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TEACHING CHILDREN WITH AUTISM TO RESPOND TO AND INITIATE BIDS FOR JOINT ATTENTION

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A multiple baseline design across 3 children with autism was used to assess the effects of prompting and social reinforcement to teach participants to respond to an adult's bid for joint attention and to initiate bids for joint attention. Participants were taught to respond to an adult's bid for joint attention by looking in the direction of an object at which the adult pointed, by making a comment about the object, and by looking back at the adult. Additional training and reinforcement were needed to teach the participants to initiate bids for joint attention. Findings are discussed in terms of the social relevance of teaching children with autism to respond to and initiate bids for joint attention.

DESCRIPTORS: autism, joint attention, social skills, teaching language

Joint attention is recognized as one of the earliest forms of communication in young children and involves the coordinated attention between a social partner and an object or event in the environment (Bruner, 1975; Mundy, Sigman, & Kasari, 1994). Researchers have distinguished two forms of joint attention: (a) responses to another person's bid for joint attention and (b) initiations for joint attention (Jones & Carr, 2004; Mundy & Willoughby, 1996). Bakeman and Adamson (1984) note that children typically develop nonverbal joint attention between 9 and 18 months of age. The earliest topography of joint attention involves coordinated gaze shift between an object or event in the environment and a familiar person (Tomasello, 1995). Late in the first year of life, typically developing infants begin to respond to adults' bids for joint attention and to initiate joint attention in response to an interesting object or event (Butterworth, 1995).

Several studies have shown that children with autism display deficits in joint attention skills (Charman, 1998; Jones & Carr, 2004; MacDonald et al., 2006; Mundy, 1995; Mundy & Crowson, 1997). For example, MacDonald et al. observed that children with autism were more likely to respond to bids for joint attention than to initiate bids for joint attention compared to their typically developing peers. Indeed, the absence of joint attention before 1 year of age is one of the earliest symptoms and indicators of autism (Baron-Cohen, Allen, & Gillberg, 1992).

In the developmental literature it is hypothesized that a child initiates bids for joint attention to attract the adult's attention to meet a social goal of sharing information or an experience rather than to obtain access to a desired item (Schertz & Odom, 2004). The emergence of joint attention is described as a pivotal point in a child's social and communicative development, because it signals the development of processes that provide a foundation for language development and social competence (Bakeman & Adamson, 1984; Bruner, 1975; Vaughan et al., 2003).

From a behavior-analytic perspective, responses to bids for joint attention (e.g., looking at an item that an adult is referencing) fall under discriminative control of the adult's

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mand for the child's attention and are likely maintained by generalized reinforcers (e.g., social attention; Dube, MacDonald, Mansfield, Holcomb, & Ahearn, 2004). The child's initiations of bids for joint attention are more properly viewed as mands for the adult's attention directed toward the item or event. The appearance of a noteworthy item or event in the presence of an adult may serve as a motivating operation (MO), momentarily establishing the reinforcing value of the adult's attention.

One form of adult attention is adult attending stimuli, defined as "visual indicators that the adult is aware of and attending to the item or event of interest" (Dube et al., 2004, p. 199), such as the adult's eyes being open and oriented toward the stimulus. The child's gaze shift between the item or event and the adult may be maintained by these adult attending stimuli. These stimuli (i.e., the adult's attention to the item or event) may serve as both (a) conditioned reinforcers due to their previous association both with the adult's reaction to items or events and with overall increased reinforcement and (b) discriminative stimuli for other adult-mediated contingencies (e.g., the adult's continued attention to the item or event or participation in the event).

There may be three possible reinforcers related to adult-mediated consequences and thus three separate operant classes of initiations for joint attention (Dube et al., 2004). One is positive reinforcement in the form of participation in the event or engagement with the item (e.g., a child's mother might smile and interact with the child in the presence of a new toy). A second possibility is positive reinforcement in the form of helping to maximize reinforcement (e.g., helping the child to manipulate a new toy). The third possibility is negative reinforcement in the form of alleviating fear or distress about the item or event (e.g., assuring the child that a large dog will not cause harm).

Several emerging studies offer tentative support for the hypothesis that joint attention is established and maintained by environmental events and social contingencies, and that behavior analysts can manipulate those events and contingencies to promote joint attention in children with autism. A noteworthy study by Whalen and Schreibman (2003) used vocal, gestural, and physical prompts to teach 5 children with autism to follow an adult's point and gaze to an object in the room. The authors also taught the children to look up from a toy they were playing with to the adult and to point to a novel toy. The experimenter provided reinforcement in the form of access to the toy when the child responded correctly. Kasari, Freeman, and Paparella (2006) used various prompting and reinforcement procedures to teach 20 young children with autism to engage in joint attention responses (i.e., following an adult's point to look at an item) and initiations (i.e., coordinated eye contact between the adult and items, showing or giving the item to an adult, or pointing to an item). Results showed that children with autism who received training with these procedures showed overall increases in joint attention responses and initiations compared to a control group that did not receive training.

Even though these studies show that joint attention responses can be facilitated using prompting and reinforcement (Dube et al., 2004), research has not yet documented that social contingencies alone (e.g., adult attending stimuli and social interaction) can function as reinforcement for joint attention responses in children with autism. In addition, the effects of teaching responses to bids for joint attention on the subsequent emergence of initiations for joint attention have not been examined. Finally, the topographies of joint attention responses documented in the literature have been limited to eye contact and gestures, but gaze shifting, vocal comments, and vocal initiations have not been targeted.

The purpose of the current study was to examine the effects of prompting procedures

and social (rather than tangible) reinforcement contingencies to teach children with autism to engage in three components of joint attention: to shift their gaze between an object and an adult's eyes, to vocally respond to bids for joint attention, and to initiate vocal bids for joint attention.

METHOD

Participants and Setting

Three young children with autism participated. Erica, 8 years old, had been receiving intensive behavioral intervention since the age of 3 years. She spoke in five- to six-word sentences, primarily to mand for tangible items or actions. She was able to engage in scripted conversations of up to six exchanges with adults, but she rarely initiated novel comments. Cooper, 5 years old, had been receiving intensive behavioral intervention since the age of 2 years. He used vocal verbal behavior to mand for tangible items and actions and could tact attributes, verbs, and prepositions. James, 3 years old, had been receiving intensive behavioral intervention since the age of 2 years. He spoke in three- to five-word sentences and could mand for tangible items and actions and tact attributes and verbs. All of the participants displayed characteristic language and socialization deficits associated with autism (e.g., difficulties in comprehending multistep directions, limited use of vocal verbal behavior for a variety of purposes, and avoidance of social interaction with peers). The participants had not been observed to initiate bids for joint attention and inconsistently responded to an adult's bid for joint attention.

All 3 participants attended a behaviorally based school program for children with autism. Sessions were conducted in a room in the school equipped with a table and chairs. Novel setting probes were conducted in various locations in and around the school (e.g., office, kitchen, gym, playground).

Materials

The materials used in this study were (a) toys that were novel or potentially visually enticing (e.g., the participants had no prior exposure to or experience with the item, or the item's attributes were enhanced or unusual in some way, such as an oversized balloon) or (b) toys that the participants had seen before but were now arranged in some unusual way so as to be potentially enticing. More specifically, the items were changed in some way from their usual appearance (e.g., a toy horse wearing a clown wig) or placed in an unusual position or location (e.g., an umbrella hanging from the ceiling, bicycle turned upside down, basketball on a kitchen counter). The stimulus materials included items such as scary masks, a large stuffed snake, and a Chia pet. The items as well as their locations were changed regularly to promote novelty and to prevent loss of interest in the items.

Data Collection and Measurement

There were four dependent variables: (a) the percentage of trials in which the participant looked at the target item in response to the instructor's point (defined as the child having his or her head facing the item and having both eyes directed toward the item within 5 s), (b) the percentage of trials in which the participant commented appropriately about the target item (defined as a contextually relevant verbalization about, the object, such as "it's big" or "it's upside down"), (c) the percentage of trials in which the participant looked back at the instructor within 5 s after looking at the item and making the comment (defined as the child having both eyes directed toward the instructor's face), and (d) the number of bids for joint attention initiated by the child (defined as a declarative statement prompting the adult to orient toward an item in the environment that the instructor determined to be novel or unusual). The child had to (a) point toward the item, (b) make a directive statement (e.g., "look" or "wow"), and (c) make a comment

about the item (e.g., "it's a mess") to be scored a bid. All four dependent variables were measured only during probe sessions (not during teaching sessions). The observer did not score (a) repetitions of bids, (b) bids initiated toward items that the instructor determined were not novel or arranged in some atypical manner (e.g., book on a bookshelf), and (c) bids referencing items that the instructor had referenced already. The number of opportunities to respond to a bid by the adult differed across sessions, depending on how many bids the child initiated.

Independent Variables

The observer scored the following variables to assess integrity of the implementation of the intervention: (a) presentation of the verbal directive assigned to each target item (e.g., saying "wow" in reference to an oversized balloon) to the participant, (b) presence of the target items (e.g., stuffed alligator), (c) instructor's response to the child's comment, and (d) correct use of prompting strategies (i.e., following the least-to-most prompting hierarchy as described below). Data were expressed as the percentage of trials on which the instructor implemented all components of the intervention accurately. Procedural integrity data were collected for at least 35% of sessions with each participant and was 100% for all scored sessions.

Experimental Design and Interobserver Agreement

We used a multiple baseline across participants design to evaluate the effects of the intervention on responses to and initiations of bids for joint attention. An independent observer collected interobserver agreement data on all dependent variables during 40% of sessions. An agreement was defined as both observers recording the occurrence or nonoccurrence of each response listed above. A disagreement was defined as one observer scoring a response as having occurred and the other observer scoring the response as having not occurred. Interobserver agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and converting this ratio to a percentage. The total mean agreement for all participants was 98% (range, 90% to 100%). Mean agreement was 99% for Erica and Cooper and 97% for James.

Procedure

Baseline and probe sessions. One of the authors served as the instructor in all sessions and conducted no more than one baseline or probe session per day. During each baseline and probe session, the instructor baited the environment with putative visually enticing or unusually placed items as described above. A leisure activity (e.g., book, puzzle) was available on the table. The instructor brought the participant into the room, and the instructor waited 1 min for the participant to initiate a bid for joint attention. If the participant initiated a bid for joint attention, the instructor responded with an appropriate social comment (e.g., "somebody made a big mess!"). If the participant initiated a bid toward an item that was not novel or arranged in some atypical manner (e.g., book on a shelf), the instructor did not respond. After 1 min in which the participant did not initiate a bid or made fewer than the potential total number of bids, the instructor asked the participant to sit down at the table and join her in playing with the activity. After they were seated and had engaged with the activity, the instructor pointed to one of the target items and initiated a bid for joint attention approximately once every 30 s. The instructor initiated bids about only those items that the participant had not referenced. For example, if the participant had initiated bids about four items, the instructor only initiated bids about the remaining two items. There were a total of six possible bids, consisting of the following statements: (a) "wow!" (e.g., in reference to an oversized balloon), (b) "look!" (e.g., in reference to a doll hanging from the ceiling), (c) "that's silly"

(e.g., in reference to a stuffed animal wearing a wig), (d) "uh oh!" (e.g., in reference to a spilled liquid), (e) "aaaah!" (e.g., in reference to a scary mask), and (f) "oh, no!" (e.g., in reference to a bike turned upside down). These statements were associated with a variety of objects (e.g., "uh oh!" could refer to a spilled liquid or a ripped piece of paper). If the participant made a comment in response to the instructor's bid, the instructor responded with an appropriate social response (e.g., smiled and enthusiastically said, "Yes, that is a big balloon!"). If the participant initiated a bid about an item about which the adult had already made a bid, the instructor responded with an appropriate social response (but this was not scored as a bid). The instructor did not provide additional prompts or reinforcement during these sessions.

Training on responding to bids. During the training sessions, the instructor and the participant were seated at the table. The instructor initiated a bid for joint attention (e.g., pointed at an item and said, "wow!") and then used least-to-most prompting to prompt the participant to look in the direction of the point, to make a comment about the item, and to look back at the instructor. If the participant did not respond to the bid within 5 s, the instructor first provided a gestural prompt (i.e., pointed in an exaggerated manner from the participant's visual orientation to the item). If the participant still did not look in the direction of the item within 2 s, the instructor physically guided the participant to turn his or her head toward the item (e.g., the instructor lightly touched the participant's cheek to turn his or her head in the direction of the item). When the participant looked in the direction of the item, the instructor provided an echoic prompt of a comment (e.g., a vocal model of the comment for the participant to imitate). All participants imitated the vocal model on 100% of trials. After making the comment, if the participant did not independently look back at the instructor within 2 s, the instructor prompted the participant to look at the instructor by moving her finger in an exaggerated fashion from the item up to her eyes. If the participant still did not look at the instructor, the instructor provided the verbal prompt, "Look at the [item], then look back at me." When the participant looked back at the instructor, the instructor responded to the participant's comment with an appropriate social interaction in an enthusiastic manner (e.g., smiled and said, "Yeah, the doll is hanging upside down, that's so silly!") and physical social interaction (e.g., tickles).

An example of a typical training trial was as follows: The instructor pointed to the item (e.g., a doll hanging from the ceiling) and made a bid for joint attention (e.g., said, "look!"). She then used exaggerated gestures (e.g., pointed from the participant's eyes toward the item) to prompt the participant to orient toward the item. After the participant looked at the item, the instructor modeled a comment for the participant to imitate (e.g., "the doll is hanging upside down") and then provided a gestural prompt for the participant to look back at her. The instructor then provided social reinforcement (e.g., she said, "that's so silly!" and tickled the participant).

Training on initiating bids. Specific training procedures were used to teach the participants to initiate bids for joint attention toward target items because Erica never initiated a bid and Cooper and James never initiated more than two bids during the probe sessions (even after we conducted training on responses to bids). During this condition, the instructor conducted a probe session immediately prior to each training session. A prompt delay procedure was used with all 3 participants. During these training sessions, the instructor walked the participant within approximately 50 cm of a target item and waited 5 s to determine whether the participant would initiate a bid. If the participant did not make a bid within the 5-s interval, the instructor prompted the participant

using most-to-least physical and gestural prompts to point to the item and provided an echoic prompt to make a comment about the item. For example, the instructor escorted the participant to an item and stood in front of it. If the participant did not initiate a bid within 5 s, the instructor guided the participant's hand to point to the item, provided an echoic prompt of a bid (e.g., "say, 'look!'"), and prompted the participant to look back at her. The instructor provided social comments and physical social interaction following each prompted response. We increased the time between approaching the item and providing the prompt in 2-s increments over successive trials. Thus, following two prompted or independent responses, the instructor approached the item with the participant and waited 7 s for the participant to initiate a bid (i.e., the 5-s delay plus the 2-s delay increment). The final delay was no more than 13 s for any participant. If any of the participants initiated a bid toward an item that would not ordinarily occasion a bid (e.g., a book on a shelf as opposed to a doll hanging from the ceiling), the instructor said, "We see books all the time, it's not necessary to talk about books," and, if needed, directed the participant to an item that should occasion a bid.

Checklist for initiating bids. Erica did not respond to the prompt delay after 3 days of training. Therefore, we introduced an index card that contained textual prompts and boxes to check off. We chose this procedure because Erica had a history of using similar stimuli to learn various responses. Prior to each session, the instructor said, "Erica, talk about what you see, check off the boxes, and then you can have [a preferred item]." The instructor then gave Erica a pen and the index card that read "Talk about what you see" and contained six boxes to check off. During the training sessions, the instructor walked into the room with Erica. If Erica noticed an item and initiated a bid (e.g., pointed to a doll hanging from the ceiling and said, "Hey, look at that!"), the instructor responded with an appropriate social comment (e.g., smiled and enthusiastically said, "Wow, that doll looks funny up there!") and prompted her to make a check in the box on the index card. Erica was given access to the preferred item after all boxes had been checked. Over subsequent sessions, the instructor faded prompts using a most-to-least prompting hierarchy until Erica used the check-off system independently. For example, the instructor initially used hand-over-hand physical prompts for Erica to check off boxes on the index card. The instructor then used gestural prompts until finally all prompts were faded. Sessions eventually were conducted without the index card and without the instruction, "Talk about what you see."

Novel setting and stimuli probes. We conducted pre- and posttest probe sessions in and around the school building to assess generalization to novel or unusually placed items in nontraining environments. We conducted one pretest probe (i.e., prior to the implementation of training for all responses) and one posttest probe (i.e., following implementation of training for all responses) with each participant. During these probes, the instructor placed items in locations throughout the school (e.g., hallway, gym, office) and outside (e.g., playground). For example, the instructor hung an umbrella upside down on the basketball hoop in the gym. Baseline procedures were in place during these probe sessions except that we instituted a 30-s delayed prompt (the instructor paused in front of the target items and waited 30 s to determine if the participant would initiate a bid in the presence of novel or unusually placed stimuli). The instructor used an interval of 30 s to increase the likelihood that the participant would orient to and notice the item in a more distracting environment (e.g., a gym with many distracting toys). The instructor pointed to the item and initiated a bid (e.g., said "look!") if the participant did not

initiate a bid within 30 s. The instructor responded with an appropriate social response (e.g., smiled and said, "Yes, that is a big balloon!") if the participant made a comment. The instructor did not provide additional prompts or reinforcement.

RESULTS

Figure 1 shows the percentage of opportunities in which the participant looked at the item referenced by the instructor. During baseline, the mean percentage of responding for Erica, Cooper, and James was 62%, 88%, and 72%, respectively. All participants' responding increased to 100% within one to five probe sessions after we began training on responding to bids.

Figure 2 shows the percentage of opportunities in which the participant made a comment about the target item. During baseline, mean percentage of comment making was 38% for Erica, 35% for Cooper, and 3% for James. When training on responding to bids began, Erica's responding during probe sessions increased to 100% and was maintained at 100% after the fourth probe session for the duration of the study. Cooper's mean percentage of commenting increased to 100% within three probe sessions and remained at 100% for seven of the final eight probe sessions. James made a comment on 100% of opportunities during four probe sessions, and responding was maintained at 100% after the seventh probe session for the duration of the study.

Figure 3 shows the percentage of opportunities in which the participant looked back at the instructor. During baseline, mean percentage of looking back was 4% for Erica, 15% for Cooper, and 11% for James. When we began training on responding to bids, Erica's responding was somewhat variable; however, she reached 100% during the eighth probe session and obtained 100% consistently for six of the last eight probe sessions. Cooper's responding increased to 100% within two sessions, followed by some variability, but remained above 83% for five of the last six probe sessions. James' mean percentage of looking back increased to 67% (range, 17% to 100%).

The total percentage of probe sessions during which the participants completed all three responses (i.e., looked at the item, made a comment, and looked back at the instructor) for each trial was 39% for Erica, 50% for Cooper, and 15% for James.

Figure 4 shows the total number of bids for joint attention initiated by each participant during probe sessions. Erica never initiated a bid for joint attention when training for responding to bids was implemented. When training on initiating bids was begun, Erica did initiate a few bids during the probe sessions. A consistent increase in the frequency of bids did not occur until we implemented the checklist. The number of bids decreased to one bid by the third session when we removed the checklist. The number of bids immediately increased to six when we reintroduced the checklist. Cooper initiated one bid for joint attention in baseline and only two bids when we implemented training on responding. Following training on initiating bids, the mean number of bids per session increased to three, and he routinely initiated at least five bids during the last four sessions. During baseline, James initiated one bid for joint attention during 4 of the 11 sessions. The number of bids per session ranged from zero to two ($M = 0.5$) when we began training on responding to bids. The total number of bids per session ranged from one to four ($M = 2.7$) when we began training on initiating bids.

Pre- and posttests for novel setting and stimuli probes were conducted with all of the participants. All of the participants looked at the items pre- and posttreatment, although there was a slight decrease in this response for James (i.e., from 100% to 80%). All of the participants showed an increase in the percentage of opportunities in which they made a

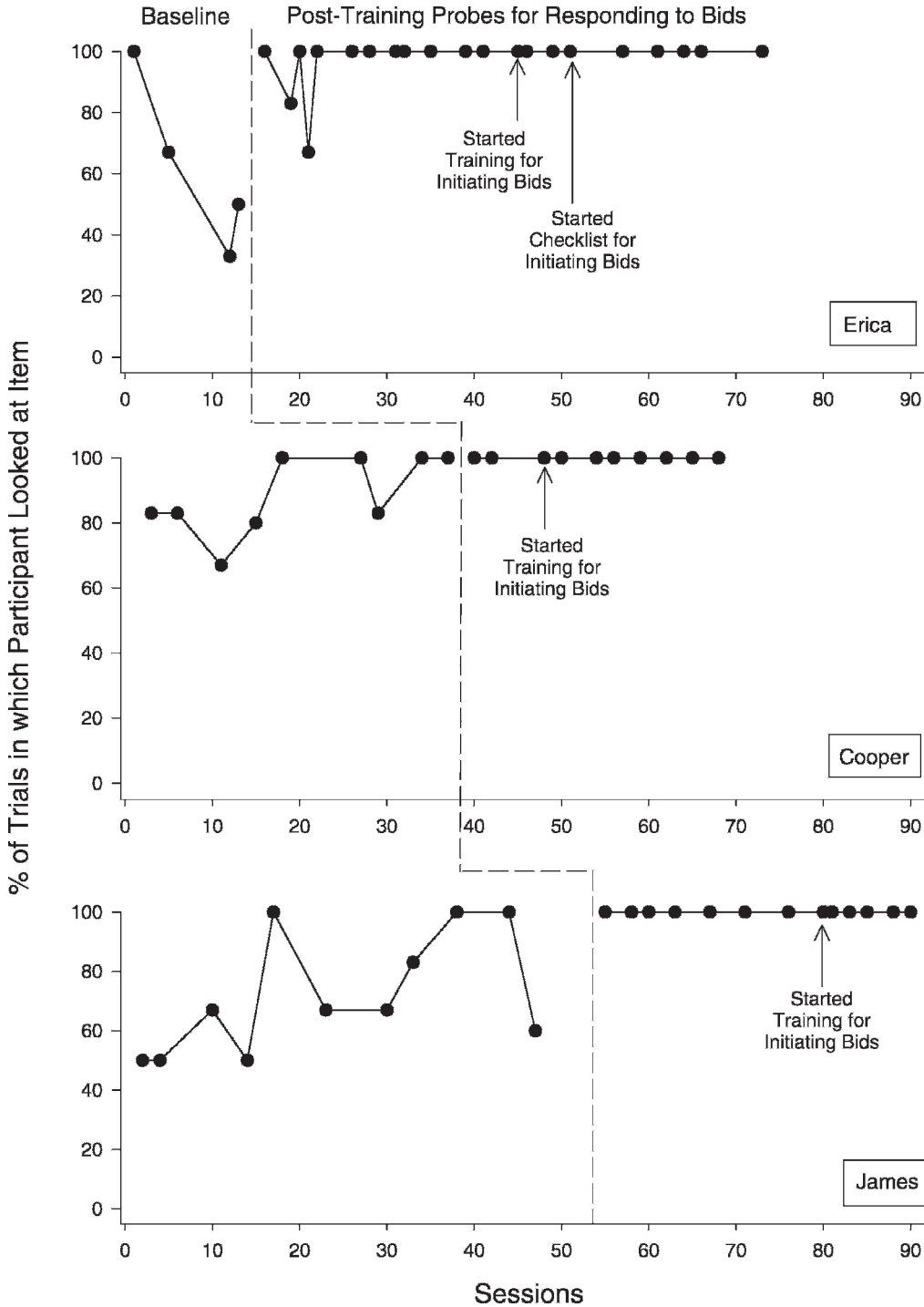

Figure 1. Percentage of trials in which Erica (top), Cooper (middle), and James (bottom) looked at the target item across sessions.

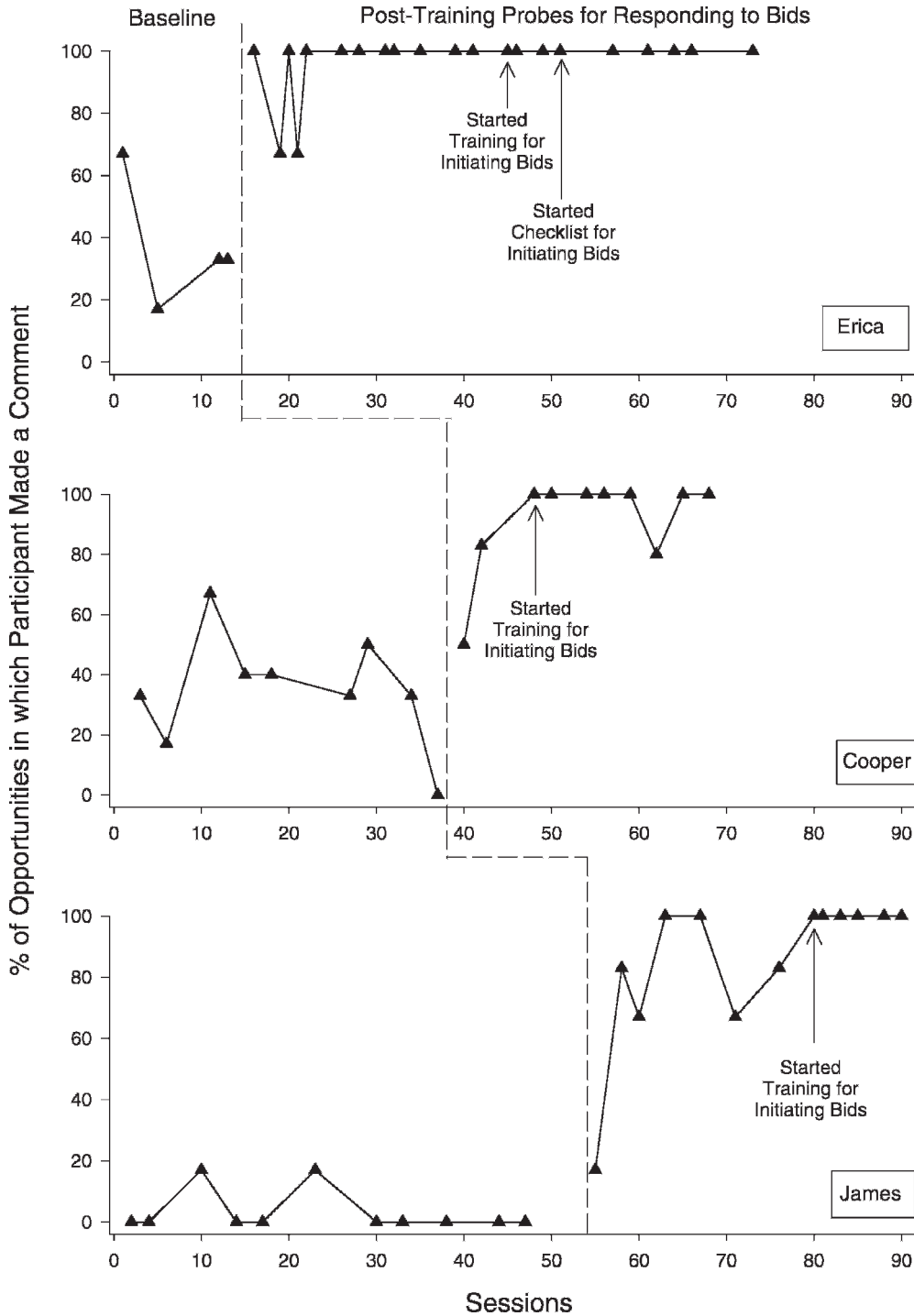

Figure 2. Percentage of opportunities in which Erica (top), Cooper (middle), and James (bottom) made a comment about the target item across sessions.

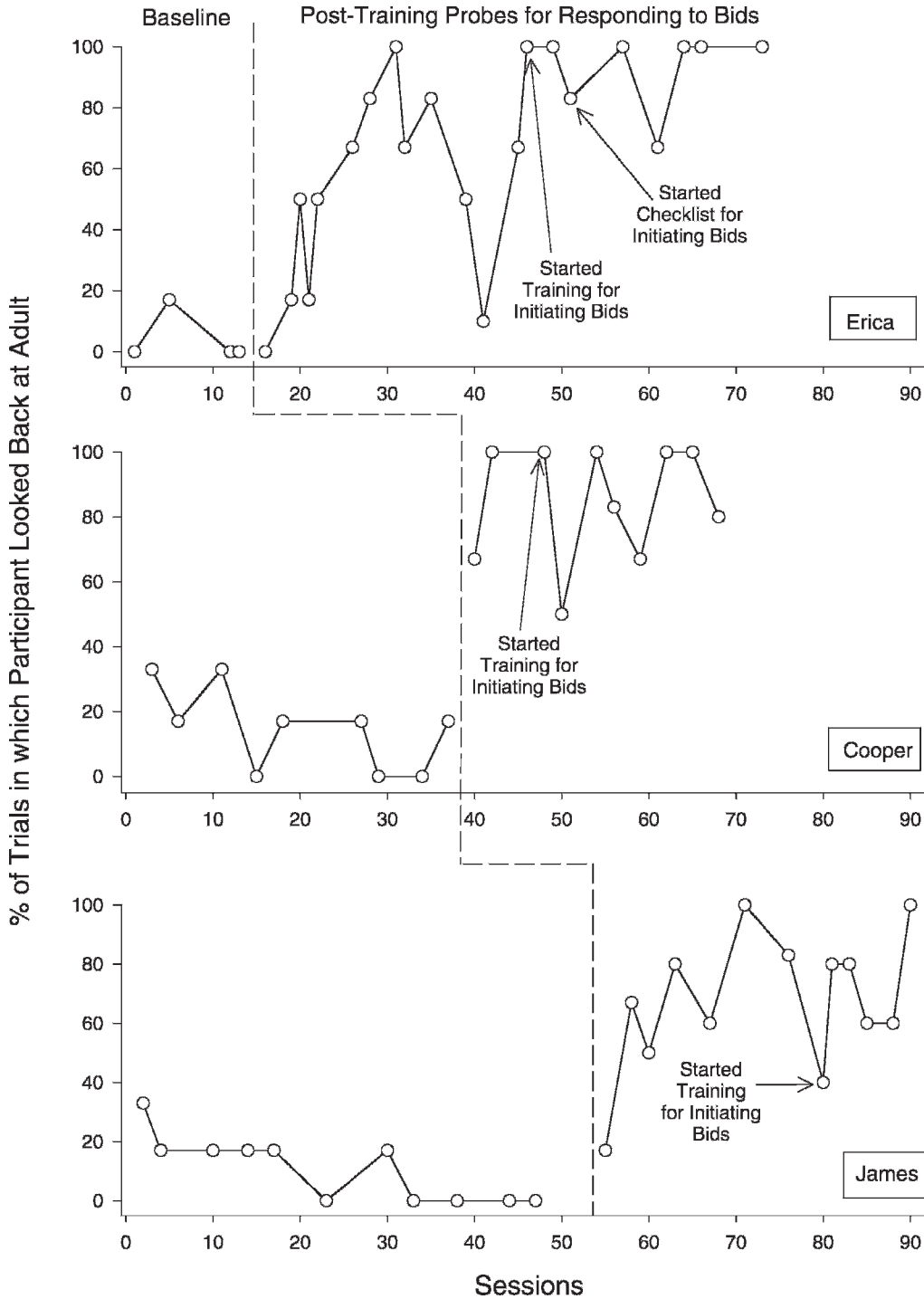

Figure 3. Percentage of opportunities in which Erica (top), Cooper (middle), and James (bottom) looked back at the adult across sessions.

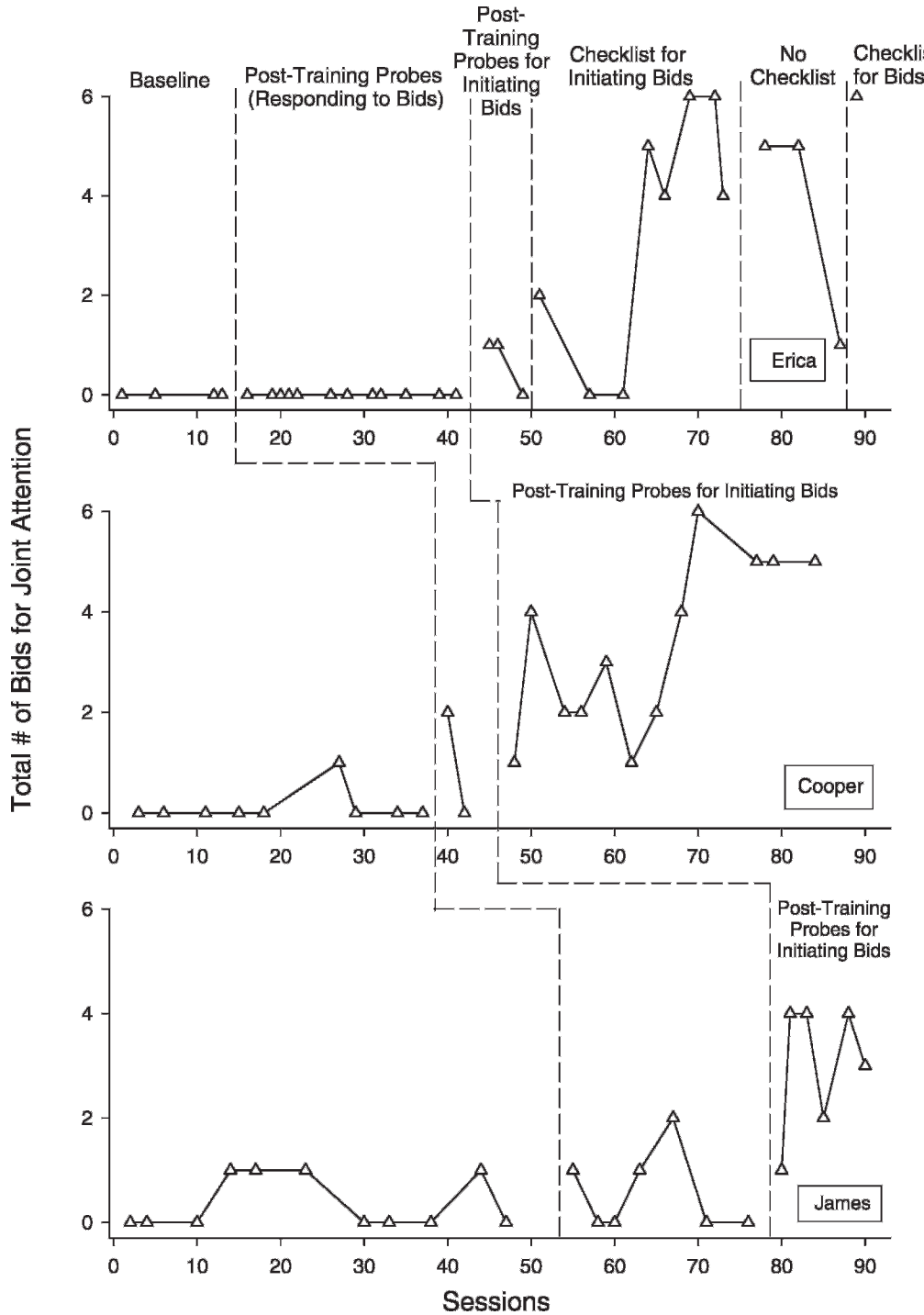

Figure 4. Total number of bids for joint attention initiated by Erica (top), Cooper (middle), and James (bottom) across sessions.

comment (i.e., Erica and Cooper increased to 100%, and James increased from 0% to 60%). Only Erica showed an increase in looking back at the instructor from pre- to posttest (i.e., from 17% to 75%). Erica and James demonstrated an increase in the percentage of opportunities in which they made a bid for joint attention to 67% and 20%, respectively.

DISCUSSION

The present study supports previous research (e.g., MacDonald et al., 2006) indicating that some children with autism engage in some of the components of joint attention (e.g., looking in the direction of a point) without specific instruction. By contrast, more complex or socially governed responses (e.g., initiating bids and coordinating gaze shift between an object and a person) may require direct intervention. During baseline in the present study, the participants demonstrated moderate levels of looking in the direction of the point, made few comments about the items, and rarely looked back at the instructor. Performance improved during probe sessions for all participants once we introduced training for responding to bids.

Erica never initiated a bid and Cooper and James never made more than two bids during baseline or training for responding to bids, despite the presence of six potentially enticing and interesting items. This indicated that learning to respond to bids for joint attention did not lead to the skill of initiating bids. Thus, participants required specific instruction in the skill of initiating bids for joint attention.

Cooper and James responded favorably to the prompt delay procedure and began to initiate bids more frequently when we introduced training for initiating bids. By contrast, Erica required the introduction of a textual stimulus combined with a tangible reinforcer to learn to initiate bids. Erica's bids may have been under the discriminative control of the textual stimulus (i.e., the index card) and were maintained by access to the tangible reinforcer rather than by social attention. As such, Erica's responses during these sessions may not have been bids for joint attention. Nonetheless, her performance may be characteristic of some children with autism who require supplemental antecedent stimuli and extrinsic rewards to establish these responses. Future studies may want to determine whether tangible rewards can be paired with social interaction to create a conditioned reinforcer, and whether those rewards can strengthen responses in children with autism whose bids for joint attention may not necessarily be reinforced by adult attending stimuli or social engagement.

The current study appears to be the first to have used only adult attending stimuli (i.e., the adult's visual indicators that she was attending to the item or event) and social engagement as consequences for responses to and initiations for joint attention (with the exception of Erica). The findings support the hypothesis of Dube et al. (2004) that socially relevant stimuli are necessary and functional reinforcers for some of the responses associated with joint attention. Further, in the present study, reinforcers were social in nature and increased the likelihood that initiations would serve as mands for social reinforcers (e.g., adult attending stimuli and social engagement) and not for the tangible item.

It is possible that the initiations for joint attention were tacts (e.g., labeling an upside-down umbrella) maintained by generalized reinforcers (e.g., social comments from the adult) and not mands for adult attending stimuli. Future research may want to determine if initiations of bids for joint attention are mands (under the control of MOs) or tacts (under the control of discriminative stimuli) by manipulating and examining the strength of the MO systematically (e.g., conditions in which adult attention is available consistently vs. when it is unavailable; conditions in which the available items are more noteworthy or unusual vs. less noteworthy). It may be possible to

determine if the child's initiation for joint attention occurs in response to an MO (and serves as a mand) by examining the child's orientation toward the adult when making the initiation: If the child orients toward the adult, it would suggest that his or her initiation was more likely a mand for adult attending stimuli rather than a tact.

In general, gaze shifting (looking from the object back to the instructor) proved to be challenging to teach and remained a fairly inconsistent response. It may be interesting in future studies to determine if teaching the response of gaze shifting between an object and an adult prior to introducing it in training for joint attention would lead to faster acquisition during the training sessions.

The response of looking back also may have been difficult to shape because it may be maintained by a different reinforcer than other components of joint attention (e.g., it may be maintained by negative reinforcement rather than positive social reinforcement). Anecdotally, we found that our participants more often looked back at the instructor when the stimulus was aversive, as in the case of a scary mask, seemingly to obtain information about the potential danger posed by the stimulus. Thus, acquisition of the gaze shift may have been more difficult because not all stimuli were distressing, and the participant did not need to look back to obtain information about potential danger with nondistressing stimuli (e.g., there was no MO for negative reinforcement in effect). Future studies may want to tease out the effects of these variables by assessing the acquisition of gaze shifting under conditions in which an MO for information about a distressing or fear-provoking stimulus is in effect compared to contexts in which an MO for social interaction is in effect. It may be that gaze shifting could be taught more readily in conditions in which there is a sufficient MO for escape (e.g., as in the presence of a distressing stimulus; Michael, 1993).

There are several limitations to the present study. First, the participants demonstrated all three responses (looking at the item, making a comment, and looking back) on 100% of trials only in 50% or fewer sessions. These low percentages appeared to be due to the inconsistency in the response of looking back at the instructor. Future studies may want to ensure that criteria for mastery be several consecutive sessions in which all three responses are completed on 100% of trials if the presentation of all three responses truly comprise joint attention.

Second, participant-initiated bids about items that were not considered by the instructor as noteworthy or enticing were redirected and not scored. These decisions were based on subjective rather than objective measures (i.e., judgment of the instructor). In this study we arranged particular stimuli in such a way that we assumed would be evocative and function as an MO. It is possible that what is and is not an appropriate stimulus for occasioning a bid for joint attention may be highly idiosyncratic. As such, future researchers may want to conduct assessments with participants (or possibly typically developing children) to ascertain the particular conditions and items that enhance the MO for joint attention, as well as the functions of vocalizations in these contexts (Kelley et al., 2007).

Third, Erica's responses to bids and initiations of bids tended to sound scripted, and the quality of the response did not appear to resemble those of typical peers. Future studies may want to incorporate social validity measures (Whalen & Schreibman, 2003) to determine how independent raters would have judged the responses of the children with autism compared to typical peers.

Fourth, this study examined only two of the three possible reinforcement contingencies for joint attention responses proposed by Dube et al. (2004): positive social reinforcement and, in some cases (e.g., with distressing stimuli), negative reinforcement. Future studies may

want to systematically investigate the presence of the third possible reinforcement class (i.e., that some joint attention responses might function to have the adult improve the positive reinforcement value associated with the item or event).

Lastly, this study incorporated only one pre- and posttest assessment to determine if the responses occurred in the presence of novel stimuli located in novel settings around the school building. Although we conducted only one posttest assessment probe, these data suggest some challenges in generalizing responses beyond the treatment environment. It is unclear why, for example, some of the responses decreased for some participants in the posttest probe compared to the pretest probe (e.g., looking back at the instructor for Cooper and James). In addition, having the instructor stop in front of the noteworthy or unusually placed item during the novel setting or stimuli probes may have served as a prompt, thereby more readily occasioning responses during the pretest probes. Future studies may want to increase the likelihood of generalization by training joint attention responses in more natural settings or varying the setting for training across each training opportunity. Further, future researchers should conduct more extensive pre- and posttest measures to assess more thoroughly the impact of training on responding in novel environments and to novel stimuli.

The development of joint attention skills is associated with the emergence of social communication in typically developing toddlers. For children with autism, however, the development of these responses can be delayed or nonexistent. This study is promising and offers support to the growing body of literature that behavior-analytic procedures can be used to increase joint attention responses in children with autism. As Dube et al. (2004) have noted, joint attention responses are emitted in the presence of certain discriminative stimuli and are learned and maintained based on the consequences that follow. This study supports the premise that discriminative stimuli (e.g., the presence of an adult's bid), social reinforcers (e.g., adult attending stimuli and social interaction), and motivating operations (e.g., the presence of potentially visually enticing or noteworthy objects) can be arranged to increase joint attention responses. Prior research indicates that better joint attention is associated with improved language functioning in typically developing children as well as children with autism. Although the effects of acquiring these responses on the overall language functioning of the participants in this study are currently unknown, behavior-analytic procedures offer tools to shape these responses and open the door to future research. For a child with autism, learning joint attention responses may open up a different door: one to interactive communication and shared social experience.

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