EFFECTS OF PROMPTING AND FADEING PROCEDURES TO ESTABLISH
FOLLOWING THE LINE OF REGARD IN A CHILD WITH AUTSIM

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Children with autism show deficits in communication skills, including joint attention, a component of which is following the line of regard. Two experiments were conducted. The first experiment examined how prompting and fading procedures affected following the line of regard in a child with autism. The second experiment examined this effect on the child’s learning the names of novel objects. One ten-year-old boy, with a primary diagnosis of autism, participated. A changing criterion design was used in Experiment I. Experiment II used a succession of interventions to assess incidental learning of novel object names. Results indicate that prompting and fading with reinforcement was an effective training procedure for teaching this child to follow the line of regard. However, this skill did not automatically lead to the child’s learning the names of novel objects.
I would like to thank Sigrid Glenn and Janet Ellis for their continued support throughout all aspects of this study. I would also like to thank Christine Fleming for assisting in data collection. In addition, I would like to thank my colleagues and peers for their support. Finally, I would like to thank the child who participated in this study.
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INTRODUCTION

Two of the defining characteristics of autism are deficits in social behavior and language development (American Psychiatric Association, 2000). An extensive literature exists on using behavioral principles to teach children with autism the social and language skills that typically developing children seem to learn easily. One complex skill that has received increased attention in recent research is called “joint attention.” Joint attention is the shifting of attention (usually visual) between another person and some feature of the environment (Pierce & Schreibman, 1995). In everyday words, it is “sharing an experience” (Scott, Clark, & Brady, 2000). For example, looking back and forth between a caregiver and a scene that the caregiver is looking at, or otherwise responding to, indicates joint attention. The behavior called “following the line of regard” is looking where someone else is looking or pointing, and it could be a component of the more complex behavior of joint attention.

Current interest in joint attention may be due to the fact that, as some theoretical discussions imply, an important relationship exists between the acquisition of joint attention skills and early language development. In addition, more children than in the past are being diagnosed at younger ages with a deficit in joint attention behavior, or with disabilities characterized by marked impairments in this skill area. This may be due to improved diagnostic criteria. Due to the increased number of children being diagnosed with autism, and the evidence that early intervention makes a critical difference to outcome (NY State
Department of Health, 1999), more attention is being placed on insuring that very young children with autism acquire skills that characterize the repertoires of typically developing children.

According to Cicchetti and Toth (1994), typical development of communication skills in the first two years of life may be conceptualized in terms of three phases. The first two phases involve nonverbal communication that sets the stage for the emergence of verbal communication in the third stage. In the first phase, which occurs during the first five months, communication often involves face-to-face exchanges between the infant and caregiver (e.g., eye contact, facial animation, smiles, conversation). In the second, 6-to-18-month-phase, a type of communication called “joint attention” develops. The child who has learned the social behaviors characteristic of the first phase now learns to follow the caretaker’s gaze and/or her point toward an object in their shared environment. Caretakers often draw the child’s attention to the object by calling the child’s name and pointing to the object after the child looks at the caretaker. Scaife and Bruner (1975) label the child’s response of looking at the object to which the caretaker is calling his attention as “following the line of regard.” If the caretaker names or talks about the object of shared attention, the child may learn to look for that object later when the caretaker names it or to name it himself once he has acquired some speech. The child also learns to draw the caretaker’s attention to him/herself and his interest in an external object by alternating between eye contact with the caretaker and looking at or pointing to an external object. This can be viewed as a kind of verbal communication that
precedes speech. Joint attention, then, in its most elaborated form, is a prerequisite of speaking about the shared world and listening to others’ speech about that world. In the final 12- to 24-month phase, vocal verbal communication emerges, and the child begins to communicate with speech about the world.

In contrast to typically developing infants who show preferential attention to social rather than inanimate stimuli, and who prefer to focus on the more socially revealing features of the face, such as the eyes rather than the mouth, individuals with autism seem to lack these early social predispositions (Dawson, Meltzoff, & Osterling, 1998). Thus, young children with autism usually display a serious deficit in the development of joint attention skills (Mundy & Gomes, 1998). Recent research has attempted to isolate the preverbal communication elements missing in the developmental profiles of children with autism and to ascertain how these results compare with their typically developing peers. Klin, Jones, Schultz, Volkmar, and Cohen (2002) reported that individuals with autism focused twice as much time on the mouth region of the face and 2.5 times less on the eye region of the face. This research on gaze has important implications for gaining a better understanding of how joint attention behavior, in general, and following the line of regard, specifically, may relate to an individual’s development.

Because these joint attention bids appear to be lacking in the early development of children with autism, as compared to their typically developing peers, several investigators have measured and intervened on joint attention
behaviors in autistic and/or developmentally delayed populations. Hwang and Hughes (1995) found that in children with autism a collateral relationship exists between social interactive strategies and social communication skills (i.e., eye contact, joint attention, and, imitation). When the treatment package was implemented, all three social communication skills increased in frequency, and then when the package was removed all three behaviors decreased in frequency. However, effects of components of the treatment package were not isolated and, therefore, results do not indicate which parts (if any) of the social interactive training package directly promotes improvement in joint attention skills.

Klin et al. (2002) found that when viewing naturalistic social situations, children with autism demonstrated abnormal patterns of social visual pursuit consistent with decreased salience of eyes and increased salience of mouth, bodies, and objects. Mundy and Crowson (1997) conducted a study on eye contact and found that older children with autism rarely alternate eye contact between an active mechanical toy or an interesting event and other people. This contrasts with typically developing infants, who consistently do so around 18 months of age (Butterworth, 1991).

The relation between children’s pre-linguistic communication behaviors (of which joint attention is one) and development of vocal language has been examined in several studies. Sheinkopf, Mundy, and Oller (2000), studying children with autism as well as those with developmental delays, found a correlation between initiating joint attention (using eye contact and/or gestures to
direct the experimenter’s attention to an object/event) and canonical babbling and expressive language. In addition, these researchers reported that children with autism were less likely to follow the experimenter’s point toward objects than were developmentally delayed children. These findings suggest that pre-linguistic communication may be a prerequisite for linguistic behavior, and that communication deficits of children with autism may have their origin in pre-linguistic communication deficits.

Sigman and Kasari (1995) found that in children with autism lower levels of joint attention behaviors were negatively correlated with verbal language outcomes. Parents perceived children who lacked joint attention behaviors as displaying more disturbances in language and social behaviors as rated by the scales used in the study. Unfortunately, these researchers did not attempt to improve joint attention skills.

The research reported above suggests that joint attention, or, more specifically, following the line of regard, may be a behavioral cusp (Rosales-Ruiz & Baer, 1997). A behavioral cusp is a behavior change that has consequences for the learner beyond the change itself, some of which may be critical to future learning. For example, learning to follow the line of regard may allow a child to learn new behaviors such as labels for objects that are not within immediate reach.

Typically developing children acquire language under natural environmental conditions, as described earlier; whereas, children with developmental disabilities, including autism, require more systematic teaching
procedures to learn behaviors that might open doors to further development. For these reasons, experimenters are spending more time investigating ways to measure and teach such behaviors to children with autism. The purpose of this study was to determine the effects of prompting and fading procedures, with positive reinforcement, in teaching a child with autism to follow the line of regard, a component of the complex skill of joint attention. Additionally, this paper investigated whether following the line of regard would function as a behavioral cusp (cf. Rosales-Ruiz & Baer, 1997). Specifically, will following the line of regard result in the participant learning to label objects being pointed to and labeled by a caretaker?
GENERAL METHOD

Participant

A ten-year-old male, with a primary diagnosis of autism and behavioral deficits including marked impairments in social reciprocal interactions, communication, play skills, and academics, was the participant in both experiments. His lack of skills in the area of social reciprocal interactions was the focus of this study. His verbal skills were limited to approximately six-or-seven word utterances; however, he could receptively and expressively label over 100 common objects/pictures. The participant’s social behaviors included making and maintaining eye contact when requesting items, responding to social initiations by adults, and engaging in solitary activities, such as looking at pictures through a Viewfinder® and playing with an interactive book. He did not reliably follow the line of regard and did not acquire novel (unprogrammed) skills without repetitive direct teaching trials.

Setting

Both experiments were conducted in a room containing ten stacked chairs, a computer and desk, and a projector (none of which were used during this study) at an education and treatment facility serving children with autism spectrum disorders, where the participant has been a student since November 1997. For the experiment two rectangular tables, approximately 8 ft x 1 ft, and 2 ft in height, were positioned to the participant’s right and left between 2 and 9 ft away. The distance of the tables varied depending on the phase of the study.
The participant sat at a child-sized desk in a child-sized chair. The participants desk was positioned 3 ft in front of where the experimenter stood. Only the participant and the experimenter were in the room during the study four days/week. On one day/week an independent observer collected interobserver agreement (IOA) data.

Materials

Three sets of toys were used. Toys the participant labeled correctly during a pre-test were used as stimulus objects in Experiment 1. (Figure 1). Toys the participant could not label in the pre-test (novel toys) were used as stimulus objects in Experiment 2. (Figure 2). The participant was allowed to play with a third set of toys, which had been previously confirmed as preferred activities. Preferred activities included looking at a Viewmaster®, playing with a Vtech® alphabet game, or handling a carpet square. These three activities were available at all times during the experiment, and he was allowed to change activities throughout.

While the participant engaged in his preferred activities, the experimenter was engaged in a writing activity (drawing, writing, or doodling on paper); however, he was not able to see what I was writing. Experimenter materials included paper, pencil or pen, data sheets (Figures 3 and 4), and a timer.

Pre-Baseline

Prior to beginning the first experiment, a pre-baseline assessment was conducted to determine the participant’s ability to follow the line of regard. Assessment outcomes indicated that when he was seated in front of the
experimenter in an empty room he consistently followed the line of regard. However, under more naturalistic conditions when he engaged in a preferred activity while the experimenter was engaged in an activity, such as writing on paper, he did not consistently follow the line of regard. Naturalistic conditions were used throughout both experiments.

Pre-Test

A pre-test was conducted to determine which of 13 remote control objects the participant could label. An effort was made to include objects thought to be both known and unknown. The experimenter placed items (one at a time) on the participant’s desk and asked, “What is it?” The experimenter re-presented the objects, in a different order, a second and a third time for a total of 39 trials. Each object labeled by name was scored correct, and the object was defined as “known” if the participant labeled it correctly on any trial. An object was considered “unknown” if the participant failed to label it accurately on all of the three trials it was presented. Six known objects were selected for use in Experiment 1 and six unknown objects were reserved for Experiment 2.

Data Collection

The experimenter collected data for Experiment 1 and Experiment 2, on data sheets designed for each experiment (Figures 3 and 4). A trained observer independently collected IOA data once per week, on baseline, probe, and training sessions.

Sessions

Three two-min training sessions (6-min total) were conducted on most
school days during regular school hours. Following each session, the participant was allowed to take a two-min break to play in the school’s gym. The gym housed a variety of gross motor equipment, including large balance balls, a stationary bicycle, small trampoline, balance beam, tent, parachute, bicycles, scooters, scooter boards, play garage with cars, rock climbing wall, and various other toys and activities.
EXPERIMENT 1

Method

Dependent Variable

The dependent variable was following the line of regard for known objects at target distances ranging between 2 and 9 ft away. Following the line of regard was defined as the participant orienting his head toward a target object and naming it after the experimenter called his name and pointed to one of the target objects in the room.

Independent Variable

The independent variable was an intervention that included prompting and fading procedures with reinforcement for looking at and labeling objects to which the experimenter pointed.

Baseline Procedures

During each baseline session, the six known objects (as determined by the pre-test) were placed approximately 9 ft away from the participant, to his left, to his right, or directly behind him on a table (approximately 4 ft tall), or on the floor. Three objects were placed on tables, one in each location, and three were placed on the floor, one in front of each table. When he entered the room he was immediately escorted to his seat at the child-sized desk. While standing approximately 3 ft in front of the participant and facing him, the experimenter suggested that he engage in preferred activities at his desk. While the participant played, the experimenter engaged in a 1-min writing activity. Then
she said, “____, look”, while pointing and (extending her arm, pointing with her index finger) toward one of the six objects. If the participant oriented (turned his head) toward the specified object, the experimenter asked, “What is it?” If he responded by vocally naming the object, the response was designated as correct. Then 10 s later a new trial began, whether or not the participant looked and named the designated object. If he failed to look and name the object within 10 s, the response was recorded as incorrect. The procedure was repeated until all objects had been pointed to by the experimenter. His response to each object was recorded on the data sheet. Throughout baseline the participant was encouraged with positive comments (e.g., “Nice job,” “Good boy,” “Way to go!”), independent of his performance, and on average after every third trial.

**Intervention Procedures**

Following baseline, systematic fading and prompting procedures were implemented with reinforcement for correct responses. Training began with objects placed 2 ft away. The experimenter called his name, extended her index finger toward one of the objects, and said, “Look.” When he oriented toward the target item the experimenter asked, “What is it?” If he correctly labeled the item the experimenter reinforced that response by activating the toy via remote control for 10 s. If the participant did not orient toward the targeted item, the experimenter activated the toy for 2 s to prompt him to look, repeating the instruction, “____, look” while pointing to the object. If he oriented toward the object and correctly labeled it, the toy was activated again for 10 s; however, if he did not orient toward the object or incorrectly labeled it, the object was not
activated and next trial began after 10 s. Each object was pointed to 3 times/session for a total of 18 training trials. Following the 10th session the number of objects was reduced to 4, because the participant appeared fearful of looking at objects located behind him. Subsequent sessions consisted of 12 trials, with four objects placed in their locations to the right and left on tables and on the floor in front of the tables.

When the participant had looked at and named all objects pointed to (i.e., followed the line of regard) and correctly labeled them in each of three consecutive sessions across all 12 trials (100% of opportunities), the next phase of the intervention began. The target objects were moved back 1 ft (faded) and training continued. Fading continued in 1 ft increments until the participant followed the experimenter’s points on all trials across three consecutive probe sessions when objects were at the targeted distance of approximately 9 ft. Three 2-min sessions/day were conducted during training.

Probe Sessions

The effect of the training was assessed during probe sessions, which were conducted at least 20 hours after the three training sessions of the previous day. Probe sessions were conducted in the same manner as in baseline. Each session consisted of 6 trials, one for each object placed in one of the six locations 9 ft from the participant. Praise (e.g., “Nice job,” “Good boy,” “Way to go!”) was intermittently delivered, independent of his performance, approximately once per probe session. Following the 10th session the number of objects was reduced to four, because the participant appeared fearful of looking
at objects located behind him. Subsequent probe sessions consisted of 12 trials, with four objects placed in their locations to the right and left on tables and on the floor in front of the tables. When all objects placed at the 9-ft distances during probe trials were reliably identified without auditory or visual prompts, the experiment ended.

Results

Trial-by-trial interobserver agreement (IOA) was calculated for Experiment 1 by dividing the total number of agreements by agreements plus disagreements and multiplying by 100. IOA was obtained across 25% of baseline sessions and 50% of training and probe sessions. IOA was 100% for baseline and intervention sessions.

Figure 5 illustrates the participant's performance in following the line of regard for baseline, intervention and probe sessions. The participant's baseline performance was variable with the final four data points below 70%. He followed the line of regard an average of 53% of the times he was instructed to look and name an object 9 ft away by the experimenter. During the course of training, the participant's performance on probe trials rose to 100% for three consecutive data points. These data indicated that the participant was reliably following the line of regard to an object 9 ft away, when both he and the instructing adult were engaged in other activities at the time the instruction was given.
EXPERIMENT 2

Experiment 2 was conducted to determine if the same participant would learn the names of novel objects in the environment by following the line of regard when these objects were at least 9 ft away from him and were named by the experimenter.

Method

Dependent Variable

The dependent variable was defined as expressive and receptive labeling of novel objects (as described below).

Independent Variable

Verbal modeling of object labels was provided during each trial for which the participant followed the line of regard to an object 9 ft away. In addition, auditory and visual prompts, as described in Experiment 1, were used if the participant did not follow the line of regard within 10 s of the instruction, “Look.”

Baseline Procedures

Four of the objects identified as unknown in the pre-test were used. Baseline sessions consisted of 12 expressive language trials followed by 12 receptive language trials. On expressive trials each object was presented on the desk in front of the participant, one at a time, and the experimenter asked, “What is it?” If he named the object using the label designated as the label to be trained, a correct score for that trial was recorded and the next object, presented. If the participant failed to name the object or labeled it incorrectly, an
incorrect score was recorded and the next object was presented. This procedure continued until all four objects were presented three times, for a total of 12 trials.

Receptive trials consisted of placing three of the objects on the table in front of the participant and asking him to select (“Point to,” “Go find,” or “Touch”) the object named by the experimenter. If he selected the target object a correct score was recorded for that trial and the next trial began. If he failed to select the target object or selected the wrong object an incorrect score was recorded and the next trial began. The objects were re-presented in various orders on subsequent trials until all four objects had been presented three times each for a total of 12 trials. Baseline continued until all three trials of each object were tested expressively and receptively for a total of 24 trials.

**Intervention Procedures**

For each intervention session, four unknown objects were placed 9 ft away from the participant, either right or left on a table, or on the floor in front of a table, as in Experiment 1. He was asked to orient toward an object (i.e., follow the line of regard) at the 9 ft target distance; however, in this phase, the experimenter labeled that object while he oriented toward it. The experimenter called his name, pointed to an object, and said, “Look.” When he oriented toward the object, the experimenter said the object’s name and activated the object via remote control for 10 s. If the participant did not orient toward it (i.e., follow the line of regard), the object was activated via remote control for 2 s and the instruction was repeated.
Following the 48th session, one of the four target objects was replaced with a similar object (with the same name but slightly different appearance) because the original object was broken and could no longer be activated by remote control. Although an exact duplicate of the object was unavailable, an object serving the same vocal function as the target object was used (i.e., both the broken object and its replacement were “skateboards.”)

The intervention was revised after the 88th session. At this time the experimenter added a verbal request for the participant to actively respond by repeating the new label given when he followed the line of regard. The experimenter called the child’s name and said, “____, look” while pointing to and looking at the target object. If the participant oriented toward the target object, the experimenter labeled it and activated it (for a total of 10 s) during which time the experimenter asked, “What is it?” The participant repeated the object label and the experimenter labeled the object three or four times during the remainder of the 10 s interval. If the participant did not orient toward the target object, the experimenter activated the object for 2 s and then repeated the trial as stated above. If he did not orient toward the target object, the next trial with a different targeted object was presented.

Another change in procedure was implemented following the 133rd session. At this time the experimenter removed the preferred activities from the experiment. Additionally, the experimenter was no longer engaged in a writing activity. Now, the participant sat at the desk without engaging in any activities. The same procedure was carried out as described above.
Probe Sessions

The effect of the training was assessed in probe sessions, conducted at least 20 hours after an intervention session of 12 trials. Probe procedures were the same as described in baseline procedures for Experiment 2. The criterion set for ending the experiment was 80% correct receptive and expressive labeling of previously novel objects over at least eight consecutive probe sessions.

Results

Interobserver agreement (IOA) was calculated as for Experiment 1, by taking the total number of trial-by-trial agreements and dividing that number by agreements plus disagreements and multiplying by 100. IOA was obtained during 25% of baseline sessions and 50% of training and probe sessions. IOA was 99% (range 90% - 100%).

Figure 6 shows the participant's expressive and receptive labeling performances during baseline and probe sessions in Experiment 2, and also his following the line of regard during training sessions. During baseline the participant followed the line of regard with 100% accuracy, and receptively identified objects correctly on 34% of opportunities. The participant never correctly responded on expressive identification of objects.

During Intervention I, responses of following the line of regard varied, starting at 100% and dropping to 58%, while rates for receptive identification began at zero and rose to 50%. Again, expressive identification never exceeded
During Intervention II in Experiment 2, the participant’s following the line of regard and receptive identification continued to vary, while the pattern for expressive identification rates remained at zero throughout. During Intervention III, variability also marked the participant’s performance. Following the line of regard stabilized at 100% for five consecutive data points but then precipitously dropped to 25% and rose again to 66%. Rates for receptive identification during this intervention followed a similar pattern, increasing to 58% then dropping to 18%. Again, expressive identifications remained near zero throughout.

During Intervention IV, frequency of following the line of regard and accuracy of receptive identification of objects steadily declined. The participant followed the line of regard on 92% of the trials in the first session of the intervention, followed by three sessions of 100% correct. Performance became highly variable over the next several sessions and ultimately dropped to 33% before the experiment was terminated. An analogous pattern appeared for receptive identification of objects in probe sessions. Accuracy began at 58%, climbed to 75% in the second probe session of Intervention IV, and then steeply declined and continued to hover between 8% and 17% over the last 6 sessions. Rates for expressive identification remained at zero throughout Intervention IV.
DISCUSSION

The results of Experiment 1 suggest that it is possible to use prompting and fading with positive reinforcement to teach a child with autism to follow the line of regard to objects that are 9 ft away from him. In 43 2-min sessions, the participant learned to follow the line of regard with four objects at a minimum of 9 ft away. These results extend previous research in autism treatment by demonstrating the effectiveness of a specific training procedure to teach this important skill. In previous experimental interventions, joint attention and following the line of regard were measured as behavioral components of a treatment package. In the present research, the components of the package were taught one at a time to see if acquisition of the earlier component, following the line of regard, would function as a behavioral cusp under the specific environmental conditions outlined here.

According to Rosales-Ruiz and Baer (1997), a behavioral cusp is a special kind of behavior change. Specifically, it is a behavior change that has consequences for an organism beyond the benefits of the change itself. Experiment 2 examined the possibility that achieving the skill of following the line of regard would allow the participant to learn object labels under quasi-natural environmental conditions. In this experiment, when the participant followed the line of regard to one of four novel objects 9 ft away from him, the experimenter labeled the object. This procedure roughly resembles what caretakers typically do in the natural environment of developing children. Variations in the procedure were tried, but the participant did not learn, in the absence of
programmed contingencies, to label 11 of the 12 novel objects. For one of the objects, the data indicate that the participant did learn to identify and label one object. However, his responding was less than 100% accuracy throughout Experiment 2. Therefore, the behavior of following the line of regard did not appear to function, under the conditions of Experiment 2, as a behavioral cusp for this participant.

In Experiment 2, the participant’s best performance occurred in the first two sessions of the last intervention, where receptive identification of novel objects was 58% correct and 75% correct. Expressive identification never rose above 8%, or one correct labeling of an unknown object in a session. When the participant did label an object correctly, it was the same object each time. After his performance high of 75% receptive identification in Session 139, the participant’s performance dropped to approximately 45% over the next several sessions and then in Session 169, to 16%. Performance in the remaining sessions averaged (about) 12% correct.

Following session 197, the experiment was discontinued. The participant was observed, both in the experimental sessions and throughout the school day, to engage in new problem behaviors incompatible with learning this new skill. In addition, data in Experiment 2 on following the line of regard indicated that shortly after his receptive identification performance dropped, he stopped following the line of regard. Rather than continue in a situation where the participant’s newly acquired skill could be further disrupted, Experiment 2 was terminated.
There are several factors that may have influenced this participant’s deteriorating performance in Experiment 2. One such factor may have been a feature of the procedure used in Intervention IV. During this time, the experimenter asked the participant to actively respond (by labeling) the object while the object was activated. That is, the child was prompted to emit a verbal response at the same time that the reinforcer (activated toy) was being delivered. This however, may have prohibited the participant from consuming the reinforcer. In such, the participant’s performance may have been hindered due to this interference.

Additionally, his mother had given birth to twins during the experiment. This event resulted in numerous changes in the participant’s home environment and, over many weeks, was accompanied by many behavior changes, observed both at school and at home. For example, the child began having urination accidents after seven years of appropriate toileting. He also began engaging in self-injurious behavior, such as hitting his head with his hand and crying without clear antecedent stimuli. Whether the changes in the child’s home environment were relevant to his school performance is unknown. What was observed was a correlation between the birth of his twin siblings and deterioration at school of previously learned academic, social, and self-help skills.

The conditions of the experiment, per se, may have accounted for the child’s deteriorating performance. Because of his learning difficulties, the participant’s school environment was characterized by highly structured teaching conditions. The structured procedures of Experiment 1 were consistent with
those conditions, but the more naturalistic conditions of Experiment 2 may not
have provided him with enough structure to allow learning of the particular
behavior being taught. Before performance deteriorated in the final sessions
conducted, there was evidence of some learning, after the procedures became
more structured.

Given the results of Experiments 1 and 2, it is recommended that further
research be continued on the use of prompting and fading to teach following the
line of regard and understanding behavioral cusps. There are several areas
researchers might consider for future studies. First, increasing the number of
participants would be useful in validating the procedure’s effectiveness. The
more participants who learn to follow the line of regard using this procedure, the
more reliable this teaching procedure becomes. Second, including a
generalization probe for novel objects across people and across settings would
determine the generalizability of the procedure’s usefulness. Such measures
should include other adults and environments, especially the natural
environment.

A third suggestion for future research would be to determine if following
the line of regard is a behavioral cusp for learning new object labels for other
children with autism. Further investigations could determine what behaviors a
participant must demonstrate to follow the line of regard in order to be
considered a behavioral cusp. A more general research question might ask
whether children with autism who learn to follow the line of regard will acquire
language at a faster rate than those who do not learn that skill.
Figure 1. Photographs and trademark information for known objects.

1. Sanyo ® Remote Control TV/VCR (Sanyo, North America Corporation, San Diego, CA)

2. Echo ® Radio Control BMX Bike (Echo Toys Ltd., Hong Kong)

3. Sesame Street ® Remote Control TV (Mattel, Inc., New York, NY)

4. Tonka ® Fins Vehicle with Figure (Hasbro, Pawtucket, RI)

5. Marvel ® Mega-Armor Remote Control X-Men (Marvel Enterprises, New York, NY)
Figure 2. Photographs and trademark information for unknown objects.


3. **Battlebots® Custom Series Radio Control Vlad the Impaler Battlebot** (Hasbro, Pawtucket, RI)

4. **Disney Pixar® Toy Story 2 Woody w/RC** (Mattel, New York, NY)

5. *** Echo® Remote Control X-Board Skateboard** (Echo Toys Ltd., Hong Kong)

* This object was removed from the study after the 10th trial and was replaced with object #1 above.
Randomly place the objects in their locations to the right and left. After 10 s say, “____ look” while pointing and looking at the first object identified on the data sheet. If he looks ask, “What is it?” If he labels correctly activate the toy for 10 s. Record a “yes” in each box. If he doesn’t look, activate toy for 2 s and ask, “What is it?” If he label correctly activate toy for 10s. If he labels it incorrectly wait 10s and move to the next trial. Record “no” in each box.

2 m break between sessions. Rotate objects prior to next session.
Figure 4. Data sheet used in Experiment 2.

Participant name______   Date____________
Observer name_______   Treatment Phase ________

Receptive Identification:
In a field of 3 objects, the participant will select the correct target object.
Instruction: “Point to _____”

Expressive Identification:
Place one object on the desk in front of the participant
Instruction: “What is it?”

<table>
<thead>
<tr>
<th></th>
<th>Receptive</th>
<th>Expressive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woody</td>
<td>___ ___ ___</td>
<td>___ ___ ___</td>
</tr>
<tr>
<td>Tank</td>
<td>___ ___ ___</td>
<td>___ ___ ___</td>
</tr>
<tr>
<td>skateboard</td>
<td>___ ___ ___</td>
<td>___ ___ ___</td>
</tr>
<tr>
<td>Engine</td>
<td>___ ___ ___</td>
<td>___ ___ ___</td>
</tr>
</tbody>
</table>
Figure 5. A line graph for following the line of regard.
Figure 6. A line graph for object identification.
REFERENCES


