EVALUATION OF A TRAINING PACKAGE TO TEACH CHILDREN WITH AUTISM SPECTRUM DISORDER TO ASK "WHO" QUESTIONS

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CERTIFICATION OF APPROVAL

EVALUATION OF A TREATMENT PACKAGE TO TEACH CHILDREN WITH AUTISM SPECTRUM DISORDER TO ASK "WHO" QUESTIONS

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ABSTRACT

Children diagnosed with an Autism Spectrum Disorder (ASD) often have trouble initiating social interactions. Deficits include omission of questions which are mands for information. This pragmatic language skill may be especially difficult to establish because the presumed motivational variables related to their occurrence may be low or absent in children with this diagnosis. This study evaluated the effectiveness of a training package to teach "who" question asking to four children aged 4 years who were diagnosed with autism. The training package presented three types of training stimuli: icons, photographs, and videos. Icons were used to teach the syntax of asking "who" questions. Photographs were altered to contain the silhouette of a person and videos showed a partially obscured individual in order to arrange for contact with the consequences that may maintain this type of question asking. Contrived *in vivo* probes were conducted to assess generalization to more naturalistic situations. Results from pre-training measures showed that the children infrequently asked "who" questions, regardless of stimulus type. Once training began, all of the children met mastery criteria in less than seven training sessions. Furthermore, three of the four children asked at least one "who" question during the *in vivo* probe trials during training and 3 of the 4 children asked "who" questions during the post-training *in vivo* assessment. The average number of words per trial also increased by at least one word for all four children. Finally, the percent correct syntax improved for all 4 children following delivery of the intervention package.

EVALUATION OF A TRAINING PACKAGE TO TEACH CHILDREN WITH AUTISM SPECTRUM DISORDER TO ASK "WHO" QUESTIONS

Typically developing children ask questions about their environment and they do this even before complex language is acquired (Callanan & Oakes, 1992; Kemler Nelson, Chan Egan, & Holt, 2004). Questions such as "Mama?" to inquire where their mother has gone or "What's that?" to ask about an object are typically observed in children by two years of age. Although not complex, the sentence structure tends to identify the establishing operations in effect. By the time children enter preschool, questions have become more defined and complex.

Valuable information can be learned through asking questions about items that are unfamiliar to individuals. Not only can asking questions increase information learned about parts of the environment, but it can also lead to further social interaction and increase the child's vocabulary (Shillingsburg, Valentino, Bowen, Bradley & Zavatkay, 2011).

The underdevelopment of language is often one of first signs noticed by parents of children who are eventually diagnosed with Autism Spectrum Disorder (ASD). This deficit is so widely seen that it has until recently been part of the formal diagnostic criteria. For example, The Diagnostic and Statistical Manual of Mental Disorders 4th edition revised (DSM IV-TR) stated that the "delay in or total lack of, the development of spoken language (not accompanied by an attempt to compensate through alternative modes of communication such as gesture or mime)" (p.75). If the child does have spoken language, according to the DSM IV-TR, she often has

difficulty initiating and sustaining conversations with other people. Minkin et al. (1976) were among the first to note that question asking is one of the three key components in a conversation. Individuals who lack question asking in conversations or do so infrequently were rated as poor conversers. In children diagnosed with autism, question asking is a skill that is typically delayed (Koegel, Koegel, Green-Hopkins, & Carter Barns, 2010; Ostryn & Wolf, 2011; Shillingsburg, Valentino, Bowen, Bradley, & Zavatkay, 2011; Taylor & Harris, 1995).

Since question asking is a skill that does not always develop independently in children with ASD, researchers and clinicians alike have sought ways to establish this skill. Charlop and Milstein (1989) were among the first to experimentally evaluate interventions for this skill. They taught three boys between the ages of six and seven years and diagnosed with autism conversation skills using video modeling procedures. Their procedure taught question asking in the context of a conversation as opposed to isolated situations in which a single question was asked. Their results showed that this intervention helped the boys maintain a conversation and encouraged generalized question asking to topics that were not taught in the videos. Maintenance of question asking was also reported several months after the study was completed.

Similarly, Taylor and Harris (1995) taught two 9 year-olds and one 5 year-old to ask the question “What’s that?” while pointing to unknown items displayed on a table in front of them. They also wanted to see if the children would learn novel information from asking questions. Once these phrases were learned, the children were taught to ask questions while walking around their school. Unknown objects

were placed around their school environment prior to taking a walk with their instructor each day. As they walked they would briefly pause (about 1 s) in front of the unknown items. During training trials, the question “What’s that?” was modeled until the child independently stated the question. All three children began to ask questions about novel stimuli while in the school setting and acquired novel labels from their environment.

Williams, Donley, and Keller (2000) further evaluated ways to teach this skill and taught two 4-year-old children diagnosed with autism to ask three separate questions regarding objects located in a box. The first question (“What’s that?”) gave the child access to the name of the item. If the child then asked the second question (“Can I see it?”), the child was allowed to look at the item. If the child produced the third question (“Can I have it?”), the child was allowed to hold the item. Both children learned to ask questions about hidden objects which generalized across settings and people. This was important because each question type produced a different response. If the child wanted a specific response (e.g., the child wanted to hold the item instead of see it), the child needed to ask the correct question. Each child was able to demonstrate correct question asking after the study concluded. Williams et al. (2000) were also able to teach children to ask different questions to acquire different answers.

Concerns were raised, however, that the questions taught in the Williams et al. (2000) study consisted of teaching a single response class or a response sequence

and that the questions are not operant's maintained by their own specific consequences. To ensure that the children's responding emerged under the proper controlling variables, Williams, Perez-Gonzalez, and Vogt (2003) conducted a follow up study. They wanted to extend the previous findings by making sure that each question was asked independently of the first. In other words, the issue was to try to determine if the questions served the function of seeking information or were merely a chain of behaviors leading to one consequence. Once all questions were taught, question asking was followed by reinforcement only when it involved the other two types of questions but not when the response was "Can I see it?" At other times, "unpleasant" objects such as insects were placed in the box. When the child asked the first question "What's in the box?" they were given the answer (e.g., a spider). They found that the children did discriminate among the three different types of questions when one of the three was placed on an extinction schedule. Also, when "unpleasant" items were presented, the last two questions ("Can I see it?" and "Can I have it?") were seldom asked. The results indicated that the questions were used to seek information and that the children discriminated each question type and were maintained by the relevant controlling relations.

When children with autism are first taught to mand for valued items, primary reinforcers are often used initially. The item they have shown interest in may be placed in front of the child. A word may be modeled and then the item provided to the

child after imitating the model. Thus given the presence of a strong establishing operation, the specific reinforcer is provided for the specific response.

However, the reinforcement for mands for information may be absent or weak in individuals with this diagnosis, likely reflecting something about the nature of autism. In these circumstances, the behavior is not maintained by a potent reinforcer as it would be when manding for an item such as water when thirsty; if the information has reinforcing properties, it is likely weakly conditioned. As seen in the Williams, Perez-Gonzalez, and Vogt (2003) study, producing the question, “What is in the box,” only provided access to the information. The children were unable to see or have access to the item unless they asked the appropriate question. The information they received either helped them identify if they wanted to ask another question (e.g., “Can I have it?”) or decreased the chances of them asking another question (there was an unpleasant item in the box).

While questions which are mands for specific items clearly have survival value, it is also important to children to mand for information. In fact it could be argued that manding for information is a behavioral cusp. According to Bosch and Fuqua, 2001, a behavioral cusp provides access to new reinforcers or environments, has social validity, is generative, competes with inappropriate responses, and benefits others. Teaching children to mand for information meets each of these criteria. Also, once they have learned to acquire information through question asking, they can

continue to directly assist in their own learning by acquiring new information. This would be a desirable lifelong skill.

It is hypothesized that typically developing children begin to ask questions to acquire novel information about their environment (Shillingsburg, Valentino, Bowen, Bradley, & Zavatkay, 2011). Their motivation seems to come from acquiring this new information because it helps gain access to new environments and additional reinforcers, including social interactions. In children with autism, however, the behavior of asking questions to seek new information is often weak. One reason could be that acquiring new information has weak reinforcing properties. That is, the act of asking a question and receiving an answer does not provide sufficient reinforcement to maintain this skill.

In general when individuals diagnosed with autism are taught new skills, the reinforcer for providing the correct response often includes some type of tangible item (e.g., a food item, access to a preferred toy). These items are preferred enough by the individual to help maintain the behavior but may be supplementary and not related to the typically available consequences in more natural environments. Over time, the tangible reinforcement for performing the wanted behavior is thinned until the child is performing the behavior without the tangible reinforcement. When teaching children with autism to ask questions, one approach might be to thin the schedule of reinforcement involving the delivery of supplemental, tangible items with the premise that the social interactions themselves, or the information derived from

them, would eventually come to provide sufficient reinforcement to maintain this behavior. This approach is in contrast to the more "naturalistic" described by Koegel and Koegel (2005) called Pivotal Response Training. However, no direct comparison has been made with respect to evaluating these two approaches against one another along this particular dimension.

Because typically developing children acquire simple question asking at such a young age, it is likely important to begin teaching children diagnosed with autism to ask simple questions as soon as possible. "That?" or "What's that?" is one of the first types of questions that emerge in typically developing children and is often one of the ones taught first to children who have deficits in question asking. Koegel, Camarata, Valdez-Menchaca, and Koegel (1998) taught two 3-year-olds and one 5-year-old diagnosed with autism to ask "What's that?" by incorporating motivational techniques such as, letting the child lead verbal interactions with their interests and utilizing rewarding consequences for question asking. They also assessed whether this skill would generalize to novel objects, people and settings. They found that all of the children learned to ask the question in response to previously unknown items even when the schedules for delivery of reinforcing items were thinned. This skill generalized to their home environment with their mothers as well.

Although most studies have focused on teaching somewhat older children with autism to ask questions, others have attempted to teach preschool aged children the same question asking skill in hopes that learning at a younger age will help the

child's generalization (Koegel, Camarata, Valdez-Menchaca, & Koegel 1998; Ostryn & Wolfe, 2011). Another study conducted by Koegel, Koegel, Green-Hopkins, and Carter-Barns (2010) assessed whether two 3-year-old children and one 4-year-old child diagnosed with autism could be taught to ask the question "Where is it?" in the appropriate context and whether the question would generalize to more natural settings. They found that the question asking skill was quickly learned when paired with preferred items. It also generalized to the natural setting. This study provided evidence that younger children diagnosed with autism can be taught to ask questions in the appropriate context and can be extended outside of the training setting.

Pictorial prompts (prompting through pictures) have also been used to teach various skills. Pictorial prompting is an effective method of teaching a skill because it provides the individual with a visual aid to reference. Once the individual has learned the skill, the visual prompt can be faded. Some researchers have used pictorial prompts with other clinical populations to teach vocational skills, microcomputer skills, and daily living tasks (Frank, Wacker, Berg, & McMahon, 1985; Wacker & Berg, 1983; Wacker, Berg, Berrie, & Swatta, 1985). Others have used icons or stylized pictorial prompts to increase novel phrases (Zwitman & Sonderson, 1979). Fischer, Howard, Sparkman, and Moore (2010) used such an approach to increase sentence complexity and syntactically correct verbal responses with four preschoolers diagnosed with autism. Prior to training, each child produced 1-2 phrases per picture. After the intervention utilizing pictorial prompts, each child averaged six words per

picture and produced novel sentences to novel pictures using more complex sentence structure and correct syntax.

The current study extends both the methodology and scope of that utilized in Fischer et al. (2010) by evaluating the effectiveness of an intervention package using icons, photographs, and videos to increase "who" question asking in four children diagnosed with autism. Generalization to more naturalistic contexts and potentially more commonly found controlling variables was measured during *in vivo* trials prior to, concurrent with, and following the delivery of the training package.

Method

Recruitment Procedures and Participant Selection

Participants

A flyer was provided to clinical staff of a non-public agency (NPA) that utilizes applied behavior analysis to treat children diagnosed with Autism Spectrum Disorder (Appendix A). Participants had to be between the ages of 3-5 years, have a mean length utterance of 4-5 words, but also ask few "who" questions. Once clinical staff members identified children thought to meet the prerequisite skills, a packet was distributed to their parents. The packet contained an overview of the study, the informed consent form, a page noting foods and other potential reinforcers the child would be allowed to receive through the course of the study (Appendix B). The researcher met in person which each parent or addressed questions through email or by phone.

Four boys and one girl with an ASD diagnosis of Autistic Disorder or Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS) were identified by the staff and parents as potential participants of the study. One participant was later excluded from the study due to "who" question asking during the pre training assessment. Therefore, three boys and one girl participated in the study: Lucas, Zander, Josh and Anna. At the time of the study, Lucas was four years, eight months, Zander was four years, five months, Josh was four years, nine months, and Anna was three years, 11 months. Lucas was enrolled in a general education preschool five mornings a week while Josh participated in a general education transitional kindergarten classroom, also five mornings a week. Zander attended a general education preschool three mornings a week while Anna attended a general education preschool two mornings a week.

Lucas, Zander, and Anna's previous language and cognitive scores were reviewed prior to beginning the intervention. When standardized testing is used, each child receives a standard score (ss) based on his or her performance on the test. From this score, one can identify how many standard deviations the child is from the mean (m = 100). When a child's standard score falls within 85 – 115, he or she considered in the average range. If the child's score falls between 84 – 69, he or she is one standard deviation below the mean and is considered in the below average range. If the child's score falls between 68 – 53, the child is two standard deviations below the mean and falls in the low range. Likewise, if the child's score falls within 116 – 131,

he or she is one standard deviation above the mean and is considered above average. At 2 years, 10 months of age, Lucas' language scores showed that he was below average (ss = 74, which places him one standard deviation below the mean). Cognitive testing revealed he was in the above average range. Prior to beginning the intervention, Lucas had been enrolled in the early intervention program for 1.5 years. Zander's language was assessed at 2 years, 11 months of age and placed him in the low range. At 4 years, 7 months Zander's cognitive ability was tested which placed him in the high average range. Zander had been enrolled in the early intervention program for 1 year before the study began. Anna's language was assessed at 2 years, 5 months of age and placed her in the average range (ss = 89, placing her in the normal range). Her cognitive scores also placed her in the average range (ss = 95). Prior to starting the intervention, Anna had been enrolled in the EIBT program for 1.5 years. In addition, all of the children had previous experience using similar icons from the Fokes Sentence Builder Kit (Fokes, 1976, 1983) through their intervention program. Fokes Sentence Builder is used by speech and language pathologists to expand declarative sentences. A prerequisite skills assessment was given to each child prior to starting the training which included showing them each of the picture icons (Fokes "who" labels) and picture location icons (Fokes location icons) to ensure they could correctly label them. All answers provided were recorded on the prerequisite skills assessment data sheet (Appendix C). Any missed labels for icons or location icons were taught to mastery criteria by teaching them in a discrete trial format.

Mastery criterion was defined as correct responses for 80% of 10 trials across two sessions.

Setting and Materials

Sessions were conducted individually in a room containing a child-sized table and chairs. A portable video camera was set up in the room hidden underneath a tissue so that the children were not distracted by its presence. Whenever possible the sessions were video recorded. A token board containing 10 tokens with picture icons of reinforcers was also present. Once the children earned all the tokens they exchanged the tokens for a toy or edible reinforcer provided by the staff at the center. Five different types of stimuli were utilized in the study: 20 picture icons, 31 picture location icons, 24 "who" photographs, 24 control photographs, 15 videos, and ten *in vivo* probes. The picture icons were pulled from Fokes Sentence Builder (Fokes, 1976, 1983) and were used to teach correct "who" question syntax to the children. The "who" card contained a bold question mark and the location icon depicted a location with a bold "X" somewhere in the picture. Therefore, if there was a "who" icon next to a location icon with a picture of a tree with an "X" in it, the correct response would be "Who is in the tree?" These icons were used in the baseline and training phases only. See Figure 1 for sample icon.

The "Who" photographs and control photographs were created by selecting a scenic background, similar to places the children may see in their everyday life (a doctor's office, a garden, McDonald's, etc.). Silhouettes of a person were then added

to each “who” photograph. The control photographs were left unaltered and contained only the scenic background. These photographs were used in all phases of the study. See Figures 2 and 3 for an example.

The videos were especially created for this study and presented on an iPad®. Each video was 5 s in duration and showed a familiar, but partially obscured, person engaged in some activity. All persons shown in the “who” videos were members of the staff at the intervention center. An example of a video could be a staff person standing at a sink with their face hidden by a hat. This video was designed to evoke “Who is at the sink?” These videos were used for all phases of the study. See Table 2 for a brief description of each video.

The fifth type of stimulus measured generalization and involved an *in vivo* scenario presented during probes and the pre-post training assessments. *In vivo* trials took place at the intervention center for all participants. These scenarios were preplanned and similar to the scenarios depicted by the icons and photographs and videos. During this time, two staff members were present, the trainer and the one whose body or face was obscured. For example, one adult lowered the upper part of their body so that it was under a table prior to the child entering that area. Upon entering, the other adult gave the child an “expectant” look, defined as having the chin tilted down with an eye brow raised while looking at the child and waited for the child to respond. Generalization probes were conducted during the pre/post assessments, baseline and training phases.

The five types of stimuli were used to create the three stimulus sets for the study. This was done so that each condition used separate stimuli. Stimulus set A contained five "who" photographs, five control photographs, five videos and five *in vivo* probes while and stimulus set B contained 20 icons, 31 location icons, eight photographs, eight control photographs, five videos, and five *in vivo* probes. Stimulus Set C contained eight photographs, eight control photographs, and five videos. For Stimulus Set 2, two separate lists were generated for each stimuli type so as to change the order presented to each participant. Therefore, participants all saw the same stimuli within this set but they were presented in different order per participant. So, for video clips, one participant may have started by seeing a video of someone on a swing while another participant saw a video of someone on a slide. Both were within the same set but the order of presentation was changed. (See Table 1 for a description of specific stimulus sets using during all phases of the study).

Design

The study utilized a multiple baseline across participants design. Each participant began baseline in August and finished training by the end of September and all sessions took place in the same room of the NPA.

Independent Variable

The independent variable in the current study was the training sequence with icons, photographs and videos used to teach the correct "who" question format to each child.

Dependent Measures

1. **Correct, unprompted "who" questions.** Whenever a child initiated an appropriate "who" question in response to an icon, "who" photograph, video, or *in vivo* probe during pre-post training assessments, baseline, training, and maintenance phase. In order to be scored as correct the child's response had to begin with "who" and correctly label features of the situation ("under the desk" or "wearing the hat").

2. **Correct, unprompted descriptive responses to control photographs.** Unprompted responses to control photographs were defined as any instance where the child made a comment about the control photographs instead of asking a question during the pre-post training assessment, baseline, training, and maintenance phases. In order to be correct the child had to describe features of the photograph as opposed to asking a question.

3. **Number of words per trial.** The number of words per trial during the pre-post training assessments, baseline, training, and maintenance phases were measured by counting the words that each child emitted for each set of icons, photographs, videos or *in-vivo* probes. Word fillers or repeated words were not counted.

4. **Percent correct syntax.** Percent correct syntax during pre-post training assessment, baseline, training, and maintenance phases was defined as the amount of time each session that each participant correctly stated all parts of the question. Percent correct syntax was scored on a three point scale with three being the most points the child could obtain. One point was given to each question part spoken correctly (i.e., subject, predicate, object). For example, if the child stated “who /is/ in the tree” he received three points since he correctly stated all parts of the sentence. If the child stated “who /is/ the tree” he received two points since he omitted the predicate. If the child stated “who / in tree” then he received one point since several parts were left out of the sentence.

Procedure

Pre- training assessment. A pre-training assessment was conducted utilizing Stimulus Set A (see Table 1). This set was only used during the pre- and post-training assessments. It included five *in vivo* trials presented over a period of 30 minutes and interspersed with five photographs, five control photographs and five videos. During this time, each child was provided with breaks; reinforcers were assessed frequently to maintain attending and appropriate table behavior. The experimenter provided each child with an “expectant” look and a point to the picture to obtain the child’s

response. No prompts were given nor were any corrections provided. All responses were recorded on the pre/post training assessment datasheet (Appendix D).

If the child asked an appropriate “who” question, the researcher responded by answering the question (e.g., “the boy is in the tree” or “the man is at the door”) and showing the picture or video of the actual person, community helper or character. Therefore, the picture of the silhouette or the video with the persons face hidden was removed and the child was able to see the face of the individual. This was done to ensure that the question asking behavior was not extinguished by not receiving an immediate answer. Tokens were provided for appropriate sitting and following directions rather than correct answers and were exchanged at the end of a session for an item that the child identified at the beginning of the session. The next trial began following a response or after 5 s had elapsed but no response was made.

Baseline. Baseline began one month after the pre-training assessment was completed. Each session was 12 trials and typically occurred in the afternoons since the children were at school in the morning. Also, each session was composed of the following types of stimuli in the following order. Icons were presented during trials one through three and six through eight, photographs were presented every fourth and ninth trial, control photographs were presented every fifth and tenth trial, and videos were presented as the last two trials of each session. Stimulus Set B was used during all baseline and training phases (see Table 1). Sessions were conducted daily by the experimenter for Lucas, Zander, and Josh and three times a week for Anna due to her

school schedule. Sessions lasted between 10-15 m and consisted of 12 trials as described below. Baseline conditions were similar to the pre-training assessment except for the inclusion of trials with icons. Data collection lasted until the baseline data were stable. The researcher had the baseline data sheet (Appendix E), a token board consisting of 10 tokens, and the choice icons. When each child received all their tokens they were able to trade their token board for the item they chose. All twelve trials were completed prior to the child earning all 10 tokens. Tokens were again given for compliant behavior but not for correctly asking the question. If the child asked a question correctly, the appropriate response was given (e.g., "The pilot is at the door" and then the picture or video of the pilot was shown) so the behavior was not extinguished. Tangible and social reinforcement for asking the question was not given. Also, some modifications were made during sessions to help with participant attention to the stimuli. For all participants, a finger sweep from the first icon to the last icon was introduced during the baseline phase. This was done to help the children track the pictures and ask a question or make a statement. As sessions progressed, the sweep was removed and only the expectant look was used as the discriminative stimulus.

Training. Stimulus Set B was used during training (see Table 1). Icons, photographs and control photographs were arranged horizontally in front of the child during each session and used during the first 10 trials of each session.

At the beginning of each session, a “who” question card was placed on top of a “who” icon stack. The location icon stack was placed on the right side of the “who” icon stack on the table. Other cards containing pictures of people were within the same set under the “who” card (see Figure 1). Before each training trial, the icons were placed in front of the child and the experimenter pointed to the stack while giving the child an “expectant” look. As during baseline, icons were presented during trials one through three and six through eight, “who” photographs were presented every fourth and ninth trial, control photographs were presented every fifth and tenth trial, and videos were presented as the last two trials of each session. If an *in vivo* probe was conducted during that session, it occurred after the last video was viewed. A progressive time delay prompt was utilized to teach the correct question form. As sessions increased in number, the time delay increased until it reached a 3 s delay. During the first two training sessions, a verbal model of the correct question was given to the child. As the training sessions continued, the time delay increased by one second. Therefore, the third and fourth training sessions began on a 1 s delay; the fifth and sixth began on a 2 s delay and the seventh on a 3 s delay. This progressive time delay gave the child time to ask the question independently after the “expectant” look was given. Tokens and praise were given for correct question asking during this condition. Also, if the child asked the question correctly, they were shown the answer to the question for the icons, photographs, control photographs, videos and *in vivo* probes. It should also be noted that during session 14, a “Where is it” prompt was

introduced for Zander prior to providing the expectant look. This was utilized to help with overall fluency when asking each question.

If syntax errors, word omissions, label errors, or articulation errors occurred, the trainer modeled the correct sentence form and then had the child imitate the model. If the child incorrectly named a label, the trainer presented a three step correction procedure which included prompting the correct response and practicing the correct response independently. These errors also did not prohibit the child from reaching mastery criteria but were corrected. So, if the child correctly asked a question but incorrectly named a label or emitted fluency errors, the errors were corrected but the trial was counted as correct since they appropriately asked a question or made a comment depending on which stimulus they saw.

Maintenance. A maintenance phase was conducted two weeks after the child mastered the question format in the training sessions. The researcher utilized Stimulus Set C during this phase only (see Table 1) and the maintenance data sheet (Appendix F). The maintenance phase was conducted exactly like the training phase except a progressive time delay prompt was not used. This allowed the child to independently respond when the question or statement was known. Photographs, control photographs, and videos were used throughout this phase but icons were omitted. If the child produced the correct question, then he or she was shown the answer and was provided with verbal praise and tangible reinforcement. Each session started on a 3 s time delay prompt and the phase was mastered when the child answered correctly

80% or better across two sessions. If the child produced an error during the maintenance phase, the same training phase correction procedure was used. Likewise, if the time delay lapsed, a verbal model was provided.

Post-training Assessment. A post-training assessment was conducted two days after the maintenance phase was mastered. It was administered identical to the pre-training assessment and used the same stimulus set as the pre-training assessment (Stimulus Set A).

Treatment integrity. Treatment integrity was collected on 50% of the training sessions. Overall treatment integrity was 100%. An assessment tool was created by the researcher that focused on ensuring stimuli were set up prior to starting session, stimuli were presented in the correct order, data were recorded correctly, and the correct second delay was followed. An independent observer viewed the taped sessions and used this assessment tool to rate the researcher across training sessions (See Appendix G for full assessment tool).

Inter-observer agreement for the dependent measure. Inter-observer agreement was collected for 55% of the sessions. This was scored by an independent observer who watched all taped sessions and recorded what the child stated or asked per each trial. The independent observer then went through and calculated the number of trial by trial agreements between he and the researcher and then divided that by the number of trial by trial agreements plus disagreements and multiplied by 100. Overall IOA across participants, sessions and phases was 88%. Lucas' individual IOA across

sessions was 84% while he ranged from 82.5%-85.4%, while Zander's was 82% with a range of 78.2%-84.2%. Josh's overall IOA was 91% while he ranged from 81.3%-100%, while Anna's was 91% with a range of 82.5%-100%.

Results

All four participants completed all phases of the study. Mastery was reached after an average of six training sessions conducted over a period of five weeks. Josh required the fewest training sessions (5) while Zander required the most (7).

Figure 4 shows the percentage of correct unprompted "who" responses during baseline, training and maintenance conditions. This graph combines data for the three types of training stimuli (Icons, Photographs, and Video). Data from *in vivo* probes are plotted separately. During baseline the children asked few "who" questions to any of the stimuli. Josh, Anna and Lucas did not ask any "who" questions during the trials, while Zander averaged a question on only 18% of the opportunities. However, all four children began to ask questions by the third training session and all met the 80% mastery criteria within seven sessions. In addition, each of the children generally continued to perform at mastery level (80% or better across two sessions) during the maintenance sessions. Lucas, Josh, and Anna met mastery over two maintenance sessions, which was the minimum; Zander required only one additional session to meet these same criteria.

Figure 4 also shows that prior to training, none of the children asked "who" questions during *in vivo* probes. Once training began, Zander, Josh, and Anna all

asked at least one “who” question during the training sequence which consisted of one *in vivo* probe a week. In addition, this behavior was also observed during the post-training assessment with the *in vivo* trials for Lucas, Zander, and Anna. Although Lucas was not observed to ask a “who” question during the training sequence he responded to four out of five *in vivo* probes during the post assessment. Josh was the only child who did not to ask any “who” questions during the post-assessment *in vivo* trials although he was observed to ask a “who” question during training sessions. See Table 4.

Type of training stimuli. Figure 6 shows the percentage of correct responses to the different training stimuli: Icon data (closed triangles), photographs (open square) and video (x) for all participants across all phases and conditions. In general, there was no differentiation in terms of correct responding related to the type of training stimuli.

Number of words per utterance and percent correct syntax. In addition to increasing the percentage of trials during which correct, unprompted “who” question asking occurred, the number of words used on each trial also increased. Table 5 shows that words per utterance increased a minimum of 50% for each child from pre- to post-training assessment. This is an average increase of at least one word per each child.

Gains were also noted in the percentage of correct syntax used. Figure 7 shows that during baseline none of the participants demonstrated utterances that were

greater than 60% correct in syntax but during the training and maintenance phase, three of the participants averaged at least 80% correct syntax.

Control Photographs

Figure 5 presents the percentage of correct responses to control photographs across all conditions and phases for all of the children. For each of the control photographs, the child was taught to make a comment about the picture instead of asking a question about the picture. While variable, it shows that each of the children produced high levels of correct responses to stimuli designed to evoke descriptive statements rather than "who" questions (absence of silhouette of person) throughout all phases of the study.

Discussion

In this study, four children with an ASD diagnosis were taught to ask "who" questions in response to several types of pictorial prompts delivered as part of a training package. Responses to *in vivo* probes and pre-post training assessment provided evidence of generalization from the training package. During the post-assessment, all participants began responding to photographs and videos not seen during training. Likewise, three of the four participants responded to *in vivo* probes during the post-assessment. Although utilizing pictorial prompts to teach question asking is not widely seen, these findings support previous studies (Koegel et al., 1998; Ostryn & Wolfe, 2011; Koegel et al., 2010; and Taylor and Harris, 1995) where question asking was trained to specific stimuli and generalized to novel people, places

and stimuli. Overall, the training procedure appeared to be effective in teaching question asking.

In addition to generalization to familiar or untrained stimuli, Lucas, Josh and Zander were also observed to ask “who is it” when presented with persons in the pictures that were unfamiliar. For example, when they were shown the answer to a video or photograph, they would ask “who is it” or “who is that” if the character or community helper pictured was not familiar to them. This additional question was not prompted or reinforced outside of the answer to the question being given (e.g., it’s a delivery man). Also, when this additional question asking began with Lucas, he began requesting additional information by stating “what is it” but as sessions progressed he began asking “who is it” instead to request the identity of the person or character. Zander was observed to ask “who is it” even when he knew who the individual was (e.g., people around the treatment center that were known to him). Anna did not show this additional generalization in the form of asking “who is it.” However, she was observed to ask “what is it” when seemingly attempting to gain the answer to which person or character was shown.

This training package was designed to teach the appropriate syntax and promote generalization. Syntax was targeted by arranging the stimuli in a linear format in front of the participant, similar to reading a book. This format was similar to the language training that each child previously received while expanding declarative sentences with Fokes stimuli; therefore, they were able to learn the new

question structure easily. Each session was set up to teach the correct question format, show the difference between question evoking stimuli and non- question evoking stimuli and to promote generalization.

The juxtapositioning of the icon trials with photographs and videos may have helped encourage the participants to generalize the syntactical response forms to these examples. Lastly, frequency of sessions may have contributed to the effectiveness of the current teaching method. Three of four participants had sessions daily (unless unavailable due to absence) and the fourth received sessions three days a week.

Training was also relatively brief. Sessions lasted at maximum, 15 minutes. Given that all participants mastered the training phase between five and seven sessions, this means that participants were able to master correct question asking in approximately two hours of training time. The rate at which the skill was acquired makes this teaching procedure an effective way to teach question asking to children with an ASD diagnosis. The quicker a skill is acquired and generalized, the more ready the child is to continue building upon that skill. By learning to ask questions in a controlled environment that includes generalization, the child is able to practice the skill and receive reinforcement for using the skill appropriately.

Some concerns have been raised that when teaching question asking to children with an ASD diagnosis, we are teaching a narrow response class where the child is not learning to ask questions to maintain a specific consequence. However, as seen in the Williams et. al (2003) study, generalization was seen throughout the

current study in the form of asking questions to untrained *in vivo* probes and by additional question asking to unfamiliar characters or community helpers in the photographs. Three of the four participants generalized asking "Who is it" to the people or characters in the pictures that were unfamiliar to them. Since this phrase was never modeled for the answer to the people or characters in the pictures, this shows that generalization did occur. Likewise, all participants responded to *in vivo* probes at some point throughout the training sequence. Three of the four participants also responded appropriately to 60% or more opportunities during the post-training assessment. Although Josh did not provide questions to the *in vivo* probes during the post-training assessment, he did respond correctly on one occasion to an *in vivo* probe during training.

Although the current study involved "who" questions, future research could examine how this training package could be adapted to teach other types of questions such as "what" (What is in the tree?) or "where" (Where is the box?). These are both additional question types that we ask daily. Teaching these forms would be another way to expand the child's question repertoire. Future research should also look at using this format to teach a specific question (e.g., "what") and then see if it generalizes to alternative question types (e.g., "who" or "where"). For example, can teaching "what" in this format lead to also mastering "who" through video trials and *in vivo* probes only? Lastly, the training sequence utilized in this study to teach question asking was very specific. Future research should look at analyzing the

various stimulus types to see which, if any are more effective or promote quicker generalization. For example, one could also use icons for descriptive statements and additionally add in control videos and control *in vivo* probes. This way, the children are exposed to various forms of stimuli that may or may not evoke a question. The current study only looked at control photographs but interspersing control icons, control videos, and control *in vivo* probes may also be a good way to help the children discriminate between asking a question and not asking a question.

There were several limitations to this study. Although asking "who" questions generalized to the *in vivo* probes, these were still conducted in the clinical context. There is no evidence that the children generalized this skill outside of their session or to alternative settings. Each child was able to ask a question to an *in vivo* probe at some point during the study, but this was to specific stimuli and probes that were set up to be similar to the training stimuli. In different contexts or situations, the children may not ask a "who" question since it was not set up with a similar topography. Along these lines, we know that children with an ASD diagnosis often have difficulty generalizing newly learned skills to new locations, new people, a new discriminative stimulus and new stimuli. The same could be true here. Although each child demonstrated this skill with the researcher across several sessions and to different stimuli, there is no evidence to support that this skill continues to be demonstrated outside of the study in other contexts or with other people. This skill may need to be taught in multiple contexts with several SD's and across several researchers to

maintain and generalize further. Another limitation to this study is that all children had advanced language skills due to being in the intervention program. All used several words when speaking and could use up to seven or eight words or more when expanding declarative sentences. This intervention package seemed to help them acquire “who” question asking within this context, but this intervention package may not be suitable for children with less language or children that have not previously used the Fokes icons to expand declarative sentences. Lastly, we know from previous research (Callanan & Oakes, 1992; Kemler Nelson, Chan Egan, & Holt, 2004) that typically developing children ask multiple types of questions frequently throughout their day. Although these children were taught to ask “who” questions in response to the stimuli used in this study and learned to generalize to novel *in vivo* probes, the rate at which each child asked questions was not comparable to their same age peers. Typical children are usually inquisitive anytime they are around novel objects or people and will typically ask a question to seek information during this time. Teaching a child to ask the same “who” question for 10 attempts in 10 minutes is not comparable to what their same age peers are asking in a novel context.

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Table 1
Stimulus Sets Used During Pre-Post Training Assessment, Training, And Maintenance Conditions

Stimuli Set	Type of Stimuli	Phase Used
Stimuli Set A	Video Set 1	Pretest/Posttest
	Photographs Set 1	Pretest/Posttest
	Control Photographs Set 1	Pretest/Posttest
	In-Vivo Set 1	Pretest/Posttest
Stimuli Set B	Icons Set 1	Baseline/Training
	Video Set 2	Baseline/Training
	Control Photographs Set 2	Baseline/Training
	Photographs Set 2	Baseline/Training
Stimuli Set C	Photographs Set 3	Maintenance
	Video Set 3	Maintenance
	Control Photographs Set 3	Maintenance

Table 2
Description of Videos And Target Responses For All Phases

Video Set	Video Topography	Expected Response
Video Set 1 “Who”	A person is washing their hands at the sink with their face hidden.	“Who is at the sink?” or “Who is washing their hands?”
	A person is pulling the wagon with their face hidden.	“Who is pulling the wagon?”
	Half of a person is hidden by a door.	“Who is behind the door?”
	A person is reading a book with their face hidden.	“Who is reading a book?
	A person in on the computer with their face covered.	“Who is on the computer?”
Video Set 2 “Who”	A person is shown on a swing but their face is covered.	“Who is on the swing?”
	A person is shown going down the slide.	“Who is on the slide?”
	A person is shown in a car with their face covered.	“Who is in the car?”
	A person is shown gardening from behind.	“Who is in the garden?”
	A person is shown sleeping with their face covered.	“Who is sleeping?”
Video Set 3 “Who”	A person is shown getting a drink of water.	“Who is drinking?”
	A person is partially sitting behind a tree.	“Who is behind the tree?”
	A person is crawling into a tent.	“Who is in the tent?”
	A person is playing on the playground.	“Who is on the playground?”
	A person in playing at the water table.	“Who is at the water table?”

Table 3
Description of In-Vivo Probes And Target Responses For All Phases

In Vivo Set	*In Vivo* Topography	Expected Response	Phase Used
In Vivo Set 1	Person knocking	"Who is knocking?" Or "Who is at the door?"	Pre/Post
	Person building with blocks	"Who is building the blocks?"	Pre/Post
	Person riding a bike	"Who is riding the bike?"	Pre/Post
	Person coloring	"Who is coloring at the table?"	Pre/Post
	Person popping popcorn	"Who is making popcorn?	Pre/Post
In Vivo Set 2	Person looking in the refrigerator	"Who is looking in the refrigerator?"	Baseline/Training
	Person getting a drink at the water fountain	"Who is getting a drink?"	Baseline/Training
	Person hiding under the table	"Who is under the table?"	Baseline/Training
	Person hiding in a tent	"Who is in the tent?"	Baseline/Training
	Person playing with a toy car	"Who is playing with the car?"	Baseline/Training

Table 4
Correct Responses By Participant During In Vivo Pre-Post Training Assessment Probes

Participant	Pre-Assessment	Post-Assessment
Lucas	0%	80%
Zander	0%	80%
Josh	0%	0%
Anna	0%	60%

Table 5
Average Words Per Session By Participant

Participant	Pre-Training Assessment	Post-Training Assessment
Lucas	2.35	3.75
Zander	2.55 3.5	4.1
Josh	2.4	3.75
Anna	2	3.55

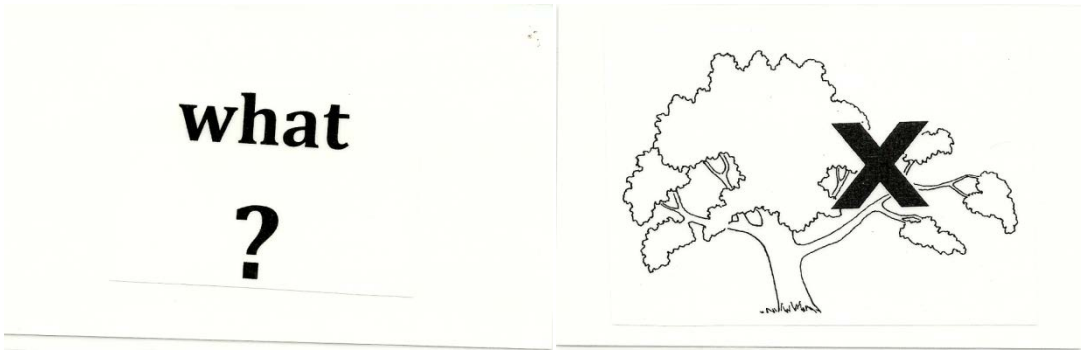


Figure 1. Icon (Fokes) stimuli is arranged with the “what” or “who” card first, followed by the “where” card. The cards are read left to right like text. This question reads “What is in the tree?” Fokes, J. (1976). *Fokes sentence builder*. Boston: Teaching Resources. Fokes, J. (1983). *Fokes sentence builder*. Columbus OH: SRA/ McGraw-Hill.

Figure 2. The sample “who” photograph depicts the silhouette of a person in a real life environment. The question reads “Who is in the forest?”

Figure 3. The sample control photograph depicts a scene that does not evoke a "who" question.

Figure 4. Percentage Correct "Who" Responses During *In Vivo* Probes, And Baseline, Training, And Maintenance Conditions

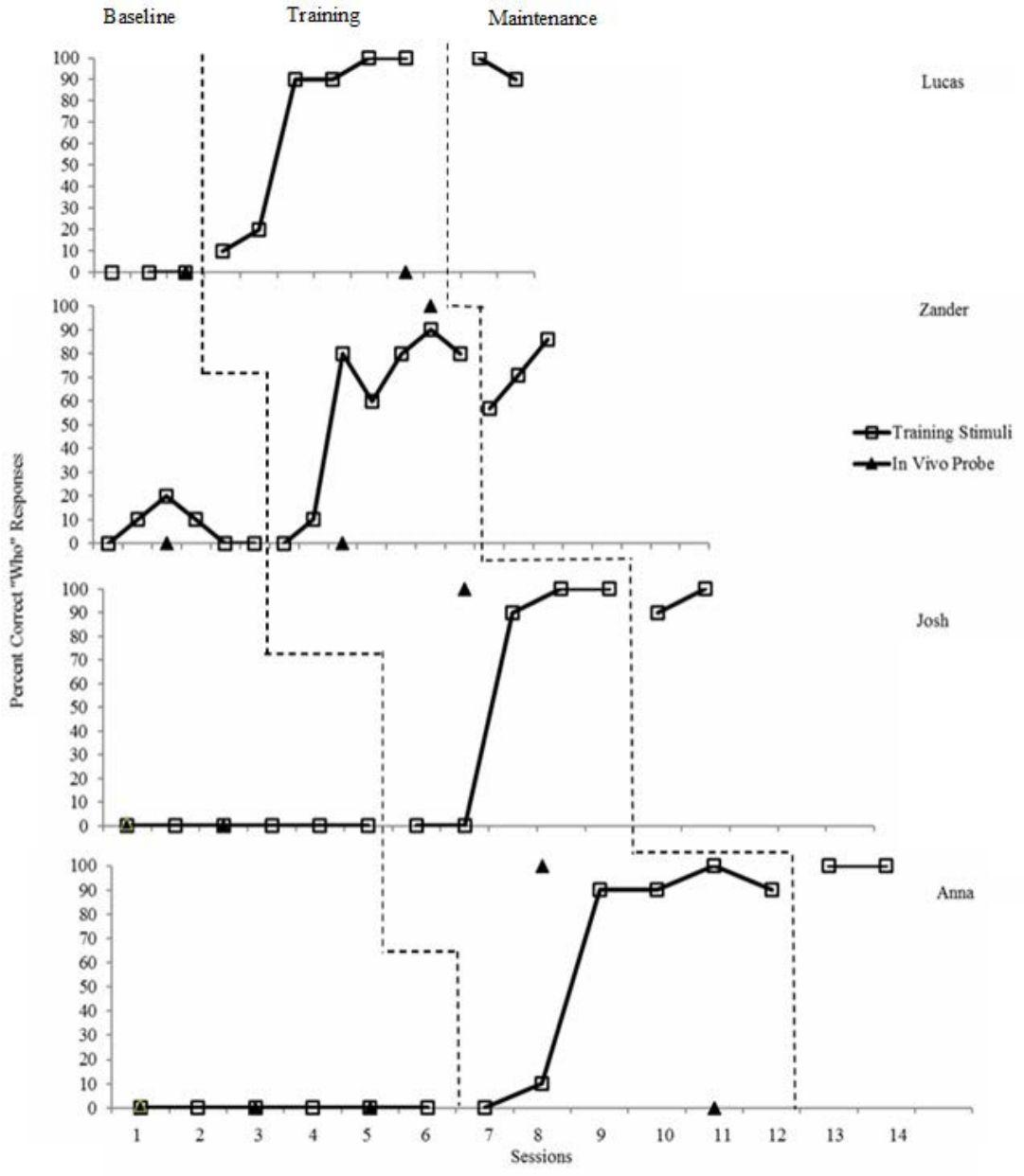
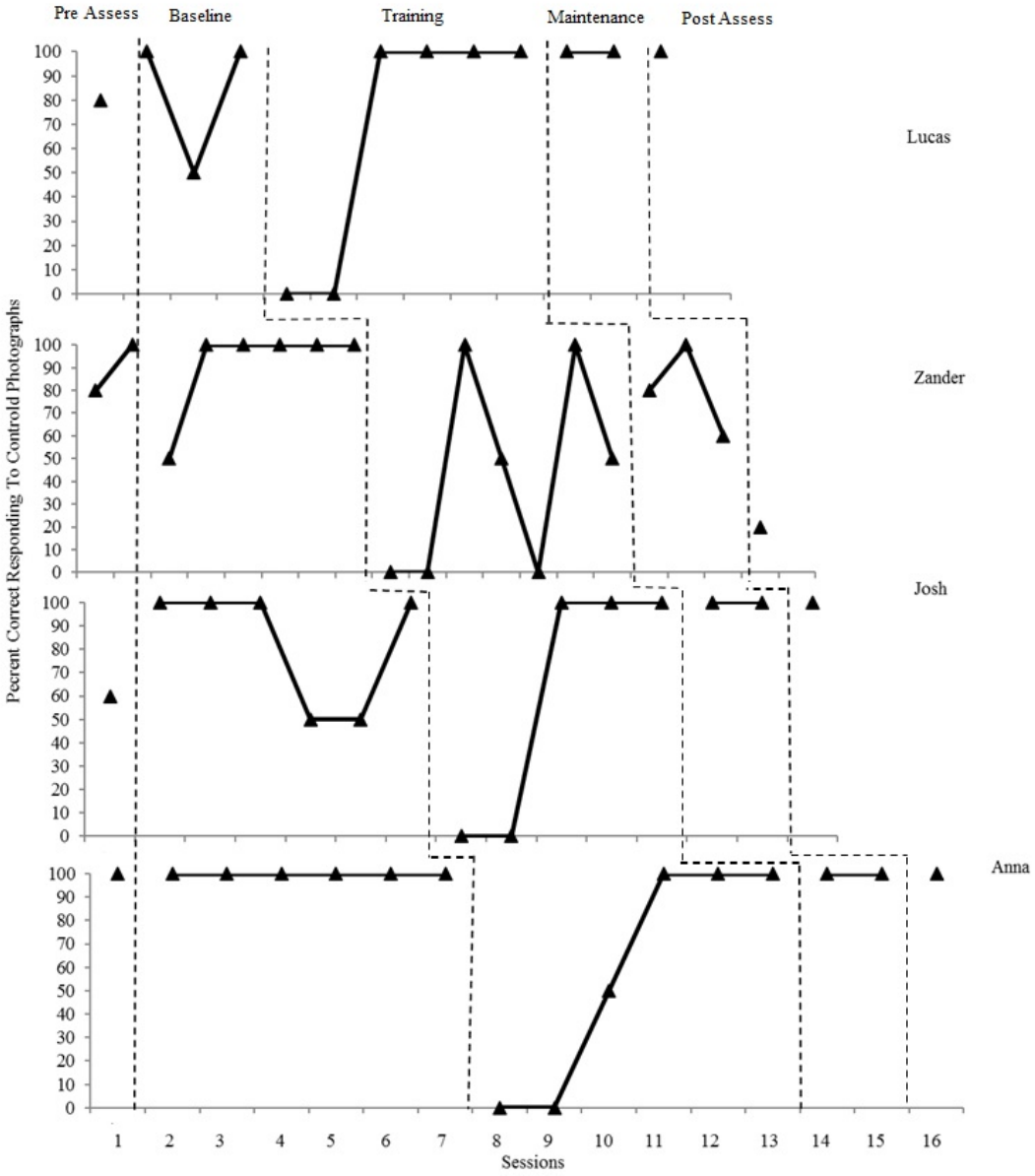
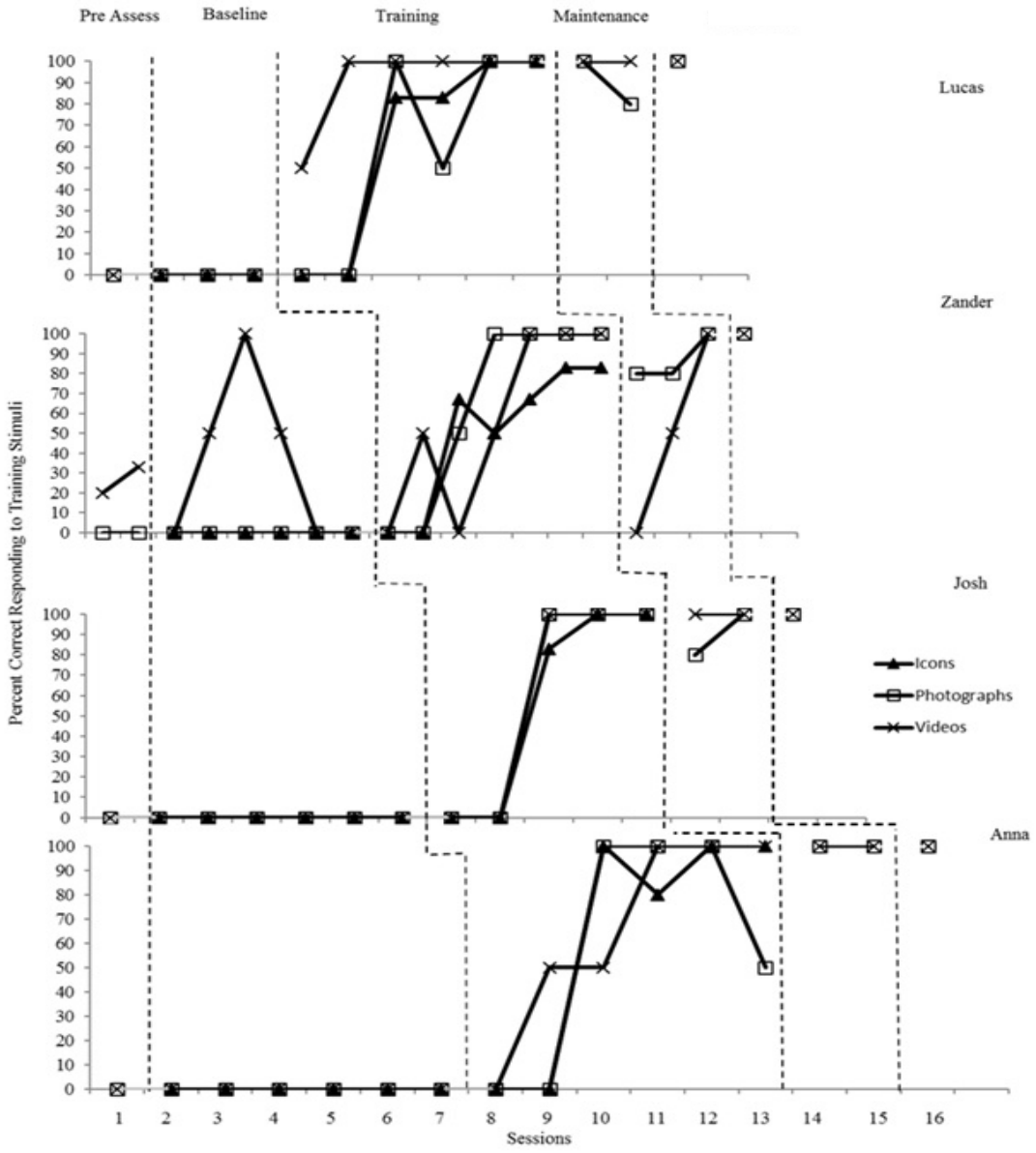


Figure 5.[1] Percentage Correct Responses To Control Photographs During Baseline, Training, And Maintenance Conditions



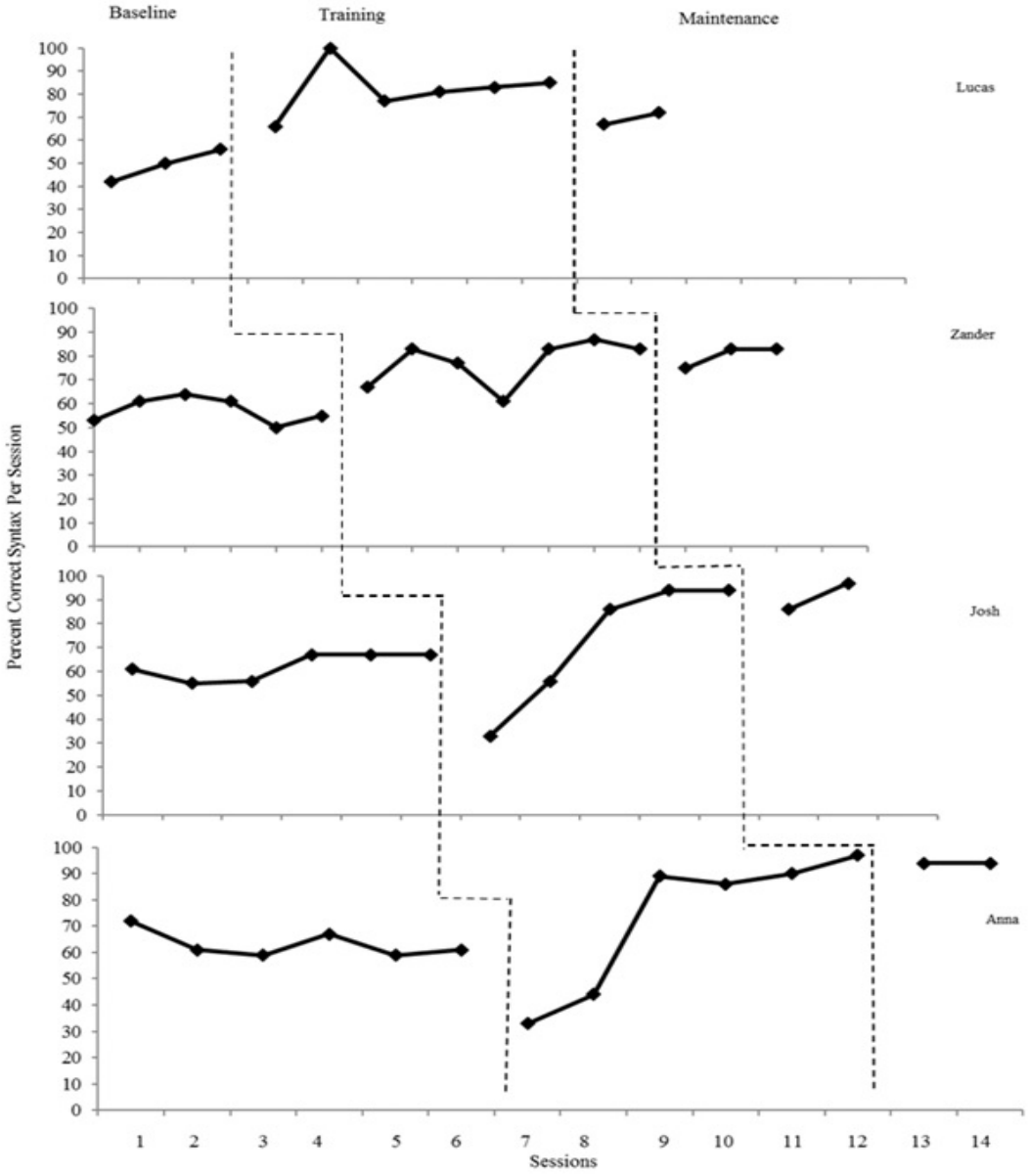
[1] The number of control trials varied during each phase of the study. During the pre/post training assessment each child received five control photograph trials. During the maintenance phase, each child received five control photograph trials per session. During the baseline and training phases, each child received two control photograph trials per session.

Figure 6.[2] Percentage Correct Responses By Training Stimulus



[2] During the pre/post training assessment, each child was shown five photos, five control photos, and five videos. No icons were shown at this time. During the baseline and training phase, each participant saw eight icons, two photos, two control photos, and two videos during each session. They also saw one *in vivo* probe a week. During the maintenance phase, each child saw five photos and control photos as well as two videos per session.

Figure 7.[3] Percentage Correct Syntax During Baseline, Training, And Maintenance Conditions



[3] To calculate percent correct syntax, all trials were used including icons, photographs, control photographs, video clips, and *in* vivo probes.

APPENDICES

APPENDIX A

FLYER DESCRIBING THE STUDY

I am conducting a research study on increasing question asking in children with Autism using pictorial prompts.

If you know a child who meets the following criteria, please share this flyer with their parents.

We would like to study children who:

- 3-5 years old
- Have a diagnosis of Autism or Pervasive Developmental Disorder- Not Otherwise Specified
- speak 3-5 words at a time when making requests or comments
- Don’t ask many questions

If you would like to learn more about this research study, please contact
Deanna Burgess at 209-832-7756 or dburgess@tpathways.org
Psychology Master’s Student
California State University, Stanislaus

APPENDIX B

PACKET GIVEN TO PARENTS

Overview of Study

The purpose of the current research study is to evaluate the effectiveness of using pictures and videos to promote question asking in children diagnosed with autism. Teaching procedures include presenting your child with pictures that, we hope will encourage a question. For example, a familiar person will be shown working at a computer but it will be difficult to say who it is as only that person's back of their head is visible. If your child does not ask a question closely related to the picture, then a prompt will be given. Reinforcement will be provided for good attempts and correct answers. Video clips will also be shown similar to the picture prompts to promote question asking along with in vivo trials (e.g., a person hides under a desk to promote the question "Who is under the desk?").

Informed Consent

Purpose:

The purpose of the current research study is to evaluate the effectiveness of using pictorial prompts to promote question asking in children diagnosed with autism. Training procedures include presenting your child with pictures that promote a question. They will then be prompted to ask the correct question and reinforcement will be provided. Video clips will also be shown similar to the picture prompts to promote question asking along with in vivo trials (e.g., a person hides under a desk to promote the question "Who is under the desk?").

This research project will be conducted by Deanna Burgess, a graduate student in Psychology at California State University, Stanislaus and supervised by Dr. Jane Howard, Professor of Psychology at CSU, Stanislaus. Ms. Burgess is conducting this research project in order to fulfill thesis requirements for a Master's Degree in Psychology, with a concentration in Behavior Analysis.

I give consent for my child, _____ to participate in the study conducted by Therapeutic Pathways- The Kendall School. This study will be conducted alongside my child's programming and will not impede on direct therapy time. It will require 15 minutes five days a week.
Initials_____

I understand my child's participation in this study is voluntary. I acknowledge that I may stop my child's participation at any time and that I may request that my child's data be destroyed.
Initials_____

I understand that the decision to allow my child to participate in this study or to decline to have my child participate will have no effect on my child's services from Therapeutic Pathways. Initial_____

I understand that there are benefits and risks to participating in the current research study. Although safety measures are taken prior to the session starting (e.g., reinforcer assessment) your child may become upset or frustrated while learning the new skill. If your child or family experiences other distress while participating in this study, please contact a professional who may be able to provide support to you or your child. Your regional center case manager may be able to provide you with a list of professionals with experience in working with individuals with special needs. The possible benefits to the study include increased question asking, knowledge about new items and people in the environment, and improved conversation skills.
Initials_____

I understand that all sessions will be videotaped for data collection purposes. Videotaped sessions will be viewed only by individuals related to the research project. All data will be stored in a locked cabinet when not being viewed. Videotapes will be destroyed 6 months after the conclusion of the study unless written permission is provided by you stating that they may be used for presentations.

Initials_____

If you have any questions on the research, contact Campus Compliance Officer at IRBadmin@csustan.edu.When the study concludes you will be provided with the results and the findings will be discussed.
Initials_____

In this research:
(1) Your child's real name will not be used in any published report.
(2) Video footage will be collected for data collection purposes only. Video footage for presentations will only be used with your consent.
(3) You child's privacy and confidentiality will be protected. No identifiers will be used in this study. Please check all of the lines below that apply:

____ Yes, I have read this letter and agree to have my child participate in this research study.

____ I give permission for my child's video to be used in a presentation format.

____ I do not give permission for my child's video to be used in presentation format.

____I give permission for my child's file at The Kendall School to be accessed during the course of the research study.

____I do not give permission for my child's file at The Kendall School to be accessed during the course of the study.

____ No, I decline to have my child participate in this research study.

_____	_____	_____
Child's Name	Parent Signature	Date

Additional Resources:

If you are interested in learning more about increasing question asking in children with autism, please see the articles below. If you would like to inquire more about the current study or view the findings of the study, please email Deanna Burgess at dburgess@csustan.edu.

Taylor, B. A., & Harris, S. L. (1995). Teaching children with autism to seek information: Acquisition of novel information and generalization to responding. *Journal of Applied Behavior Analysis, 28*, 3-14. doi:10.1901/jaba.1995.28-3

Williams, G, Donley, C. R., & Keller, J. W. (2000). Teaching children with autism to ask questions about hidden objects. *Journal of Applied Behavior Analysis, 33*, 627-630. doi:10.1901/jaba.2000.33-627

Food Consent Form

Throughout the course of the study, your child will be offered edible reinforcement along with play activities and toys for appropriate working, following directions, etc. Food reinforcement is often used to teach new behaviors because it is quick to deliver and is preferred by the child.

1. Please list any food items that you do **NOT** want your child to consume during this study:

_____
_____
_____
_____

2. Please list any food items that your child prefers to consume and that you approve of your child consuming for the purpose of this study (e.g., candy, cereal, chips, popcorn, etc.):

_____
_____
_____
_____

Please initial the appropriate lines below:

_____ I give permission for my child to consume food reinforcement in this study **with the exception** of the items listed on number 1.

_____ I give permission for my child to consume food reinforcement from the foods I listed on **number 2 only**.

_____ I **do not** want my child to receive any food reinforcement.

_____ _____ _____

Parent Signature Child's Name Date

APPENDIX C

PREREQUISITE SKILLS ASSSESSMENT DATA SHEET

Student Observed: _____ Observer: _____ Date: _____

Label	Utterance

APPENDIX D

PRE/POST TRAINING ASSESSMENT DATA SHEET

Student Observed: _____ Observer: _____ Date: _____

Stimuli type:	Utterance:	Total Words:	Syntax (correct/3):

APPENDIX E

BASELINE DATA SHEET

Student Observed: _____ Observer: _____ Date: _____

Stimuli type:	Utterance:	Total Words:	Syntax (correct/3):

APPENDIX F

MAINTENANCE DATA SHEET

Student Observed: _____ Observer: _____ Date: _____

Stimuli type:	Utterance:	Total Words:	Syntax (correct/3):

APPENDIX G

TREATMENT INTEGRITY CHECK LIST

Name: _____
Date: _____
Evaluator: _____

Reliability check: yes no

- Presentation of stimuli
    - Stimuli presented correctly for lesson YES NO
        - Correct card sequence
        - Markers if needed
    - Attending established with each trial YES NO
    - Child prompted to look at cards if needed YES NO
    - Sets up In Vivo trials prior to session beginning if applicable YES NO
    - Sets up video clips before session begins YES NO
    - Presents real life photograph every 4th trial YES NO
    - Presents a control picture every 5th trial YES NO
    - Presents video clips for last two trials YES NO
- Follows prompting/correction procedures
    - Uses sentence markers/ pointing if needed, but fades within first two sessions if possible YES NO
    - Follows second delay as written on data sheet YES NO
    - Provides a 2 second delay for ALL video clips YES NO
    - Accurate correction procedures YES NO
        - Corrects label then represents SD
        - Models entire sentence from beginning for fluency/sentence errors
        - Follows modeled sentences with an independent response
    - Gives praise and tokens following correct responses YES NO

- Shows student the answer to the question following correct responses.[4]
  YES NO

- Accurate data collection
  - Observer's Data:

- 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
  - Instructor's Data:

- 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
  - IOA 80% or better? YES NO

Strength:
_____
_____
_____
_____

Focus Area:
_____
_____
_____
_____

[4] From Fischer, J. L., Howard, J. S., & Sparkman, C. R. (2010, February), Establishing generative syntax for "wh" questions in students with autism. In Christen Rae (Chair), *Improving Complex Joint Attention, Curiosity, and Inference 'Making' in Children with Autism Spectrum Disorder (ASD).* Symposium conducted at the meeting of California Association of Applied Behavior Analysis, Burlingame, CA.