Words Are Not Enough
Providing the Context for Social Communication and Interaction

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This article elucidates the unfolding of 3 phases of cognitive development through which typical children move during the first 2 years of life to illuminate the interrelationships among early cognition, communicative intention, and word-learning strategies. The resulting theoretical framework makes clear the developmental prerequisites for social communication and sheds light on how some children with autism spectrum disorder can learn words and phrases but fail to develop true social language. This framework is then applied to a case example of a child called Henry, using data from 10-min videos of clinician–child interaction that were collected each week to evaluate the child's progress in social communication while working with his graduate-student clinician. Eye-tracking data also were collected as an indirect measure of eye contact. The data showed that Henry made progress in social engagement, reciprocal verbal interactions, and diversity of communicative intentions. In addition, eye-tracking data suggested an increase in eye contact commensurate with a typical age mate. Implications for social communication intervention are discussed. **Key words:** *autism spectrum disorders*, *emerging language*, *eye tracking*, *social cognition*

AUTISM SPECTRUM DISORDER (ASD) is a heterogeneous neurodevelopmental disorder that severely compromises the development of social relatedness, reciprocity, social communication, joint attention, and learning. The Centers for Disease Control and Prevention (2014) estimated that 1 in 68 children

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are on the autism spectrum. Although there is no cure for ASD, early identification and intervention can make a significant difference in a child's cognitive, language, and adaptive functioning (Dawson et al., 2010; Reichow, 2012; Wallace & Rogers, 2010; Warren et al., 2011). Deficits in social communication and interaction, however, persist throughout life. This makes understanding the early interrelationship between social-cognitive challenges and language development critical for supporting the long-term success of these children.

IMPORTANCE OF SHARED ATTENTION

It is well recognized that children with ASD have extraordinary challenges in developing shared attention and intention (Charman, 2003; Mundy, Sigman, & Kasari, 1990; Rollins, 1999; Rollins & Snow, 1998). Sharing attention and intention is often demonstrated when the child directs another's attention toward objects or events for the purpose of sharing and when the child coordinates attention between a social partner and objects or events of mutual interest. This

important social-cognitive milestone marks the emergence of the intentional stance, or the understanding that other people have attentions and intentions that are different from their own, which can be shared verbally or nonverbally with their communicative partner (Rollins & Snow, 1998; Tomasello, 1999; Tomasello & Carpenter, 2007). The emergence of shared attention and intention signifies true social understanding and provides the infrastructure for social communication (Rollins, 2003; Tomasello, Carpenter, Call, Behne, & Moll, 2005) and structural language (Gillespie-Lynch et al., 2013; Rollins & Snow, 1998). Typical infants routinely engage in shared attention with their caregivers by 12 months (Bakeman & Adamson, 1984; Carpenter, Nagel, & Tomasello, 1998), the age at which first words often appear.

LINGUISTICALLY BASED INTERVENTIONS AND SHARED ATTENTION

Unlike typical children, children with ASD often acquire words and phrases in the absence of shared attention (Rollins, 1999). This apparent disassociation between language and social cognition may make children with ASD appear linguistically more sophisticated than they actually are. Although there are exceptions (see Kasari, Paparella, Freeman, & Jahromi, 2008), language interventions too often focus on language form without considering the child's underlying social-cognitive skills, which are necessary for the development of social communication. Many language interventionists use evidence-based practices, such as naturalistic interventions that follow the child's focus of attention, to model language or expand on the language forms produced by emerging-language children with ASD. These linguistically based interventions are rooted in language acquisition and intervention research that is conducted with participants who already are capable of shared attention and intention (Rollins, 2003, 2014). Such linguistically based interventions are developmentally too advanced for children with ASD who use words even

though they have not yet established shared attention for the intersubjective purpose of sharing objects or events with another person.

When exposed to linguistically based interventions, children with ASD may develop large vocabularies but fail to integrate their word knowledge into generative language. In addition, they may use isolated words and phrases to request and label, which falls short of the depth of true social communication. True social communication would involve directing another's attention, such as by pointing and showing or commenting to share information. This requires the understanding that others have attentions and intentions that are different from one's own (Camaioni, 1993; Rollins & Snow, 1998). Intervention priorities for children with ASD who are beginning to use words should not focus solely on peripheral linguistic forms. Examples of linguistic form goals include the acquisition of nouns (e.g., body parts and object labels), increasing the mean length of utterances by requiring the child to use modifier-plus-noun sentence constructions (e.g., labeling red ball vs. green ball), or producing frozen phrases (e.g., I want _____, please). Rather, goals must be located within a developmental framework appropriate to the child's social-cognitive abilities.

The purpose of this article was to elucidate the unfolding of the three phases of cognitive development through which typical children move during the first 2 years of life and to illuminate the interrelationships among early cognition, communicative intention, and word-learning strategies (Figure 1). The resulting theoretical framework makes clear the developmental prerequisites for social communication and sheds light on how some children with ASD can learn words and phrases but fail to develop true social language. These ideas are then translated into clinical recommendations and illustrated with a clinical case example.

COGNITIVE DEVELOPMENT

It is well accepted that infants are socially motivated and prone to orient themselves

	Phase 1 (2–6 mos.)	Phase 2 (6–10 mos.)	Phase 3 (10–24 mos.)
Cognitive capability	Sharing emotion	Sharing perceptions and pursuing goals	Sharing attention and intention
Characteristics of cognitive phase	Face-to-face interaction • Mutual gazing • Responsive to vocalization • Well-balanced, reciprocal exchanges of emotion.	Adult creates shared space • Selective attention to goals • Persists until goal is met • Monitors adult's actions • Predicts what comes next • Takes turns with objects	Child understands he or she is sharing with partner
Communicative intention	None	Behavior regulation (request, protest) Labeling	Directing attention (pointing and showing) Sharing attention (commenting)
Word learning strategies	Perceptual salience Temporal pairing	Perceptual salience Temporal pairing	Eye gaze Social context
Expressive language	None	Isolated words and phrases	Creative language

Figure 1. The interrelationships among early cognition, communication, word learning strategies, and language (adapted from Rollins, 2014), of which *only* Phase 1 is the developmental precursor for social cognition communication and interaction.

toward socially salient information from very early in life. Newborns prefer listening to speech over nonspeech sounds (Vouloumanos, Hauser, Werker, & Martin, 2010), and they are able to imitate adults of their own volition (Meltzoff & Moore, 1983, 1989). They engage in vocal turn-taking interactions (Trevarthen, 1979), respond differentially to persons and objects (Legerstee, 1991; Trevarthen, 1979), and selectively attend to human faces (Johnson & Morton, 1991; Maurer, 1985). Over the first years of life, typical infants and young children undergo several qualitative changes in how they

monitor, control, and predict the behavior of others, culminating in the capacity for mutual understanding and cooperation with people around them. These gradual qualitative changes have been quantified as movement from "sharing emotions" to "sharing perceptions and pursuing goals" to "sharing attention and intention" (Tomasello et al., 2005). As will be made clear, sharing emotions and sharing attention and intention are socially motivated whereas sharing perceptions and pursuing goals are not. In fact, sharing emotions is the developmental precursor to sharing attention and intention (Adamson &

Russell, 1999; Rochat & Striano, 1999; Rollins & Greenwald, 2013; Stern, 1985; Tomasello et al., 2005) and, as such, constitutes the cognitive underpinning for social communication (Figure 1).

Phase 1: Sharing emotions

Around 2 months of age, infants across cultures become increasingly alert and begin to smile in response to social stimuli (Spitz, 1965; Wolff, 1987). The onset of social smiling, coupled with an increase in gazing at the caregiver's face, is highly significant to Western culture, as it launches dyads into a new quality of shared experiences (Rochat & Striano, 1999; Stern, 1985). These dyadic, face-to-face interactions reflect well-balanced, reciprocal, and rhythmic exchanges of affect and emotions (Brazelton, Koslowski, & Main, 1974; Stern, 1985; Trevarthen, 1979) and are a precursor to later shared attention (Adamson & Russell, 1999; Rochat & Striano, 1999; Rollins & Greenwald, 2013; Stern, 1985; Tomasello et al., 2005). Within these interactions, sensitive caregivers respond to the infant as a communicative partner, and the exchanges take on a conversational quality (Snow, 1977), so much so that they have been referred to as "protoconversations" (Bateson, 1975; Trevarthen, 1979).

Phase 2: Sharing perceptions and pursuing goals

Around 6 months, typically developing children become more interested in objects and the interaction turns from dyadic to triadic. Triadic refers to the child, the caregiver, and a third entity, such as an object or event. As illustrated in Figure 1, the cognitive capabilities developed during this phase of sharing perceptions and pursuing goals and the emanating behavior and linguistic skills are not inherently social (Tomasello et al., 2005). What makes children appear to be social during this phase is the caregiver's contribution to the interaction. For example, caregivers, especially in Western cultures, focus on what the child is playing with and may actively follow the child's focus of attention (e.g., by commenting on the child's play with objects). In so doing, the caregiver creates the appearance of a shared interaction. Bakeman and Adamson (1984) described these early triadic interactions as "passive joint engagement." Children's roles are passive in these early interactions because they do not acknowledge the caregiver's contribution to the interaction by attending to both the caregiver and a shared referent. Rather, the caregiver actively supports the child's perceptions by expanding the child's solitary focus to include the caregiver's verbal and nonverbal information about the attentional target.

Understanding another's action and predicting what comes next

The phase of sharing perceptions and pursuing goals can be challenging to understand. The nuanced behaviors of which typical infants are capable during this phase of cognition also may be assigned to children with ASD. This contributes to misconceptions or misunderstandings about the interactional capabilities of these children, whose cognitive skills actually may have plateaued in this phase. During this phase, both typical infants and children with ASD engage in triadic interactions that are not socially motivated, but the interactions do help them acquire many important cognitive abilities. Specifically, children in the phase of sharing perceptions and pursuing goals are goal directed. They have selective attention to their goals and often persist until their goals are met.

In addition, they begin to understand that their caregivers have intentional actions. They monitor their caregiver's actions and can make predictions about what action comes next in the interaction exchange, allowing them to take turns with objects. For example, the caregiver and the infant between 6 and 9 months of age may both be looking at a block. The caregiver may start to build a block tower. The infant learns to predict what comes next and joins in an alternating sequence of placing blocks on the tower. After the caregiver places a block on the tower, the infant predicts that it is his or her turn and

does the same. Although they are both perceiving the blocks and experiencing the same activity of building the tower, the infant does not yet look back at the caregiver and coordinate his or her attention between the block and the adult. The infant does not yet have the understanding that they are *sharing* their attention and intention to build the tower.

Regulating behavior

Toward the end of the phase for sharing perceptions and pursuing goals (around 9–10 months), typically developing infants begin to use gestures and vocalizations with communicative intent (Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979; Bates, Camaioni, & Volterra, 1975). The earliest preverbal intentions serve a protoimperative function (i.e., nonverbal forms of requesting and protesting). Typically developing infants who have the cognitive ability of sharing perceptions and pursuing goals are able to regulate or influence the behavior of others but may not be able to influence their mental states (Camaioni, 1993). Influencing another's behavior requires little more than the attribution of agency to the interactive partner and the ability to share perceptions of the intended goal (Camaioni, 1993; Tomasello et al., 2005). Children in this phase have the will to affect the caregiver by some purposeful behavior (Ninio & Snow, 1996), using instrumental communicative acts such as requesting (actions, objects, or assistance) and protesting.

Phase 3: Sharing attention and intention

As typical infants make the transition to the phase of sharing attention and intentions (between 10 and 12 months), they are capable not only of monitoring the caregiver's behavior but also of actively monitoring the caregiver's attentional focus (Bakeman & Adamson, 1984; Carpenter et al., 1998). This milestone is sometimes referred to as "responding to joint attention" (Mundy & Thorp, 2008). It marks the infant's recognition that the caregiver's attention is different from his or her own (Tomasello, 1995; Trevarthen & Hubley, 1978). Soon, the infant begins to coordinate his or her attention between the caregiver and an object of mutual interest and is actively looking back and forth between the caregiver and the object of attention (Bakeman & Adamson, 1984; Carpenter et al., 1998).

This newly acquired social competency is a form of cooperative intersubjectivity, as it includes the active sharing of thoughts and emotions about an outside entity (Trevarthen & Aitken, 2001). Tomasello et al. (2005) referred to this development as "shared intention," as it reflects the understanding that other persons have unique objects of attention and intentions. This new level of social-cognitive skill emerges around the first birthday in typical children, but it is extraordinarily difficult for children with ASD to attain (Camaioni, 1993; Rollins & Snow, 1998; Rollins, Wambacq, Dowell, Mathews, & Reese, 1998; Tomasello et al., 2005).

The development of shared attention and intention requires that both the adult and the child have mutual knowledge that they are doing something together in relationship, which marks the emergence of mutual cooperation (Tomasello et al., 2005). When the preverbal child is capable of understanding that others have attentions and intentions different from his or her own, true social communication emerges (Camaioni, 1993). Children with the social-cognitive understanding of shared intention are capable of directing the caregiver's attention with gestures by showing an object or pointing to an object for the purpose of sharing interest (Bates et al., 1975; Ninio & Snow, 1996; Tomasello, Carpenter, & Liszkowski, 2007; Wetherby, Yonclas, & Bryan, 1989).

As young children learn words, their early communicative repertoire continues to reflect the unfolding of shared intentionality and the mutual understanding that they are communicating with another. Directing the other's attention (which has been referred to as "initiating joint attention"; see Mundy & Thorp, 2008) and a new skill of discussing a joint focus of attention continue into the second year of life. These early discussions of the here and now often take the form of

commenting on objects or events in the immediate environment while interacting around toys or looking at picture books together.

TYPICAL WORD LEARNING

Children use a combination of perceptual, cognitive, social, and linguistic inputs or cues for word learning, and the child's sensitivity to these cues changes over the course of development (Hirsh-Pasek, Golinkoff, & Hollich, 2000; Hollich et al., 2000; Rollins, 2003). Across the early word-learning period (under 2 years), typically developing children use both perceptual and social cues to identify words and meaning relations. Perceptual cues, such as those that pair interesting things they see with what they hear, dominate early in development (i.e., before 10 months of age). A progressive shift occurs toward the reliance on social factors around 12–18 months (Hirsh-Pasek, Golinkoff, Hennon, & Maguire, 2004; Hollich et al., 2000; Rollins, 2003). This means that typical infants and children with ASD who are functioning in the phase of sharing perceptions and pursuing goals may be learning words by using the earlier mechanism of temporal pairing of what they hear with perceptually salient objects and events they see (Hirsh-Pasek et al., 2000; Rollins, 2003; Rollins & Trautman, 2011). In contrast, children with the ability to share attention and intention begin to rely more heavily on social cues and what appears to be intended. These children learn new words in situations in which the adult looks at and labels an object that the child is not looking at. Here, for word learning to occur, the child must use eye contact and gaze shifts to determine the adult's intended focus (Baldwin, 1993). The child also can learn the names of objects that the adult intends (Tomasello & Barton, 1994).

HOW ASD IS DIFFERENT

Words in ASD

The apparent dissociation between language and social cognition in children with ASD may be explained through the lens of the word learning and communicative functions available to children in the second phase of sharing perceptions and pursuing goals. Unlike typical infants who pass through this phase before they begin to talk (~6–10 months), many children with ASD exhibit sharing perceptions and pursuing goals capabilities in early childhood (3–5 years) or even later. These children with ASD may acquire many words through the early word-learning strategy of pairing perceptually salient objects and events with the words and phrases that they hear. Caregivers, teachers, and therapists then support the child's perceptions of objects and events through naming the object or event. This, in turn, may facilitate the acquisition of many words (Rollins, 2003; Tomasello, 1999), but it does not lead to rule-governed generative language (Tomasello, 1999). True integration of vocabulary into grammar does not happen until a child is able to share attention and intention (Bates & Goodman, 1997, 1999; Rollins, 2003; Rollins & Snow, 1998; Tomasello, 1999).

Requesting and labeling in ASD

Consistent with the repertoire of communicative behaviors that can be acquired during the phase of sharing perceptions and pursuing goals (as shown in Figure 1), many children with ASD learn to use words and phrases for the purpose of regulating or controlling another person's behavior (i.e., requesting and protesting) but not for drawing their attention to objects or events of mutual interest and sharing information. Some children with ASD may begin to label objects and events in their environment without any evidence that they are sharing information with their social partner.

Labeling is often elusive and misunderstood because the adult's support of the child's attention gives the appearance of a shared interaction. Labels appear more self-directed and lack the intention to share information with another person. Labeling is distinct from commenting, which denotes a shared mutual understanding with another

person (Rollins, 2014). Some evidence-based intervention practices require children with ASD who are beginning to use words to label pictures and objects to use progressively longer utterances for this function. These linguistically based interventions, however, do not provide the social environment necessary for social communication to develop, as they enable the child to continue to practice and use forms that are not socially motivated. In contrast, there is evidence to suggest that, before a child with ASD develops shared attention and intention, his or her intervention should focus on critical foundational social communication skills, such as face-to-face reciprocal social interactions (Ingersoll & Gergans, 2007; Rollins, Campbell, Hoffman, & Self, 2016; Schertz & Odom, 2007; Wallace & Rogers, 2010), that are precursors to shared attention (Adamson & Russell, 1999; Greenspan & Shanker, 2004; Rollins et al., 2016; Rollins & Greenwald, 2013).

Clinical recommendation

For social communication and creative language to develop in a child, intervention priorities must be located within a developmental framework that pertains to the child's social-cognitive functioning. As described earlier and illustrated in Figure 1, the first phase of sharing emotions is the developmental precursor to the third phase of sharing attention and intention. This three-phase framework guides interventionists who work with children on the spectrum who are functioning in the second phase of sharing perceptions and pursuing goals to focus their intervention efforts instead on facilitating shared emotional skills of face-to-face reciprocal social interactions, mutual eye gazing, and contingent imitation of vocalizations and gestures.

A handful of interventions are now available that are mindful of the child's social-cognitive level and that address the early foundational social communication skills necessary for shared attention and creative language (see Ingersoll & Gergans, 2007; Kasari et al., 2008; Rollins et al., 2016; Schertz & Odom, 2007). These interventions provide the social envi-

ronment necessary for social communication by facilitating dyadic, face-to-face reciprocal social interactions. In particular, our clinical recommendation is for interventionists who currently work with children in the second phase of sharing perceptions and pursuing goals to facilitate Phase 1 sharing emotions skills by including five key features essential for this phase. The five key features include the following: (a) position yourself face to face with the child; (b) engage in social sensory routines, limiting the use of toys whenever possible; (c) establish eye contact without verbal and physical prompts, making sure to reinforce eye contact immediately; (d) use animation; and (e) use contingent imitation of the child's gestures, vocalization, and words. To support this recommendation, I provide a clinical case example of Henry and his graduate-student clinician, Alice.

CLINICAL CASE EXAMPLE

Participants

Henry, a 29-month-old toddler with ASD (see Table 1 for test scores and demographic information), and Alice, his graduate-student clinician, participated in this project. Henry was functioning within the second cognitive phase of sharing perceptions and pursuing goals. Consistent with a child in this phase, Henry used verbal and nonverbal means to request and label items in his environment. Henry, however, rarely looked at his communicative partner; instead, he focused his gaze on the objects around him.

Henry was enrolled in a linguistically based program for toddlers aged 18 months to $3\frac{1}{2}$ years with ASD or other developmental disorders. The program is a training site for graduate students in speech–language pathology and provides intensive communication interventions 4 days a week for $2\frac{1}{2}$ hr. Graduate students provide the children with both group and individual therapies. In this linguistically based program, the goals for toddlers with ASD who function in the second phase of sharing perceptions and pursuing goals

Table 1. Henry's test scores and family demographics

Measure	Result
Henry's age at entry	29 months
Mother's age	35 years
Mother's education	Bachelor's degree
Language in the home	English only
Day care	Spanish-speaking nanny
ADOS-1: Communication	5
ADOS-1: Reciprocal social interaction	9
ADOS-1 total score	14
CARS-2 rating	35
Range of concern	Mild-moderate
PLS-5	2nd percentile

Note. ADOS-1 = Autism Diagnostic Observation Schedule Module 1 (Lord, Rutter, DiLavore, & Risi, 2002) for children with few to no words; CARS-2 = Childhood Autism Rating Scale–2; PLS-5 = Preschool Language Scale, fifth edition. A diagnosis of autism spectrum disorder was verified using a cutoff score of 12 on the ADOS and substantiated with a score of above 30 on the CARS-2. All tests were administered by trained clinicians.

include using words to request, increasing utterance length, and engaging in reciprocal turn-taking using objects.

The motivation for our engagement with this case was to change Henry's intervention to be consistent with the developmental framework described earlier. Specifically, the goal was to move away from a linguistic approach that focuses on the Phase 2 skills to a social approach that focuses on the five key features, described earlier, essential to facilitating Phase 1 sharing emotions skills. We used an informed consent procedure approved by the Human Subjects Institutional Review Board (IRB) from the University of Texas at Dallas (IRB 13-10) to obtain Henry's parents' permission for him to participate in this research.

Procedures

Alice took Henry from his usual program to a nearby therapy room for a 30-min individual session each day. Once a week, the session began with my digitally recording (on an iPad 2) 10 min of Alice and Henry's interaction. We used these tapes in both qualitative analyses of clinician–child interaction and quantitative analyses of Henry's social interaction and communication, as described in the following text.

Baseline phase (Weeks 1–4)

The linguistic approach, which was used initially with Henry, served as a baseline against which the social approach could be compared. During the baseline sessions, Alice followed the linguistic approach and the recommendations for Henry's program. Specifically, she actively followed Henry's focus of attention, stayed on Henry's physical level, chose simple, high-interest, slow-paced activities, used introductory alerters (e.g., gasps, the child's name, "Look!" and "Wow!") to direct Henry's attention to objects and events. She also used pause time, simplified her language, and commented on Henry's actions or focus of attention.

Social intervention phases (Weeks 5–9)

To implement the social approach, we needed an evidence-based practice that fit our developmental framework and, specifically, the five key features from the clinical recommendation. Although several toddler programs are available to facilitate the first phase of sharing emotions (see Ingersoll & Gergans, 2007; Rollins et al., 2016; Schertz & Odom, 2007; Wallace & Rogers, 2010; Wetherby & Woods, 2006), we chose the Pathways to Early Autism Intervention (hereafter Pathways; Campbell & Thibodeau Hoffman, 2014) to guide this intervention. This selection was made for three reasons. First, evidence had shown Pathways to be effective in increasing the early foundational social communication skills of eye contact, social engagement, and verbal reciprocity in toddlers with ASD who are enrolled in an IDEA Part C Early Childhood Intervention program (Rollins et al., 2016). Second, although other toddler programs use key features similar to those of Pathways

(e.g., face-to-face reciprocal interactions, animation, imitation), to our knowledge, they do not work directly on eye contact. The importance of facilitating eye contact as an intervention target has been emphasized by Jones and Klin (2013), who suggested that early intervention focusing on eye contact may build on the neural networks that subserve early reflexive gaze. Finally, key features of the Pathways program (i.e., face-to-face social sensory routines, eye contact, animation, and imitation) outlined in Table 2 could be used to build on the bidirectional strategies that Alice and Henry already were using, particularly because the Pathways features are added slowly. This helps the clinician–child dyad develop increasingly more sophisticated levels of interaction before the clinician adds more difficult key features into the interaction. For example, as we show in the qualitative analysis later, Henry learned to make and maintain eye contact through reinforcement and without physical prompts during social sensory routines before Alice required him to respond to animation.

Behavioral measures

To evaluate Henry's social interaction and communication, we coded several behavioral measures from the 10-min recordings of Alice and Henry's interaction. Specifically, the digitized recordings were coded for (a) social engagement (i.e., simultaneously smiling and looking at Alice's face), (b) verbal reciprocity (i.e., taking at least one vocal/verbal turn contingent on Alice's vocalization/verbalization); and (c) communicative intention (verbal and nonverbal combined). Communicative intention was coded using a coding scheme described by Ninio, Snow, Pan, and Rollins (1994), which emphasizes socially constructed communicative interchanges. In Ninio et al.'s (1994) scheme, communicative intent is coded on the level of the social interchange (e.g., engaging with a partner in routines, regulating another's behavior, engaging in discussions), acknowledging the existence of an organization of talk at a level higher than the single utterance (see Dore & McDermott, 1982; Streeck, 1980). A social interchange is defined as one or more rounds of talk, all of which serve a unitary interactive function implicitly agreed upon by the interlocutors.

Procedure for coding videos

Social engagement, verbal reciprocity, and communicative intentions were coded from the digitized videos using a continuous partial interval coding system (Yoder & Symons, 2010). Specifically, each 10-min video was segmented into 5-s intervals and linked to a computer file for later coding, using the digitized video functions of the CHILDES

Table 2. Pathways[a] interactional strategies to facilitate Phase 1 of sharing emotions by week and recommended key features

Week	Intervention Strategies	Key Feature
Week 5	1. Engage in face-to-face positioning	Face-to-face
	2. Create dyadic social sensory games and routines (limit toys)	Social sensory routines
	3. Reinforce eye contact without verbal or physical prompts	Eye contact
Week 6	4. Add animation, gestures, facial expressions, and vocal quality	Animation
Weeks 7–9	5. Add imitation of action, gestures, and sounds	Imitation

[a]The Pathways strategies are explained by *Pathways Early Autism Intervention*, by M. Campbell and R. Thibodeau Hoffman, 2014, Unpublished manuscript, Dallas, TX. They are shared here with permission of the authors.

utilities (MacWhinney, 1991). In continuous partial interval coding, a behavior of interest is coded from the video only once per interval, regardless of how many times the behavior occurs during that interval. For a 10-min video, there were a total of 120 codable intervals, making the total possible frequency range for each behavior between 0 and 120. Using this system, each 5-s interval was coded for each measure during separate passes through the video. All coders were blind as to week of intervention. Two coders independently coded 20% of the videos from Weeks 1 to 4 (linguistically based intervention) and 20% of the videos from Weeks 5 to 9 (socially based intervention), chosen at random. Interrater reliability, expressed as Cohen's κ, which takes into account chance agreement between coders, ranged from 0.65 to 1.0 for Weeks 1–4 and 0.76 to 1.0 for Weeks 5–9, which is considered substantial to almost perfect agreement (Landis & Koch, 1977).

Eye tracking

The naturalistic interactions captured on video did not allow us to measure Henry's eye contact with Alice precisely, which was a focus of the intervention. Therefore, Alice brought Henry into the eye-tracking laboratory on two separate occasions. The first time (Time 1) was during the baseline phase, and the second (Time 2) was a few days after the Week 9 session. The eye-tracking laboratory was equipped with a SensoMotoric Instruments (SMI) RED-m portable eye-tracking laboratory, with a sampling rate of 60 and 120 Hz. The eye tracker was used to record and quantify Henry's eye movements as an indirect measure of eye contact. To collect the eye-tracking data, Henry sat on Alice's lap in front of a 15-in. LCD display. The video stimulus was a female actor who was looking directly into the camera and was engaged in childhood songs (e.g., "Peek-a-boo," "Wheels on the Bus") to simulate a dyadic interaction. The scene was filmed in front of distractor toys. The video was presented using a laptop that ran SMI's Experiment Center software. The eye tracker was first focused and

calibrated. During the calibration, Henry was shown images of an animated and concentric circle that appeared in one of five locations on the screen. Quality of calibration was verified by the deviations on the *x*- and *y*-axes. If any deviation was larger than 1°, the calibration procedure was repeated. The SMI BeGaze video analysis package was used to draw dynamic areas of interest (AOIs) on each frame of the video to ensure continuous motion within the AOIs. The BeGaze program calculated the total fixation time and the percentage of visual fixation time to each set of eyes, mouth + nose, body, all toys, and outside the region of AOIs.

In addition, we compared Henry's eye-tracking results with the results for Jena, a typically developing child who matched on age (29 months), mother's age (34 years), and language in the home (English). Jena was enrolled in English-speaking day care and scored in the 96th percentile on the Preschool Language Scale (fifth edition). Jena's mother brought her to the eye-tracking laboratory one time. All eye-tracking procedures used to collect, record, and quantify Jens's eye movements were the same as those for Henry, except that Jena sat on her mother's lap.

Results

This section presents the results of three analyses. The first is a qualitative analysis that uses excerpts from the 10-min digitized videos to elucidate Alice and Henry's interaction during the baseline and social intervention phases. The qualitative analysis is followed by two quantitative analyses of the results based on the behavioral measures and eye-tracking data.

Qualitative results

The qualitative results are presented in terms of five excerpts. The excerpts begin at baseline and span 8 weeks. Excerpts 2-5 illustrate key features from Table 2.

Excerpt 1: Baseline (linguistic intervention)

In this excerpt from Week 4, which illustrates the linguistic intervention, Henry

and Alice are positioned next to each other, building a block tower at a table. Alice has a pile of blocks in front of her. Henry is standing, and Alice is kneeling.

Alice turns her head to the side to look at Henry and says, "Henry!" while holding up a block.

Henry looks at the block in Alice's hand and then looks down at the floor.

Alice, still looking at Henry, says "Oh!"

Henry looks at the block in Alice's hand, grabs it, and says, "More block."

Henry looks at the block tower and places the block on top.

Alice looks at the pile blocks and says, "You want another one?"

Alice looks at Henry and holds up a white block and a pink block.

Henry continues to look at the block tower and vocalizes to himself as he adjusts the pieces.

Henry looks at the pile of blocks in front of Alice.

Alice looks at Henry, holds up two blocks, and says, "What color?"

Henry looks at the white block and tries to take it.

Alice, still looking at Henry, holds the blocks higher and again says, "What color?"

Henry continues to look at the white block in Alice's hand, points to it and says, "White."

Alice hands the block to Henry and says, "You want the white block?"

Henry looks at the tower in front of him as he adds the white block and says, "White."

Alice looks at the tower and says, "I'll put one on top," as she adds the block to the tower.

Henry, still looking at the tower, adjusts the block that Alice added and vocalizes to himself.

Alice picks up a block from the table.

Henry, looking at the tower, jumps and smiles while he vocalizes.

Alice slides the block to Henry and says, "Now you."

Henry looks at the tower as he adds the block to the top.

In this excerpt, Alice chose simple, high-interest, slow-paced activities, knelt to be on Henry's physical level, used alerters to direct his attention to the block, simplified her language, and used pause time to facilitate Henry's word use and turn-taking with an object, which were the targets of the linguistic approach. In response, Henry labeled and requested as well as allowed Alice to take her turn in building the tower. Although he appeared happy, he never looked at Alice's face, as would be expected for a child with social understanding. Instead, he gazed at the blocks and block tower for the entirety of the interaction.

Excerpt 2: Social intervention, using face-to-face, social sensory routines and eye contact

In this excerpt from Week 5, Alice's goals are to position herself so that she is sitting face to face with Henry while engaging him in social sensory routines and reinforcing his eye contact without verbal or physical prompts. Henry is sitting in an adult desk chair, and Alice is sitting on the floor below him. He is requesting that Alice spin him in the chair.

Alice spins the chair around one time and then stops it in front of her.

Alice looks up at Henry and tries to look into his eyes.

Henry looks at the arm of the chair as he touches it.

Alice looks up at Henry's face and tries again to look into his eyes.

Alice moves Henry's hand from the arm of the chair and says, "Oh hand, comes off." Henry continues to look at and touch the arm of the chair and says, "Go."

Alice looks up at Henry until she is able to look into his eyes. As soon as she looks into his eyes, she spins the chair and says, "Spinning in the chair."

Alice stops the chair in front of her, looks up at Henry, and tries to look into his eyes.

Henry goes back to looking at the arm of the chair and says, "Go."

Alice continues trying to look into Henry's eyes, but Henry averts his gaze.

Henry says, "Go, go."

Alice continues to look up at Henry and is now able to look into his eyes; she immediately spins the chair and says, "Spinning the chair."

Alice stops the chair in front of her.

Henry looks at Alice's eyes, smiles, and says, "Go."

Alice spins the chair and says, "Again."

Alice stops the chair in front of herself.

Henry looks at Alice's eyes, smiles, and says, "Go."

This excerpt illustrates the three key features used in Week 5 (i.e., face-to-face social sensory routines and eye contact) that Alice had learned. Rather than sitting beside Henry, as was seen in Excerpt 1, Alice sat face to face with him, placing herself in his line of sight whenever possible. Because Henry tended to look down, averting his gaze, Alice sat below him and looked up. She concentrated on finding a motivating sensory routine without toys (i.e., spinning in the chair). To reinforce eye contact without verbal or physical prompts, Alice moved her face in line with Henry's to look into his eyes. She quickly reinforced the brief eye contact by spinning him in the chair. Henry soon understood that he needed to look at Alice's eyes to be spun and began to integrate looking at Alice's eyes with a smile (i.e., social engagement) and the word "go."

Excerpt 3: Social intervention, using face-to-face, social sensory routines, eye contact, and animation

In this Week 6 excerpt, Alice adds animation to her repertoire of strategies. She continues to use face-to-face positioning when engaging Henry in routines and quickly reinforces eye contact. By Week 6, however, Henry is more socially engaged, as this excerpt illustrates. Alice and Henry are facing each other about 4 ft apart; Henry sits in a cube chair, and Alice kneels to be on his physical level. They are rolling a large therapy ball back and forth. Henry has the ball.

Alice looks at Henry's eyes and says, "Roll the ball to . . . . "

Henry looks at Alice's eyes, gives a big smile, and says, "Alice."

Alice, still looking at Henry's eyes, opens her arms wide and laughs with an exaggerated smile.

Henry, still looking at Alice eyes, rolls the ball with a big smile.

Alice, still looking at Henry's eyes, smiles and laughs while she catches the ball.

Henry and Alice look at each other, smiling and laughing.

In Excerpt 3, Alice was more animated than in earlier sessions when she was concentrating on reinforcing eye contact. Here, Henry and Alice continuously looked at each other's eyes, which registered positive affect. They laughed and smiled as they rolled the ball to each other. Henry used words within the routine (e.g., "Alice") and was socially engaged (e.g., looked at Alice's eyes and smiled).

Excerpt 4: Social intervention, using face-to-face, social sensory routines, eye contact, animation, and imitation

In Week 7, Alice adds imitation to her repertoire of strategies. She looks for opportunities to imitate actions, gestures, and sounds. Because the interactional strategies are cumulative, she is able to use all of the strategies together, as illustrated in this excerpt. Alice and Henry are about 4 ft apart, facing each other; Henry sits in a cube chair, and Alice kneels to be on his physical level. They are rolling a large therapy ball back and forth. Alice has the ball.

Henry looks down briefly and laughs and smiles as he puts his hand to his cheek.

Henry looks at Alice's eyes and vocalizes.

Alice looks at Henry and says, "Oh!" while imitating his hand positioning.

Alice, still looking at Henry's eyes, says, "You're silly."

Alice, still looking at Henry's eyes, says, "Roll the ball," and pats the ball.

Alice, still looking at Henry's eyes, says, "Roll the ball."

Henry, still looking at Alice's eyes, says, "To Alice."

Alice looks at and points to Henry, and says, "To . . . . "

Henry continues looking at Alice's eyes and says, "Henry."

Alice still looking at Henry's eyes, says, "To Henry."

Alice, still looking at Henry's eyes, rolls the ball to Henry, as she gasps and says, "Ahhh!"

Henry looks at Alice, smiles, and repeats, "Ahhh!" while catching the ball.

Alice looks at Henry's eyes and laughs.

Henry looks at Alice's eyes and makes vocalizations.

Alice continues looking at Henry and imitates his vocalizations.

To summarize, in Excerpt 4, Alice imitated Henry's nonverbal actions (hand positioning) and vocalizations. Henry continued to use words within the routine and was socially engaged (e.g., looked at Alice's eyes and smiled). He also started to imitate Alice's vocalizations.

Excerpt 5: Social intervention, using face-to-face, social sensory routines, eye contact, animation, and imitation

In subsequent sessions, Alice continued to use all of the interactional strategies from the previous weeks. Henry appeared to be more socially engaged, and their vocal play was more reciprocal, as Excerpt 5 from Week 8 illustrates. Alice and Henry sat face to face. Alice sat on the floor and Henry in a cube chair.

Henry looks away from Alice and vocalizes.

Alice looks at Henry's eyes and imitates the vocalization.

Henry gasps, looks at Alice's eyes, and makes a raspberry.

Alice looks into Henry's eyes and gasps exaggeratedly.

Henry looks at Alice's eyes, gasps, and makes a raspberry.

Alice looks into Henry's eyes, gasps, makes a raspberry, and then laughs.

Henry looks away from Alice's eyes, smiling.

Henry looks at Alice's eyes and makes a raspberry.

As Excerpt 5 illustrates, Henry continued to be socially engaged with Alice. He appeared to show progress in social communication each week.

Quantitative results

The quantitative results are presented in terms of the behavioral measures and eye-tracking data.

Behavioral measures

Henry's progress in terms of changes in behavioral measures is displayed in Figures 2 and 3. The number of 5-s intervals during which a behavior was exhibited (y-axis) was graphed by the week number (x-axis). The baseline data for these comparisons were gathered during the use of the linguistic approach (Weeks 1–4) before beginning the social approach. When Alice began using a social approach to intervention (Weeks 5–9), Henry appeared to make progress on his use of social engagement, verbal reciprocity, and intentions within routines. Visual inspection of the graphs in Figure 2 shows a clear positive slope for social engagement and verbal reciprocity. It is noteworthy that intentions within routines appeared to decline from the first week to the last week of social intervention (negative slope). Nonetheless, Henry used more intentions within routines when Alice used a social-cognitive approach to intervention (Weeks 5–9) as compared with a linguistic approach (Weeks 1–4). Henry made progress in his use of intentions to regulate another's behavior when Alice used a linguistic approach, which continued through Week 5, when he was using eye contact to request action in a sensory game. Regulating Alice's behavior, however, declined as the intervention became more social (Figure 3).
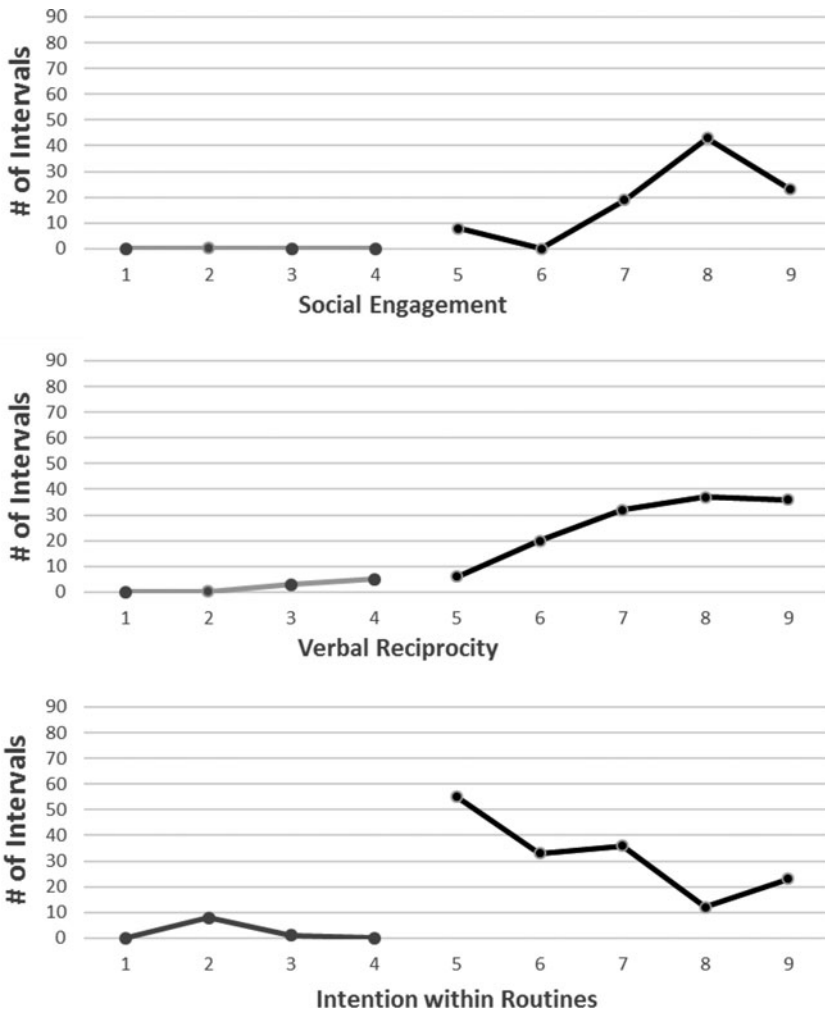
Figure 2. Henry's performance on social engagement, verbal reciprocity, and engagement in social routines across linguistic (Weeks 1–4) and social (Weeks 5–9) approaches to intervention.
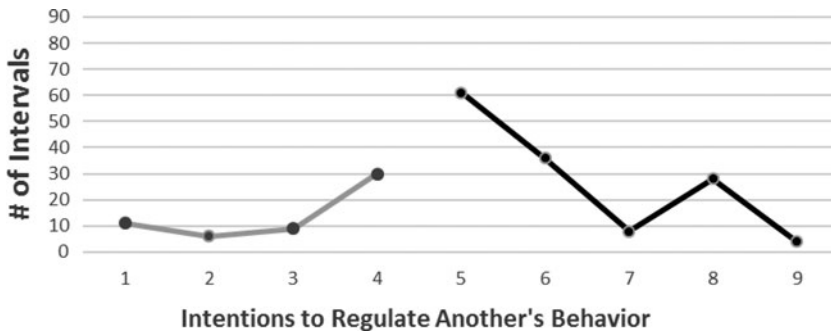
Figure 3. Henry's performance on intentions to regulate another's behavior across linguistic (Weeks 1–4) and social (Weeks 5–9) approaches to interventions.

Eye tracking

We found that Henry's percentage of fixation time to eyes, mouth, body, and toys changed from Time 1 to Time 2 (Table 3). The percentage of time that Henry looked at the eyes increased from 11.4% at Time 1 to 41.4% at Time 2. The latter percentage is remarkably similar to the amount of time that Jena looked at the eyes of the actor in the video. The amount of time that Henry looked at the mouth + nose area and the body decreased with the intervention. In addition, he spent more time looking outside the region of AIOs. Although this is only an indirect measure, it suggests that Henry's eye contact improved.

SUMMARY AND DISCUSSION

In this article, I elucidated the unfolding of the three phases of cognitive development through which typical children move during the first 2 years of life and described the interrelationships between cognition, communicative intention, word learning, and language (as illustrated in Figure 1). In addition, I explained that the social-cognitive trajectory necessary for social communication and language consists of sharing emotions and sharing attention and intention but that sharing perceptions and pursuing goals are not parts of the social-cognitive trajectory (Tomasello et al., 2005).

Historically, the second phase of sharing perceptions and pursuing goals has not been well understood or elaborated on, perhaps because sharing perceptions and pursuing goals are interwoven with sharing emotions and sharing attention and intentions in typically developing children (Tomasello et al., 2005). Children with ASD, however, often develop Phase 2 cognition, sharing perceptions and pursuing goals, without the neighboring social abilities. Cognitive skills related to sharing perceptions and pursuing goals allow children with ASD to do the following: (a) be goal directed and persistent; (b) understand that others have goals and perceptually monitor their behavior; (c) predict what comes next; and (d) take turns in an interaction that involves objects. Despite the sophistication in understanding many of these nonsocial-cognitive skills, these children appear to lack the social cognition necessary to understand mutual knowledge and that they are in a relationship in which their attention and intentions can be shared. Interventions, therefore, need to be designed to support these social developmental advances.

Children with ASD who are in the phase of sharing perceptions and pursuing goals cannot yet use social cues or understand their partner's intentions to learn language. Rather, these children use early perceptional word-learning strategies, which limit them to isolated words and phrases to label or regulate the behaviors of others. Unfortunately, these peripheral language forms do not readily progress to true social communication and language (Rollins & Snow, 1998). Social communication and creative language require

Table 3. Percentage of eye fixation on AOIs and outside the AOI for Henry at two time points[a] and for Jena, a typically developing child

	Eye	Mouth + Nose	Body	All Toys	Outside AOI
Henry (Time 1)	11.7	46.0	11.7	8.4	22.2
Henry (Time 2)	41.4	3.8	0	0	54.8
Jena	41.0	18.3	14.2	0	26.5

Note. AOI = area of interest.
[a]Henry was brought to the eye-tracking laboratory during baseline (Time 1) and, again, a few days after the Week 9 session (Time 2).

the foundational social-cognitive skill of shared emotions and shared attention and intention (Tomasello et al., 2005).

On the basis of this theoretical framework, I made the clinical recommendation that interventionists who work with children in the second phase of sharing perceptions and pursuing goals focus their interventions efforts on facilitating the sharing emotions skills of Phase 1, as these are the critical precursors of social communication. In particular, I recommended five key features essential to facilitate Phase 1 sharing emotions skills: (a) position yourself face to face with the child; (b) engage in social sensory routines, limiting the use of toys whenever possible; (c) establish eye contact without verbal and physical prompts, making sure to reinforce eye contact immediately; (d) use animation; and (e) use contingent imitation of the child gestures, vocalization, and words. To support these recommendations, I presented a clinical case in which we used Pathways, a social approach to intervention, to slowly add and integrate all five of the Phase 1 key features.

The child in the case example was Henry, a 29-month-old toddler with ASD who was in the phase of sharing perceptions and pursuing goals. He used verbal and nonverbal means to request and label items in his environment. He rarely looked at his communicative partner, focusing his gaze on the objects around him. Because Henry was enrolled in a linguistically based program, his initial goals focused on peripheral language forms and engaging in turn-taking with objects. The problem was that Henry's program created an environment that perpetuated the nonsocial language skills that he already was capable of producing.

After 4 weeks of linguistically based intervention, Henry's graduate-student clinician, Alice, and I changed Henry's intervention to a social approach, using Pathways. This provided a naturalistic baseline of data against which we could measure progress that corresponded with introduction of Pathways social approach. Alice learned to engage Henry in eye contact and social engagement using the five key features of face-to-face positioning, dyadic social sensory routines, reinforcing eye contact without verbal or physical prompts, and adding animation and imitation (as summarized in Table 2). Once the social intervention was initiated, Henry demonstrated an increase in his sharing emotions capabilities, as demonstrated by increased social engagement and verbal reciprocity (illustrated in Figure 2). In addition, his communicative intentions became more social when intention within social routines was added to his repertoire (illustrated in Figure 3). This addition is commensurate with the developmental trajectory of social communication in typical children. That is, although requests emerge early in typically developing children (as protoimperatives; Bates et al., 1975), social participation acts are more frequent (Snow, Pan, Imbens-Bailey, & Herman, 1996). Social routines precede joint attention (Ninio & Snow, 1996; Rollins, in press) and provide the contexts for a shared mutual knowledge (Rollins, 2014).

Because we were unable to measure eye contact objectively, we used eye-tracking technology to obtain an indirect measure. For this purpose, Henry was brought into an eye-tracking laboratory once during baseline (Time 1) and, again, a few days after the Week 9 intervention session (Time 2). The results of the eye-tracking data suggest that, although Henry spent more time looking outside the AOIs (eyes, mouth + nose, body, and toys) at Time 2, the percentage of time that he looked at the eyes of the actor in the video increased from 11.4% at Time 1 to 41.4% at Time 2. The latter was commensurate with a typical peer matched for chronological age and home language.

The importance of facilitating eye contact in interventions with children on the spectrum has been emphasized by Jones and Klin (2013). They found that, despite the presence of early reflexive gaze to adult eyes, infants with ASD exhibit a decline in eye gaze between 2 and 6 months. Jones and Klin suggested that infants with ASD who do not engage in eye contact miss opportunities to engage in social reciprocity and begin to

favor the object world. Jones and Klin suggested that early intervention that focuses on eye contact could build on the neural networks that subserve early reflexive gaze, which could have cascading effects on the development of social communication, as well as result in positive collateral changes in other areas of development. This case example was consistent this hypothesis.

It is noteworthy that this case example was not a study with experimental control. There are many threats to the internal validity of this case example, including that Henry may have shown improvement simply because he had more time to develop, so that changes could be due to simple maturation. The findings of changes contingent on introducing the socially based intervention, however, were consistent with those of Rollins et al. (2016), which differed in that the intervention was delivered by parents within an authentic home setting. These two reports are consistent in supporting the use of a social-cognitive approach over a linguistic approach for children with ASD who seem to be stuck in the phase of sharing perceptions and pursuing goals.

Early identification and intervention are known to have positive implications for a child's level of functioning and school placement (Dawson et al., 2010; Reichow, 2012; Warren et al., 2011). It is imperative, however, that interventionists providing early intervention understand a child's social-cognitive functioning and not be deceived by peripheral language forms. This case example provided added support for the notion that evidence-based practices used with young children with ASD are most effective when grounded in a comprehensive framework that is sensitive to the child's social-cognitive abilities.

REFERENCES

Adamson, L., & Russell, C. (1999). Emotion regulation and the emergence of joint attention. In P. Rochat (Ed.), *Early social cognition: Understanding others in the first months of life* (pp. 281-295). Mahwah, NJ: Erlbaum.

Bakeman, R., & Adamson, L. (1984). Coordinating attention to people and objects in mother–infant and peer–infant interaction. *Child Development*, *55*, 1278-1289.

Baldwin, D. (1993). Early referential understanding: Infants' ability to recognize referential acts for what they are. *Developmental Psychology*, *29*, 832-843.

Bates, E., Benigni, L., Bretherton, I., Camaioni, L., & Volterra, V. (1979). *The emergence of symbols: Cognition and communication in infancy*. New York: Academic Press.

Bates, E., Camaioni, L., & Volterra, V. (1975). The acquisition of performatives prior to speech. *Merrill-Palmer Quarterly*, *21*, 205-224.

Bates, E., & Goodman, J. (1997). On the inseparability of grammar and the lexicon: Evidence from acquisition, aphasia and real-time processing. *Language and Cognitive Processes*, *12*(5-6), 507-586.

Bates, E., & Goodman, J. (1999). On the emergence of grammar from the lexicon. In B. MacWhinney (Ed.), *The emergence of language* (pp. 29-79). Mahwah, NJ: Erlbaum.

Bateson, M. C. (1975). Mother–infant exchanges: The epigenesis of conversation interaction. *Annals of the New York Academy of Sciences*, *263*, 101-113.

Brazelton, T. B., Koslowski, B., & Main, M. (1974). The origins of reciprocity: The early mother-infant interaction. In M. Lewis, & L. A. Rosenblum (Eds.), *The effect of the infant on its caregiver* (pp. 49-76). New York: Wiley.

Camaioni, L. (1993). The development of intentional communication: A re-analysis. In J. Nadel, & L. Camaioni (Eds.), *New perspectives in early communication development* (pp. 82-96). New York: Routledge.

Campbell, M., & Thibodeau Hoffman, R. (2014). *Pathways early autism intervention*. Unpublished manuscript, Dallas, TX: Pathways Early Intervention.

Carpenter, M., Nagel, K., & Tomasello, M. (1998). Social cognition, joint attention, and communicative competence from 9 to 15 months of age. *Monographs of the Society for Research in Child Development*, *63* (4, Serial No. 225).

Centers for Disease Control and Prevention. (2014). *Facts about ASDs*. Retrieved from http://www.cdc.gov/ncbddd/autism/data.html

Charman, T. (2003). Why is joint attention a pivotal skill in autism? *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences*, *358*(1430), 315-324.

Dawson, G., Rogers, S., Munson, J., Smith, M., Winter, J., Greenson, J., et al. (2010). Randomized, controlled trial of an intervention for toddlers with autism: The Early Start Denver Model. *Pediatrics*, *125*(1), e17-e23.

Dore, J., & McDermott, R. P. (1982). Linguistic indeterminacy and social context in utterance interpretation. *Language, 58*, 374–398.

Gillespie-Lynch, K., Khalulyan, A., del Rosario, M., McCarthy, B., Gomez, L., Sigman, M., et al. (2013). Is early joint attention associated with school-age pragmatic language? *Autism, 19*(2), 168–177.

Greenspan, S. I., & Shanker, S. (2004). *The first idea: How symbols, language and intelligence evolved from our primate ancestors to modern human.* Cambridge, MA: Da Capo Press.

Hirsh-Pasek, K., Golinkoff, R. M., Hennon, E. A., & Maguire, M. J. (2004). Hybrid theories at the frontier of developmental psychology: The emergentist coalition model of word learning as a case in point. In G. Hall, & S. Waxman (Eds.), *Weaving a lexicon* (pp. 173–204). Cambridge, MA: MIT Press.

Hirsh-Pasek, K., Golinkoff, R. M., & Hollich, G. (2000). An emergentist coalition model for word learning: Mapping words to objects is a product of the interaction of multiple cues. In R. M. Golinkoff, K. Hirsh-Pasek, L. Bloom, L. Smith, A. Woodward, N. Akhtar, M. Tomasello, … G. Hollich (Eds.), *Becoming a word learner: A debate on lexical acquisition* (pp. 136–164). New York: Oxford University Press.

Hollich, G., Hirsh-Pasek, K., Golinkoff, R. M., Brand, R. J., Brown, E., Chung, H. L., et al. (2000). Breaking the language barrier: An emergentist coalition model for the origins of word learning. *Monographs of the Society for Research in Child Development, 65*(3), 1–135.

Ingersoll, B., & Gergans, S. (2007). The effect of a parent-implemented imitation intervention on spontaneous imitation skills in young children with autism. *Research in Developmental Disabilities, 28*(2), 163–175.

Johnson, M. H., & Morton, J. (1991). *Biology and cognitive development: The case of face recognition.* Oxford, England: Blackwell.

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*(7480), 427–431. doi:10.1038/nature12715

Kasari, C., Paparella, T., Freeman, S., & Jahromi, L. (2008). Language outcome in autism: Randomized comparison of joint attention and play interventions. *Journal of Consulting and Clinical Psychology, 76*, 125–137.

Landis, J., & Koch, G. (1977). The measurement of observer agreement for categorical data. *Biometrics, 33*(1), 159–174.

Legerstee, M. (1991). The role of person and object in eliciting early imitation. *Journal of Experimental Child Psychology, 51*, 423–433.

Lord, C., Rutter, M., DiLavore, P. C., & Risi, S. (2002). *Autism diagnostic observation schedule (ADOS).* Los Angeles, CA: Western Psychological Services.

MacWhinney, B. (1991). *The CHILDES project: Computational tools for analyzing talk.* Hillsdale, NJ: Erlbaum.

Maurer, D. (1985). Infants' perception of faces. In T. Field, & M. Fox (Eds.), *Social perception in infants* (pp. 73–100). Norwood, NJ: Ablex.

Meltzoff, A. N., & Moore, M. K. (1983). Newborn infants imitate adult facial gestures. *Child Development, 54*(3), 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.

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., & Thorp, D. (2008). The neural basis of early joint-attention behavior. In T. Charman, & W. Stone (Eds.), *Social & communication development in autism spectrum disorders: Early identification, diagnosis & intervention* (pp. 296–336). New York: The Guilford Press.

Ninio, A., & Snow, C. E. (1996). *Pragmatic development.* Boulder, CO: Westview.

Ninio, A., Snow, C. E., Pan, B. A., & Rollins, P. R. (1994). Classifying communicative acts in children's interactions. *Journal of Communication Disorders, 27*(2), 157–187.

Reichow, B. (2012). Overview of meta-analyses on early intensive behavioral intervention for young children with autism spectrum disorders. *Journal of Autism and Developmental Disorders, 42*(4), 512–520.

Rochat, P., & Striano, T. (1999). Social cognitive development in the first year. In P. Rochat (Ed.), *Early social cognition* (pp. 3–34). Mahwah, NJ: Erlbaum.

Rollins, P. R. (1999). Early pragmatic accomplishments and vocabulary development in preschool children with autism. *American Journal of Speech-Language Pathology, 8*(2), 181–190.

Rollins, P. R. (2003). Caregiver contingent comments and subsequent vocabulary comprehension. *Applied Psycholinguistics, 24*, 221–234.

Rollins, P. R. (2014). *Facilitating early social communication skills: From theory to practice.* Shawnee Mission, KS: AAPC Publishing.

Rollins, P. R. (in press). Developmental pragmatics. In Y. Huang (Ed.), *Handbook of pragmatics.* Oxford, England: Oxford University Press.

Rollins, P. R., Campbell, M., Hoffman, R. T., & Self, K. (2016). A community-based early intervention program for toddlers with autism spectrum disorders. *Autism: International Journal of Research and Practice, 20*(2), 219–232.

Rollins, P. R., & Greenwald, L. C. (2013). Affect attunement during mother–infant interaction: How specific intensities predict the stability of infants' joint attention. *Imagination, Cognition and Personality, 32*(4), 339–366.

Rollins, P. R., & Snow, C. E. (1998). Shared attention and grammatical development in typical children and children with autism. *Journal of Child Language*, *25*(3), 653–673.

Rollins, P. R., & Trautman, C. H. (2011). *Caregiver input before joint attention: The role of multimodal input*. Paper presented at the International Congress for the Study of Child Language (IASCL), Baltimore, MD.

Rollins, P. R., Wambacq, I., Dowell, D., Mathews, L., & Reese, P. B. (1998). An intervention technique for children with autistic spectrum disorder: Joint attentional routines. *Journal of Communication Disorders*, *31*(2), 181–193.

Schertz, H., & Odom, S. (2007). Promoting joint attention in toddlers with autism: A parent-mediated developmental model. *Journal of Autism & Developmental Disorders*, *37*(8), 1562–1575.

Snow, C. E. (1977). The development of conversation between mothers and babies. *Journal of Child Language*, *4*, 1–22.

Snow, C. E., Pan, B. A., Imbens-Bailey, A., & Herman, J. (1996). Learning how to say what one means: A longitudinal study of children's speech act use. *Social Development*, *5*, 56–84.

Spitz, R. A. (1965). *The first year of life: A psychoanalytic study of normal and deviant development of object relations*. New York: International Universities Press.

Stern, D. N. (1985). *The interpersonal world of the infant: View from psychoanalysis and development psychology*. New York: Basic Books.

Streeck, J. (1980). Speech acts in interaction: A critique of Searle. *Discourse Processes*, *3*, 133–154.

Tomasello, M. (1995). Joint attention as social cognition. In C. Moore, & P. Dunham (Eds.), *Joint attention: Its origins and role in development* (pp. 103–130). Hillsdale, NJ: Erlbaum.

Tomasello, M. (1999). *The cultural origins of human cognition*. Boston, MA: Harvard University Press.

Tomasello, M., & Barton, M. (1994). Learning words in nonostensive contexts. *Developmental Psychology*, *30*, 639–650.

Tomasello, M., & Carpenter, M. (2007). Shared intentionality. *Developmental Science*, *10*(1), 121–125.

Tomasello, M., Carpenter, M., Call, J., Behne, T., & Moll, H. (2005). Understanding and sharing intentions: The origins of cultural cognition. *Behavioral and Brain Sciences*, *28*(05), 675–691.

Tomasello, M., Carpenter, M., & Liszkowski, U. (2007). A new look at infant pointing. *Child Development*, *78*, 705–722.

Trevarthen, C. (1979). Instincts for human understanding and for cultural cooperation: Their development in infancy. In M. V. Cranach, K. Foppa, W. Lepenies, & D. Ploog (Eds.), *Human ethnology: Claims and limits of a new discipline* (pp. 530–571). Cambridge, England: Cambridge University Press.

Trevarthen, C., & Aitken, K. (2001). Infant intersubjectivity: Research, theory and clinical applications. *Journal of Child Psychology and Psychiatry*, *42*, 3–48.

Trevarthen, C., & Hubley, P. (1978). Secondary intersubjectivity: Confidence, confiding and acts of meaning in the first year. In A. Lock (Ed.), *Action, gestures and symbol* (pp. 183–229). London: Academic Press.

Vouloumanos, A., Hauser, M. D., Werker, J. F., & Martin, A. (2010). The tuning of human neonates' preference for speech. *Child Development*, *81*(2), 517–527.

Wallace, K. S., & Rogers, S. J. (2010). Intervening in infancy: Implications for autism spectrum disorders. *Journal of Child Psychology and Psychiatry*, *51*(12), 1300–1320.

Warren, Z., McPheeters, M. L., Sathe, N., Foss-Feig, J. H., Glasser, A., & Veenstra-VanderWeele, J. (2011). A systematic review of early intensive intervention for autism spectrum disorders. *Pediatrics*, *127*(5), e1303–e1311.

Wetherby, A. M., & Woods, J. J. (2006). Early social interaction project for children with autism spectrum disorders beginning in the second year of life a preliminary study. *Topics in Early Childhood Special Education*, *26*(2), 67–82.

Wetherby, A. M., Yonclas, D. G., & Bryan, A. A. (1989). Communicative profiles of preschool children with handicaps: Implications for early identification. *Journal of Speech and Hearing Disorders*, *54*, 148–158.

Wolff, P. H. (1987). *The development of behavioral states and the expression of emotions in early infancy*. Chicago: University of Chicago Press.

Yoder, P., & Symons, F. J. (2010). *Observational measurement of behavior*. New York: Springer.