). All diagnoses were confirmed by an independent evaluation of the child prior to participation. Participants who had recent evaluations (within one year prior to participation) were not required to attend the Autism Evaluation Clinic to receive an additional assessment. Of the 65 children for which we obtained a full differential diagnosis, the majority of children had a diagnosis of autism (75%, $n = 49$), with the remaining participants being identified as having Asperger's disorder (25%, $n = 16$). The remaining 14 participants were only identified as having 'ASD.' California schools do not use IQ in their assessments of children, so files provided by parents often did not include IQ. IQ was not used to include or exclude children within this study, but only as a demographic descriptor for those children who did attend the Autism Evaluation Clinic. A total of 65 of the children with ASD were administered the Weschler Intelligence Scale for Children-III (WISC-III), which yielded an average full scale IQ of 91.4 ($sd = 17.3$; range = 52–129). Children's IQ did not differ based on age or grade level, but did differ as a function of diagnosis. As expected, children with a diagnosis of autism had a significantly lower average IQ ($M = 85.36$, $sd = 14.21$) compared to children with Asperger's disorder ($M = 102.31$, $sd = 19.41$, $t(59) = -3.71$, $p < .001$).

Among the 79 typical peers, 88.6% were male, as they were matched to the children with ASD; however, we do not have information on ethnicity. Given the high rate of similar ethnicity within each classroom, however, we anticipate that the random selection of gender-matched controls resulted in a sample similar in ethnicity to the children with ASD.

Procedures

All participating children completed a Friendship Survey (Cairns & Cairns, 1994) in a group administration format, with clear instructions to ensure comprehension and individual assistance provided for any children without good reading/writing skills, or difficulties understanding instructions. This nomination procedure results in a robust picture of the full set of classroom social networks with as few as 50% of the children in a classroom participating (Cairns & Cairns, 1994, p. 101), and has been demonstrated to be successfully utilized by children with ASD to rate their social involvement (Chamberlain et al., 2007; Farmer & Farmer, 1996). On the Friendship Survey, children were asked to nominate students in their classroom in three categories: 1) children that they like to 'hang out with' and then circling their three closest friends, and putting a star next to their best friend in the class; 2) children that they did not like to 'hang out with' in their class; and 3) list children who 'hang out together' in groups. Using this free-recall method indicated each child's salience in the social structure of the class. From these student reports, multiple measures were calculated.

1. *Reciprocal top three friendships and best friend.* Reciprocal friendships refer to the number of peers who mutually listed each other as their top three friends within their class. Best friendships were counted only if they were reciprocal. In the event that a peer listed a child as a friend who did not complete the questionnaire, this information was coded as missing data instead of a non-reciprocal friendship.

2. *Acceptance.* Acceptance for each child was calculated using a z-score of the total number of friend nominations received from all other peers within the classroom. Thus, this provided a score of relative acceptance for each child within the classroom ranging from -1 to +1. Using this z-score, 0 represented the average level of acceptance within the classroom, and negative scores represented acceptance that was lower than the average, while positive scores represented above-average levels of acceptance.

3. *Rejection.* A sum of the number of peers who listed a child as one that they did not like to hang out with was also transformed into a z-score within the class. This number provided the relative level of rejection within each classroom for each student similar to levels of acceptance.

4. *Social network centrality.* Centrality refers to the prominence of an individual in the overall classroom social structure. Three types of centrality were evaluated, each student's: 1) 'individual centrality', 2) 'cluster centrality', and 3) 'social network centrality' (SNC). Using methods developed by Cairns and described by Farmer (Cairns, Gariepy, & Kindermann, 1990; Farmer & Farmer, 1996), the first two types of centrality were used to determine the third. Based on Farmer and Farmer (1996, p. 437), there are four levels of 'social network centrality' that are possible, ranging from isolated to nuclear (0 = isolated, 1 = peripheral, 2 = secondary, and 3 = nuclear). Isolated status refers to children without any connections to peers in the classroom, while peripheral status refers to those students who have only tenuous connections to one or two peers. Secondary status describes those children who are involved in the classroom social network, but not the most nominated students in the class, whereas nuclear status represents those students who are most frequently nominated by classmates as having friends. For the purposes of these analyses, this four-level variable of SNC was further collapsed into a two-level variable, separating those students that were peripheral or isolated (low SNC) relative to students who had secondary or nuclear centrality status (high SNC).

5. *Social connections.* The total number of social connections was calculated from the classroom social network map for each child within the classroom. A co-occurrence matrix of all social relationships was developed based on reports from all students completing the survey within the classroom, and any significant correlations (above 0.40) between two students within the classroom were considered social connections (see Cairns & Cairns, 1994 for a full description of analysis procedures).

Data analysis

The distributions of social network variables met standard statistical assumptions. Analyses were two-tailed, and a level of $p < .05$ was used as a cutoff to identify significant results. All Friendship Survey outcomes were compared by both autism status and grade level (early, middle, or late). Effects of class size and gender, ethnicity and IQ of children with ASD were controlled within analyses, but produced the same pattern of results across grade groups; thus, original analyses are presented. One exception is noted in the results.

Results

Within the group of children with ASD, there were few differences across grade group levels. Although low across all grade groups, children with ASD were significantly more socially included in early (55.0%) and middle (57.9%) grades than later grades (23.8%; $\chi^2(2) = 6.81, p = 0.03$). However, there were no significant differences by grade level in the number of top three reciprocal friendships, best friendships, acceptance or rejection by peers, or the total number of social connections. Children with ASD did receive nominations as friends ($M = 1.68, sd = 1.84$), and often nominated several peers as friends ($M = 4.19, sd = 2.94$), however, these nominations often did not match between the typical children and children with ASD, as we see low rates of reciprocal top three (21.2%) and best friendships (11.6%) overall. Children with higher (secondary or nuclear) SNC were compared to those who had lower (peripheral or isolated) SNC on demographic characteristics, but no differences were found. Controlling for child factors (gender, ethnicity, and IQ), children with ASD who had at least one reciprocal friendship had significantly higher SNC ($M = 1.59, sd = 0.91$), and acceptance ($M = -.29, sd = 1.08$) relative to children with ASD with no reciprocal friendships (SNC $M = 1.19, sd = 0.74, F(1, 53) = 4.33, p = 0.042$; acceptance, $M = -.95, sd = 0.75, F(1, 53) = 8.63, p = 0.005$).

Among the matched sample of typical peers, there were no differences across grade group levels in SNC, reciprocal top three or best friendships, or rejection, however, children were significantly more accepted

by their peers in the early grades ($M = 0.63, sd = 0.87$) than in the middle ($M = -.05, sd = 0.63$) or later grades ($M = -.06, sd = 0.89; F(2) = 4.39, p = 0.017$). Typically developing children also showed significantly higher numbers of social connections in the older ($M = 5.57, sd = 3.01$) relative to middle grades ($M = 4.03, sd = 2.05; F(2, 76) = 3.47, p = 0.036$).

Although approximately half (48.1%) of children with ASD were socially involved in their classrooms (secondary or nuclear SNC), this was significantly lower than the percentage of typically developing peers within the same social network status (91.1%; $\chi^2(1) = 34.59, p < .001$; see Table 1). Children with ASD were also significantly lower than typical classmates in almost all measures of social involvement, except rejection from peers.

When separating comparisons within each grade group, results showed a slightly different pattern (see Table 2). Overall, children with ASD were still far below their typical classmates on most measures of social involvement; however, there were fewer differences in the early than in middle and late grade groups. For example, within the early grade group, children with ASD and typical peers had similar rates of reciprocal best friendships, while in the middle and late grade groups, children with ASD showed significantly lower rates of reciprocal best friendships than typical classmates (middle $\chi^2(1) = 7.86, p = 0.005$; older $\chi^2(1) = 7.20, p = 0.007$). Although acceptance was significantly lower for children with ASD than typical peers across all grade groups, rejection by peers remained non-significant regardless of grade.

Discussion

This study explored the social networks of children with ASD and a matched set of their typical peers in early, middle, and late elementary school. There were three major observations. First, in inclusive classrooms with at least one child with ASD, typical children's social involvement demonstrated normative, developmental patterns. Across all grade groups, typical students were socially connected to their classmates, with higher numbers of social connections in the higher elementary grades,

Table 1 Social involvement of children with ASD compared to gender-matched typical peers across all grade levels

	Typical peers (<i>n</i> = 79)	Children with ASD (<i>n</i> = 79)	Significance	Effect Size
Social network centrality: % nuclear/ secondary status	91.1%	48.1%	$\chi^2(1) = 34.59, p < .001$	$d = 1.11$
Rejection	.40 (1.03)	.41 (1.46)	NS	
Acceptance	.15 (.79)	-.71 (.96)	$t(156) = 6.12, p < .001$	$d = 1.00$
Reciprocal top three friends	61.7%	21.2%	$t(134) = 6.38, p < .001$	$d = 1.11$
Reciprocal best friendship	47.8%	11.6%	$\chi^2(1) = 13.78, p < .001$	$d = .88$
Social connections	4.44 (2.36)	2.91 (2.45)	$t(156) = 4.00, p < .001$	$d = .66$

Table 2 Social involvement of children with ASD compared to gender-matched typical peers at each grade group

	Early grades, K–1st		Middle grades, 2nd–3rd		Late grades 4th–5th	
	Typical peers (<i>n</i> = 20)	Children with ASD (<i>n</i> = 20)	Typical peers (<i>n</i> = 38)	Children with ASD (<i>n</i> = 38)	Typical peers (<i>n</i> = 21)	Children with ASD (<i>n</i> = 21)
Social network centrality:% nuclear/secondary status	95.0%*	55.0%*	92.1%*	57.9%*	85.7%*	23.8%*
Rejection	.55 (1.11)	.44 (1.30)	.27 (.97)	.19 (1.29)	.42 (1.05)	.67 (1.85)
Acceptance	.55 (.83)*	–.39 (.97)*	–.02 (.72)*	–.78 (1.02)*	.00 (.79)*	–.89 (.79)*
Reciprocal top three friends	<i>N</i> = 1754.9%*	<i>N</i> = 1723.5%*	<i>N</i> = 3467.2%*	<i>N</i> = 3325.7%*	<i>N</i> = 1957.9%*	<i>N</i> = 169.4%*
Reciprocal best friendship	<i>N</i> = 1233.3%	<i>N</i> = 1118.2%	<i>N</i> = 2450.0%*	<i>N</i> = 2412.5%*	<i>N</i> = 1060.0%*	<i>N</i> = 80.0%*
Social connections	4.05 (1.73)*	2.65 (1.57)*	4.03 (2.05)*	2.79 (2.22)*	5.57 (3.06)*	3.38 (3.41)*

*Significant difference between Children with ASD and matched peers within grade group level.

as would be predicted by previous research (Berndt & Hoyle, 1985; Rubin et al., 1983; Rubin et al., 2005).

Second, children with ASD had significantly fewer reciprocal relationships in all grades relative to typical classmates. Reviewing both students' reciprocal top three and best friendships, results demonstrated that children with ASD looked more similar to classmates in early grades in contrast to middle and late grades, although they have significantly fewer reciprocal top three friendships across all grade groups. Given these differences, it appears that social involvement was at its peak for children with ASD in the early and middle elementary school years.

Reciprocity is a key component of friendships that offers bonding, intimacy, and support (Berndt, 1998; Buhrmester, 1998; Freeman & Kasari, 2002). However, children with ASD showed misperceptions of their social involvement, as they listed children as friends who did not consider them within their social group. This replicates earlier findings by Bauminger and Kasari (2000), and Chamberlain and colleagues (2007), who also found that children with ASD did not accurately report their friendships. It is still unclear, however, whether this misrepresentation stems from a misunderstanding of the nature of friendships, or an inability to assess the reciprocal nature of their own relationships. The importance of friendships was highlighted, however, by the finding that children with ASD who had at least one reciprocal friendship were more socially involved in their classroom social networks and more accepted by peers overall. More information is needed to clarify the role of individual reciprocal friendships in assisting children with ASD to become more fully involved in the classroom social structure.

The most dramatic difference between children with ASD and typical peers, however, was in their SNC scores. Across all grades, children with ASD were significantly lower in their social network cen-

trality relative to typical classmates. Only 55.0% and 57.9% of children with ASD were considered nuclear or secondary in classroom social networks at the early and middle grades, respectively, while only 23.8% of children with ASD were in that category in the later grades. These are incredibly low rates of inclusion relative to their typical peers, who were considered to be nuclear or secondary within the classroom at rates of 95.0%, 92.1%, and 85.7% respectively across the grade levels. This dramatic downward shift in the late elementary grades among children with ASD may suggest many changes between the middle to late grade level groups. Peers may begin to not only recognize differences between themselves and the child with ASD, but also become much less tolerant of differences and aberrant behaviors (Santrock, 1997). Peers may also become more aware of, and fear, stigma that could be linked to them if they associate with a child within the classroom that is otherwise rejected (Major & O'Brien, 2005).

Still, it is encouraging that overall, 48.1% of children with ASD were socially involved within their classroom social networks (secondary or nuclear). These are encouraging results to support classroom inclusion, especially in the younger and middle grade group levels. Unfortunately, there were no demographic variables collected that distinguished these children. Future studies should focus on obtaining more complete demographic and functioning information to be able to identify child-level predictors of social involvement. On the other hand, we may also need to look outside of characteristics of the child to environmental factors that were not measured in this particular study, to explore other aspects that might be impacting their social involvement.

One explanation for differences observed in the social involvement of children with ASD across grade groups is in the games played on the playground. In the oldest grade group level, games become more sophisticated, and sportsmanship becomes

increasingly important. Solitary play is directly associated with peer rejection (Spinrad et al., 2004), which is a common feature of ASD. Cooperative games that can be played in a parallel or solitary fashion in early grades are replaced by competitive ones in later grades. Children with ASD often lack motor coordination and have difficulty understanding games, especially with complex or changing rules. This puts children with ASD at a significant disadvantage with their peers as children get increasingly competitive in later grades. Especially for boys (who are disproportionately represented at a higher rate within ASD) in the later elementary school years, sports are a considerable source of group identity. Many typically developing boys, when completing the social network questionnaire, listed children according to who played which game on the yard (i.e., basketball group, etc.), and not being a part of one of those groups may leave children with ASD on the periphery.

One of the limitations of this project was the small sample size of children with ASD, especially females. Greater information on female children with ASD could possibly shed light on gender dynamics with peers that cannot be seen with this limited group. In addition, the small sample size of children with ASD allowed a comparison of only three aggregated grade groups of children, which may neglect differences between individual grades. Further exploration with larger numbers of children with ASD would be optimal to more fully evaluate the developmental changes in social involvement in each grade level. Future research may also need to examine relationship quality or loneliness, in addition to the level of social involvement, to get a better understanding of the impact of peer relationships on the child with ASD.

Another consideration for future studies is to use a different comparison group. As parents are often asked to choose between inclusive or separate settings for their child's education, having more information on differences between these two settings on the involvement of children with ASD in the social group of each type of classroom might be valuable to inform children's placement.

The cross-sectional design of this study also limits understanding of what changes might occur across grades within the group of children with ASD. Further characterization of the functioning of each child with ASD, as well as the classrooms and peers could provide essential information on the match between children's abilities and general education classrooms that best promote social involvement. Having longitudinal studies watch well-characterized children over time could help specify the challenges that arise for certain children with ASD that could better explain the drop in social involvement at the oldest grades.

This study represents a first look at differences in social involvement for children with ASD at three elementary school grade group levels. Children with ASD show a considerably different pattern of social network inclusion from their typical classmates. Although inclusion alone may be sufficient to integrate some children with ASD into the social structure of classrooms in the younger and middle elementary school years, more assistance may be needed at the older grades to facilitate true social involvement. Changing demands in both cognitive and physical skills, with emerging and evolving competitive games, leave children with ASD significantly less included than their typical classmates. Longitudinal studies are clearly needed to follow children with ASD throughout these elementary school years, and specifically examine the challenges that arise to make social involvement in the later years so much more difficult.

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Correspondence to

Erin Rotheram-Fuller, 1301 W. Cecil B. Moore Ave. RA-257, Philadelphia, PA 19122, USA; Tel: 215-204-5745; Email: erf@temple.edu

Key points

- Across grades, almost half of children with ASD were socially involved in their regular education classroom social networks.
- The involvement of children with ASD in classrooms is comparable to typical peers in early elementary grades, but lower than peers in older elementary grades.
- Reciprocal relationships are a considerable challenge for children with ASD within regular education classrooms across grade groups.
- Common activities and skills building may be necessary to fully involve children with ASD in the social groupings of their peers, beyond current inclusion practices.

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