

Joint Attention in Children with Autism:

Theory and Intervention

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Joint attention is an early-developing social-communicative skill in which two people (usually a young child and an adult) use gestures and gaze to share attention with respect to interesting objects or events. This skill plays a critical role in social and language development. Impaired development of joint attention is a cardinal feature of children with autism, and thus it is important to develop this skill in early intervention efforts. Several interventions are described that involve teaching joint attention to young children with autism. These interventions focus primarily on the *forms* of joint attention; however, they only partially address the unique social *function* of this behavior. Drawing on the joint attention literature, as well as extensive intervention literature from the field of applied behavior analysis, we describe a set of strategies that could be used to teach and support joint attention, function as well as form, in young children with autism.

Sam and his mother were playing in the park when an airplane flew overhead. Sam looked up excitedly, then looked back at his mother, and finally pointed to the airplane, as if to say, "Hey, Mom, look at that!" Sam's mother looked at where her son was pointing and responded, "Yes, Sam, it's an airplane!"

Sam directed his mother's attention to the airplane flying overhead. He was not requesting that his mother do anything; he simply wanted to share his experience of the airplane with her. He engaged his mother in an episode of *joint attention*.

Around 9 months of age, typically developing children begin to engage in joint attention, an early social-communicative behavior in which two people share attentional focus on an object or event (Bakeman & Adamson, 1984). It is defined by specific forms, namely, gaze alternation and conventional gestures. It also has a specific function,

namely, social interaction concerning objects and events in the surrounding world. Children with autism, however, do not develop joint attention.

In what follows, we will first review the literature on joint attention in typically developing children and in children with autism as a backdrop for understanding the importance of this early social-communicative skill in development. Then we will describe the influence of joint attention on multiple areas of development, leading to the notion that this skill may constitute a pivotal response class, that is, a set of behaviors that, once strengthened through intervention, is likely to affect a wide variety of other behaviors (L. Koegel, Koegel, Harrower, & Carter, 1999). For this reason, a focus on joint attention ought to be a key component of early intervention programs. The important role that joint attention plays in the development of communication skills is especially noteworthy, given that such skills often facil-

itate successful outcomes in children with autism (Drasgow & Halle, 1995; Durand, 1990). Our own research demonstrates, for example, that gains in communicative competence may prevent or decrease problem behavior and lead to increased community inclusion (Carr & Durand, 1985; Carr et al., 1994; Carr et al., 1999; Reeve & Carr, 2000). In the final section, we will examine the intervention literature with respect to the issue of teaching the various behavioral topographies (forms) of joint attention and, most critically, the potential for enhancing the social motivation (function) that underlies this behavior.

Joint Attention in Typically Developing Children

Joint attention involves two people actively sharing attention with respect to an object or event and monitoring each other's attention to that object or event (Adamson & Bakeman, 1984; Bruner, 1975). It first occurs between infants and caregivers, and later with peers (Adamson & Chance, 1998; Bakeman & Adamson, 1984). A variety of labels have been used to refer to joint attention or aspects of joint attention, including *joint visual attention* (Butterworth, 1995), *commenting* (Warren, Yoder, Gazdag, Kim, & Jones, 1993), *indicating* (Bruner, 1975), *proto-declaratives* (Bates, Camaioni, & Volterra, 1975), and *coordinated joint engagement* (Bakeman & Adamson, 1984, 1986; Tomasello, 1995).

Forms

Joint attention develops between 9 and 18 months of age as dyadic interactions begin to include reference to objects and events in the surrounding environment (Butterworth, 1995; Corkum & Moore, 1995). There are two ways in which a child engages in joint attention: The child either *responds to* another person's attention directive or *initiates* joint attention with another person, directing the other person to adopt the child's own attentional focus (Charman, 1997, 1998; Mundy & Gomes, 1998). Late in the first year of life, infants consistently respond to adults' bids for joint attention (Butterworth, 1995; Tomasello, 1995). An adult's bid typically takes the form of the adult's shifting his or her gaze and turning his or her head to an object (Mundy & Hogan, 1994; Scaife & Bruner, 1975), paired with a conventional gesture, such as a point directed toward the object (Leung & Rheingold, 1981; Murphy & Messer, 1977). Adults also often comment on the object of joint attention (Bruner, 1981, 1983; Bruner & Sherwood, 1983). For example, when infant and caregiver are playing together, the caregiver might make a bid for joint attention by turning to look at and point to a toy car while saying, "Look at that car!" in an exclamatory voice. The infant responds to the adult's bid for joint attention by following the adult's gaze and point, and looking at the target object. Later (between 12 and 14 months), after following the direction of an adult's gaze or point, infants begin to *check back* with the adult by alternating their own gaze from the object to the adult and back to the object (Tomasello, 1995). *Gaze alternation* between the object and adult helps to ensure that the infant and adult are focused on the same thing, that is, are sharing attention to the same object (Tomasello, 1995). The result of responding to an adult's joint attention bid is a brief social interaction about, and continued shared attention to, the object of joint attention.

Toward the end of the first year of life, infants also begin to initiate joint attention in response to the presence of an in-

teresting object or event and a person to share it with. Infants initiate joint attention using gestures such as pointing and showing, in conjunction with gaze alternation, as if to say, "Hey, look at that!" (Bates et al., 1975; Bruner, 1983; Tomasello, 1995). At first, infants initiate joint attention through nonverbal means (i.e., through gaze alternation and gesture); however, infants soon begin to accompany these nonverbal joint attention behaviors with vocalizations, in the form of simple sounds such as "da," to direct their adult partner's attention (Bruner, 1981; Leung & Rheingold, 1981). The consequence for initiating joint attention with respect to an object or event is that the adult and child engage in a social interaction in which they share attention with respect to that object or event. Often, the adult looks at and comments on (e.g., by labeling) the object or event (Bates, O'Connell, & Shore, 1987; Bruner, 1983; Leung & Rheingold, 1981).

By the middle of their second year of life, infants have developed well-coordinated joint attention skills that take the form of gaze alternation and conventional gestures, providing the infant with the means to interact with adults about the surrounding world. These forms, however, are insufficient for defining the totality of joint attention; in order to fully define joint attention, one must consider function as well as form.

Function

Bates et al. (1975) described joint attention, or "proto-declaratives," as involving the "use of an object (through pointing, showing, giving) as the means for obtaining adult attention" (p. 209). The function of joint attention, then, is social, reflecting the infant's growing understanding of the world and motivation to interact with adults about interesting objects (Bruner & Sherwood, 1983; Gómez, Sarriá, Tamarit, 1993; Mundy, 1995; Tomasello, 1995). This specifically social function of joint attention is most apparent when it is compared with another early-developing communication skill, namely, requesting.

Both the initiation of joint attention and requesting entail gaze alternation and conventional gesture use to coordinate attention between self, object, and other (Adamson & Chance, 1998; Bates et al., 1975). Although the form of these two skills may be the same, they each serve a discrete communicative function (Bates et al., 1975; Bruner, 1983). Initiating joint attention serves a declarative, or indicating, function—specifically, to show an object to someone else. Requesting, on the other hand, serves an imperative function—specifically, to obtain an object or assistance. When requesting, the child alternates gaze and points to an object, delivering the message "Give me that thing over there!" The reward is nonsocial. In contrast, when initiating joint attention, the child alternates gaze and points to an object, delivering the message "Hey, look at that interesting thing over there!" The reward is a social interaction in which the child and adult share attention to the object of interest.

It is the function that makes joint attention more than just a repertoire of gestural and gazing skills. Within the first year and a half of life, typically developing children master the forms of joint attention and demonstrate motivation to seek the social consequences of joint attention. In contrast, joint attention is absent in children with autism, who characteristically are not interested in such social interactions (Charman, 1998; Mundy & Crowson, 1997).

Joint Attention in Children with Autism

A deficit in the development of joint attention is one of the earliest symptoms of autism, evident before 1 year of age and often before any diagnosis has been made (Baron-Cohen, Allen, & Gillberg, 1992; Charman et al., 1998; Osterling & Dawson, 1994). Compared with children with mental retardation or specific language delay, matched for developmental level, only children with autism show deficits in joint attention (Charman et al., 1998; Landry & Loveland, 1988). A

deficit in joint attention discriminates 80% to 90% of children with autism from those with other developmental disabilities (Lewy & Dawson, 1992; Mundy, Sigman, Ungerer, & Sherman, 1986). In fact, infant screening and diagnostic instruments for autism, such as the *Checklist for Autism in Toddlers* (CHAT; Baron-Cohen et al., 1992) and the *Pre-Linguistic Autism Diagnostic Observation Schedule* (PL-ADOS; DiLavore, Lord, & Rutter, 1995), include assessment of deficits in joint attention as a marker for autism.

Forms

A number of studies have demonstrated consistent deficits in both responding to and initiating joint attention bids in preschool children with autism (Sigman, Mundy, Sherman, & Ungerer, 1986; Stone, Ousley, Yoder, Hogan, & Hepburn, 1997). Only a few studies have examined joint attention in older children with autism; these have involved children in middle childhood (Baron-Cohen, 1989; Curcio, 1978; Landry & Loveland, 1988; Wetherby & Prutting, 1984). Studies indicate that the impairment in joint attention changes over the course of development: Whereas skills in initiating joint attention remain impaired, some children with autism who show more advanced cognitive development begin to demonstrate the ability to respond to others' joint attention bids (Charman, 1998; DiLavore & Lord, 1995; Mundy, Sigman, & Kasari, 1994).

Function

Children with autism demonstrate, as a cardinal symptom, a lack of social interest and understanding (Charman, 1998; Mundy, 1995; Mundy & Crowson, 1997; Sigman & Kasari, 1995). Currently, diagnostic criteria for autism in the *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR*; American Psychiatric Association, 2000) include "a lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (e.g., by a lack

of showing, bringing, or pointing out objects of interest)" (p. 75). The deficit in joint attention is an early marker of the disturbance in social motivation that is characteristic of autism (Mundy, 1995; Mundy & Crowson, 1997; Mundy & Hogan, 1994).

The developmental changes in the nature of the deficit in joint attention illustrate the importance of function in understanding this impairment. Given the differential development of responding to and initiating joint attention bids, it may be that the two skills involve somewhat different functions and that only initiating joint attention requires true social motivation. In examining the differences between responding to and initiating joint attention behaviors in typically developing toddlers, Mundy and Gomes (1998) concluded that initiating joint attention appears to more clearly involve the social motivation that truly defines the function of joint attention. In fact, Corkum and Moore (1995, 1998) proposed that responding to others' bids for joint attention may not necessarily require social motivation. When a child responds to another person's joint attention bid, he or she may have learned that "looking where someone else is looking" (Butterworth & Jarrett, 1991, p. 55) is likely to be reinforced by the presence of interesting objects and events (Corkum & Moore, 1995, 1998; Matsuda & Omori, 2001; Moore & Corkum, 1994). Corkum and Moore (1995) demonstrated that responding to others' bids for joint attention could be taught to infants who had not yet developed joint attention using a simple conditioning paradigm in which responding to another person's joint attention bid was reinforced by the presence of interesting stimuli at the site where the other person was looking. Such an explanation could account for responding to joint attention bids; however, it is unclear how this could account for the young child's motivation to *initiate* joint attention (Tomasello, 1995).

Comparing initiating joint attention with requesting also illustrates the functional nature of the deficit in joint attention in children with autism. Recall that

requesting and initiating joint attention look the same but serve different functions. Children with autism are relatively unimpaired in using gestures and gaze alternation to obtain objects and assistance, that is, to request (Baron-Cohen, 1989; Curcio, 1978; Mundy et al., 1986; Wetherby & Prutting, 1984); however, they do not also use these forms for the social purpose of joint attention that involves sharing interest about an object or event with another person (Goodhart & Baron-Cohen, 1993; Loveland & Landry, 1986).

Developmental Significance of Joint Attention

Dunham and Moore (1995) described joint attention interactions as "social hot spots" influencing many different dimensions of early development" (p. 23). Joint attention is theoretically related to two core areas of disturbance in autism: language and social development (Bakeman & Adamson, 1984; Bruner, 1975; Moore & Dunham, 1995; Mundy, 1995; Mundy & Willoughby, 1996, 1998). It is likely to promote development in these areas because children engage in social and language exchange within the context of joint attention interactions (Adamson & Chance, 1998; Baldwin, 1995; Tomasello, 1988, 1995).

Joint Attention and Language Development

Bruner (1983) suggested that joint attention provides a basis of shared experience that is necessary for language acquisition. In fact, joint attention is both concurrently and predictively related to language ability in both typically developing children and those with autism (Loveland & Landry, 1986; Markus, Mundy, Morales, Delgado, & Yale, 2000; McCathren, Warren, & Yoder, 1996; Mundy & Gomes, 1998; Mundy, Sigman, & Kasari, 1990, 1994). In a study of typically developing toddlers, Mundy and Gomes demonstrated that responding to others' bids for joint

attention uniquely predicted receptive language ability and initiating joint attention uniquely predicted expressive language ability.

One explanation for the relationship between joint attention and language is that language (e.g., vocabulary) is learned during episodes of joint attention (Baldwin, 1995; Baron-Cohen, Baldwin, & Crowson, 1997; Morales et al., 2000; Tomasello, 1988, 1995). When an adult directs a child's attention (so the child must respond to the adult's joint attention bid), the adult often labels the object of joint attention (Bruner, 1983; Bruner & Sherwood, 1983). Researchers have demonstrated that children learn object labels during such episodes of joint attention (Tomasello & Farrar, 1986; Tomasello & Todd, 1983). Most of this research has examined receptive vocabulary acquisition in relation to joint attention interactions in which children respond to adults' bids for joint attention. Gaze alternation (rather than just looking where the other person is looking) enhances accurate vocabulary acquisition. Early in the second year of life, when an infant hears a novel word, he or she checks the adult's attentional focus (by alternating gaze between the object and adult) to determine the correct target object to associate with the novel word (Baldwin, 1991; Tomasello, 1995). When the child and adult are not jointly focused (i.e., the child's attentional focus is discrepant from the adult's verbal label), gaze alternation serves to check the reference of the label. In a discrepant labeling situation, the child is required to determine the reference of the adult's label. Baron-Cohen et al. (1997) examined discrepant labeling situations and found that typically developing children checked the adult's line of regard (by gaze alternation) and correctly ascertained that the adult's label referred to the item on which the adult was focused, not the item on which the child was focused. In contrast, children with autism did not engage in joint attention and did not check the adult's line of regard, and consequently they incorrectly associated the object label with the object of their own focus.

Joint Attention and Social Development

Although social motivation is thought to underlie joint attention and joint attention is believed to indicate the beginnings of social understanding (thereby setting the stage for more complex social skills to develop; Baron-Cohen, 1995; Bretherton, 1991; Mundy & Crowson, 1997; Tomasello, 1995), considerably less research has been directed at the social correlates of joint attention. Mundy et al. (1994) found an association between joint attention skills and parent reports of social behavior on the *Autism Behavior Checklist* (ABC; Krug, Arick, & Almond, 1979) in both typically developing children and those with autism. More frequent joint attention behaviors were associated with parental perception of more positive social behaviors (including eye contact, affect, and imitation). Travis, Sigman, and Ruskin (2001) found that for individuals with autism, initiating joint attention was related to measures of social competence (e.g., engagement with peers on the playground) and prosocial behaviors in a laboratory task.

Joint attention is also theoretically related to both pretend play and theory of mind, two social-cognitive abilities that develop later and are also specifically impaired in individuals with autism. Whereas joint attention first develops before 1 year of age in typically developing children, pretend play is not seen until the second year of life, and theory of mind begins to emerge in the preschool years. Broadly, pretend play consists of acting as if something were the case, when in fact it is not, such as when a young child pretends that a banana is a telephone (Leslie, 1987). Children with autism are specifically impaired in spontaneous pretend play (Jarrold, Boucher, & Smith, 1993). The second, later developing social-cognitive ability is theory of mind, or the ability to take the perspective of another person, and to attribute complex mental states, such as thinking and believing, to another person, that is, "knowing that other people know, want, feel, or believe things"

(Baron-Cohen, Leslie, & Frith, 1985, p. 38). Children with autism show specific impairments on theory-of-mind tasks (Baron-Cohen et al., 1985). In principle, joint attention reflects an implicit, more rudimentary theory of mind in which the child possesses a basic understanding of what is in other people's minds as reflected by what they are attending to and what they are interested in (Baron-Cohen, 1997; Bretherton, 1991; Wellman, 1993). Charman et al. (2001) found a relationship between early joint attention and later developing theory of mind in typically developing children. It has also been suggested that theory of mind, pretend play, and joint attention all share an underlying cognitive capacity; however, the specific associations remain to be fully examined (Baron-Cohen, 1997; Charman, 1997; Leslie, 1987; Mundy & Hogan, 1994; Wellman, 1993).

The developmental connections between joint attention and social and language development require that the child display both the forms and the function of joint attention. A child who is unable to follow another person's gaze and/or point, and who is unable to direct another person's attention to interesting objects and events (impaired forms of joint attention) is a child who is likely to have a great deal of difficulty following and understanding social interactions and associating language labels with objects. A child who is not motivated to share the world around him or her with others (impaired function of joint attention) is not likely to even engage in joint attention.

Joint Attention as a Pivotal Skill in Early Intervention

Given that a deficit in the function of joint attention reflects a cardinal feature of autism and that joint attention facilitates other areas of development also impaired in autism, it has been suggested that joint attention should be a priority for early intervention (Bristol et al., 1996; Klinger & Dawson, 1992; Mundy & Crowson, 1997) and may be a pivotal

skill (Mundy & Crowson, 1997; Schreibman, Stahmer, & Pierce, 1996). Pivotal skills are those skills that, once strengthened, result in positive changes in other areas of functioning and improvements in subsequent learning (Koegel et al., 1999). These collateral changes may occur in a variety of areas, including language, pragmatics, and academics. L. Koegel et al. (1999) reviewed several of the pivotal areas that have been identified in the literature, including responsivity to multiple cues, self-management, and motivation. *Motivation* refers to an individual's responsiveness to social and environmental stimuli (L. Koegel et al., 1999; R. Koegel & Johnson, 1989; R. Koegel & Koegel, 1988). Children with autism characteristically lack motivation to respond to environmental stimuli, particularly to engage in social interaction with other people. Employing motivation-enhancing variables in intervention programs results in collateral decreases in problem behavior, along with more rapid skill acquisition and greater generalization of acquired skills than is the case for those interventions lacking motivational procedures (R. Koegel, Koegel, & Surratt, 1992; R. Koegel, O'Dell, & Koegel, 1987). Intervening on pivotal skills, rather than on each and every deficient skill, produces a more efficient and cost-effective intervention (L. Koegel et al., 1999; Schreibman et al., 1996).

The associations between joint attention and language and social development suggest that remediating the deficit in joint attention in children with autism can result in positive changes in these other areas as well (Mundy & Crowson, 1997). Since both form and function define joint attention, addressing joint attention as a pivotal skill necessitates teaching both.

Interventions for Joint Attention

Recently, the field has begun to look systematically at intervention strategies designed to enhance joint attention. Two early studies (Landry & Loveland, 1989;

Lewy & Dawson, 1992) examined how broad social-context factors might influence joint attention in children with autism. Landry and Loveland investigated how three different social contexts, varying in the amount and type of adult control and direction, influenced joint attention in children with autism (5 to 13 years old). In the first social context ("adult-directed"), the adult controlled the interaction and required specific responses by the child to the adult's joint attention bids. In the second social context ("request"), the adult withheld a motivating object from the child, and the child was required to make a request using language or gesture. In the third social context ("spontaneous"), the interaction was not adult controlled; instead, the child played freely and determined the course of all interactions. Observations of joint attention behaviors (including pointing, showing, and commenting) indicated that compared with developmentally matched typically developing children and children with language delay, the children with autism continued to show fewer joint attention behaviors regardless of social context. Apparently, simple manipulations of the social context had modest effects on the joint attention exhibited by these children.

Lewy and Dawson (1992) compared joint attention in different play contexts: adult-centered and child-centered. During child-centered play, the adult imitated the child's verbalizations, hand/body movements, and toy play. During adult-centered play, the adult performed novel actions on the toys that the child had previously been playing with. The adult also attempted to direct the child's attention to a different object from the one with the child was playing with. In contrast, during child-centered play, the adult directed the child's attention to the identical toy with which the child was playing. The 20 participants with autism were all under 6 years of age and matched for developmental level (receptive language abilities), with one group made up of 20 children, slightly younger in age, who had mental retardation and another group comprising 20 typically

developing children who were, on average, 18 months of age. Although more time was spent engaging in joint attention behaviors (e.g., looking at the object and alternating gaze) in the child-centered play condition than in the adult-centered play condition, the children with autism continued to show significantly fewer joint attention behaviors than both comparison groups.

These studies suggest that joint attention is likely to be only modestly improved by relatively simple manipulations of social and play contexts. It seems that more explicit instruction is required. Some of the most promising intervention programs for children with autism have come from the field of applied behavior analysis; however, the comprehensive curricula from these intervention programs do not explicitly address joint attention. The few explicit intervention programs for teaching joint attention use a variety of intervention strategies and vary in (a) the forms of joint attention taught and (b) their emphasis on function.

General Interventions and Joint Attention

Several general interventions, though not focused on joint attention per se, include procedures that could nonetheless strengthen that skill. These include comprehensive behavioral approaches and general social skills training.

Comprehensive Behavioral Approaches. Applied behavior analysis has provided an extensive technology of effective interventions for the behavior deficits and excesses exhibited by children with autism. Comprehensive behavioral programs have been successful in teaching a variety of skills and decreasing challenging behaviors (Birnbauer & Leach, 1993; Harris, Handleman, Gordon, Kristoff, & Fuentes, 1991; Lovaas, 1987). Eye contact (part of joint attention) is typically one of the first skills taught. The curricula also include instruction of forms related to joint attention (e.g., gaze alternation and pointing)

but not joint attention itself (Klinger & Dawson, 1992; Leaf & McEachin, 1999; Maurice, Green, & Luce, 1996; Schreibman et al., 1996). Relatedly, Carr and Kemp (1989) taught requesting in the form of gaze alternation and pointing (the exact forms of joint attention). Four young children with autism (3 to 5 years old) were taught to point and look in order to request reinforcers, such as food and toys. Clearly, this protocol could be used to teach not only the forms of requesting but also the forms of joint attention. However, research suggests that joint attention will not automatically develop in children with autism from such general requesting skills (Tager-Flusberg, 1994; Wetherby, 1986).

In one comprehensive curriculum guide for children with autism (Maurice et al., 1996), general recommendations were made for enhancing the young child's communication, including aspects of joint attention. The following suggestion was made with respect to *commenting*, another term for verbally initiating joint attention: "Commenting by your child can be begun at the very earliest stages by encouraging him to point to show an object of interest. Shape his hand into a point when something is, for example, funny (say 'Funny!' as you point or 'scary,' or 'big,' 'broken,' and so on)" (Rappaport, 1996, p. 309). Rappaport suggested staging novel or silly situations to elicit commenting (e.g., putting a toy in the refrigerator). This particular teaching strategy for commenting has not been examined in the research literature. Gaze alternation was omitted in that discussion but is an essential component of nonverbal joint attention. Rappaport emphasized verbally initiating joint attention but did not address responding to others' bids for joint attention or others' comments. Rappaport did suggest that parents comment to their children (i.e., make bids for joint attention), but she did not discuss if, or how, the child is expected to respond to these joint attention bids. Although the function of joint attention was alluded to by emphasizing comments on objects of interest and novel events, no further discussion was made of building the child's

interest in the objects or the social interaction.

As part of a comprehensive language training curriculum, Freeman and Dake (1996) discussed teaching verbal joint attention and, additionally, differentiated between initiating a comment and responding to another person's comment. In their protocol, the child was taught both to initiate a comment, such as "Look, it's a ___!" and "I have a ___." and to respond when another person commented on interesting stimuli. The joint attention behavior described did not include gaze alternation, but it did include conventional gestures (e.g., showing). Comments were prompted when the child had looked at something, that is, had shown an interest in some object or event, thereby building on the child's interest as a way to enhance motivation for the display of joint attention. No research has yet examined this particular teaching protocol.

Commenting is also mentioned within the *Picture Exchange Communication System* (PECS; Bondy & Frost, 1998). PECS has been used successfully to teach a variety of communicative behaviors to children with developmental disabilities. Instruction initially focuses on the requesting function of communication and later introduces more social-communicative functions. Commenting is taught by asking the child, "What do you see?" This verbal prompt is later faded so that the child is commenting on objects he/she encounters, without any verbal instruction to comment. The child's comment takes the form of a sentence strip "I see ___." with the object symbol. Commenting, as taught via PECS, is similar to what has already been discussed (Freeman & Dake, 1996; Rappaport, 1996), but the gaze alternation and conventional gesture components of joint attention are not a specific focus of intervention.

Reichle (1991) provided one of the few curricular recommendations for teaching *nonverbal* joint attention behaviors, including gaze behaviors. He suggested teaching the child to respond (in the form of gaze alternation between the object and adult) to another person's

bid for joint attention by enhancing the salience of the adult's attention-directing behavior and chaining the social interaction to some more powerful reinforcer. Reichle described a situation in which a father consistently shifts his gaze to the front door just before the child's mother arrives home from work with a treat for her child. Over time, the child begins to follow his father's gaze shift to the door in anticipation of the reinforcer that his mother brings. The reinforcer in this scenario is, however, nonsocial (i.e., the treat mother brings) rather than the typical social interaction that reinforces joint attention interactions (i.e., attention from mother). Reichle also suggested using novel events, such as a spilled drink, to encourage the child to direct an adult's attention to the event (i.e., initiate joint attention about an event). To date, no research exists that evaluates the effectiveness of such teaching procedures with respect to enhancing joint attention.

Aside from Reichle's (1991) work, joint attention has generally been defined in the curricula described as verbal commenting behavior, a more advanced joint attention skill. The different topographies (gaze alternation and conventional gestures) and the difference between *responding* and *initiating* joint attention are only partially addressed. Few procedures are included that directly address the defining feature of joint attention, namely, its social function. Finally, no research exists examining these teaching procedures or their impact on the core deficit of autism, that is, social motivation.

General Social Skills Interventions.

Researchers have begun to examine joint attention as one positive outcome of broader social skills intervention programs not directly targeted at joint attention per se. Pierce and Schreibman (1995, 1997a, 1997b) conducted several studies using peers to teach a variety of social skills. In their 1995 study, the authors examined joint attention as an outcome of peer-implemented social skills intervention for two children with autism. Peers were taught strategies that

focused on a variety of social behaviors, including gaining the attention of the child with autism, modeling appropriate social behaviors (e.g., verbal statements and complex play actions), reinforcing social attempts, and engaging in turn-taking. Each peer and target child played with interactive toys and games during the intervention. The primary intervention targets involved initiating and maintaining interactions with the peer. Videotaped play sessions between the peer and target child were examined for joint attention using a coding scheme developed by Bakeman and Adamson (1984). Specifically, two of the coded behaviors were *supported joint engagement* (in which the peer trainer manipulates the toy to support the target child's joint attention) and *coordinated joint engagement* (in which the child with autism is actively involved in playing with the object along with his or her peer, looking at both the object and the peer). During supported joint engagement, the child is primarily object-focused, while the partner "complements this engagement" (Bakeman & Adamson, 1984, p. 1279). The child is not required to look at the partner, alternate gaze between the partner and object, or be otherwise actively relating to his or her joint attention partner. Rather, the child must simply be involved with the same object as his or her partner. The partner supports joint attention by manipulating the object to draw the child's attention to it. Coordinated joint engagement, on the other hand, is demonstrated when the child with autism looks at the joint attention partner as well as at the toy (gaze alternation). In the latter case, the partner is no longer completely supporting joint attention; rather, both child and partner are actively engaged in joint attention. In short, during supported joint engagement, the child is not necessarily concerned with the partner's attention to the object. Therefore, supported joint engagement may not be the best demonstration of joint attention. In the study by Pierce and Schreibman (1995), both participants with autism showed few joint attention behaviors before intervention, whereas after intervention, one child showed increases pri-

marily in coordinated joint engagement behaviors, while the second child showed small gains in coordinated joint engagement but larger gains in supported joint engagement.

In another study, Baker (2000) sought to improve social play interactions between children with autism and their siblings. Three 5- to 6-year-old children with autism and three 7- to 8-year-old siblings participated as pairs in the intervention. The intervention goal for each pair of children was to learn to play a highly motivating individualized game together, as a way to facilitate social interaction. Although the intervention was unrelated to joint attention per se, joint attention was one of the dependent measures (coded using Bakeman & Adamson's [1984] coding scheme). The procedure resulted in an 80% increase in joint attention (supported and coordinated joint engagement combined) from pre- to postintervention. However, separate data were not reported for coordinated versus supported joint engagement; therefore, it is unclear whether the more advanced coordinated joint engagement skill increased or the results largely reflected increases in supported joint engagement. In sum, for both studies—Pierce and Schreibman (1995) and Baker (2000)—it is interesting to note that the intervention strategies used, although not directly targeted at joint attention, nonetheless positively affected joint attention.

Research on Joint Attention Interventions

Specific interventions have also been developed for teaching joint attention. These include prelinguistic milieu teaching, developmental approaches, intensive behavioral programs, and the use of peer trainers.

Prelinguistic Milieu Teaching. Prelinguistic milieu teaching (Warren et al., 1993; Yoder & Warren, 1999) is an extension of milieu teaching, an approach to language intervention that employs naturalistic teaching procedures (Warren & Yoder, 1998). Milieu teaching has

been used to successfully teach a variety of linguistic and prelinguistic skills to children with developmental disabilities (Kaiser, Yoder, & Keetz, 1992; Warren & Kaiser, 1988). It is characterized by arranging the environment to elicit desired responses, teaching within social routines and ongoing interactions, following the child's attentional lead, and using specific prompts and models (Kaiser et al., 1992; Warren & Yoder, 1998).

Yoder and Warren (1999; Warren et al., 1993) used the prelinguistic milieu approach to teach commenting (the verbal initiation of joint attention) to young children. Specifically, the environment was arranged to elicit commenting within typical interaction routines (e.g., playing house). Commenting was also elicited by introducing systematic variations in these routines, and by violating the typical order with novel, silly, strange, or sabotaged objects/events, as also suggested by Reichle (1991). The strategy of following the child's attentional lead involved the interventionist's using toys that the child was currently playing with to teach joint attention, capitalizing on the child's rapt attention, preference, and sustained interest in the activity. By using the child's current focus of interest, interventionists tapped into the motivation to share interesting objects with other people. Specific prompts, for example, modeling the commenting behavior, were also used to elicit correct responses. The interventionist was initially positioned close to the child, at eye level. Gradually the distance between the child and interventionist was increased so the child had to work harder to direct the adult's attention. The natural consequences for joint attention, namely, social interaction with the adult and continued attention paid to the object of joint attention, were used to reinforce joint attention.

In one study, Warren et al. (1993) taught prelinguistic skills, including commenting, to two young children: a 20-month-old child with Down syndrome and a 30-month-old child with developmental delays. The definition of commenting in this study included a verbal component (e.g., any simple verbaliza-

tion, such as “ba”) and a nonverbal component (i.e., looking at the adult and the object of comment). For the 20-month-old child, the frequency of commenting increased to a level greater than that observed in typical children, whereas the 30-month-old child showed more modest gains in commenting. Generalization was assessed for the second child only. This child showed moderate levels of generalization across settings, peers, and teachers. Yoder and Warren (1999) extended these findings with a sample of 58 children with developmental delays of varying etiologies (including Down syndrome, failure to thrive, etc.), aged 17 to 32 months. Again, prelinguistic milieu teaching resulted in significant increases in commenting that maintained during a 6-month follow-up.

Results suggest that milieu procedures can be used to teach children with developmental delays to verbally initiate joint attention (comment). This intervention does not, however, address responding to others’ bids for joint attention. More important, the children involved in these investigations were not diagnosed with autism and would not be expected to show the specific deficit in joint attention (both form and function) characteristic of autism. Further, the participants involved in these studies began intervention with low rates of commenting, rather than the complete absence of commenting. Whether or not similar milieu procedures would be effective for teaching joint attention to young children with autism is an important, but unanswered, research question.

Developmental Interventions. Klininger and Dawson (1992) designed a developmentally based intervention specifically for children with autism. The intervention focused on facilitating social awareness, progressing through a developmental sequence that included eye contact, attention to an adult partner, turn-taking, anticipatory behaviors, spontaneous requesting, and, finally, nonverbal joint attention. Similar to prelinguistic milieu teaching, the use of ongoing interactions involving interesting and novel activities, variations in the typical

routine, and following of the child’s lead was an integral part of intervention. However, no specific prompts were used to teach; rather, teachers imitated the child’s behavior in an effort to engage him or her in an interaction and elicit joint attention. The teacher also positioned his or her own face, as well as the object of interest, in the child’s direct line of sight to elicit gaze behaviors. As noted, intervention followed a developmental sequence. Only one child, a 5-year-old diagnosed with autism, had progressed far enough in the sequence to be ready to learn joint attention. Before intervention, the child showed an object to an adult upon request; that is, he was able to demonstrate a conventional gesture (showing) that could be a part of initiating joint attention. By the 12th week of intervention, he also followed an adult’s point (i.e., responded to joint attention bids) and looked toward an adult when a novel toy was introduced (i.e., used his gaze to initiate joint attention). Overall, Klinger and Dawson’s results suggest that certain forms of joint attention can be strengthened in children with autism. Gaze alternation was taught as a means to initiate joint attention; however, no conventional gestures, such as pointing or showing, were directly taught to initiate joint attention. The functional aspect of joint attention was addressed through the choice of novel objects and events, and by following the child’s lead. These served to draw and maintain the child’s attention and interest. The child in this study was, however, verbal, showing only mild expressive language impairments before intervention. Therefore, the generalizability of these results to individuals showing more significant impairments cannot be determined.

More recently, Hwang and Hughes (2000) conducted a study using an intervention protocol similar to the one just described, but with younger (between 32 and 43 months of age) nonverbal children. Hwang and Hughes taught eye contact, motor imitation, and joint attention to three nonverbal children with autism who did not demonstrate any of these skills before intervention. Initiating joint attention, defined

by gaze alternation *or* the use of conventional gesture (i.e., pointing and showing), was taught. Responding to others’ joint attention bids was not addressed. Improvements were noted for all three of the intervention targets (eye contact, motor imitation, and joint attention); however, more modest improvements occurred for joint attention than for eye contact or motor imitation. Joint attention also showed the most limited generalization (to another person in another setting) of the three skills. Hwang and Hughes concluded that more competent joint attention might require additional instruction.

Intensive Behavioral Programs. Using a behavioral intervention protocol, Buffington, Krantz, McClannahan, and Poulson (1998) sought to improve gesture use in young children with autism. Intensive behavioral instruction was characterized by repeated instructional opportunities in which the child was prompted to emit the target response and reinforced for doing so. In contrast to the milieu and developmental approaches just described, the behavioral instruction occurred during adult-directed teaching sessions, rather than during interactions controlled by the child. Four children with autism, 4 to 6 years of age, participated. A total of nine responses, consisting of gesture and verbalization pairs, were taught. Although Buffington et al. did not intend to teach joint attention per se, one of the gestural-verbal responses taught corresponded to initiating joint attention, specifically, the attention-directing response of pointing to an object and saying, “Look!” After intervention, the frequency of all gestural and verbal responses increased. Evidence of generalization to novel stimuli and novel settings was also observed. However, from the data presented, it was unclear to what extent the specific joint attention gestural-verbal response increased and generalized. Recall that when children initiate joint attention, they do so because they see an interesting object or novel event that they want to share with an adult (McCathren et al., 1996; Tomasello,

1995). However, the gestural-verbal behavior taught in this study occurred in response to an adult's verbal instruction ("Let's talk about . . .") rather than the typical discriminative stimulus for initiating joint attention, namely, the presence of an interesting object or event and someone to share it with. Ultimately, it is necessary to teach joint attention in response to the stimuli that naturally elicit this behavior. Otherwise, the child may have learned a skill that does not readily fit into everyday social interactions of the type that typify naturalistic joint attention.

Peer Trainers. Zercher, Hunt, Schuller, and Webster (2001) examined the effects of an integrated playgroup on joint attention, symbolic play, and language skills. Peers were trained to use specific cues (e.g., "Look at me," "Show me," "What do you want?") to elicit joint attention, symbolic play, and language during play sessions with two participants with autism. In this study, joint attention was defined as both the comprehension (respond) and production (initiate) of joint attention acts, including gaze alternation, gestures, or verbal comments. Note that gaze alternation between the object and joint attention partner was not a required part of either responding or initiating joint attention. Increases were found in the overall frequency of joint attention acts; however, those increases were due primarily to increases in responding to others' joint attention bids, with minimal changes in the initiation of joint attention acts. Recall that responding to others' joint attention bids may be the "easier" of the two joint attention skills and less reflective of the social-motivation function of the behavior.

General Intervention Issues. The research to date demonstrates success in teaching various forms of joint attention. However, *both* form and function define joint attention. Simply teaching the forms of joint attention to children with autism is not likely to enhance motivation to interact socially with another person. Therefore, intervention programs must also include strategies to build the

function of joint attention. Dawson, Meltzoff, Osterling, Rinaldi, and Brown (1998) pointed out that "unless children with autism are taught that social stimuli are interesting, rewarding, and meaningful, they may not be as likely to acquire more complex communicative or social skills" (p. 484). Without building the function of joint attention (i.e., social motivation), the core deficit has not fully been addressed.

Building Social Motivation in Joint Attention

The literature on generalized reinforcement, as well as that on the development of pivotal skills, suggests specific strategies that can be used to increase a child's motivation to engage in joint attention.

Establishing the Presence of Adults as a Generalized Reinforcer

In typically developing children, joint attention interactions first occur between a child and his or her caregiver (Bakeman & Adamson, 1984, 1986). Presumably, typically developing children find the social interaction with their caregiver that results from joint attention to be enjoyable and reinforcing and that this, at least in part, is what motivates the child to continue to engage in joint attention (Bates et al., 1975; Bruner, 1983). If a child is not interested in interacting with a particular person, it is unlikely that he or she would engage in joint attention with that person. Thus, part of building social motivation for joint attention necessitates establishing the value, for the child, of interacting with the joint attention partner. One plausible way to increase the probability of interaction is to establish the adult partners of joint attention as generalized reinforcers (Carr et al., 1994; Magito McLaughlin, 1999). Establishing an adult as a generalized reinforcer involves repeatedly pairing the presence of the adult with a wide variety of highly preferred reinforcers (Skinner, 1953). Because the presence of the adult has now become a discriminative stimu-

lus that signals the likely presence of preferred reinforcers, the child seeks proximity to and contact with the adult (Carr et al., 1994). Procedurally, this involves having the adult partner dispense a variety of the child's most preferred reinforcers, such as foods and activities, intermittently over time, and on a regular basis. Such a strategy, though possessing face validity, has yet to be tested empirically.

Pivotal Skill Procedures

Once the presence of the adult evokes proximity-seeking on the part of the child (following the use of the generalized reinforcement strategy), procedures from the pivotal skills literature could be used to further increase the child's motivation to engage in joint attention. Providing choice/preference, using natural consequences, and interspersing maintenance activities are three important strategies derived from the pivotal skills literature that, used together, could enhance the child's motivation to engage in joint attention.

Child Choice/Preference. This strategy involves using child-chosen and/or child-preferred materials for instruction of joint attention. For typical children, the literature on joint attention highlights the important role that preferred objects have in motivating them to engage in episodes of joint attention (Bruner & Sherwood, 1983; McCathren et al., 1996). Relatedly, for children with disabilities, the literature on milieu teaching emphasizes following the child's lead, that is, allowing the child's preferences (choices) to dictate the flow of instructional opportunities, thereby maintaining the child's motivation to continue interacting with the adult (Warren & Yoder, 1998; Warren et al., 1993; Yoder, Kaiser, Alpert, & Fischer, 1993). Finally, the applied behavior analysis literature further corroborates the importance of permitting choice. Specifically, several studies demonstrate that providing the child with choices or using preferred materials during instruction facilitates his or her acquisition of target skills

as well as increases the child's interest in and engagement with tasks (Clarke et al., 1995; Dunlap, 1984; Dunlap et al., 1994; Dunlap, Foster-Johnson, Clarke, Kern, & Childs, 1995; R. Koegel, Dyer, & Bell, 1987). Taken together, the research suggests that the careful structuring of adult-child interaction to include child choice/preference is likely to be a useful strategy for motivating children with autism to engage in joint attention.

Several studies further describe the nature of the stimulus materials that children are most likely to choose and focus their attention on during joint attention. Specifically, stimulus novelty influences child preference. The presence of novel objects and events motivates typically developing children to engage in joint attention (McCathren et al., 1996; Tomasello, 1995). Investigators have reported that for people with disabilities, presenting a *variety* of preferred items, a strategy that increases novelty, helps sustain attentional focus (Dunlap et al., 1995; Parsons, Reid, Reynolds, & Bumgarner, 1990). An additional factor involves object salience: Objects that provide sensory stimulation by moving, lighting up, or making noise seem more likely to elicit and support joint attention (Bruner, 1981; Butterworth, 1995; Butterworth & Jarrett, 1991).

In sum, structuring adult-child interactions to include materials and events that are preferred or interesting, novel, and salient may be an important way to motivate a child to engage in sustained episodes of joint attention with an adult.

Natural Consequences. This term refers to those consequences that are functionally related to the target behavior. For example, within the context of an adult's attempting to teach a child to label a picture book (e.g., "Say, 'This is a book'"), the adult would give the book to the child after the child engaged in correct labeling (e.g., "Yes, it is a book. You can look at it if you like"). The consequence (i.e., being able to look at the pictures in the book) is a natural one that is functionally related to the presence of the book within the instructional exchange. In contrast, arbitrary conse-

quences are not functionally related to the target behavior. For example, the adult might give the child a potato chip as reinforcement for correct labeling. Although edible consequences are commonly used in teaching children with autism, they are not, in the example given, functionally related to the object of instruction, in this case, the picture book. Numerous studies from the pivotal skills literature demonstrate that the use of natural consequences results in more rapid skill acquisition as well as increased motivation on the part of the child to sustain adult-child interaction (L. Koegel et al., 1999; R. Koegel, O'Dell, & Koegel, 1987; R. Koegel & Williams, 1980; Williams, Koegel, & Egel, 1981).

The pivotal skills literature implies that the use of natural consequences may help motivate children to engage in joint attention. The natural consequence for joint attention is a social interaction about the object of joint attention (e.g., the adult comments on the object/event of joint attention). Unfortunately, such social interaction (e.g., conversation about the object or event) is typically not reinforcing to children with autism. Nonetheless, specific *idiosyncratic* forms of social attention may be highly reinforcing for these children (Green et al., 1988; Sulzer-Azaroff & Mayer, 1991). For example, the adult may provide idiosyncratic attention in the form of a very loud "Wow!," an exaggerated smile or funny face, or high-amplitude tickles. These consequences are functionally related to the attention-seeking aspect of joint attention. In sum, by incorporating the use of natural consequences that involve idiosyncratic social reinforcers, an adult may be able to enhance child motivation for engaging in joint attention.

Activity Interspersion. This strategy is relevant to motivating interest in more difficult activities by interspersing easier activities between the difficult ones (L. Koegel et al., 1999). The pivotal skills literature demonstrates that interspersal can be successfully used to increase the rate of acquisition of difficult tasks as well as to motivate sustained child interest in the task (Dunlap, 1984; L. Koegel &

Koegel, 1986; L. Koegel et al., 1999). Usually, the use of this strategy refers to alternating novel or more difficult instructional tasks with easier, previously acquired tasks. In the present case, the difficult task would be joint attention. The easy task would be, for example, playing with the object of joint attention. In fact, children often engage in brief episodes of joint attention, alternating with longer periods of interacting with the reinforcing object or event (Bakeman & Adamson, 1984). For example, while playing with a toy radio, a child activates the music. He then engages in joint attention with his mother about the music from the toy. The joint attention results in natural social consequences (e.g., the mother comments on the music). After that, the child continues to listen to the music for a period of time. In the example given, an easy and more reinforcing activity (listening to music) is interspersed with a more difficult, less reinforcing activity (engaging in joint attention). This natural sequence of interspersing activities helps sustain joint attention. In sum, by sequencing adult-child interactions so that many opportunities for engagement with preferred, varied, and salient objects and events are interspersed with and dependent upon occasional opportunities for exhibiting joint attention, followed by idiosyncratic social reinforcers, the adult may be able to better motivate the child to engage in joint attention.

An Example of Building Social Motivation for Joint Attention

The strategies just described can be used to build social motivation for joint attention. To illustrate, consider a child named Johnny. First, strong approach and proximity-seeking on the part of Johnny toward his adult partner would be facilitated through the process of establishing the adult as a generalized reinforcer. Second, a number of preferred objects would be identified for Johnny (child choice/preference and variety). These preferred toys would be made more salient by adding lights, noises, and movement (salience). Some of Johnny's

favorite toys include his Teletubby stuffed toys. Using the preferred Teletubby toys, the adult would teach Johnny to respond to others' joint attention bids as well as to initiate joint attention.

To teach responding to others' bids for joint attention, the adult partner would make a bid for joint attention by pointing to and turning his or her head to look at one of the preferred toys while making an exclamatory verbalization, such as, "That's a cool Teletubby!" The child's nonverbal joint attention response, prompted when necessary, would involve gaze alternation between the Teletubby and the adult. Any preferred form of social interaction (e.g., an excited "Wow") would serve as the natural social consequence of joint attention (natural idiosyncratic consequence). Following a successful joint attention response, the child would be allowed to continue to play with the object of joint attention (activity interspersal).

To teach initiating, the adult partner would provide the discriminative stimulus, namely, the presence of a preferred object or event. The child would initiate joint attention, prompted when necessary, by alternating gaze between the novel object and the adult, along with pointing at the toy. Specifically, the child would look at the toy, look up at the adult, and then point to and look back at the toy, as if to say, "Hey, look at that!" Again, the natural social consequence (natural idiosyncratic consequence) would be followed by the opportunity for sustained play with the preferred object (activity interspersal).

Conclusion

Deficits in joint attention represent a cardinal feature of autism. Although there has been much theoretical discussion of this issue, the development of practical intervention strategies that address the problem lags behind the development of theory. In the present article, we drew on a variety of conceptual and empirical sources to highlight strategies, either existing or plausible, that might be used to enhance joint attention skills with respect

to both form and function. Given the centrality of joint attention to the development of social-communicative competence, the strategies outlined could prove to be an important means for improving the effectiveness of early intervention for children with autism.

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AUTHORS' NOTES

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