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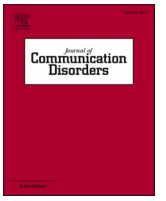

The role of eye contact in young children's judgments of others' visibility: A comparison of preschoolers with and without autism spectrum disorder

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ABSTRACT

Typically-developing (TD) children under age 5 often deny that they can see a person whose eyes are covered (e.g., Moll & Khalulyan, 2017). This has been interpreted as a manifestation of their preference for reciprocal interactions. We investigated how 3- to 4-year-old children with autism spectrum disorder (ASD, n = 12) respond in this situation. Because a lack of interpersonal connectedness and reciprocal communication are core features of this disorder, we predicted that young children with ASD will not make mutual regard a condition for seeing another person and therefore acknowledge being able to see her. Against this prediction, children with ASD gave the same negative answers as a group of TD (n = 36) age-mates. Various interpretations are discussed, including the possibility that some children with ASD are capable of relating to others as second persons.

1. Introduction

Most preschoolers younger than 5 years deny that they can see a person whose eyes are covered (Flavell, Shipstead, & Croft, 1980; McGuigan, 2009; Moll, Arellano, Guzman, Cordova, & Madrigal, 2015; Russell, Gee, & Bullard, 2012). When facial areas other than the eyes are covered, children acknowledge that the person is visible (Bridges & Rowles, 1985; McGuigan & Doherty, 2006). Being able to look others in the eyes thus matters a great deal to children (see Starmans & Bloom, 2012). But having visual access to the eyes is not sufficient: Most children still deny seeing another unless they make eye contact (Russell et al., 2012).

An explanation for this phenomenon was recently offered by Moll and Khalulyan (2017) and Moll et al. (2015), who argue that children start out with a *bidirectional* notion of perceiving others. In this view, young children aspire to engage reciprocally with others and -encounter them as "second persons" (see Darwall, 2006; MacMurray, 1961). They want to enter a bidirectional relationship in which self and other express mutual recognition. The idea is that young children assume that A can successfully see B only if A and B see each other. We might say that young children model seeing, where its object is a person, on social acts like giving or telling. These acts are inherently bidirectional because their success depends on the addressee's uptake or acceptance. A cannot give B an object unless B takes it from A, and, as social epistemologists argue, A cannot tell B anything unless B takes A's word for it (McMyler, 2011; Moran, 2013; Small, 2014). Philosopher Thomas Reid calls these acts "social operations of the mind" (Reid, 1788/2010; Reid, 1788) because they involve the participation of two mutually responsive persons. By claiming not to see someone with obstructed eyes, young

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children extend the principle of bidirectionality to person perception, thus treating a solitary act of perception like a reciprocal social act.

Young children's demand for mutual gaze attests to the importance of reciprocal relations in their lives. Before turning to and exploring objects, infants seek contact with other humans with whom they strive to exchange affect (Reddy, 2008). Face-to-face interaction is intrinsically rewarding for them (Kinsbourne & Helt, 2011: p. 5). Of the various facial parts it is especially the eyes that attract infants' attention (Maurer & Salapatek, 1976). Infants prefer open eyes to closed eyes, (Batki, Baron-Cohen, Wheelwright, Connellan, & Ahluwalia, 2000) and direct gaze to averted gaze (Farroni, Csibra, Simion, & Johnson, 2002), which aids their facial recognition (Guellai & Streri, 2011). They also favor highly contingent social exchanges (Gergely & Watson, 1996; 1999; Watson, 1972) and aim toward interactional synchrony by mimicking and anticipating others' sounds and movements (Condon & Sander, 1974; Meltzoff & Moore, 1977). These dyadic encounters set the stage for triadic relations in which infants share others' perceptions of and attitudes toward objects in the world. For example, they spontaneously imitate others' actions and orientations (Hobson, 2007; Meltzoff & Moore, 1977; 1983; 1989), reciprocate acts others perform toward them (Carpenter, Tomasello, & Striano, 2005; Tomasello, 2020) and take complementary roles in the context of cooperation (Warneken, Chen, & Tomasello, 2006). In sum, infants and young children naturally relate to others reciprocally and bidirectionally. They are "persons in relation" (MacMurray, 1961).

However, not all young children are equally prone to forming reciprocal social relations with ease. Most notably, children with autism spectrum disorder (ASD) do not develop the same sense of interpersonal connectedness (2002, Hobson, 1993; Schilbach et al., 2013). A core feature of ASD is a deficit in reciprocal interaction and communication (DSM-V). Among the first and most noticeable manifestations of ASD is atypical gaze behavior (Nakano et al., 2010; Senju & Johnson, 2009). Children with ASD are less proficient than TD controls at recognizing faces (Klin et al., 1999) and detecting direct gaze (Senju, Kikuchi, Hasegawa, Tojo, & Osanai, 2008; Senju, Tojo, Yaguchi, & Hasegawa, 2005; Senju, Yaguchi, Tojo, & Hasegawa, 2003). They do not preferentially look to others' eyes (Jones & Klin, 2013; Jones, Carr, & Klin, 2008) and spend an unusually long time focusing on the mouth (Klin, Jones, Schultz, Volkmar, & Cohen, 2002; Neumann, Spezio, Piven, & Adolphs, 2006) or unfeatured facial areas (Pelphrey et al., 2002; Rutherford, Clements, & Sekuler, 2007).

Children with ASD respond to eye contact with heightened physiological arousal (Kaartinen et al., 2012; Kylliäinen & Hietanen, 2006) and amygdala activation (Dalton et al., 2005; Kleinhans et al., 2010; Tottenham et al., 2013). It is still debated if they are indifferent toward mutual gaze (Moriuchi, Klin, & Jones, 2016) or experience it as aversive (Tottenham et al., 2013). An interesting fact about human eyes is that they combine the function of perception with that of expression (Gobel, Kim, & Richardson, 2015). Human eyes not only take in visual information, they can also express states of mind, such as joy or sadness (Eisenbarth & Alpers, 2011). Children with ASD are often unaware of the expressive aspect of gaze, as shown by their difficulties with "reading" intentions (Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997), emotions (Celani, Battacchi, & Arcidiacono, 1999), and other mental states (Baron-Cohen, Campbell, Karmiloff-Smith, Grant, & Walker, 1995) from others' eyes.

These deficits lead to a cascade of secondary effects whereby children with ASD miss out on key interpersonal exchanges that are foundational for further cognitive development, including triadic joint attention. The capacity for play that essentially involves another person is often impaired (Jordan, 2003; Wolfberg & Schuler, 1999). While infants with ASD do at times engage others' attention with gestures, they tend to deploy gestures to request objects, not to initiate shared attention (Charman et al., 1997; Mundy, Kasari, & Sigman, 1992; Mundy, Sigman, & Kasari, 1994). Their use of the first and second person pronoun is more often delayed and incorrect than in TD controls (Lee, Hobson, & Chiat, 1994; Naigles et al., 2016). Children with ASD are inclined to violate norms of turn-taking in conversations (Prizant & Rydell, 1993) and to derail from conversational topics (Hale & Tager-Flusberg, 2005; Tager-Flusberg & Anderson, 1991). In games of role reversal, they fail to alternate complementary roles like offering and taking (Carpenter et al., 2005) and lack understanding of the equivalence of self and other in these roles (Hobson & Meyer, 2005).

Taken together, a vast body of evidence suggests that children with ASD struggle to form reciprocal social relations. They may attentively track others' behavior, but express little interest in mutual regard. One might say that they view others as third, not second, persons (Schilbach et al., 2013). If this is so and if TD children's negations of seeing another person outside of eye contact reflect *their* second person stance toward others, we would expect children with ASD to affirm, not negate, that they can see others who cannot also see them. They should not endorse the bidirectional notion of seeing persons that TD children have been shown to endorse.

1.1. The current study

The aim of this study was to investigate whether young children with and without ASD differ in making mutual regard a requirement for person perception. To this end, we compared 3- to 4-year-old children with and without ASD in their self-reported ability to see a human whose eyes were occluded. In a control condition, the human's eyes were not occluded (No Occlusion Condition). To control for the possibility that children deny seeing *any* partially occluded object, human or not, we added a control task with artefacts. Such a control task is important because the attentional style of some children with ASD favors parts over wholes (Happé, 2005; Happé & Frith, 2006) and makes their attention fixate on particular features (Elsabbagh et al., 2013; Landry & Bryson, 2004; but see Fischer et al., 2016, for findings that attentional disengagement is unimpaired in children with mild forms of ASD). Consequently, children with ASD might deny seeing others whose eyes are obstructed because of general attentional particularities rather than defective reciprocal engagement. To also control for the opposite possibility that children with ASD uncritically *affirm* questions (perhaps as a response strategy they adopt when failing to understand the question), a negation test was included to check if children correctly negate questions in contexts other than perceptual judgments.

Every child with ASD was matched with three TD children on gender and chronological age (+/ 3 months). To ensure that the groups are comparable in their cognitive and language skills, all children completed the visual reception and (expressive and receptive)

Fig. 1. Example of Stimuli from the Human and Object Tasks.
Top panels show the experimenter facing the child in the Occlusion Condition (left) and the No Occlusion Condition (right) of the Human Task. Bottom panels show one of the objects in the Occlusion Condition (left) and the No Occlusion Condition (right) in the Object Task.

language subscales of the *Mullen Scales of Early Learning* (MSEL; Mullen, 1995). Additionally, children's parents completed the Social *Responsiveness Scale, Second Edition* (SRS-2; Constantino & Gruber, 2012), which was used to confirm that the groups markedly differ in their social responsiveness.

2. Method

2.1. Participants

This study was approved (UP-14-00072) by the Institutional Review Board of the University of Southern California. Participants were 36 (12 female) TD 3- to 4-year-olds ($M = 52;04$, range = 34;07–59;24) and 12 (4 female) 3- to 4-year-olds with ASD ($M = 52;23$, range = 36;22–60;15). All children spoke English. Recruitment and testing took place in the Greater Los Angeles area. TD children were recruited from a database of children whose parents volunteered to participate in studies of child development (n = 21), from a local children's museum (n = 14) and preschool (n = 1). Nine children were White, 8 Asian, 7 Hispanic, 2 African-American, and 10 multiracial. Their socioeconomic background varied widely, with annual family incomes ranging from $20,000 to above $120,000. No TD children were excluded.

Of the ASD children, nine were recruited from a local intervention clinic for autism and three from a local parent support group. Six were tested at home, four at the intervention clinic, and two at the University's child laboratory. Five children were White, 3 African-American, 1 Asian, 1 Hispanic, and 2 multiracial. Their socioeconomic background varied, with annual family incomes ranging from $40,000 to above $120,000. Two additional ASD children were tested but excluded because they failed the negation test (1) or because parental consent was retracted post-test (1). All children met the criteria for ASD as described in the *Diagnostic and Statistical Manual-V* and *the Autism Diagnostic Observation Schedule-Generic* (DSM-V: APA, 2013) and were diagnosed by community-based clinicians who were independent from the study. Diagnoses occurred between 5 and 25 months before study participation and were conducted with standard assessments, including the ADOS-2, ADOS-T, and ADI-R. All children received therapeutic interventions, which, at the time of test, had lasted between 6 and 24 months ($M = 16$ months). These were standard-of-care applied-behavior analytic interventions, implemented by independent service providers in the community. Interventions were aimed at building a variety of skills across developmental domains, with an emphasis on joint attention, sensory and other forms of perspective-taking and social communication.

2.2. Materials

There were two tasks: a Human Task and an Object Task. In the Human task, two female experimenters (E1 and E2) alternated in the roles of the questioner and of the experimenter facing the child (see Procedure for details). In the Object Task, stimuli for children to perceive were a house (23 × 15 × 15 cm) with a door and two windows, and a toy clock (23 cm diameter, 8 cm high) with two hands and removable numbers. An occlusion strip made of black felt (18 × 6 cm) was used to occlude the eyes of the experimenter facing the child and of the objects' parts, as shown in Fig. 1.

Fig. 2. Sample of Stimuli Used in the Negation Test.
The puppet (top) posed questions about the identity of objects (bottom) shown in the picture book.

2.2.1. Negation test

A picture book with four white pages (15 × 21 cm) was used. Each page contained a single image (9 × 6 cm) of a dog, a chair, a fire truck, and a banana, respectively. The page order was variable (see Design). A penguin puppet named "Leo" (26 × 16 × 13 cm), operated by E1, asked children questions about the objects' identities. Fig. 2 shows the puppet and two of the book pages.

2.3. Design

For 50 % of the children in each group, the Human Task was presented before the Object Task and vice versa for the other 50 %. Each task included eight trials: four Occlusion trials and four No Occlusion trials. In two Occlusion trials in each task, the experimenter used a felt strip to cover her eyes or the object's parts; in the other two, she used her hands. Occlusion trials directly preceded or followed the corresponding No Occlusion trial, in which the human or object was not occluded. Conditions alternated in an order that was counterbalanced between tasks (No Occlusion → Occlusion vs. Occlusion → No Occlusion).

The Negation Test was delivered between the Human and the Object Task and comprised four questions (one per page). Page order was quasi-randomized. Questions posed on the first two pages and the last page afforded a negative answer (because the puppet misidentified the objects on these pages). The question asked on the third page afforded a positive answer (because the puppet correctly identified the object on this page). This was interspersed to break up the sequence of negative answers and demand of children that they pay attention to every question.

2.4. Procedure

After the parent filled out the required forms, the child was brought to the test room. Parents were present in the test room only if they or their child requested it. In this case, the parent was seated outside of the child's view and was asked to remain silent. The child was seated in a chair, with E1 to her left and E2 to her right. Sessions were video-recorded. The experiment began with the Human or Object Task.

2.4.1. Human task

Depending on the counterbalancing schedule, E1 or E2 moved to sit facing the child at a distance of about 75 cm. What happened next varied by condition. In the Occlusion Condition, the experimenter facing the child announced "Now I'll place this/my hands here, like this!" and covered her eyes with the occlusion strip or her hands. Next, the other experimenter in her role as questioner asked "Right now, [*name of child*], can you see [*name of experimenter facing child*]?" In the corresponding No Occlusion trial, which directly preceded or succeeded the Occlusion trial, the questioner posed the same question with the sole difference that the eyes of the experimenter facing the child were unoccluded. The same was repeated with the other means of occlusion (e.g., hands if occluding strip was used earlier). This procedure was repeated with E1 and E2 in reversed roles.

2.4.2. Object task

This task took place at a table, with E1 sitting to the child's left and E2 to her right. E1 brought out the first object. For the house, she said "This is a house. It has a door – here, you can go inside!" while pantomiming steps toward the door with her fingers. For the clock, E1 said "This is a clock. It has numbers – here, you can take them out!" and removed some of the numbers. After the child briefly played with the object (about 45 s), E1 held the object approximately 75 cm in front of the child, roughly at eye level. In the Occlusion Condition, E1 stated "Now I'll place *this* (occlusion strip)/my hands here, like this!", covered the house's windows/clock's hands, and asked the child: "Right now, [*name of child*], can you see the [*name of object,* e.g., house]?" In the corresponding No Occlusion trial,

Table 1
Sample Characteristics Broken down by Group.

Variable	Group					
	ASD (n = 12; 8 male)			TD control (n = 36; 24 male)		
	Mean	SD	Range	Mean	SD	Range
Age in Months	52	6.1	36–60	52	5.4	34–60
Cognitive (MSEL*)	131.4	27	94–172	152.8	26.6	81–204
Language	43.6	9.6	30–65	51.7	10.7	30–73
Visual Reception	44.3	12.9	20–65	49.3	10.6	21–69
Social (SRS-2**)	69	26.4	49–145	45	5.7	36–58

Note. *MSEL denotes the Mullen Scales of Early Learning. It is a composite score of the Language subscales (Receptive and Expressive, which were averaged in this table) and the Visual Reception subscale. **SRS denotes the Social Responsiveness Scale. See Appendix A for individual scores.

which directly preceded or succeeded the Occlusion trial, E1 asked the same question with the sole difference that the object was not occluded. The procedure was repeated with the other object.

2.4.3. Negation test

E1 brought out the picture book and introduced Leo, the puppet. Leo looked at the object on the first page and asked "Is this a [*mislabel, e.g, bird*]?" After the child answered, Leo replied "Ok". E1 turned the page and Leo asked the analogous question about the next object etc. Leo mislabeled the first two and the final object ('bird' for dog, 'bed' for chair, 'bike' for firetruck, 'ice-cream' for banana), but correctly labeled the third object. To be included in the final sample, children had to negate at least two of the three questions containing mislabels. One child from the ASD group did not meet this criterion and was therefore excluded.

2.5. Additional measures

2.5.1. Mullen Scales of Early Learning

These scales assess young children's cognitive skills in a semi-structured setting. The Visual Reception, Receptive Language, and Expressive Language scales were selected because our dependent measure requires verbal or gestural answers to questions about visual perception. Completion of the scales took approximately 30 min. Answers were coded live and subsequently scored by the first author. Raw scores were transformed into standardized equivalents for each scale.

2.5.2. Social Responsiveness Scale, Second Edition (SRS-2)

The preschool version of this form, tailored to children age 2.5–4.5, was used. The scale contains 65 items on a 4-point Likert scale and aims to identify the presence and severity of symptoms indicative of ASD. Parents took about 10 min to complete the survey, which was subsequently scored (total T-scores are reported) by the first author. Scores lower than 59 T are within the normal limits; scores at or above 59 T indicate social impairment.

These additional measures were obtained for all children. The average scores for the two groups along with chronological age are shown in Table 1 (see Appendix A for individual scores). Independent samples t-tests revealed that the two groups were comparable in chronological age, p = .76, visual reception, $p = .24$, and language skills, $p = .08$. As expected, lower levels of social responsiveness were observed in the ASD group than the TD group as indicated by higher SRS scores, $p = .01$. (The majority (75 %) of ASD children ($M = 69$ T) scored above the cut-off point indicating social impairment, whereas none of the TD children ($M = 45$ T) passed this threshold.)

Because the SRS score of 25 % of children in the ASD group was below the threshold indicating social impairment, one might doubt whether all children in fact had ASD. The following considerations, however, should remove the doubt. First, three of the four ASD participants in the normative range scored near (> = 54 T) the threshold, suggesting mildly impaired social responsiveness. Second, the SRS is sensitive to effective interventions (Pine, Luby, Abbacchi, & Constantino, 2006), so lower scores might reflect treatment effects. Third and last, screeners such as the SRS, whose results fluctuate with child and family characteristics (Moody et al., 2017) and with the source of the scores (e.g., parents vs. teachers, Nilsson Jobs, Bolte, & Falck-Ytter, 2019), cannot replace a clinical diagnosis, which remains the best available tool to test for ASD. One would thus expect group differences on the SRS (which we found) without necessarily expecting all scores from one group to fall on the same side of the threshold. We thus suppose that children in the ASD group did in fact have ASD, although their overall SRS ($M = 69$ T) and their satisfaction of strict attentional and communicative criteria (e.g., passing the negation test) indicate milder forms of severity.

2.6. Scoring and reliability

Responses were coded live during the session. For the seeing task (Human and Object Task), positive answers included "yes" and head nodding; negative ones included "no" and head shaking. Negative responses were scored as "1" and positive ones as "0". For the negation test, correct responses (the child correctly affirmed/denied the question asked by the puppet) were scored as "1" and incorrect ones (the child erroneously affirmed/denied the question asked by the puppet) were scored as "0". To assess inter-rater reliability for these two measures, a research assistant, who was unaware of group membership and the hypothesis, coded the answers of a randomly selected subset of 25 % of the children in each group (4 ASD children, 9 TD children). Inter-rater reliability was

Table 2
Output of Generalized Linear Mixed Models Predicting Children's Negations in the Seeing Task.

Fixed Effects	Estimate	S.E.	z value	P
Model for Both Groups				
(Intercept)	−6.28	.77	−8.12	<.01
Group	0.22	.97	0.22	.82
Condition	6.17	.62	9.92	<.01
Task	0.73	.33	2.21	.03
Group x Condition	−1.76	.88	−1.88	.06
Group x Task	0.70	.59	1.18	.24
Model Strength	$R^2 = .46$			
Model for ASD Group				
(Intercept)	−4.81	.89	−5.40	<.01
Condition	4.27	.70	6.08	<.01
Task	1.33	.49	2.74	<.01
Model Strength	$R^2 = .47$			
Model for TD Group				
(Intercept)	−6.91	.88	−7.86	<.01
Condition	6.56	.69	9.58	<.01
Task	0.82	.36	2.32	.02
Model Strength	$R^2 = .47$			

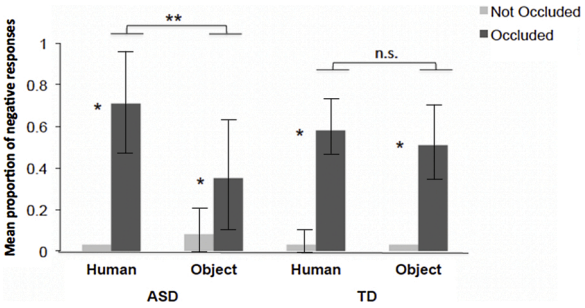

Fig. 3. Mean Proportion of Children's Negative Responses Broken Down by Group, Task, and Condition (with Error Bars Showing Standard Deviations).
Note. * and ** indicate statistical significance at .05 and .01, respectively. ASD = group of children with autism spectrum disorder; TD = group of typically-developing children.

perfect, both for the perceptual questions and for the negation test (*Kappa* = 1 for each).

2.7. Analyses

To compare the groups on the seeing task, a generalized linear mixed model (GLMM) for repeated measures with a binomial error structure and a logit link function was run using the glmer function in the "lme4" package. The model included group (TD, coded as "0", vs. ASD, coded as "1") as between-subjects factor, task (Object, coded as "0", vs. Human, coded as "1") and condition (Not Occluded, coded as "0" vs. Occluded, coded as "1") as repeated-measurement variables, and children's responses ("yes" coded "0", "no" coded "1") as the dependent variable. Subject was included as a random effect. Gender, cognitive/language abilities (MSEL), and social responsiveness (SRS), which were entered as covariates, had no effect on children's responses, *p*s > .17. They were removed from the final model for better model strength ($R^2 = .46$).

3. Results

The full output of the GLMM is presented in Table 2. As expected, the GLMM yielded an effect of condition, $\beta = 6.17$, $p < .01$, with children giving many more negative answers when humans and objects were partially occluded than when they were not occluded. The largeness of this effect results from the low variability of answers (2 % negations) in the No Occlusion Condition. As predicted, there was a main effect of task, with children giving more negative answers when asked about humans compared to objects, $\beta = .73$, $p = .02$. Against the prediction, there was no main effect of group, $\beta = .22$, $p = .82$; ASD and TD children negated the questions equally often.

A marginally significant 2-way interaction between group and condition was observed, $\beta = -1.67$, $p = .06$. Models separating the two groups were thus run to investigate the effect of condition within each group. Fig. 3 shows how often children in the distinct groups

negated the questions as a function of condition and task. For both groups, there was a strong effect of condition, with children giving many more negative answers in responses to occluded humans/objects than unoccluded ones (ASD group: $\beta = 4.27$, $p < .01$; TD group: ß = 6.56, $p < .01$). There was also a task effect in both groups, with children giving many more negative answers when asked about humans than when asked about objects (ASD group: $\beta = 1.33$, $p < .01$; TD group: $\beta = .82$, $p = .03$).

The relatively high number of negative answers children gave when asked if they could see partially occluded objects is noteworthy. We conjecture that the cause of this lies in the occluded parts' importance for the objects' functioning and identity. A clock without hands hardly qualifies as a clock; similar for a house with no windows. Moll et al. (2015) observed less negations when a truck with covered headlights was used in addition to the other objects. This might explain the difference in number of negations, but future research is needed to further explore the conditions under which children deny seeing partially covered objects.

4. Discussion

This study further corroborates an intriguing and robust error in children's judgments about person perception. As in prior studies (Moll et al., 2015; Moll & Khalulyan, 2017; Russell et al., 2012), a large number of preschool children claimed not to see a person whose eyes were covered. For the first time, we investigated how preschoolers with ASD behave in this situation, predicting that they will affirm seeing a person with covered eyes. This prediction rested on evidence that children with ASD are limited in their capacity to relate to others reciprocally—as shown by their deficits in imitation (see Edwards, 2014, for a meta-analysis), role reversal (Carpenter et al., 2005; Lee et al., 1994), participation in social games (Jordan, 2003) and cooperative and reciprocal discourse (Ochs & Solomon, 2004). On the whole, empirical findings suggest that children with ASD tend to view others as third, not second, persons. In Buber's (1923) terms, they primarily engage in the "I-It" instead of the "I-Thou" mode.

Against the prediction, most children with ASD responded like their TD age-mates: 83 % denied seeing a person on at least one trial when the person's eyes were occluded. Descriptively, their negations even outnumbered those of the TD group, in which 67 % denied seeing the person on at least one trial. How should we interpret these unexpected null findings?

One possibility is simply to drop the claim that negations in the seeing task manifest a desire for reciprocal engagement, because lacking the desire (or capacity) for such engagement is part of the definition of what it means to have ASD. The argument is that if children with ASD responded like TD children, then these responses cannot be indicative of a drive toward reciprocity; something else must have led children—from either group—to deny the questions. Perhaps they were confused by or misunderstood the questions. Whatever else might have caused the negations, this interpretation rejects the claim that they express a sense of failing to reach the other at a personal, and thus mutually responsive, level.

Although we cannot entirely debunk this view, some empirical facts render it unlikely. First, children's negations in the seeing task correlate with their understanding of the reciprocal pronoun "each other" (Moll et al., 2015). Children who skillfully identify acts of social reciprocity (e.g., two persons waving at each other) from among other social acts deny seeing others outside of eye contact more often than those with a poorer ability to identify social reciprocity. Those who say "no" in the seeing-task are thus especially good at detecting reciprocal exchanges. Furthermore, children's negations are limited to cases in which the other figures as a person, not a mere object of perception. TD children affirm seeing a blindfolded person's body and even her head (Russell et al., 2012). They also acknowledge that they can look at her (Moll et al., 2015). In these task variants, the other is a mere *body in space*—an object of perception like any other. As such, the other remains visible when her eyes are occluded; but she is not, according to these children, addressable qua person. This suggests that when eye contact is blocked, children sense that reciprocal social exchange is prevented.

Another interpretation accepts that the seeing task measures children's striving for reciprocal recognition but rejects the view that children with ASD are categorically incapable of or uninterested in such recognition. Roughly, this view asserts that children with ASD, at least those in treatment and/or with milder levels of severity, *are* in fact sensitive to and *can* participate in reciprocal relations—but it might take special social circumstances for them to exhibit this capacity. One important factor is to actively direct or guide their attention. Support for this comes from studies on joint attention toward a shared object (e.g., Bruner, 1995; Moll & Meltzoff, 2011; Tomasello, 1995). Mundy and colleagues have shown that children with ASD rarely *initiate* joint attention (e.g., by pointing or otherwise directing another's attention) but readily *respond to* others' bids to share experiences (Mundy & Jarrold, 2010; Mundy & Newell, 2007; Mundy, Sigman, & Kasari, 1990). Hurwitz and Watson (2016) also found that although children with ASD engage in joint attention less frequently, they respond to others' bids for joint attention and behave like control subjects once joint attention is established. Work on imitation furthermore suggests that a sense of personal connectedness can be sparked in toddlers with ASD by imitating them, thereby offering a ground for shared experience (Escalona, Field, Nadel, & Lundy, 2002; Field, Field, Sanders, & Nadel, 2001; Nadel, 2006). In our study, children's attention was ostensibly directed to an adult whose eyes were obstructed. Under these circumstances, children with ASD responded like agemates without ASD and denied seeing the person presumably because reciprocal engagement is impeded. Our findings thus concord with data showing that, despite limited *motivation* (Stavropoulos & Carver, 2014; see Chevallier, Kohls, Troiani, Brodkin, & Schultz, 2012 for a review) or *capacity* (e.g., due to inflexible attention, Elsabbagh et al., 2013; Landry & Bryson, 2004, but see Wilson & Saldaña, 2018) for spontaneously initiated reciprocal exchange, children with ASD are responsive to such engagement if their social attention is properly guided.

Another important factor is the test format used to assess social understanding. Against the classic view of ASD as mind-blindness (Baron-Cohen et al., 1995), those affected by ASD show relatively small degrees of impairment on *direct* theory of mind tests in which subjects explicitly articulate another's mental state (Bowler, 1992; Callenmark, Kjellin, Rönnqvist, & Bölte, 2014; Happé, 1995; Senju, 2012; Steele, Joseph, & Tager-Flusberg, 2003). These tests assess social understanding in circumstances that shield the participant from the "strains of involvement" (Strawson, 1962) of social interaction: the participant judges another's mental state from a spectator's, not a participant's, point of view. Many *indirect* tests, by contrast, measure awareness of others' mental states by investigating

Table A1
Individual Participants' Characteristics, Scores, and Treatment Duration (ASD Group).

Subject	Gender	Age (mos.)	Mullen Scales			SRS (T-Sc.)	Treat (mos.)
			VisRec	RecL	ExpL		
ASD 1	F	54	52	45	65	59	17
TD match	F	55	55	34	41	45	–
	F	55	55	57	37	43	–
	F	52	45	43	37	52	–
ASD 2	F	36	52	64	56	54	13
TD match	F	34	67	64	56	48	–
	F	39	50	46	42	37	–
	F	39	42	43	46	42	–
ASD 3	M	56	40	39	33	64	18
TD match	M	54	40	57	52	38	–
	M	55	60	67	66	40	–
	M	53	48	45	41	48	–
ASD 4	F	50	34	36	38	57	17
TD match	F	52	33	41	44	49	–
	F	53	69	70	65	42	–
	F	50	44	56	51	53	–
ASD 5	M	60	35	47	48	64	8
TD match	M	59	43	63	68	44	–
	M	57	39	54	45	49	–
	M	57	47	59	40	49	–
ASD 6	M	58	61	42	44	145	22
TD match	M	56	34	62	52	45	–
	M	56	60	48	39	49	–
	M	55	58	53	54	40	–
ASD 7	M	52	55	43	40	68	24
TD match	M	53	48	50	42	52	–
	M	51	50	45	41	54	–
	M	50	59	74	65	46	–
ASD 8	F	50	20	36	38	64	17
TD match	F	52	40	70	55	49	–
	F	51	39	40	47	39	–
	F	47	43	47	55	41	–
ASD 9	M	54	42	39	38	56	16
TD match	M	53	55	65	61	36	–
	M	53	42	41	40	45	–
	M	51	50	61	51	58	–
ASD 10	M	55	40	52	40	83	6
TD match	M	54	59	70	65	40	–
	M	57	55	51	43	55	–
	M	56	48	51	52	38	–
ASD 11	M	52	35	32	28	49	24
TD match	M	55	21	26	34	48	–
	M	48	59	78	60	55	–
	M	49	59	53	57	43	–
ASD 12	M	56	65	54	49	65	18
TD match	M	54	69	55	44	41	–
	M	53	52	57	48	43	–
	M	59	40	58	35	44	–

Note. VisRec = Visual Reception Scale; RecL = Receptive Language Scale, ExpL = Expressive Language Scale; SRS = Social Responsiveness Scale (T-scores); Treat = treatment duration in months.

gaze patterns, expressions and motor action as the participant actively takes part in an ongoing social event by way of helping or emotionally engaging with another person (Buttelmann, Carpenter, & Tomasello, 2009; Moll, Kane, & McGowan, 2016; Moll, Khalulyan, & Moffett, 2017). Individuals with ASD show greater impairments in these online tests which require spontaneous and prompt mind-reading skills (Schilbach, 2016; Schilbach et al., 2013; Senju et al., 2010). For our study, such interactive and immersive skills were not necessary. Because the other's eyes were covered, any social back-and-forth was precluded. Children with ASD could thus rely on their offline social understanding and determine that under the given circumstances—no possibility for mutual gaze—the other could not be seen. Ostensively guiding children's attention and giving them the chance to explicate their take on a social scenario they are not fully immersed in might be key for these children to access their social understanding.

Limitations of our study concern the small sample size, the exclusive focus on one measure of reciprocal engagement, and the low number of data points and statistical comparisons. To confirm that such engagement is possible at least for certain children with ASD, studies with larger samples, more trials from each child, and more statistical comparisons are needed. Such research should also expand the measures used, perhaps by examining expectations of reciprocity in the context of exchanging objects or "phatic expressions" that serve to establish and strengthen social bonds (Malinowski, 1923, e.g., "Thank you"/"You're welcome"). Further work

along these lines can generate greater understanding of the scope and limits of an inclination for reciprocity in children with ASD and their variation with levels of severity and treatment exposure. In the current study, all children with ASD had received (for at least 6 months) some form of treatment concentrating on joint attention and other social-cognitive skills. Perhaps this treatment contributed to the similar performance of children with and without ASD, although it could be countered that interventions would lead to more affirmative answers in the seeing task because interventions aim to increase accurate responses. Our study is not suited to address these questions which would require systematic variation in treatment exposure. Further future directions point to the relation of reciprocal engagement of the kind tested here and theory of mind capacities. Our conjecture is that toddlers' motivation for reciprocal social exchanges strengthens their perspective-taking and similar theory of mind skills by way of learning about others' attitudes and points of view toward things in the world.

In conclusion, our study is reason for some hope that young children with ASD—at least those with milder levels of severity and/or a history of therapy—are capable of reciprocal encounters and of recognizing whether the conditions for such encounters are met. Although they are less likely than those without autism to initiate these encounters and less skilled at taking others' perspectives in ongoing human interaction, they appear to be aware of what such encounters afford from participants: bidirectional engagement. Being able to recognize this is an important requisite for adaptive social-cognitive development.

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CRediT authorship contribution statement

Allie Khalulyan: Data curation, Investigation, Investigation, Writing - review & editing. **Katie Byrd:** Methodology. **Jonathan Tarbox:** Data curation, Investigation, Writing - review & editing. **Alexandra Little:** Data curation, Investigation, Writing - review & editing. **Henrike Moll:** Conceptualization, Supervision, Writing - review & editing.

Declaration of Competing Interest

The authors report no declarations of interest.

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Appendix A

See Table A1.

References

Baron-Cohen, S., Campbell, R., Karmiloff-Smith, A., Grant, J., & Walker, J. (1995). Are children withautism blind to the mentalistic significance of the eyes? *British Journal of Developmental Psychology, 13*(4), 379–398.

Baron-Cohen, S., Jolliffe, T., Mortimore, C., & Robertson, M. (1997). Another advanced test of theory of mind: Evidence from very high functioning adults with autism or Asperger syndrome. *Journal of Child Psychology and Psychiatry, 38*(7), 813–822.

Batki, A., Baron-Cohen, S., Wheelwright, S., Connellan, J., & Ahluwalia, J. (2000). Is there an innate gaze module? Evidence from human neonates. *Infant Behavior and Development, 23*(2), 223–229.

Bowler, D. M. (1992). "Theory of Mind" in Asperger's syndrome. *Journal of Child Psychology and Psychiatry, 33*(5), 877–893.

Bridges, A., & Rowles, J. (1985). Young children's projective abilities: What can a monster see? *Educational Psychology, 5*(3–4), 251–266.

Bruner, J. (1995). From joint attention to meeting of minds: An introduction. In C. Moore, & P. Dunham (Eds.), *Joint attention: Its origins and role in development* (pp. 1–14). Hillsdale, NJ: Nawrence Erlbaum Associates.

Buber, M. (1923). *I and thou*. New York, NY: Touchstone (W. Kaufman, Trans.). (Original workpublished 1970).

Buttelmann, D., Carpenter, M., & Tomasello, M. (2009). Eighteen-month-old infants show false belief understanding in an active helping paradigm. *Cognition, 112*(2), 337–342.

Callenmark, B., Kjellin, L., Rönnqvist, L., & Bölte, S. (2014). Explicit versus implicit social cognition testing in autism spectrum disorder. *Autism, 18*(6), 684–693.

Carpenter, M., Tomasello, M., & Striano, T. (2005). Role reversal imitation and language in typically developing infants and children with autism. *Infancy, 8*(3), 253–278.

Celani, G., Battacchi, M. W., & Arcidiacono, L. (1999). The understanding of the emotional meaning of facial expressions in people with autism. *Journal of Autism and Developmental Disorders, 29*(1), 57–66.

Charman, T., Swettenham, J., Baron-Cohen, S., Cox, A., Baird, G., & Drew, A. (1997). Infants with autism: An investigation of empathy, pretend play, joint attention, and imitation. *Developmental Psychology, 33*(5), 781–789.

Chevallier, C., Kohls, G., Troiani, V., Brodkin, E. S., & Schultz, R. T. (2012). The social motivation theory of autism. *Trends in Cognitive Sciences, 16*(4), 231–239.

Condon, W. S., & Sander, L. W. (1974). Neonate movement is synchronized with adult speech: Interactional participation and language acquisition. *Science, 183*(4120), 99–101.

Constantino, J. N., & Gruber, C. P. (2012). *Social responsiveness scale*. Los Angeles, CA: Western Psychological Services.
Dalton, K. M., Nacewicz, B. M., Johnstone, T., Schaefer, H. S., Gernsbacher, M. A., Goldsmith, H. H., … Davidson, R. J. (2005). Gaze fixation and the neural circuitry of face processing in autism. *Nature Neuroscience, 8*(4), 519–526.
Darwall, S. L. (2006). *The second-person standpoint: Morality, respect, and accountability*. Cambridge, MA: Harvard University Press.
Edwards, L. A. (2014). A meta-analysis of imitation abilities in individuals with autism spectrum disorders. *Autism Research, 7*(3), 363–380.
Eisenbarth, H., & Alpers, G. W. (2011). Happy mouth and sad eyes: Scanning emotional facial expressions. *Emotion, 11*(4), 860–865. https://doi.org/10.1037/a0022758.
Elsabbagh, M., Fernandes, J., Webb, S. J., Dawson, G., Charman, T., & Johnson, M. H. (2013). Disengagement of visual attention in infancy is associated with emerging autism in toddlerhood. *Biological Psychiatry, 74*(3), 189–194.
Escalona, A., Field, T., Nadel, J., & Lundy, B. (2002). Brief report: Imitation effects on children with autism. *Journal of Autism and Developmental Disorders, 32*(2), 141–144.
Farroni, T., Csibra, G., Simion, F., & Johnson, M. H. (2002). Eye contact detection in humans from birth. *Proceedings of the National Academy of Sciences, 99*(14), 9602–9605.
Field, T., Field, T., Sanders, C., & Nadel, J. (2001). Children with autism display more social behaviors after repeated imitation sessions. *Autism, 5*(3), 317–323.
Fischer, J., Smith, H., Martinez-Pedraza, F., Carter, A. S., Kanwisher, N., & Kaldy, Z. (2016). Unimpaired attentional disengagement in toddlers with autism spectrum disorder. *Developmental Science, 19*(6), 1095–1103.
Flavell, J. H., Shipstead, S. G., & Croft, K. (1980). What young children think they see when their eyes are closed. *Cognition, 8*(4), 369–387.
Gergely, G., & Watson, J. S. (1996). The social biofeedback model of parental affect-mirroring. *The International Journal of Psycho-Analysis, 77*(6), 1181–1212.
Gergely, G., & Watson, J. S. (1999). Early socio-emotional development: Contingency perception and the social-biofeedback model. *Early Social Cognition: Understanding Others in the First Monthsof Life, 60*, 101–136.
Gobel, M. S., Kim, H. S., & Richardson, D. C. (2015). The dual function of social gaze. *Cognition, 136*, 359–364.
Guellai, B., & Streri, A. (2011). Cues for early social skills: Direct gaze modulates newborns' recognition of talking faces. *PLoS One, 6*(4), Article e18610. https://doi.org/10.1371/journal.pone.0018610.
Hale, C. M., & Tager-Flusberg, H. (2005). Social communication in children with autism: The relationship between theory of mind and discourse development. *Autism, 9*(2), 157–178.
Happé, F. (1995). The role of age and verbal ability in the theory of mind task performance of subjects with autism. *Child Development, 66*(3), 843–855.
Happé, F. (2005). The weak central coherence account of autism. *Handbook of Autism and Pervasive Developmental Disorders, 1*(3), 640–649.
Happé, F., & Frith, U. (2006). The weak coherence account: Detail-focused cognitive style in autism spectrum disorders. *Journal of Autism and Developmental Disorders, 36*(1), 5–25.
Hobson, R. P. (1993). *Autism and the development of mind*. Hove, UK: Erlbaum.
Hobson, R. P. (2002). *The cradle of thought*. London, UK: Macmillan.
Hobson, R. P. (2007). Communicative depth: Soundings from developmental psychopathology. *Infant Behavior and Development, 30*(2), 267–277.
Hobson, R. P., & Meyer, J. A. (2005). Foundations for self and other: A study in autism. *Developmental Science, 8*(6), 481–491.
Hurwitz, S., & Watson, L. R. (2016). Joint attention revisited: Finding strengths among children withautism. *Autism, 20*(5), 538–550.
Jones, W., & Klin, A. (2013). Attention to eyes is present but in decline in 2-6-month-old infants later diagnosed with autism. *Nature, 504*, 427–431.
Jones, W., Carr, K., & Klin, A. (2008). Absence of preferential looking to the eyes of approaching adults predicts level of social disability in 2-year-old toddlers with autism spectrum disorder. *Archivesof General Psychiatry, 65*(8), 946–954.
Jordan, R. (2003). Social play and autistic spectrum disorders: A perspective on theory, implications and educational approaches. *Autism, 7*(4), 347–360.
Kaartinen, M., Puura, K., Mäkelä, T., Rannisto, M., Lemponen, R., Helminen, M., … Hietanen, J. K. (2012). Autonomic arousal to direct gaze correlates with social impairments among children with ASD. *Journal of Autism and Developmental Disorders, 42*(9), 1917–1927.
Kinsbourne, M., & Helt, M. (2011). Social entrainment of typically developing and autistic children. In D. Fein (Ed.), *The neuropsychology of autism* (pp. 339–365). Oxford, UK: Oxford University Press.
Kleinhans, N. M., Richards, T., Weaver, K., Johnson, L. C., Greenson, J., Dawson, G., & Aylward, E. (2010). Association between amygdala response to emotional faces and social anxiety in autism specdtrum disorders. *Neuropsychologia, 48*(12), 3665–3670.
Klin, A., Jones, W., Schultz, R., Volkmar, F., & Cohen, D. (2002). Visual fixation patterns during viewing of naturalistic social situations as predictors of social competence in individuals with autism. *Archives of General Psychiatry, 59*(9), 809–816.
Klin, A., Sparrow, S. S., De Bildt, A., Cicchetti, D. V., Cohen, D. J., & Volkmar, F. R. (1999). A normed study of face recognition in autism and related disorders. *Journal of Autism and Developmental Disorders, 29*(6), 499–508.
Kylliäinen, A., & Hietanen, J. K. (2006). Skin conductance responses to another person's gaze in children with autism. *Journal of Autism and Developmental Disorders, 36*(4), 517–525.
Landry, R., & Bryson, S. E. (2004). Impaired disengagement of attention in young children with autism. *Journal of Child Psychology and Psychiatry, 45*(6), 1115–1122.
Lee, A., Hobson, R. P., & Chiat, S. (1994). I, you, me, and autism: An experimental study. *Journal of Autism and Developmental Disorders, 24*(2), 155–176.
MacMurray, J. (1961). *Persons in relation*. London, UK: Faber & Faber.
Malinowski, B. (1923). The problem of meaning in primitive languages. In C. K. Ogden, & I. A. Richards (Eds.), *The meaning of meaning* (pp. 296–336). London: Kegan Paul.
Maurer, D., & Salapatek, P. (1976). Developmental changes in the scanning of faces by young infants. *Child Development, 47*, 523–527.
McGuigan, N. (2009). Does the direction in which a figure is looking influence whether it is visible? *Journal of Genetic Psychology, 170*(3), 227–233.
McGuigan, N., & Doherty, M. J. (2006). Head and shoulders, knees and toes: Which parts of the body are necessary to be seen? *British Journal of Developmental Psychology, 24*, 727–732.
McMyler, B. (2011). *Testimony, trust, and authority*. New York, NY: Oxford University Press.
Meltzoff, A. N., & Moore, M. K. (1977). Imitation of facial and manual gestures by human neonates. *Science, 198*, 75–78.
Meltzoff, A. N., & Moore, M. K. (1983). Newborn infants imitate adult facial gestures. *Child Development, 54*, 702–709.
Meltzoff, A. N., & Moore, M. K. (1989). Imitation in newborn infants: Exploring the range of gestures imitated and the underlying mechanisms. *Developmental Psychology, 25*(6), 954–962.
Moll, H., & Khalulyan, A. (2017). "Not see, not hear, not speak": Preschoolers think they cannot perceive or address others without reciprocity. *Journal of Cognition and Development, 18*(1), 152–162.
Moll, H., & Meltzoff, A. (2011). Perspective-taking and its foundation in joint attention. In J. Roessler, H. Lerman, & N. Eilan (Eds.), *Perception, causation, and objectivity* (pp. 286–304). Oxford, UK: Oxford University Press.
Moll, H., Arellano, D., Guzman, A., Cordova, X., & Madrigal, J. A. (2015). Preschoolers' mutualistic conception of seeing is related to their knowledge of the pronoun "each other". *Journal of Experimental Child Psychology, 131*, 170–185.
Moll, H., Kane, S., & McGowan, L. (2016). Three-year-olds express suspense when an agent approaches a scene with a false belief. *Developmental Science, 19*(2), 208–220.
Moll, H., Khalulyan, A., & Moffett, L. (2017). 2.5-year-olds express suspense when others approach reality with false expectations. *Child Development, 88*(1), 114–122.
Moody, E. J., Reyes, N., Ledbetter, C., Wiggins, L., DiGuiseppi, C., Alexander, … Rosenberg, S. A. (2017). Screening for autism with the SRS ad SCQ: Variations across demographic, developmental, and behavioral factors in preschool children. *Journal of Autism and Developmental Disorders, 47*(11), 3550–3561.
Moran, R. (2013). Testimony, illocution and the second person. *Aristotelian Society Supplementary Volume, 87*, 115–135.
Moriuchi, J. M., Klin, A., & Jones, W. (2016). Mechanisms of diminished attention to eyes in autism. *American Journal of Psychiatry, 174*(1), 26–35.
Mullen, E. M. (1995). *Mullen scales of early learning*. Circle Pines, MN: American Guidance Service.
Mundy, P., & Jarrold, W. (2010). Infant joint attention, neural networks and social cognition. *Neural Networks, 23*(8–9), 985–997.

Mundy, P., & Newell, L. (2007). Attention, joint attention, and social cognition. *Current Directions in Psychological Science, 16*(5), 269–274.
Mundy, P., Kasari, C., & Sigman, M. (1992). Nonverbal communication, affective sharing, and intersubjectivity. *Infant Behavior and Development, 15*(3), 377–381.
Mundy, P., Sigman, M., & Kasari, C. (1990). A longitudinal study of joint attention and language development in autistic children. *Journal of Autism and Developmental Disorders, 20*(1), 115–128.
Mundy, P., Sigman, M., & Kasari, C. (1994). Joint attention, developmental level, and symptom presentation in autism. *Development and Psychopathology, 6*(3), 389–401.
Nadel, J. (2006). Does imitation matter to children with autism? In S. J. Rodgers, & J. H. G. Williams (Eds.), *Imitation and the social mind: Autism and typical development* (pp. 118–137). The Guilford Press.
Naigles, L. R., Cheng, M., Rattansone, N. X., Tek, S., Khetrapal, N., Fein, D., & Demuth, K. (2016). "You're telling me!" The prevalence and predictors of pronoun reversals in children with autism spectrum disorders and typical development. *Research in Autism Spectrum Disorders, 27*, 11–20.
Nakano, T., Tanaka, K., Endo, Y., Yamane, Y., Yamamoto, T., Nakano, Y., … Kitazawa, S. (2010). Atypical gaze patterns in children and adults with autism spectrum disorders dissociated from developmental changes in gaze behaviour. *Proceedings of the Royal Society of London B: Biological Sciences, 277*(1696), 2935–2943.
Neumann, D., Spezio, M., Piven, J., & Adolphs, R. (2006). Looking you in the mouth: Abnormal gaze in autism resulting from impaired top-down modulation of visual attention. *Social Cognitive and Affective Neuroscience, 1*(3), 194–202.
Nilsson Jobs, E., Bolte, S., & Falck-Ytter, T. (2019). Preschool staff sot social communication difficulties, but not restricted and repetitive behaviors in young autistic children. *Journal of Autism and Developmental Disorders, 49*(5), 1928–1936.
Ochs, E., & Solomon, O. (2004). Introduction: Discourse and autism. *Discourse Studies, 6*(2), 139–146.
Pelphrey, K. A., Sasson, N. J., Reznick, J. S., Paul, G., Goodman, B. D., & Piven, J. (2002). Visual scanning of faces in autism. *Journal of Autism and Developmental Disorders, 32*(4), 249–261.
Pine, E., Luby, J., Abbacchi, A., & Constantino, J. N. (2006). Quantitative assessment of autistic symptomatology in preschoolers. *Autism, 10*(4), 344–352.
Prizant, B. M., & Rydell, P. J. (1993). Assessment and intervention considerations for unconventional verbal behavior. *Communicative Alternatives to Challenging Behavior: Integrating Functional Assessment and Intervention Strategies, 3*, 263–297.
Reddy, V. (2008). *How infants know minds*. Cambridge, MA: Harvard University Press.
Reid, T. (1788) (1788/2010). In K. Haakonssen, & J. A. Harris (Eds.). *Essays on the active powers of man* (Vol. 7). University Park, PA: Pennsylvania State University.
Russell, J., Gee, B., & Bullard, C. (2012). Why do young children hide by closing their eyes? Self- visibility and the developing concept of self. *Journal of Cognition and Development, 13*(4), 550–576.
Rutherford, M. D., Clements, K. A., & Sekuler, A. B. (2007). Differences in discrimination of eye and mouth displacement in autism spectrum disorders. *Vision Research, 47*(15), 2099–2110.
Schilbach, L. (2016). Towards a second-person neuropsychiatry. *Philosophical Transactions of the Royal Society B: Biological Sciences, 371*(1686), Article 20150081.
Schilbach, L., Timmermans, B., Reddy, V., Costall, A., Bente, G., Schlicht, T., & Vogeley, K. (2013). Toward a second-person neuroscience. *Behavioral and Brain Sciences, 36*(4), 393–414.
Senju, A. (2012). Spontaneous theory of mind and its absence in autism spectrum disorders. *The Neuroscientist, 18*(2), 108–113.
Senju, A., & Johnson, M. H. (2009). Atypical eye contact in autism: Models, mechanisms and development. *Neuroscience and Biobehavioral Reviews, 33*(8), 1204–1214.
Senju, A., Kikuchi, Y., Hasegawa, T., Tojo, Y., & Osanai, H. (2008). Is anyone looking at me? Direct gaze detection in children with and without autism. *Brain and Cognition, 67*(2), 127–139.
Senju, A., Southgate, V., Miura, Y., Matsui, T., Hasegawa, T., Tojo, Y., … Csibra, G. (2010). Absence of spontaneous action anticipation by false belief attribution in children with autism spectrum disorder. *Development and Psychopathology, 22*(2), 353–360.
Senju, A., Tojo, Y., Yaguchi, K., & Hasegawa, T. (2005). Deviant gaze processing in children with autism: An ERP study. *Neuropsychologia, 43*(9), 1297–1306.
Senju, A., Yaguchi, K., Tojo, Y., & Hasegawa, T. (2003). Eye contact does not facilitate detection in children with autism. *Cognition, 89*(1), B43–B51.
Small, W. (2014). Teaching and telling. *Philosophical Explorations, 17*(3), 372–387.
Starmans, C., & Bloom, P. (2012). Windows to the soul: Children and adults see the eyes as the location of the self. *Cognition, 123*(2), 313–318.
Stavropoulos, K. K., & Carver, L. J. (2014). Reward anticipation and processing of social versus nonsocial stimuli in children with and without autism spectrum disorders. *Journal of Child Psychology and Psychiatry, 55*(12), 1398–1408.
Steele, S., Joseph, R. M., & Tager-Flusberg, H. (2003). Developmental change in theory of mindabilities in children with autism. *Journal of Autism and Developmental Disorders, 33*(4), 461–467.
Strawson, P. F. (1962). Freedom and resentment. In G. Watson (Ed.), *Proceedings of the British Academy* (Vol. 48, pp. 1–25). Oxford, UK: Oup Oxford.
Tager-Flusberg, H., & Anderson, M. (1991). The development of contingent discourse ability in autistic children. *Journal of Child Psychology and Psychiatry, 32*(7), 1123–1134.
Tomasello, M. (1995). Joint attention as social cognition. In C. Moore, & P. J. Dunham (Eds.), *Jointattention: Its origins and role in development* (pp. 103–130). Hillsdale, NJ: Erlbaum.
Tomasello, M. (2020). The role of roles in uniquely human cognition and sociality. *Journal for the Theory of Social Behavior, 50*, 2–19.
Tottenham, N., Hertzig, M. E., Gillespie-Lynch, K., Gilhooly, T., Millner, A. J., & Casey, B. J. (2013). Elevated amygdala response to faces and gaze aversion in autism spectrum disorder. *Social Cognitive and Affective Neuroscience, 9*(1), 106–117.
Warneken, F., Chen, F., & Tomasello, M. (2006). Cooperative activities in young children and chimpanzees. *Child Development, 77*(3), 640–663.
Watson, J. S. (1972). Smiling, cooing, and "the game". *Merrill-Palmer Quarterly of Behavior and Development, 18*(4), 323–339.
Wilson, C. E., & Saldaña, D. (2018). No evidence of atypical attentional disengagement in autism: A study across the spectrum. *Autism*. doi: 1362361318768025.
Wolfberg, P. J., & Schuler, A. L. (1999). Fostering peer interaction, imaginative play and spontaneouslanguage in children with autism. *Child Language Teaching and Therapy, 15*(1), 41–52.