

*TEACHING CHILDREN WITH AUTISM TO RESPOND TO  
CONVERSATION PARTNERS' INTEREST*

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Successful conversation requires that the speaker's behavior is sensitive to nonvocal listener responses. We observed children with autism spectrum disorder during conversation probes in which a listener periodically displayed nonvocal cues that she was uninterested in the conversation. We used behavioral skills training to teach conversation skills. First, we taught participants to tact nonvocal listener behavior (interested or uninterested), but this was insufficient to improve responding aimed at regaining listener interest. Participants were then taught to ask a question (Experiments 1 and 2) or change the topic (Experiment 2) when the listener was uninterested. Responding persisted over time and with changes in the stimulus conditions. The behavior change was also deemed socially valid by blind observers. In Experiment 3, participants learned to shift to the other trained response when exposed to extinction. This study illustrates a set of procedures for bringing speaker behavior under control of nonvocal listener cues.

*Key words:* autism spectrum disorder, behavioral skills training, conversation skills, social skills

The Individuals with Disabilities Education Act made special education and related services a federal legal right. With this right came education in the least restrictive environment and, therefore, increased opportunities for inclusion with typically developing peers (e.g., Burack, Root, & Zigler, 1997). Despite these increased opportunities, social deficits may still put people with autism at risk for rejection or isolation from peers. According to a retrospective review conducted by Church, Alisanski, and Amanullah (2000), children with autism spectrum disorder (ASD) are often reported to have difficulty responding to nonvocal social cues

such as body language, facial expressions, and gestures within social interactions such as conversations.

A social interaction is conceptualized behaviorally as a verbal exchange that occurs between a speaker and one or more listeners (Skinner, 1957). When engaged in a conversation, the listener provides the consequences that at least partially determine the future likelihood of the speaker's responses. Skinner said that "listeners differ in the extent to which they tolerate and continue to reinforce distortions in the stimulus situation" (1957, p. 175). In the context of conversations, then, verbal behavior is ideally sensitive to the social consequences of the listener, and these social cues come to reinforce, punish, or extinguish verbal behavior. Thus, the listener influences the verbal behavior of the speaker.

Listener behavior may have less influence on the verbal behavior of people with ASD, whose social behavior is often described as less sensitive to social consequences and particularly nonvocal consequences. For example, Volkmar and Klin (2000) said, "The child often uses social interaction to engage the conversational partner in long-winded, verbose conversations about his or her topic of special interest, with, however,

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little attention to the often distancing reactions of others" (p. 38). In other words, if an uninterested listener is an ineffective consequence, the speaker may persist in talking about his or her preferred topics due to automatic reinforcement.

Ideally, listener behavior signals which responses will be reinforced in a multiple-schedule arrangement. When the listener is interested, continuing to speak may be reinforced, whereas when the listener is uninterested, some other response, such as changing the topic, may be reinforced. Kuhn, Chirighin, and Zelenka (2010) used a multiple-schedule arrangement to bring a functional communication response under stimulus control. Caregivers behaved as "busy" or "not busy" and reinforced the communication response only when "not busy." Teaching people with ASD to respond discriminatively in a social interaction based on the listener's interest may provide an additional means of improving social skills.

Few studies have investigated responding to listener interest specifically, although some notable examples exist (e.g., Koegel & Frea, 1993; Marriage et al., 1995). Stewart, Carr, and LeBlanc (2007) recognized the importance of teaching responses to nonvocal listener behavior. These experimenters trained the mother and sister of a 10-year-old boy with Asperger's disorder to implement behavioral skills training (BST) to improve his social skills. BST (e.g., Hilme, Miltenberger, Flessner, & Gatheridge, 2004) commonly consists of providing instructions regarding the desired response, modeling of that response by the trainer, rehearsal of the response by the participant, and positive or corrective feedback from the trainer. The family reported that the boy had few friends because he had "difficulties in responding to the nonverbal cues of others" and gave the example of "facial expressions indicative of boredom" (p. 254). The family used BST to teach the boy to engage in eye contact, to determine the interest of the listener, to ask if the listener was bored, to change the topic of conversation if needed, and to avoid

certain conversation topics that often led to perseveration. Data recorded during training showed that the boy learned to label aspects of the model and then quickly demonstrated these skills during rehearsals. Comparisons of pretreatment and posttreatment observations of a conversation with a confederate who "looked bored" every 30 s also showed the targeted skills either improved or remained at high levels of accuracy. This study represents one of the few attempts to improve sensitivity to a listener's nonvocal cues and demonstrates the effectiveness of BST in doing so.

The current study expands on this success by using BST to teach multiple responses to reengage an uninterested listener and using a single-subject design to evaluate the effects of treatment. We also sought to improve the social validity of the responses of both the participant and the listener. Although the participant's mother reported BST to be both effective and an acceptable means of teaching in the Stewart et al. (2007) study, the social validity of the target response was not measured. Specifically, it is not clear if asking a listener if he or she is bored is a socially acceptable response that is likely to regain listener interest. To ensure that the participants' responses were under the control of the appropriate environmental stimuli, we used the listener responses from observations of typically developing children who behaved as uninterested. In addition, we incorporated an evaluation of participant responses to extinction of the learned skills and taught them to vary responses when necessary.

The purpose of the current study was to teach children with autism to respond based on their listeners' behavior. First, we taught participants to tact (or label) a listener's body postures and facial expressions as interested or uninterested. When tact training alone did not improve performance within conversations, we taught participants to ask questions to their listeners (Experiments 1 and 2) or to change the topic (Experiment 2) when they looked uninterested. We also assessed the maintenance and social

validity (Experiments 1 and 2) of the behavior change. In Experiment 3, participants were taught to use the other previously learned response if their first attempt was ineffective at regaining listener interest (i.e., extinction).

## GENERAL METHOD

### *Participants*

All participants received services at a clinic for children with autism, had attended social skills groups, and spoke in full sentences. Identification of participants was based on parent and clinician report of difficulty responding to social cues during conversations. These participants often continued to speak despite what appeared to be very clear nonvocal signs that the listener was uninterested. This pattern persisted during social skills classes, and peers frequently gave up attempts at conversation. These participants were easily engaged in conversation and, therefore, their behavior was already sensitive to social attention. All of the participants were also included in typical classrooms for at least 80% of their day. We obtained written consent from parents or guardians before beginning the study and assent from the children before each session. No participants were excluded based on a lack of effect of training.

Information on the participants' social skills was gathered via record review, questionnaires, and informal interview. Parents were given a brief questionnaire developed for the purposes of this study, which asked them to rate their child's ability to identify and respond appropriately to a listener's interest in the conversation and to identify participants' interests (see Supporting Information for complete questionnaire). In addition, information regarding participants' interests was gathered through brief interviews with the participants and clinic staff who were familiar with the participant. A list of each participant's interests was compiled for the experimenter to reference prior to sessions. Detailed participant information for each experiment is provided below.

### *Materials and Setting*

A token system, similar to that already in place during the social group, was used for all participants during all BST sessions. A star was attached to one of 10 spaces contingent on an appropriate response (fixed-ratio 1). When a given participant had earned all 10 stars, he or she was able to trade in the stars for an activity or small toy of his or her choice. The back-up reinforcers that were available for trade-in consisted of both a "treasure box" of items known to be preferred by many of the participants (e.g., miniatures of popular characters, activity books, Legos) as well as any requested item or activity in the hosting clinic (e.g., jumping on the trampoline, playing iPad or Wii games).

All sessions were conducted in rooms familiar to the participants at the clinic. Rooms contained a variety of educational and leisure materials (e.g., books, toys) stored in their usual areas (e.g., shelves) and were equipped with a table, chairs, and recording equipment. The experimenter and the participant were seated together at a table during all sessions.

### *Design*

A multiple baseline design across participants was used to assess the efficacy of training across all experiments. Participants' responses to an uninterested listener were assessed in conversation probe sessions. These sessions occurred for each participant before beginning any training and after each participant had met criteria for completion of training for each skill.

### *Response Measurement and Interobserver Agreement*

Across all sessions, trained observers, including the experimenter, recorded responses for each trial using pen and paper either live or from the video recording. Definitions for correct responses are presented below.

Interobserver agreement was scored by two observers who independently recorded data either live or from the video recording. During

conversation probes on uninterested listener trials, an agreement was recorded if both the primary and secondary data collectors scored the same response on a trial. Interobserver agreement was calculated by totaling the agreements divided by the agreements and disagreements (total number of trials) and converting the result to a percentage.

### *Experimenter Behavior*

Ultimately, our goal was to bring participant behavior under control of naturally occurring social cues during conversations. One relevant group of conversation partners is similar-aged typically developing peers. To identify the social cues that would likely be provided by peers, the lead experimenter observed seven typically developing children, five boys and two girls, who ranged in age from 6 to 11 years old. Six of the children were siblings of children receiving services at the same clinic, and one child was related to the lead experimenter. The experimenter was familiar to all of the children and met with each child individually. She first began by talking to them about a topic of their interest. The children's responses, both physical and vocal, were recorded in narrative form. The experimenter then talked to them about something they were not likely to be interested in (e.g., politics, her work schedule, etc.) and their responses were again recorded in narrative form. Responses exhibited by two or more children were then included in the definitions of behavior indicative of interested and uninterested listeners.

One experimenter conducted conversation probes and BST sessions. The experimenter acted as interested or uninterested according to the definitions created from the observations of the typically developing children. Behaving as interested consisted of the experimenter's body, head, or both being oriented toward the speaker and looking at the speaker's eyes or mouth. The listener periodically smiled, raised her eyebrows, nodded her head, responded with facial expressions appropriate to a recent statement (e.g., if

the speaker made a remark about having a lot of homework, the listener responded with a facial expression of empathetic disappointment), or made vocal sounds of interest (e.g., "ahh"). Behaving as uninterested consisted of the experimenter's eye contact diverted away from the participant. The listener sometimes faced her body away from the participant, leaned her head on her hand, took an audible deep breath (i.e., sigh), yawned, or raised her eyebrows and widened her eyes without smiling or eye contact. We chose to include these more pronounced responses to facilitate the discriminability of the listener responses, and, because children did not hesitate to demonstrate these responses to an adult, we concluded that our participants who struggled to respond to subtle cues would likely experience similar consequences during naturally occurring interactions. By exposing the participants to these social consequences and teaching effective responses, we hoped to minimize participants' exposure to similar consequences provided by uninterested listeners.

### *Conversation Probes*

Conversation probes lasted up to 15 min and continued until the participant had five opportunities to respond to uninterested listener behavior (i.e., five trials). These uninterested listener trials were embedded in a conversation during which the experimenter responded as an interested listener and actively engaged in the conversation.

Sessions were designed to be as similar to everyday conversations as possible and began with an open-ended question, such as "What have you been up to?" or "What fun things have you done recently?" The experimenter referenced the list of the participant's interests, keeping it out of the participant's sight, if the conversation did not progress easily. The experimenter engaged in the conversation with the participant by behaving as interested, including asking and answering questions, and making comments. This continued until an opportunity for the experimenter to

behave as uninterested arose. These opportunities included the participant speaking for long durations on a topic without allowing the experimenter to respond, abruptly changing the topic, introducing certain topics (e.g., a topic the participant knew was not preferred by the experimenter or a topic that had already been exhausted in that session), or providing excessive details (e.g., the participant listed every movie he owns when asked about his or her favorite). At times, the experimenter simply began behaving as uninterested in the absence of any of these opportunities. The unpredictability of when the experimenter became uninterested was designed to require the participant to frequently monitor the listener's behavior and to make conversation probes as natural as possible. When the experimenter began to behave as uninterested, she did so for up to 10 s. If the participant responded correctly in that 10 s, the experimenter immediately began behaving as interested (the putative reinforcer) and responded to the question. If the participant did not respond correctly within that 10 s, she continued to behave as uninterested for an additional 10 s (20 s total) and then introduced a new topic by making a statement or asking a question. If the participant did not respond correctly and was still speaking at the end of the 20 s, the experimenter interrupted the participant with the new topic. If this was unsuccessful, the experimenter began a new trial by behaving as uninterested again. No additional sources of reinforcement or feedback were present during these sessions.

## EXPERIMENT 1

### METHOD

#### *Participants*

Four children participated in Experiment 1. Luke was 5 years old and had a diagnosis of pervasive developmental disorder—not otherwise specified (PDD-NOS). He often talked about his father's business trips and modes of transportation. A neuropsychological evaluation (conducted

when he was 5 years old, about 2 months before his first session) reported his verbal IQ to be 110 (75th percentile) and his performance IQ to be 103 (58th percentile) on the Wechsler Preschool and Primary Scale of Intelligence (3rd ed.; Wechsler, 2002).

Brian was 9 years old and had a diagnosis of autism. He frequently talked about chasing bunnies and the number of floors found in various buildings. A neuropsychological evaluation (9 months and 13 days before his first session) reported his full-scale IQ score to be 82 (12th percentile) on the Wechsler Intelligence Scale for Children (WISC-IV; Wechsler, 2003), although clinically and statistically significant discrepancies among subtests were reported.

Jake was 6 years old and had a diagnosis of ASD and attention deficit hyperactivity disorder (ADHD). He often talked about superheroes and things he did not like about school. A neuropsychological evaluation (5 months and 28 days before his first session) reported his age-based standard score to be 104 (61st percentile) on the Test of Nonverbal Intelligence-4.

Seth was 7 years old and had a diagnosis of PDD-NOS. He enjoyed talking about the weather and specific details of trips he had taken (e.g., what time the beach closed). Seth participated in a pragmatic language evaluation (conducted when he was 8 years 10 months old, 4 days before completion of his participation in this study) in his home school district. He received a score of 10 (14th percentile, age equivalent of 6 years 3 months) on the Test of Pragmatic Language (TOPL-2; Phelps, 2007). Most relevant to the current study, Seth responded to a peer's level of interest only when directly told by the peer that he or she was or was not interested.

#### *Response Measurement and Interobserver Agreement*

During tact training, responses were correct if the participant correctly identified the experimenter as being interested or uninterested. During

the tact baseline, responses equivalent to the correct tact of the experimenter's behavior were also accepted as correct (e.g., "She likes what I'm talking about.").

Asking a question was scored as correct if it occurred within 10 s of the experimenter behaving as uninterested and was defined as any mand for information in the form of a question and, therefore, excluded any mands for items, activities, or experimenter attention that took the form of questions. We also excluded questions asking the experimenter to repeat something (e.g., "huh?" or "what?"). Any other response, such as continuing to talk on the same topic, was scored as incorrect.

Interobserver agreement was recorded on 33% of sessions for Luke, Brian, and Seth and 37% of sessions for Jake. Mean agreement was 100% for Luke, Jake, and Seth and 96% for Brian.

### *Conversation Probes*

Conversation probes, as described above, were conducted before the tact baseline, after BST to tact listener behavior, and after BST to ask a question of an uninterested listener.

### *Tacting Listener Behavior*

It may be that individuals with ASD have responses in their repertoires to regain listener interest, but these are not under the stimulus control of listener behavior. The purpose of this training, then, was to determine if the participants could tact listener behavior as interested or uninterested and, if they could not, if learning that tact would increase appropriate responses aimed at regaining listener attention.

*Baseline.* In the context of a conversation, the experimenter behaved according to a prearranged random order as either interested or uninterested for 10 s. After 10 s, the experimenter then asked, "What does it look like I think about what you're saying?" Regardless of the participant's response, the experimenter neutrally responded, "oh," to both correct and incorrect responses. Trials continued until each

participant was given 10 opportunities to tact the experimenter's listener behavior.

*BST.* Sessions continued until the participant met the mastery criterion of at least 8 of 10 (80%) trials correct and lasted no more than 30 min. We taught tacts using BST, including verbal instructions, modeling, rehearsal, and feedback. The experimenter explained that sometimes people are interested in what you are saying and sometimes they are not, and it is important to know if the person you are talking to is interested and enjoying the conversation. The experimenter then demonstrated interested and uninterested listener behavior, twice each, while she described aspects of that type of behavior (e.g., for uninterested the experimenter pointed out that she was looking away and her body was turned away). Next, the experimenter prompted the participant to make a comment, exhibited either interested or uninterested listener behavior, and correctly tacted it as such. Finally, the participant was asked to tact the experimenter's behavior in response to his comments, similar to the tact baseline. Correct responses were praised, and a token was given. Feedback was given for incorrect responses (e.g., "I am looking away and not smiling. That means I am uninterested."). The experimenter then repeated the listener behavior and provided a verbal model of the correct response and required the participant to repeat this response. Brian and Seth received BST on tacting listener behavior in a group-based format that was discontinued due to difficulties with participant attrition. Luke and Jake received this training individually.

### *Asking Questions of an Uninterested Listener*

Although the identification of another person's degree of interest may be an important and useful skill, to maintain successful interactions the responses of the listener should also serve as discriminative stimuli that signal which speaker responses will be reinforced. Therefore, the purpose of this training was to teach a response

(asking a question) that would regain listener interest. The rationale for this response was that a conversational volley (i.e., giving the other person a chance to speak) might reengage the listener in the conversation.

*BST.* Participants were taught to ask a question of an uninterested listener using BST that included verbal instructions, modeling, rehearsal, and feedback. These sessions lasted no more than 30 min, and rehearsal continued until the participant responded independently and correctly on 8 of 10 (80%) consecutive trials.

Participants were first given a rationale and instructions, such as, "One thing you can do when you see that someone is uninterested is to ask them a question. The question can be about the same topic you were talking about or something different. First, I'm going to show you how to do this and then it will be your turn." The experimenter and participant then rehearsed this scenario four times with the experimenter acting as the speaker. The experimenter instructed the participant to look uninterested in what she was saying and said, for example, "I can see you are not really interested. I'm going to ask you a question." The experimenter then asked the participant a question. This question was on the same topic during two rehearsals and on a different topic during the other two. The participant then rehearsed asking a question of the uninterested listener. Correct responses resulted in social praise and a token, and the experimenter moved from behaving as uninterested to interested. Feedback was given for incorrect responses (e.g., "I'm not interested. You should ask me a question."), and, if the participant did not then ask a question, the experimenter used least-to-most verbal prompting for the participant to do so (e.g., by asking leading questions or making leading statements, partial, and full verbal models). When the participant responded appropriately, the experimenter repeated that same trial with a prompt for the participant to ask the same question.

#### *Follow-Up Conversation Probes*

Additional conversation probes were conducted after completion of posttraining conversation probes to determine the durability of the behavior change for three of the four participants. (Jake had moved and was no longer available for sessions.) We scheduled these sessions based on participant availability; sessions began 14 days after training with Luke, 49 days with Brian, and 54 days with Seth. If the participant did not maintain asking questions of an uninterested listener, booster BST sessions that consisted of procedures identical to BST to ask a question were conducted until the participant again performed at the 80% criterion (Brian and Seth only). At least two additional conversation probes were conducted after BST booster sessions before any additional session changes.

Because parents reported that participants had difficulty responding to nonverbal cues in conversations with different listeners, conversation probes were then conducted with additional familiar experimenters and in other familiar locations (i.e., other rooms in the clinic) provided that appropriate responding remained high (see Table 1).

#### *Blind Rater Questionnaire*

To determine if changes in participants' responding were noticeable and socially meaningful, we asked three professionals who work with children with autism to compare participants' performance before and after training. Raters were two speech and language pathologists and one licensed special education teacher, all of whom were blind to the purpose of the study and the training that had taken place. Videos of each participant's last baseline conversation probe (before any training) and the conversation probe after completion of all training were viewed by one rater. Raters were asked, via an open-ended questionnaire (available from the corresponding author), about changes observed between the videos (i.e., efficacy), the participant's social

Table 1  
Experiment 1 Follow-Up

Child	Session	Introduction of novel stimuli			Days since previous conversation probe	Correct responses (of 5)
		Experimenter	Location			
Luke	11	1	1	14	4	
	12	2	2	21	4	
	13	3	3	49	5	
	14	3	3	46	4	
	15	4	4	77	4	
Brian	12	1	1	49	5	
	13	2	2	21	3	
	14	2	2	7	3	
	15 <sup>a</sup>	2	2	125	5	
Seth	10	1	1	54	0	
	11 <sup>a</sup>	1	1	4	5	
	12	1	1	35	5	
	13	2	1	0	5	
	14	2	1	14	5	
	15	1	1	168	4	

<sup>a</sup>BST booster session conducted before the session.

competency in each video, and the acceptability of the procedures (i.e., social validity). The professionals did not observe BST; therefore, their responses about the acceptability of procedures related to conversation probes. Using procedures similar to those of Haring, Roger, Lee, Breen, and Gaylord-Ross (1986), the two probes were counterbalanced across these raters so that for some participants the raters saw the initial probe first and for others the conversation probe after training was seen first.

## RESULTS AND DISCUSSION

### *Baseline Conversation Probes*

Figure 1 shows the results of the conversation probes. None of the participants asked a question when the listener was uninterested. Some of the participants did respond in ways that had likely been reinforced with attention in the past (e.g., repeatedly saying the experimenter's name or asking, "Why aren't you listening to me?"); others displayed no overt behavior that acknowledged the experimenter's lack of interest.

### *Tacting Listener Behavior*

*Baseline and BST.* Data from baseline and BST are not depicted in Figure 1. During tact baseline, neither Luke nor Jake correctly tacted interested or uninterested experimenter behavior, and both met the mastery criterion within 10 training trials conducted in one session. Brian responded correctly in 100% of opportunities and Seth in 80% during tact baseline. These two participants had briefly participated in the study in a group-based format that was discontinued due to difficulties with participant attrition. Because of the group format, both received tact training despite having met criterion. Both met criterion for mastery in 10 training trials conducted in one session.

### *Posttraining Conversation Probes*

Despite having learned to tact the listener behavior as interested or uninterested, Brian was the only participant who asked a question of an uninterested listener, and this occurred only once. The other three participants did not ask questions after tact training.



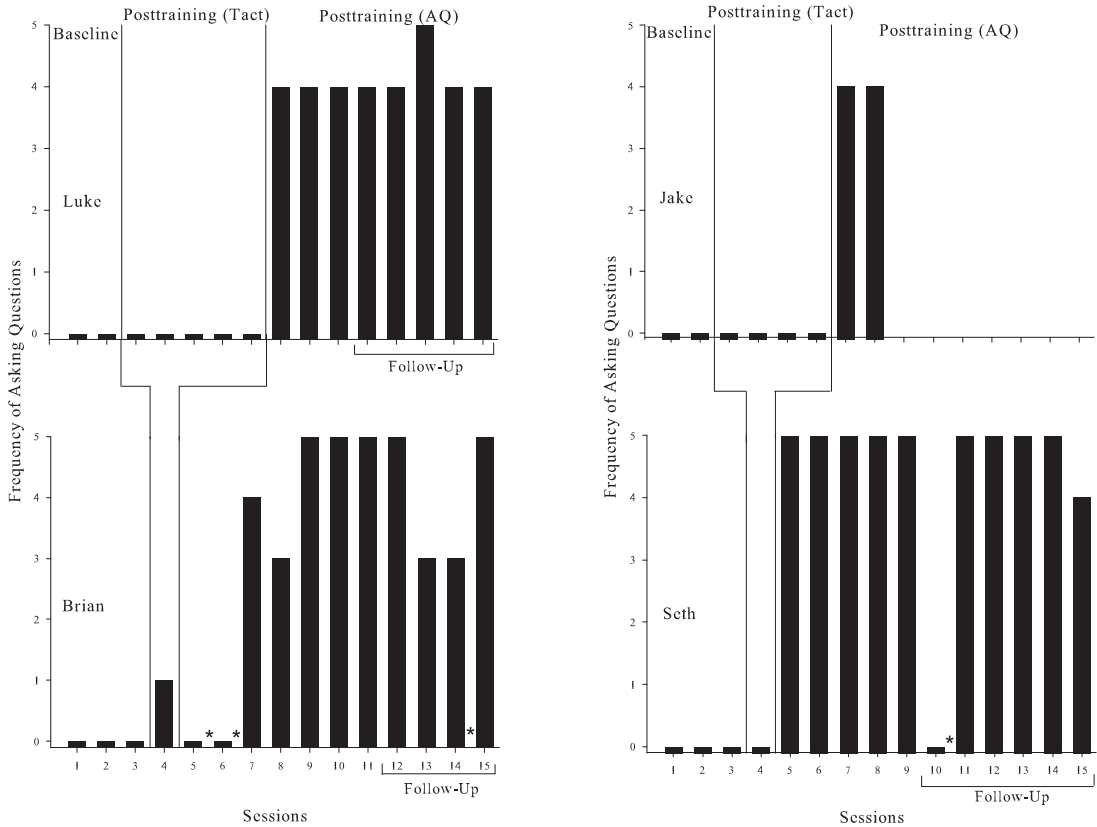


Figure 1. Frequency of asking questions of an uninterested listener (black bars) during conversation probes in Experiment 1 for Luke (top left), Brian (bottom left), Jake (top right), and Seth (bottom right). Asterisk indicates additional BST training to ask a question (Brian and Seth).

### Asking Questions of an Uninterested Listener

*BST.* Data from BST are not depicted in Figure 1. Luke and Seth mastered asking a question of an uninterested listener within 10 trials in one session. Brian required 20 trials across two sessions, and Jake required 36 trials across four sessions to meet the criterion.

### Posttraining Conversation Probes

After the participants were taught to ask a question when his or her listener was uninterested, three of the four began doing so consistently. For example, when the listener became uninterested while Jake was telling a story of “Mr. Bump squeezing his very large body through a cave,” he asked, “Have you ever heard

about Mr. Bump squeezing his body?” Seth asked, “Do you like to watch movies?” after the listener became uninterested while he had been talking about a new movie coming out. As these examples illustrate, we anecdotally observed that the questions asked were often on the same topic of conversation from when the listener had become uninterested. Unlike the other three participants, Brian did not begin asking questions until he received additional BST before Sessions 6 and 7. During the last three sessions, he asked questions on 100% of opportunities.

### Follow-Up Conversation Probes

Follow-up conversation probes are indicated on Figure 1, and Table 1 provides information on

the duration between sessions and introduction of other experimenters and locations. Luke, Brian, and Seth participated in follow-up conversation probes and demonstrated asking questions of an uninterested listener across time and under changes in the stimulus conditions. Brian required a BST booster session when a novel experimenter was introduced, and Seth required a booster session after a lengthy duration between sessions. Both participants asked questions on 100% of trials after booster training. It should be noted, however, that with only these two brief booster sessions, participants maintained these skills for more than 200 days.

#### *Blind Rater Questionnaire*

Raters detected positive effects of training (i.e., efficacy), found the changes in participant behavior to be socially meaningful, and found the conversation-probe procedures to be acceptable across participants. Raters indicated that only one of the four participants (25%) seemed to notice if the listener was interested in what he or she was saying and asked questions during the pretraining video, whereas all four (100%) did so during the posttraining video. When asked if there was a noticeable difference in the quality of interaction between the two videos and also if the participant was more responsive after training, raters reported "yes" for all four participants (100%). When asked to rate the participant's social competency on a scale of 1 to 5, participants scored an average of 2 before training and an average of 3.8 after training, and all participants' scores increased after training.

## EXPERIMENT 2

Although asking questions may often be effective in regaining the interest of a listener, at other times it may be the topic that is not of interest and changing the topic would be a more effective response. The purpose of this experiment was to teach two possibly effective responses:

asking a question and changing the topic. Also, because booster sessions were required before correct responding was seen with Brian, a more stringent mastery criterion was applied during BST in Experiment 2.

## METHOD

### *Participants*

Six children, none of whom participated in Experiment 1 but all of whom attended the same clinic, participated in Experiment 2. Data from two additional participants were excluded because they discontinued receiving services from the hosting clinic and were not available to complete all phases.

Ryan was 7 years old and had a diagnosis of PDD-NOS. He frequently described events that were embellished to join in a conversation (e.g., "I have a dog, too" when others knew he did not have a dog). Psychological testing results were not available for Ryan. His social skills were assessed and targeted via his behavior during social skills groups. At the start of his participation, skills being targeted during social groups included demonstrating socially appropriate listener behavior in the group, demonstrating appropriate speaker behavior in the group, predicting how others may react (behavior and emotions) to a social situation, answering questions about social situations (e.g., order of events, causes, and predictions), asking follow-up questions of peers, using appropriate strategies to negotiate or compromise with peers, and maintaining appropriate behavior throughout the group sessions.

Chris was 5 years old and had a diagnosis of PDD-NOS. He enjoyed talking about Thomas the Train and counting. A psychological evaluation (9 months and 9 days after his final session of this study) reported his scores on the Wechsler Preschool and Primary Scale of Intelligence-III (WPPSI-III; Wechsler, 2002). A full-scale IQ was not reported, but Chris received scores of 110 (75th percentile) on the verbal comprehension

index, 143 (99.8th percentile) on the perceptual reasoning index, 88 (21st percentile) on the working memory index, and 100 (50th percentile) on the processing speed index.

Danny was 9 years old and had a diagnosis of ADHD and PDD-NOS. He often asked socially awkward and repetitive questions, such as “What kind of car do you drive?” outside any related context and regardless of the number of times he had asked that same person. A neuropsychological evaluation (1 year and 23 days before his first session) reported his scores on the WISC-IV (Wechsler, 2003). A full-scale IQ was not reported, but he received a score of 69 (percentile not reported) on the verbal comprehension index. On the verbal subtests, Danny received an age-equivalent score of 7.6 years on the similarities subtest and less than 6.2 years on the vocabulary, comprehension, and information subtests.

Sasha was 4 years old and had a diagnosis of PDD-NOS. She enjoyed talking about princesses and recounting stories of her sibling’s misbehavior. Sasha had not had any psychological testing, but the Assessment of Basic Language and Learning Skills–Revised (Partington, 2010) was conducted at the hosting clinic 7 months before her participation in the study. Only sections that assessed verbal and social areas are described here. Sasha showed strengths in the areas of receptive language, vocal imitation, requests, labeling, and spontaneous vocalizations. In each of these areas she had either mastered or partially mastered all skills assessed (i.e., met a minimum criterion for an emerging skill). In the area of intraverbals, she was not able to describe 10 items by stating at least two relevant details about the item but demonstrated at least partial mastery of all other skills assessed. In the area of syntax and grammar, she did not yet meet the minimum criterion for irregular plurals, comparatives, labeling strength of a verbal response, the quantification of a verbal response, or labeling the emotional state associated with a verbal response.

Morgan was 6 years old and had a diagnosis of PDD. He often talked about evolution, lungfish,

and breeds of dogs. A psychological evaluation (9 months and 1 day before his first session) reported his scores on the Wechsler Preschool and Primary Scale of Intelligence–III (WPPSI-III; Wechsler, 2002). Morgan received a full-scale IQ of 113 (73rd percentile, “high average”) with a scores of 121 (92nd percentile) on the verbal comprehension index.

Emily was 5 years old and had a diagnosis of PDD-NOS. She most often described times when she and her brother did not get along and her vacations. A neuropsychological evaluation (1 year and about 5 months before her first session) reported her scores on the WPPSI-III (Wechsler, 2002). A full-scale IQ was not reported, but she received a score of 118 (88th percentile) on the verbal index, 96 (39th percentile) on the performance index, and 122 (93rd percentile) on the general language index.

#### *Response Measurement and Interobserver Agreement*

Asking a question (as described in Experiment 1) and changing the topic within 10 s of the experimenter behaving as uninterested were correct responses. A change of topic was defined as making a statement regarding something different, including compliments. The degree of difference required was somewhat minimal. For example, if Morgan was talking about Bernese mountain dogs when the experimenter became uninterested and then said, “Let’s talk about shih tzus,” reinforcement would be delivered in the form of the experimenter becoming interested. An exception was made for Sasha, who began her topic changes with “Did you know—?” This phrasing was accepted as a rhetorical question that was a conversationally appropriate way to change the topic.

Interobserver agreement was recorded on 50% of sessions for Ryan; 43% of sessions for Chris; 33% of sessions for Danny, Morgan, and Emily; and 36% of sessions for Sasha. Mean agreement was 100% for Ryan, Danny, Morgan, and Emily; 90% for Chris; and 93% for Sasha.

### *Conversation Probes*

Conversation probes, as described above, were conducted before the tact baseline and training and after tact training and BST to ask a question of an uninterested listener.

### *Tacting Listener Behavior*

*Baseline and BST.* Procedures were identical to those used in Experiment 1, with the exception of an increased mastery criterion (at least 27 of 30 consecutive responses correct).

### *Asking Questions or Changing the Topic with an Uninterested Listener*

*Baseline.* Baseline was conducted in the same manner as Experiment 1, with the addition of changing the topic as a correct response.

*BST.* The same BST procedures used in Experiment 1 were also used in Experiment 2. BST to ask a question of an uninterested listener preceded BST to change the topic for all participants. Sessions that trained one response continued until the participant had met the criterion of 27 of 30 consecutive trials correct (90%). During BST to change the topic, asking questions was scored as incorrect, and the participant was told that although this was not wrong, "Right now we are practicing changing the topic." Also, during the latter training, if a participant made errors on 5 of 10 or three of four trials, he or she was given seven examples of phrases to serve as intraverbal frames to change the topic. These phrases were, "I really like—," "I don't like—," "Yesterday I—," "I am going to—," "I like your—," "I'm excited to—," and "Let's talk about—." With four of the six participants (Chris, Danny, Morgan, and Emily), these phrases were shown and read to them during the practice component of BST. To meet the mastery criterion, however, a participant must have responded in the absence of the written statements during the block of 30 trials. When a participant met the criteria for both responses, another 10 trials were conducted in which either

reinforcement. The purpose of these trials was to ensure that both responses were in the participant's repertoire. Trials were conducted in a manner similar to BST training and consisted of a brief explanation (e.g., "We've talked about how you can ask a question or change the topic when someone is uninterested. Now we're going to do some more practice and either will be correct.") and reinforcement for either correct response consisted of the experimenter becoming interested and delivering praise and a token. If a participant did not emit both responses at least once during these trials, another 10 trials were conducted with a reminder about the response that had not yet been observed (e.g., "Remember, you can also change the topic.") between each trial. For these participants, the reminder was sufficient to observe the second response, and this training was complete.

### *Follow-Up Conversation Probes*

As in Experiment 1, additional conversation probes were conducted after completion of training to determine the durability of the behavior change. Two participants, Chris and Sasha, stopped receiving services from the hosting clinic and were therefore not available for follow-up measures. The remaining four participants demonstrated maintenance of the skills primarily through their participation in Experiment 3 (see below), but Morgan and Emily participated in one follow-up conversation probe each.

### *Blind Rater Questionnaire*

As in Experiment 1, we asked professionals who work with children with autism and who were blind to the purpose of the study and the training that had taken place to compare participants' performances before and after training. The same procedure and questionnaire as in Experiment 1 were used here. The raters were one speech and language pathologist, one licensed special education teacher, and three Board Certified Behavior Analysts. Each

participant's pretraining and posttraining videos were viewed by one rater.

RESULTS AND DISCUSSION

Baseline Conversation Probes

Figure 2 shows the results of the conversation probes for Ryan, Chris, Danny, Sasha, Morgan, and Emily.

Danny, Sasha, and Morgan did not ask questions (black bars) or change the topic (gray bars) during baseline when the listener was uninterested. Ryan changed the topic twice during his first baseline session, but this did not persist across other sessions. Chris and Emily each asked a question on one trial during one session in baseline.

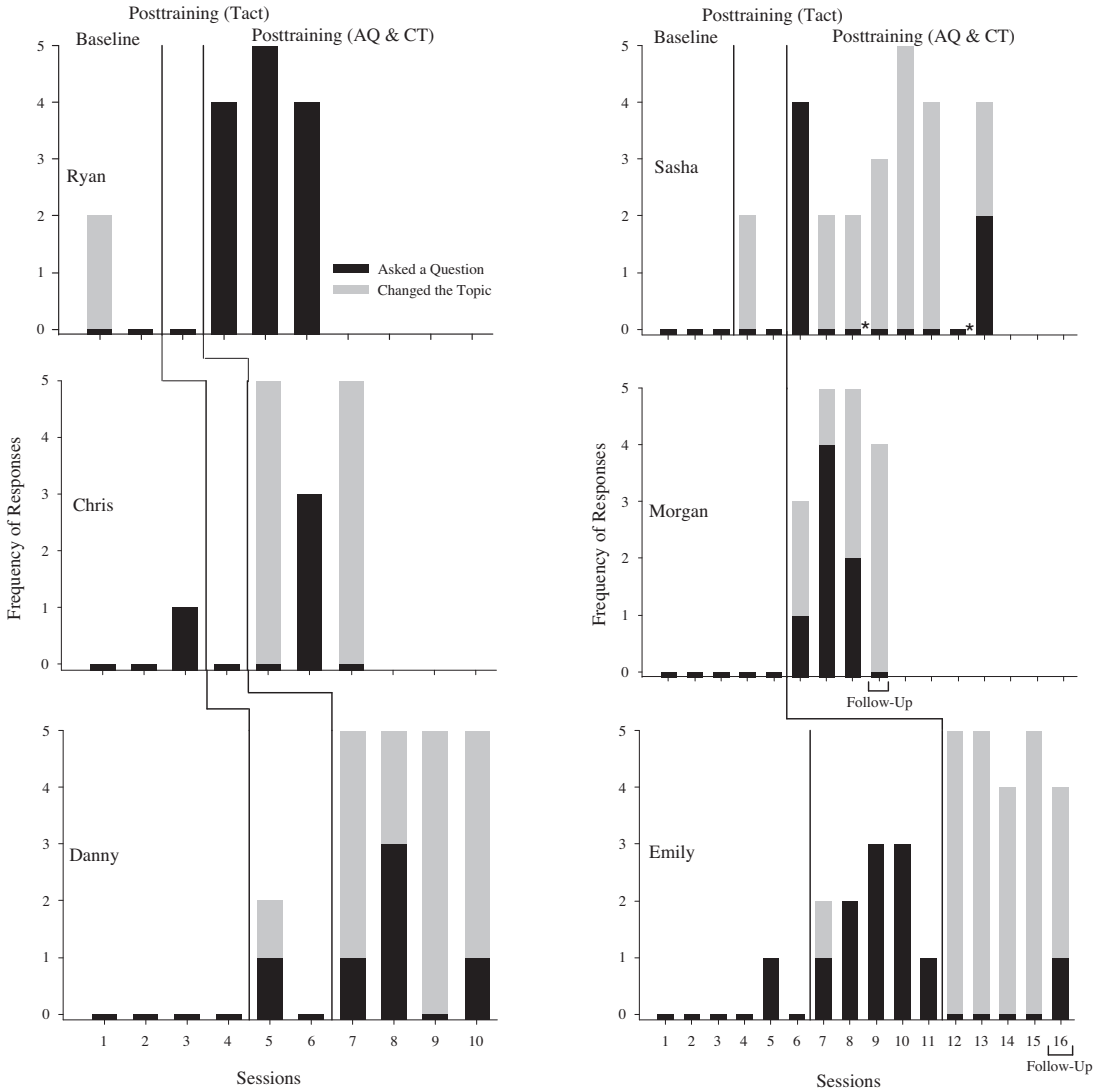


Figure 2. Frequency of asking questions (AQ; black bars) and changing the topic (CT; gray bars) with an uninterested listener in Experiment 2 for Ryan (top left), Chris (middle left), Danny (bottom left), Sasha (top right), Morgan (middle right), and Emily (bottom right). Asterisk indicates booster BST training (Sasha).

### *Tacting Listener Behavior*

*Baseline and BST.* Morgan was the only participant who demonstrated mastery of tacts of interested and uninterested listener behavior during the tact baseline. For the other five participants, tact training took relatively little time. For Ryan, Danny, Sasha, and Emily, tact training was complete within the first 30 trials conducted within one to two sessions. For Chris, 40 trials conducted across three sessions were needed to meet criterion.

*Posttact training conversation probes.* Following training to tact listener behavior, responding during conversation probes returned to or remained at zero for both responses for Ryan and Chris. Danny asked one question and changed the topic once during the first conversation probe following tact training, but correct responding did not persist in the second session. Sasha changed the topic twice in her first session following tact training, but engaged in no correct responses during the second session. Emily had the greatest increase in correct responding following tact training. She changed the topic only once during her first session, but asking questions persisted across five sessions. Because she did not meet the mastery criterion for either response, however, she also received training.

### *Asking Questions or Changing the Topic with an Uninterested Listener*

*Asking questions of an uninterested listener: BST.* The mean number of trials required to meet criterion was 44.5 (range, 34 to 52) completed across an average of 2.3 sessions (range, 1 to 3).

*Changing the topic with an uninterested listener: BST.* The mean number of trials required to meet criterion was 94 (range, 30 to 180) completed across an average of 6.3 sessions (range, 1 to 12). The number of trials conducted per session varied across participants based on scheduling and their tolerance for the session.

### *Posttraining Conversation Probes*

All six participants showed an immediate increase in correct responding when BST was complete. Ryan asked questions only when the listener was uninterested. Chris changed the topic in all of the five opportunities across two sessions and asked questions in three of the five opportunities during the other session. Danny and Morgan demonstrated within-session variability of correct responses. Emily and Sasha changed the topic more often following BST. Sasha required a booster session following her eighth conversation probe after two sessions with only two opportunities correct.

Participants could ask a question on the same topic, a different topic, or change the topic with a statement. Each response has its merits in regaining listener interest. As mentioned previously, asking an on-topic question allows the conversation partner to have the floor, should that person have something to say on the topic, or to introduce a new topic. By asking an off-topic question, the listener has these same opportunities and is also aware of an alternative topic of interest to the speaker. With the additional response trained in Experiment 2, changing the topic with a statement, the speaker does not necessarily have to relinquish the conversation floor but does increase the likelihood that the listener will become more interested in the new topic. The speaker also has the added benefit of controlling the next topic of conversation. For example, while talking about what he had done during recess that day, Morgan changed the topic by saying, "Let's talk about British colonies."

### *Follow-Up Conversation Probes*

Morgan and Emily each completed one follow-up conversation probe (indicated on Figure 2; see also Table 2 for additional information). Morgan's data demonstrate that he had maintained the skills for 28 days. Emily maintained the skills for 83 days, and she demonstrated those skills with a novel experimenter and in a novel location.

Table 2  
Experiment 2 Follow-Up

Child	Session	Introduction of novel stimuli			Correct responses (of 5)
		Experimenter	Location	Days since previous conversation probe	
Morgan	9	1	1	28	4
Emily	16	2	2	83	4

### *Blind Rater Questionnaire*

Responses to the questionnaire showed positive effects of training across participants, similar to those reported in Experiment 1. Raters indicated that only one of the six participants (17%) seemed to notice if the listener was interested in what he or she was saying, whereas all six did so during the posttraining video. Five of the six (83%) participants were rated as asking questions of an uninterested listener after training, whereas none were rated as doing so before training. All six participants were rated as changing the topic when the listener was uninterested following training, whereas none were rated as doing so before training. When asked if there was a noticeable difference in the quality of interaction between the two videos, raters reported "yes" for all six participants. The video of the participants posttraining was rated to show the participant as more responsive to the audience for all six participants and as more competent in social situations for five of the six participants (83%). However, social competency ratings revealed a potential weakness of training. Here, participants scored an average of 3.75 before training and an average of 4 after training. This was an increase in score for all but two participants, Sasha and Danny. For Danny, the rater reported the compliments he gave (as a topic change) after training did not seem genuine and were given too frequently. We encourage researchers and practitioners to pay close attention to how responses might be perceived by peers rather than to rely too heavily on a priori definitions.

### EXPERIMENT 3

Some participants in Experiment 2 exhibited a preference for one of the taught responses to an uninterested listener. This was evident from the exclusive response allocation by Ryan but was also observed to a lesser degree in responding by Sasha, Danny, and Emily. Although these preferences were not necessarily a problem, we hoped to encourage persistence and variability should the initial response be unsuccessful in regaining listener interest. The purpose of Experiment 3 was to test responding under extinction and, if necessary, teach participants to produce the other taught response if their first response was ineffective.

### METHOD

#### *Participants*

Four participants from Experiment 2 were included: Emily, Danny, Morgan, and Ryan.

#### *Response Measurement and Interobserver Agreement*

On designated reinforcement trials, correct responding included either asking a question or changing the topic within 10 s of the experimenter behaving as uninterested, as in Experiment 2. On designated extinction trials, a response was scored as correct if the participant both responded with one of the taught responses within 10 s of the experimenter behaving as uninterested and then responded with the other taught response within 10 s of having completed the first response as the experimenter continued

to be uninterested. Either order of responses (i.e., ask a question then change the topic versus change the topic then ask a question) was correct, but the second response had to be unlike the first to be considered correct. Any variation from this sequence resulted in the trial being scored as incorrect.

Interobserver agreement was recorded on 33% of sessions for Emily, Morgan, and Ryan and on 40% for Danny. Mean agreement was 100% for all four participants.

### *Conversation Probes*

Conversation probes were conducted before and after training to determine the effect of training on participant responding during a conversation. Both reinforcement and extinction trials were included to maintain responding and to ensure that responding was discriminated according to the listener's response. Conversation probes were modified in this experiment to include six trials. The consequences for correct responding (i.e., either asking a question or changing the topic) on each of these trials were prescribed, according to a predetermined random ordered list, to be either reinforcement or extinction, regardless of which correct response (asking a question or changing the topic) was emitted.

The format of the conversation probes was much the same as in Experiments 1 and 2. During extinction trials, however, if the participant responded correctly the experimenter remained uninterested. If the participant then emitted the alternative response within 10 s of having completed the initial response, the experimenter provided reinforcement by becoming interested. All incorrect responses resulted in the experimenter remaining uninterested for the additional 10 s. If the participant's responding was or became variable with exposure to extinction, this phase of the experiment was complete. If the participant's responding was not variable when exposed to extinction, BST on responding to extinction began.

*BST.* Teaching responding to extinction was similar to other BST sessions. Participants were taught to engage in the other learned response if and when the initial response did not result in an interested listener. Instructions consisted of telling the participants that sometimes their listener might not be interested even if they do what they had been taught. Participants were given examples and models of correct responding (e.g., "If I notice the person I am talking to isn't interested, I change the topic and start talking about my new Wii game. But they might not be interested in that either. If that happens, I should try asking a question like, "What kind of games do you like to play?"). Because Ryan had some difficulty changing the topic, he used the written examples of intraverbal frames to change the topic for three trials during training. Correct responses resulted in social praise, token delivery, and the experimenter moving from uninterested to interested; incorrect responses resulted in corrective feedback and the trial being repeated with least-to-most verbal prompting for the participant to engage in the correct response (e.g., asking leading questions or making leading statements, partial, and full verbal models). Training continued until the participant met the criterion of 27 of 30 consecutive trials correct (90%).

## RESULTS AND DISCUSSION

### *Baseline Conversation Probes*

Figure 3 shows the results of Experiment 3. Results are presented as a percentage of trials with correct responses on extinction trials because sessions did not necessarily include an equal number of extinction trials. The results of the baseline measure of responding to extinction showed that Emily and Danny learned to produce the other taught response reliably when the first response was met with extinction. Experience with the contingency alone increased correct responding for these participants in the absence of training. Morgan and Ryan, who did



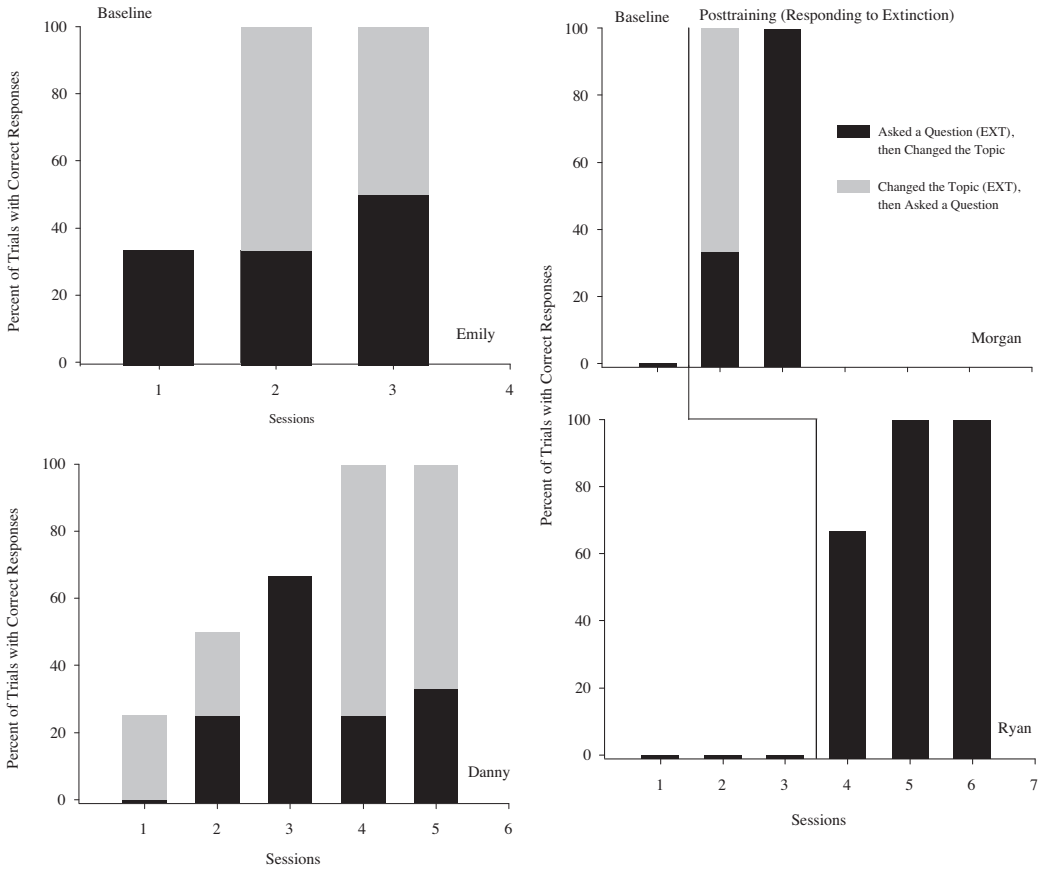


Figure 3. Percentage of extinction trials with correct responses in Experiment 3 for Emily (top left), Danny (bottom left), Morgan (top right), and Ryan (bottom right). Dark and light gray shading shows the response emitted after the initial response contacted extinction.

not produce a correct response, moved on to BST.

*BST.* Training began after the first session for Morgan and after the third session for Ryan. BST to respond to extinction was completed quickly for both participants. Both Morgan and Ryan met criterion (27 of 30 or 90%) in 30 trials conducted across two sessions.

*Posttraining Conversation Probes*

After training, both Morgan and Ryan responded variably, by engaging in the other taught response, to extinction. Ryan continued to respond to an uninterested listener initially by asking a question (demonstrated as his preferred

response in Experiment 2), but changed the topic when asking a question was not reinforced. In other words, his preferred initial response did not change, as shown in the darker gray bars. He did, however, learn to change the topic when his preferred response (asking a question) did not regain listener interest. His responding, therefore, met the goal of this experiment. Conversation probes also included trials in which the initial correct response was reinforced, as described above. Data from these trials speak to the degree to which the participants maintained the skills taught in Experiment 2. These data are not depicted in Figure 3, but Emily, Danny, and Ryan all responded correctly

in 100% of opportunities, and Morgan did so in 78% of opportunities.

## GENERAL DISCUSSION

This study extends the literature on teaching social skills to children with autism. Participants were taught to respond to nonvocal cues indicating that the listener was uninterested by asking a question (Experiments 1 and 2) or by changing the topic (Experiment 2), two ways listener interest might be regained. To date, few studies have reported data that document improvements in a participant's responding to listener behavior indicating level of interest. The current study expanded this line of research (e.g., Koegel & Frea, 1993; Stewart et al., 2007) by considering the social validity of the responses of both the listener and the speaker. In addition, participants were taught how to respond further if their first attempt did not regain their listener's interest (Experiment 3). Measures recorded over extended time periods showed that responding persisted without the need for contrived reinforcement and in the face of changes in the stimulus conditions (i.e., novel listeners and locations). Finally, professionals who were blind to the purpose of the study corroborated the efficacy of the treatment and confirmed the social validity of the improvements in the targeted skills after training.

Tact training failed to produce mastery-level changes in responding to an uninterested listener with any of the 10 participants. Although it is unclear from the current data if tacting listener behavior as interested or uninterested is necessary to respond to listener behavior, for these participants it was not sufficient. Teaching children with autism to tact nonvocal social responses (i.e., labeling or receptively identifying emotions) is a common tactic used in social skills training (e.g., Hadwin, Baron-Cohen, Howlin, & Hill, 1996; Maurice et al., 1996; Maurice, Green, & Luce, 1996; Williams, Gray, & Tonge, 2012), and collateral improvements in social skills may

be expected but not directly assessed. Based on our results, we strongly recommend that social skills programs for children with ASD include a direct assessment of important social skills and, when necessary, the direct teaching of those skills.

The procedures outlined in this study lend themselves to teaching any number of responses appropriate to conversations, particularly those for which the availability of reinforcement may be reliably predicted by nonvocal listener stimuli in multiple-schedule-type fashion. For example, participants might also be taught to respond to their listeners' expressions of confusion or subtle cues they would like to interrupt. In addition, the listener responses of the participants, including demonstrations of interest or a need for clarification, might be targeted in much the same way. Researchers who are interested in similar work should consider the assessment of treatment integrity to ensure accurate implementation. The absence of these data is a limitation of the current study.

In Experiment 3, we assessed and, when needed, taught the participants to vary their responding when the first response was met with extinction. This extension is an important step when teaching skills expected to be performed under typical social conditions in which newly taught responses may contact extinction. By including a final phase of teaching that prepares participants for extinction, we hoped to facilitate appropriate persistence under extinction and to avoid the participants experiencing potential negative outcomes of extinction under typical social conditions.

The effects of BST were evident in conversation probes conducted with adult experimenters, but we did not assess changes in conversation skills with peers or other typical conversation partners. This is an important extension we encourage researchers to pursue in additional studies. To ensure that the listener would act uninterested and supply differential consequences, we used a trained experimenter in all of our sessions. In future research, it will be important

to include peer conversation partners, but assessment conditions may need to be modified to ensure adequate opportunity for speaker and listener behavior (i.e., interested and uninterested) and differential consequences provided by the listener. For example, conversation probes could include competing contingencies for peer behavior (e.g., music playing in the background or toys available) or the inclusion of trained or coached peer confederates.

This study represents an effort to improve the conversation skills of children with autism, a population for whom these and other social skills present arguably the greatest challenge. The procedures used in this study could be adapted to address many other social skills deficits, particularly those that require responding be discriminated based on nonvocal cues of others. To help people with ASD gain the most from the opportunities available in included settings, we must continue to work toward the development of programs that produce social repertoires that are sensitive to naturally occurring discriminative stimuli and social reinforcers yet durable enough to withstand periodic extinction.

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