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# The effect of stimulus choice on a discrimination task: pictures vs. objects

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# THE EFFECT OF STIMULUS CHOICE ON A DISCRIMINATION TASK: PICTURES VS. OBJECTS

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## TABLE OF CONTENTS

## LIST OF FIGURES

## ABSTRACT

The effect of the type of stimuli, pictures vs. objects, on discrimination behavior, specifically noun discrimination, was examined with a single-subject multi-element design. A multiple probe across behaviors was used for two participants. The type of stimulus, picture or object, was the alternating treatment. Two autistic children were trained in six noun discrimination tasks utilizing a discrete trial training model counterbalancing the type of stimuli across participants. Generalization of object to pictures and pictures to objects was also examined. Results showed that type of stimuli, picture or object, did not affect treatment. Generalization data was idiosyncratic.

# INTRODUCTION

Researchers have spent years trying to understand the mechanisms that underlie autism, a pervasive disorder that affects numerous people throughout the world, and have been unable to pinpoint a cure or the cause of the disorder. However, behavioral therapy has made great strides in helping autistic children learn language, use functional communication, and enter general education classrooms (Bower, 1989; Lovaas & Buch, 1997; Caroff, 2007). The goal of many psychologists, speech therapists, and occupational therapists is to treat children at a young age so that these children can lead as normal lives as possible. More specifically, early intervention programs that utilize discrete trial training and group therapy to teach skills such as functional communication, imitation, and discrimination have shown to be effective interventions for these children (Pelios & Sucharzewski, 2004; Smith, 1999). The focus of this study is to examine how the type of stimulus presented may moderate the effectiveness of discrete trial training (DTT).

## Discrete Trial Training

Discrete trial training (DTT) is a successful method to teach children with autism. DTT is the best documented method to effectively teach autistic children speech sounds and develop these sounds into speech (Lovaas, 1977; Young, Krantz, McClannahan, & Poulson, 1994; Smith, 2001). In 1993, a follow-up study was conducted on 19 children who graduated from an early intervention program that utilized DTT and found that half the children advanced into regular education classes with little follow-up treatment while the other students in the study excelled in academic skills, life skills, and social skills (Leaf & McEachin, 1999). Discrete trial training is defined as "a method for individualizing and simplifying instruction to enhance children's learning which is used to teach new forms of behavior" (Smith, 2001, p.86). DTT consists of five parts: cue, prompt, response, consequence, and inter-trial interval. A cue is an instruction

made by the therapist such as "touch ball" when the child is presented with a ball. A prompt is used when the child does not answer or answers incorrectly. Prompts are faded as the child progresses. The response is the answer the child gives: correct, incorrect, or no answer. The consequence is positive reinforcement such as edibles, praise, or toys when the child responds correctly (Smith, 2001). If the child gives an incorrect response, the therapist gives either a verbal stern "no" or positive encouragement for responding (e.g. Good try!) and prompts the correct answer (Fox, 1984). The inter-trial interval is the time between trials, usually 5-30 seconds. Therapists work individually with a child in a room that has minimal distractions. Usually in DTT, five to ten skills are taught in a session (Smith, 2001). For each task, the therapist provides instruction, provides reinforcement based on the child's response, breaks for a few seconds between tasks, and moves onto the next skill.

Discrimination behavior is an important skill that is taught to children with autism using discrete trial training (Smith, 2001). Discrimination is important task for children to learn. People use discrimination skills in their everyday life and it is a necessity for academic progress (Smith, Mruzek, Wheat, & Hughes, 2006). Without discrimination skills, the child cannot use language functionally. A conditional discrimination task includes children discriminating between two entities, such as a cup and a spoon (Saunders & Spradin, 1989). A color discrimination task is an example of a conditional discrimination. In a color discrimination task, the therapist presents a child with two pieces of paper that are two different colors (e.g. one black and one white) and cues the child to "touch black." The child must understand that touching black and not white will result in positive reinforcement (Williams, Perez-Gonzalez, & Quieroz, 2005).

Discrete trial training is an effective tool to teach discrimination (Smith, 1999). DTT consists of a variation of prompts, intervals of times, and schedules of reinforcement to teach discrimination with the overall structure remaining consistent (Smith, 2001). A main advantage to DTT is the ability to tailor the program to the individual. For example, error correction (i.e. therapist gives the correct response) may be more helpful for one child but ignoring (i.e. therapist ignores incorrect answers) may work better for another child (Fox & Bechtel, 1982). Changes are made to tailor the program to the individual or to a specific skill for optimal learning. Researchers have conducted many studies analyzing the effectiveness of these modifications. Numerous studies have shown the effectiveness of different types of positive reinforcement (Smith, 2001; Hinerman, Jenson, Walker, & Peterson, 1982). For example, edibles, toys, or access to television time can all be effective reinforcers. The most effective types of reinforcement for a specific child can be assessed by using a preference assessment (Koegel, Dyer, & Bell, 1987).

Different prompting techniques have been shown to be effective. Stimulus fading, most-to- least prompting, or position fading are effective prompts (Koegel, Dunlap, Richman, & Dyer, 1981). Researchers have shown the optimal time delay between the prompt and the response varies depending on the child's ability to attend to the stimulus and can affect task acquisition (Dyer, Christian, & Luce, 1982). Consequences can also be tailored to the individual such as error correction or no response. Studies have shown no one technique is consistently more efficient for all learners (Smith, Mruzek, Wheat, & Hughes, 2006).

**Preference Assessment Research**

However, there has not been extensive research on the stimulus choice used to teach discrimination skills. Most studies choose some variation of pictures, objects, or tangibles but do

not provide a rationale for their choice (Chiak, 2007; Gersten et al., 1982). One type of stimulus might be better suited for the individual or easier to teach discrimination behavior. For example, pictures are easily accessible and less expensive than buying multiple objects (Higbee, Carr, & Harrison, 1999). However, pictures can be problematic because they are only a representation of the entity and lack naturalism of the environment (Northup et al., 1996). On the other hand, pictures can depict some actions (e.g. washing your hands) and events more easily than configuring objects (Conyers et al., 2002). The type of stimuli may affect the results. The child may understand the discrimination but the stimuli may be too complex leading to erroneous results (Conyers et al., 2002). If one stimulus is more efficient for teaching, this will affect the child's progress and lead to other problems (i.e. behavior problems). The stimulus instructed may also impact generalization.

Although little research has focused on stimulus selection in discrimination behavior, many studies have investigated stimulus choice in preference assessments. Northup et al. (1996) found that a verbal or pictorial preference assessment predicted reinforcers more reliably than a reinforcer survey for children with Attention Deficit Hyperactivity Disorder (ADHD). Higbee, Carr, and Harrison (1999) found that tangible reinforcers better predicted highly preferred reinforcers than did pictorial assessments in a multiple preference assessment for two mentally handicapped adults. Later studies began to investigate why stimulus choice affects the reliability of the results of a preference assessment. Clevenger and Graff (2005) conducted a paired stimulus preference assessment with children with developmental delays finding that pictorial assessments reliably identified potent reinforcers only for the children that possessed matching skills. Other studies were conducted to see if discrimination skills affect the results of the preference assessment (Yu & Martin, 2003; Conyers et al., 2002; Vries et al. 2005). Conyers et

al. (2002) used a two-choice preference assessment and compared the type of stimuli choice: pictures, tangibles, or verbal representations. They found that the child's discrimination skills reliably predicted the consistency of the participant's responses. For example, if a child cannot do a conditional discrimination, then the pictorial and verbal preference assessments were inaccurate. Vries et al. (2005) found similar results, extending the research to leisure activities.

**Stimulus Choice**

Other studies have looked at the effect of stimulus choice on teaching basic skills to children (Ramkissoon & Bhana, 1985; Handleman, Powers, & Harris, 1984). Ramkisoon and Bhana (1985) found children, ages 9-12, performed better on a free matrix classification with 3-dimensional objects than with 2-dimensional objects. In another study, the participants learned a discrimination task using different stimuli. Sailor and Taman (1972) taught a positional discrimination (i.e. "in" and "out") to three children with autism using ambiguous and non-ambiguous 3-dimensional objects. In the ambiguous condition, the same objects were used to teach both tasks. In the non-ambiguous condition, certain objects were used for "in" and other objects were used to teach "out." Sailor and Taman found that children mastered the position discrimination quicker in the non-ambiguous condition. However, the authors only utilized objects so there is no evidence to suggest these findings will generalize to pictures.

However, Handleman, Powers, and Harris (1984) used both objects and pictures to teach noun labels to three boys with autism. They used a multiple baseline design counterbalancing concrete and pictorial representations of objects. In this study, two sequences were used. In one sequence, the boys were trained with pictorial representations of the noun labels. When the boys reached mastery, they learned the noun labels with objects. The other sequence was teaching the labels first with objects then with pictures. The task required the participants to expressively

identify the noun label. The goal of the study was to see if the children could generalize the object names to pictorial representations of the objects. Handleman, Powers, and Harris (1984) found that there was not a functional relationship between learning pictures or learning objects suggesting that the order had no effect on learning and generalization was inconsistent. Children need to generalize what they see in a picture to the actual object in real life and vice versa. For example, if a child can identify a picture of his mother as "mama," he needs to generalize that label to his actual mother. In addition, these results are inconsistent with previous studies suggesting three-dimensional objects produce better results. Handleman, Powers, and Harris (1984) found that neither type of stimuli was superior for teaching noun labels. However, the children first learned the same noun labels with one modality and then were taught with the other stimulus. A carryover effect can occur from previous training with another stimuli leading to inconclusive results.

The purpose of this investigation is to extend the findings of these previous studies to see if the type of stimulus, pictures or objects, has an effect on a child's ability to discriminate between animate objects such as toys, animals, or items used in their everyday life. Although Handleman, Powers, and Harris (1984) found that there was not a functional relationship between using pictures and objects, previous preference assessments found that the relationship was a function of the child's discrimination ability. However, there is little research that focuses solely on how the type of stimulus moderates the effectiveness of teaching discrimination behavior.

# METHOD

## Participants

Two male children, ages 2 and 3, were chosen to participate in this study. Participants had a diagnosis of one of the autism spectrum disorders. Each child was assessed to ensure that he was not proficient in conditional discrimination tasks. Both participants were selected from Baton Rouge Speech and Hearing Foundation, an early intervention preschool that meets three days a week. The program serves children with autism between the ages of 1.5-6 years. The focus of the school is to prepare children with autism for general education kindergarten upon graduation. Unlike general education preschools, this program offers two 1-hour sessions of discrete trial training daily. Each session focuses on 5 to 10 skills taught individually by a therapist, an undergraduate student trained in applied behavior analysis (ABA). The curriculum for each child is coordinated by doctoral school psychology graduate students under the supervision of a school psychologist who is also a board certified behavior analyst.

## Setting

Each child participates in discrete trial training in the same room each day. The room consists of a table and two chairs with minimal distractions. During sessions, the therapist sits across the table from the participant providing verbal instructions.

## Stimuli and Apparatus

During training, a toy was used to ensure each child was able to perform a simple receptive task. Objects included toys such as a ball. Reinforcers, previously identified in a free operant preference assessment conducted at the school, were used in training. Scoring sheets were also used to assess mastery of skill.

Each child was trained on six noun discriminations. Three tasks contained only objects and three tasks contained only pictures. In the object-only condition, two target objects and two distracter objects were used. A pepper, lemon, tomato, and onion are examples of objects that were used. In the picture-only condition, two target pictures and two picture distracters were used. The pictures were photographs of objects used in the object-only condition of the same size. Reinforcers were used for treatment but were not used during probes. However, there were some generalization conditions that did include reinforcement. Scoring sheets were needed for data collection, IOA, and procedural integrity.

**Dependent Measurement and IOA**

The dependent variable was the number of independent correct responses. A correct response was recorded if the child answered within 3 seconds of the verbal instruction and no prompting was necessary. No response, incorrect response, or correct responses after prompting were considered incorrect answers. Data was recorded for each trial. The therapist recorded the response as "1" for correct and a "0" for incorrect answers. At the end of each session, the number of independent correct responses was divided by total trials to obtain a percentage of correct responses. Eighty percent correct or above, 2 sessions in a row, was defined as mastery of the skill. The child moved onto training for the next discrimination task after the initial discrimination task was mastered. All six tasks were probed in one session each initially. Probes continued for the target task until a stable pattern was evident and at least three data points have been collected. When the target task has reached mastery level, a probe session occurred for all tasks. For example, once the first two discriminations were learned, the tasks were probed as well as three probe sessions for the next two tasks and one probe session for the last two discriminations. Once all tasks have reached criterion, all tasks were probed.

Reliability was recorded using interobserver agreement (IOA) for at least 30% of all sessions. Data collectors recorded responses as correct or incorrect/ no response. Percentage agreement was the number of response agreement by data collectors divided by total responses (agreement and non-agreement responses) multiplied by 100. IOA was calculated per session. Data collectors were undergraduate assistants who were trained in the experimental procedures.

**Procedures**

A multi-element design embedded within a multiple probe across behaviors was used. The type of stimulus, picture or object, was the alternating treatment. Each child was trained on six different noun discrimination tasks. Each child was trained on two different noun discriminations simultaneously. One task was trained with pictures and the other task was trained using objects. The type of stimuli was counterbalanced by participant. For example, if child 1 used pictures for task 1 then child 2 learned that task with objects. Once the child reached mastery on the two tasks, he moved onto the next two discriminations. When the second set of discrimination tasks were mastered, the child was trained on the last two tasks. Experimental control was shown when the students reached mastery when the treatment was implemented and not when the behavior was untrained. Initially, two sessions were conducted three days a week with each session consisting of 20 trials. The first session was conducted during the first hour of the child's discrete trial training and the other session was conducted during the 2$^{nd}$ hour of training. One session was the picture condition and the other session was the object condition. The order of condition was randomly chosen each day. After discrimination one was mastered, both children received four sessions per day: two sessions in the picture condition and two sessions in the object condition. Eighty percent correct, two sessions in a row, was considered mastery of skill.

Before the first probe, participants performed a simple receptive task. Children were presented with a ball and were given the verbal instruction to "touch ball." If the participant responded correctly within 5 seconds (i.e. touching the ball), the child received access to a tangible reward and praise. If not, a most-to-least procedure was used until the participant achieved 10 trials in a row of independent correct responses. The child received reinforcement, tangible and verbal praise, for each trial. The goal of training was to ensure participants understand instructions to touch an item.

During a probe session, the instructions were similar to the noun discrimination task. The therapist sat across the table from the participant and presented the two target nouns and two distracters. The therapist put out either all pictures or all objects depending on the condition, picture-only condition or object-only condition, for that task. The therapist said "touch item." The therapist gave the child 5 seconds to respond. A correct response was touching the correct item within 5 seconds. The child did not receive reinforcement for correct answers. The therapist only gave verbal praise for attending to the task. After the child responded or there is no response after 5 seconds, the therapist moved onto the next trail. Probe sessions consist of 20 trials, 10 trials for each object or picture target. Data was collected for each trial.

Participants were seated across the table from the therapist in the noun discrimination task. The therapist presented the items necessary for each discrimination task. For each task, two targets and two distracters were presented. In the object-only condition, the four items were objects. In the picture-only condition, the four items were pictures, photographs of the objects. The therapist gave the verbal instruction to "touch" the correct item. If the child responded correctly within 5 seconds by touching the correct item, praise and access to a tangible was presented for 15 seconds. If the child responded incorrectly, the therapist said "no" and

manually guided the child's hand over the correct answer. If the child did not respond after 5 seconds, a most- to- least prompting technique was used. The therapist modeled the correct answer. If the child still did not respond, the therapist guided the child, hand over hand, to the correct answer. At first, positive reinforcement, praise and access to a tangible or edible, was given for all trials. Once the child achieved 5 trials of correct responding, only independent correct responses were reinforced. There was a 15 s delay between trials. The therapist's verbal instruction started the next trial. The procedure was the same for both conditions except for the type of stimuli, pictures or objects, presented by the therapist. Two to four sessions were conducted three days a week, alternating conditions each day. A session consisted of 20 trials. Data was collected for each trial.

Once all tasks reached criterion, all tasks were probed in the condition that was not trained. For example, if a child learned one task with pictures, he was assessed with objects to see if the child generalized responding. Generalization sessions were conducted similarly to the probe session. The therapist placed the two target items with two distracters in front of the child. The items were all pictures or all objects depending on condition. The therapist said "touch" the item and gave the child 5 seconds to respond. A correct response was touching the target item within 5 seconds. No reinforcement was given for correct answers. Verbal praise was given for attending to the task. However, the second and third discrimination for Adam and the third discrimination task for Cole included reinforcement for correct answers. This was due to noncompliance during probing sessions. A new trial began after a response or no response after 5 seconds. A session consisted of 20 trials, 10 trials for each target. Eighty percent correct was considered mastery, two sessions in a row. No more than three sessions were conducted per task. A generalization probe was conducted at the end of treatment for all six discriminations.

An additional observer monitored procedural integrity for at least 30% of all sessions. The observer completed a checklist to ensure the therapist was correctly implementing the procedure. The checklist included correct instructions, placement of objects, time delay, prompting, reinforcement, correction, and time interval. Before the procedure, all therapists working at the preschool were trained in discrete trial training.

# RESULTS

## Pre-training

Each participant completed a receptive task to ensure both children understood the direction to touch an item. Both participants completed 20 trials of touching a ball. Percentages were taken of correct responding. Both Cole and Adam responded correctly 100% touching the ball. Both participants were probed and started treatment.

## IOA and Integrity

IOA was conducted for 46.7% of the sessions for Cole and 42.9% for Adam. Agreement was 100% for Cole and 99.9% for Adam. Procedural integrity was conducted for 36.6 % of sessions for Cole and 38.1% for Adam. Procedural integrity was 100% for both participants.

## Task One

Both participants were probed on the initial task. The task consisted of two separate discrimination tasks. The participants had to discriminate between salad and mustard in the first task and between water and vinaigrette for the second task. The conditions, picture-only and object-only, were counterbalanced across participant. Cole was trained with objects for mustard and salad and learned vinaigrette and water with pictures. Adam learned water and vinaigrette with objects and was trained on mustard and salad with objects. The percent of correct responding is displayed in Figure 1 for Adam and Figure 2 for Cole.

During baseline, Adam responded less than 20% correct on both discrimination tasks. After three sessions of low responding, Adam moved to treatment. The mastery criteria for training was 80% correct or above two sessions in a row. Adam mastered both discrimination tasks. Pictures and objects were mastered in the same number of sessions. There was no meaningful difference between conditions. Adam was probed two more times to ensure

maintenance of each task. He responded over 80% correct on both discrimination tasks during Probe III and Probe IV. Objects were maintained better in Probe III but pictures were maintained better on Probe IV. However, the difference was too small to be of practical importance. Experimental control was shown when the criterion was met only when the child was trained in the task. Although training was maintained, there were no significant differences across conditions.

During baseline, independent correct responding was less than 15% for Cole. After three sessions of low responding, Cole was trained on the two discrimination tasks. Cole mastered both discrimination tasks; however, he learned pictures more quickly than objects. Two probe sessions were conducted for maintenance purposes. Cole responded correctly over 90% during both probes. There were no significant differences. Although Cole mastered pictures faster than objects, maintenance showed no significant differences.

**Task Two**

Task Two consisted of two discrimination tasks, one in each condition: picture or object. Cole was trained in cake and sandwich with objects and learned tray and eggplant with pictures. Adam learned cake and sandwich with pictures and was trained on tray and eggplant with objects. Both participants were probed during Task I and then probed again before training.

Adam responded less than 5% correct during the initial probe. After three sessions of low responding, less than 15% correct, Adam entered training for the second task. Adam mastered both tasks. He mastered the picture and object tasks at similar rates. Two probes were conducted for maintenance. Both pictures and objects were maintained during both probes. Adam responded at 90% correct for Probe III. Maintenance was the same for both conditions.

Cole did not respond during the initial probe (0%). After three sessions of low

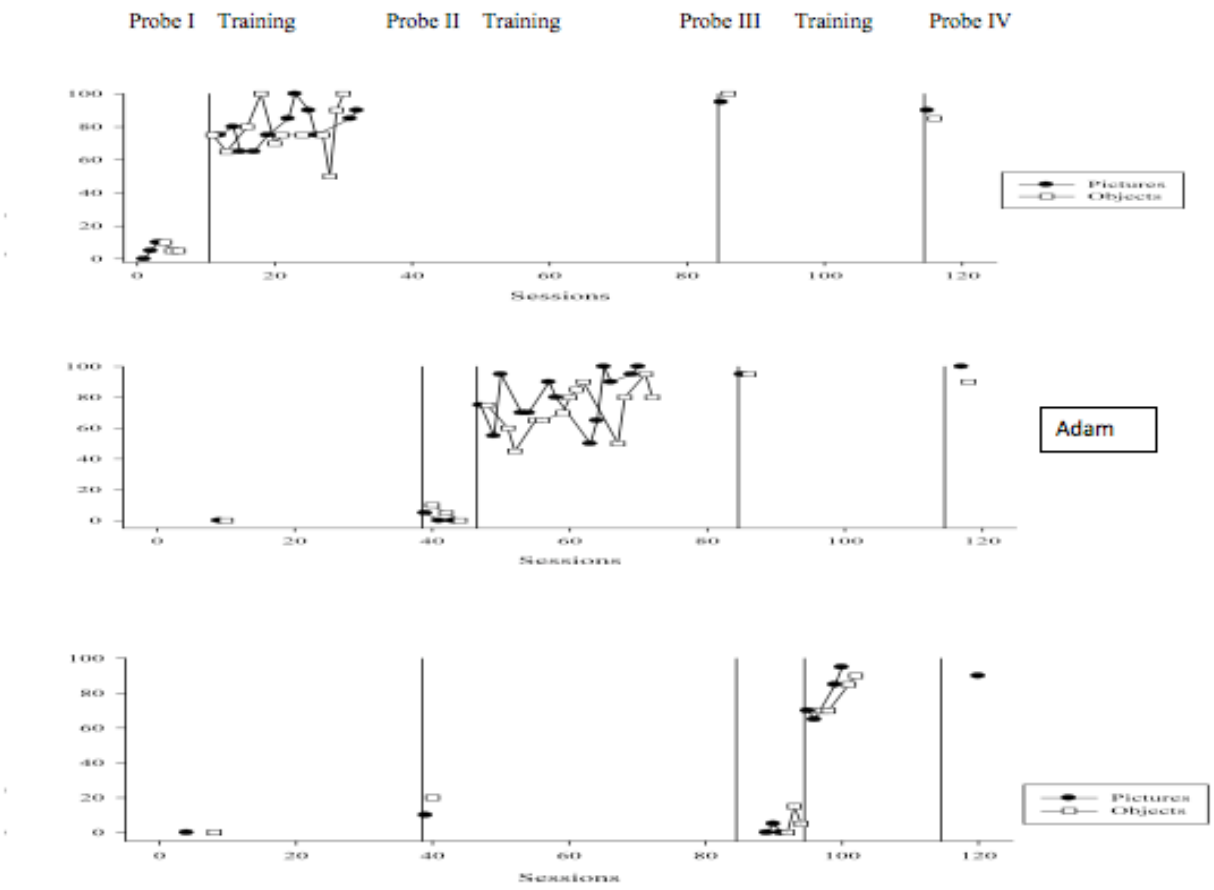


Figure 1. Adam's performance all three noun discrimination tasks with pictures and objects. The x-axis is number of sessions and the y-axis is the percent independent correct responding.

responding during baseline, less than 10% independent correct responding, he began training. Cole mastered both conditions very quickly. There was no meaningful difference. Cole maintained responding during probe sessions. Objects and pictures demonstrated similar maintenance.

**Task Three**

Task Three consisted of two discrimination tasks in two different conditions: pictures or objects. Cole learned lemon and pepper with pictures and was trained on tomato and onion with objects. Adam was trained on lemon and pepper with objects and learned onion and tomato with pictures. Both participants were probed during the first two tasks. Baseline data was conducted

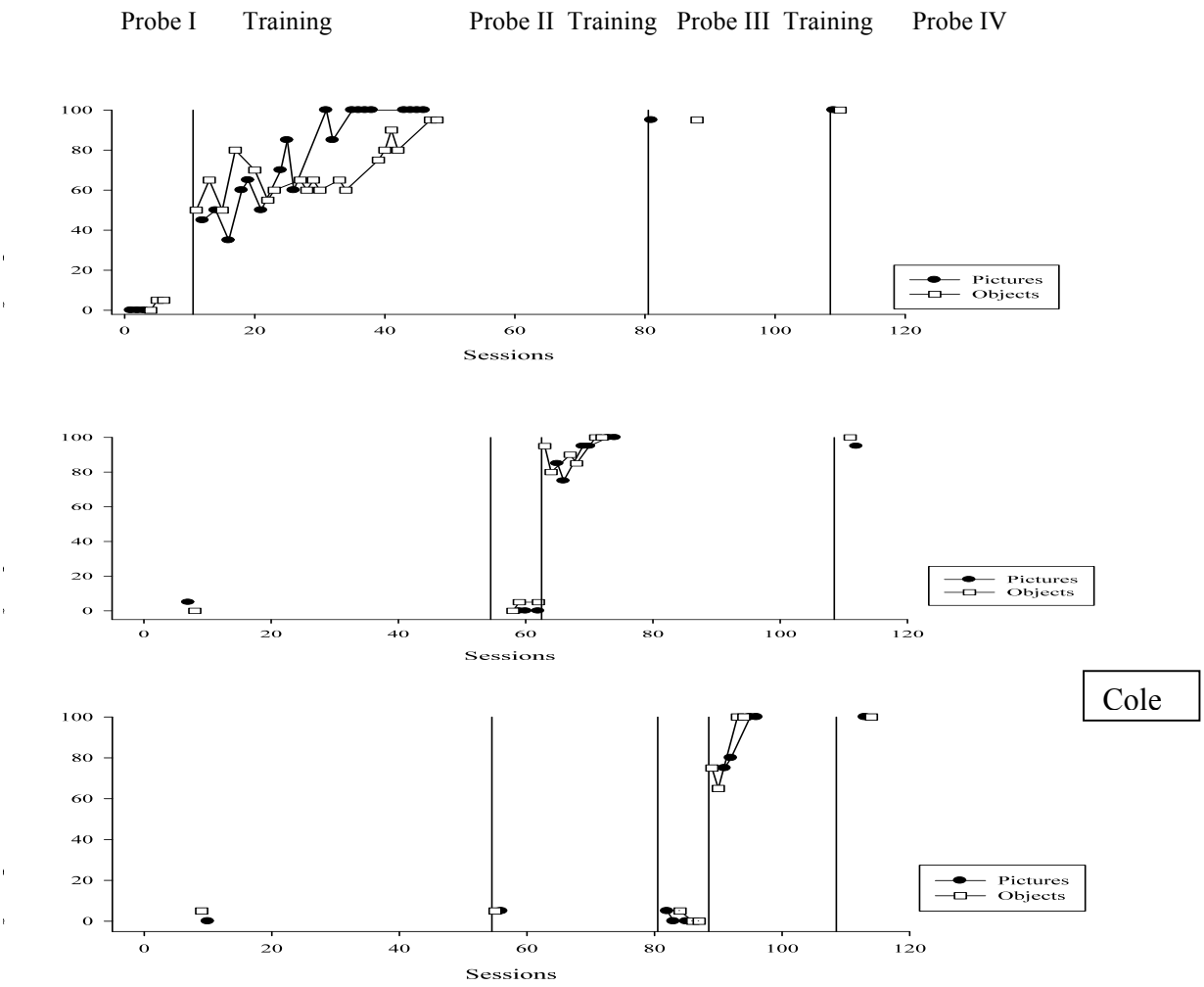


Figure 2. Cole's performance all three noun discrimination tasks with pictures and objects. The x-axis is number of sessions and the y-axis is the percent independent correct responding.

prior to training.

Adam responded correctly less than 20% on both tasks during Probe I and Probe II. After three sessions of less than 20% correct responding, he began training. Adam learned picture and object discrimination at similar rates. Both pictures and objects were maintained at 90% correct responding.

Cole responded less than 10% correct on both tasks during Probe I and Probe II. After he responded less than 10% correct during baseline, he began training. Cole mastered both pictures and objects simultaneously. He maintained both tasks at 100% correct.

**Generalization**

Generalization in the condition that was untrained was probed immediately after training and after all tasks were mastered. If the participant was trained in pictures, he was probed with objects for that task. Reinforcement was added to Task II and Task III for Adam and to Task III only for Cole. Reinforcement was added to minimize noncompliance. The final generalization probe did not include reinforcement for either participant. Generalization criteria was correct responding over 80%. Independent correct responding is displayed in Figure 3 for both participants.

Adam did not generalize in either condition for Task I. He responded better in the object to picture condition (65%) than the picture to object condition (35%). Adam responded correctly on 20% of trials in the picture to object condition and 25% of trials in object to picture condition. Adam was not compliant during the task. It was hypothesized that his noncompliance was due to not receiving reinforcement for correct answers. He was probed in Task II with reinforcement. He generalized in both conditions when he received reinforcement. Adam was probed with and without reinforcement for Task III. He did not generalize in any of the conditions. His correct responding was less than 20% across all conditions. Adam did not generalize during the final probe on all three tasks. He responded 40% correctly in the picture condition and 20% in the object condition.

Cole did not meet criteria for generalization in either condition for Task I. However, Cole did respond 75% correct in the picture to object condition and 50% in the object to picture

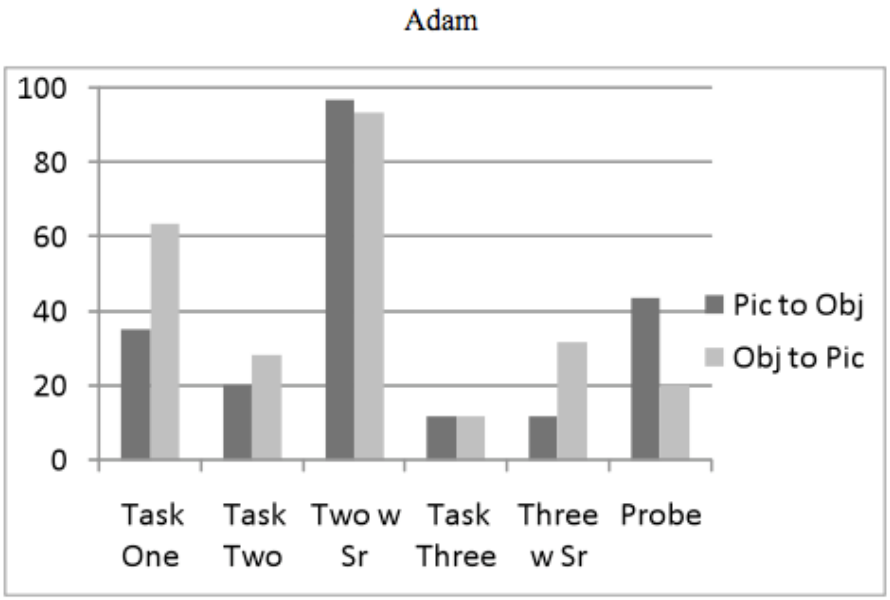


Figure 3. Adam's generalization data. The x-axis is the task and the y-axis represents the percent correct independent responding.

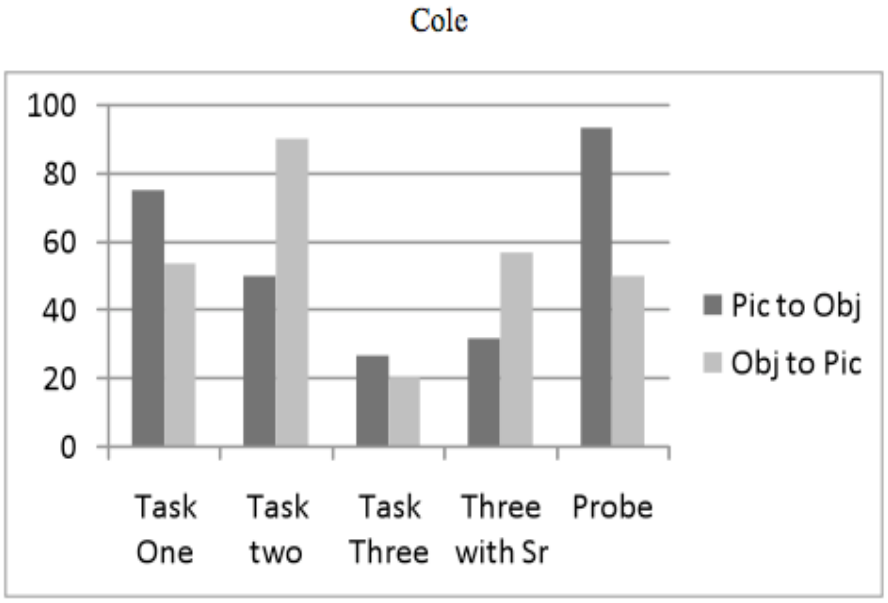


Figure 4. Cole's generalization data. The x-axis is the task and the y-axis represents the percent correct independent responding.

condition. He met criteria for generalization in the object to picture condition (85%) but not in the picture to object condition (45%) for Task II. Cole was not compliant during Task III

generalization probes so he was also probed with reinforcement. He did not meet criteria for generalization in either condition. However, responding did increase in both conditions when reinforcement was added. Correct responding increased from 25 to 30% in the picture to object condition and 20 to 55% in the object to picture condition. Cole was probed without reinforcement on all three discrimination tasks. Cole met criteria for generalization in the picture to object condition (90%) but not in the object to picture condition (50%).

## DISCUSSION

Discrimination is an important skill that children use every day; therefore, it is important to investigate how children obtain this skill. In this study, the purpose was to examine the effect of the type of stimulus, pictures or objects, on a child's ability to discriminate between animate objects such as toys, food, or items used in their everyday life. This investigation found similar results to the Handleman, Powers, and Harris study (1984) who showed that there was not a functional relationship between using pictures and objects. It was irrelevant whether the child was first trained with pictures or objects. However, the results for generalization were idiosyncratic.

Adam mastered all six discrimination tasks using both pictures and objects. Experimental control was shown when Adam learned the task only when training was introduced. The treatment was effective for Adam but the conditions did not affect his performance differently. Adam mastered the discrimination tasks in both conditions at about the same rate. Adam had a higher percentage of correct independent responding in the picture condition in all three discrimination tasks. However, both conditions were mastered in the same number of sessions. Adam met criteria for maintenance in both conditions for all six discrimination tasks. Retention was similar across conditions.

Cole mastered all six discrimination tasks in both conditions: pictures and objects. Cole did not master these tasks until training was implemented. Overall, the training was effective but the conditions did not have an effect on his performance. Cole mastered all discriminations tasks in the same number of sessions. However, his percent correct independent responding varied across tasks. Cole's percent independent responding was higher for pictures in the first discrimination task. However, he struggled with one item, mustard. Since the responses were

averaged across condition (e.g. picture 1 response + picture 2 responses/ 2), his percent correct for pictures is lower. This is an outlier and is not descriptive of his performance in all the other conditions. There was no difference between conditions in discrimination two or three. He mastered both discrimination tasks at the same rate. Cole also retained both conditions over time. Although the treatment was effective, the type of stimulus did not have an effect on learning.

This study supports previous research that had not found a functional relationship between pictures and objects demonstrating that it is irrelevant whether pictures or objects are taught first. Children with autism can be taught discrimination tasks with either pictures or objects (Handleman, Powers, & Harris, 1984). However, this study found dissimilar results from previous preference assessment studies that found the type of stimulus was dependent upon the child's ability to discriminate (Yu & Martin, 2003; Conyers et al., 2002; Vries et al. 2005). Conyers et al. (2002) found that if a child could not perform a conditional discrimination, then the pictorial preference assessment was inaccurate.

These results could be different from Conyers et al. (2002) for a number of reasons. First, the study was teaching a conditional discrimination. Conyers et al. were using pictures to assess children's preferences. The child not only had to identify the picture but also recognize the picture choice was equal to receiving that reward. The only task in this study was a conditional discrimination. Picture and object discriminations were taught simultaneously in this study. Conyers et al. were assessing preferences and conditional discriminations; no skills were taught. Further research should extend the finding of both studies to children who did not have conditional discriminations to investigate the rate of learning picture and object discrimination

when taught simultaneously and the effect of teaching discrimination on accurate pictorial preference assessments.

Generalization was also assessed in this study. Eighty percent correct independent responses was considered mastery. Participants were idiosyncratic in their ability to generalize across conditions. Adam did not meet criteria for generalization for the first two discrimination tasks. However, he learned very quickly that he was not receiving reinforcement. A reinforcement component was added to the second generalization probe. Adam generalized from picture to object and from object to picture without being taught to do so. In discrimination three, the reinforcement component was compared to a no reinforcement probe. There was no difference between reinforcement and no reinforcement condition. He did not generalize for task three. However, the reinforcement component may not have been effective for multiple reasons. Adam did not come in contact with reinforcement unless he responded correctly since there was no prompting. He also learned very quickly to discriminate between training and probing sessions. In future research, generalization probes can be conducted throughout the study to control for this problem. Generalization for all tasks was probed at the end of the study. Adam responded correctly 40% for picture to object condition and 30% in the object to picture condition. Adam generalization data was similar across conditions. This further supports that there is not a functional relationship between pictures and objects.

Cole met criteria for generalization in several of the discrimination tasks. He responded correctly on 75% of trials in the picture to object condition and 50% in the object to picture condition for discrimination one. The 50% is diminished due to trouble Cole had with mustard. Although he did not meet criteria, he averaged 75% correct. Cole did not meet criteria for generalization for objects or pictures in the second discrimination task. The reinforcement component was added in discrimination three. Cole was noncompliant when he was not

reinforced and refused to respond during the second discrimination probe. He did not meet criteria for generalization in either condition with the added reinforcement component. However, he had the same issue as Adam that he did not contact reinforcement until he received a correct answer. Generalization was probed across all tasks at the end of the study. Cole met criteria for pictures to objects but not objects to pictures. Both participants showed some generalization but the condition did not have an effect on generalization. An extension of this study would be to analyze how quickly children generalize if taught a few exemplars.

The treatment was effective for both participants. Adam and Cole mastered all six conditional discriminations. However, the type of stimulus and order of condition had no effect on acquisition. These results agree with previous research that found that there is no functional relationship between stimuli (Handleman, Powers, & Harris, 1984). Children with autism acquire conditional discriminations with either pictures or objects.

**Future Research**

This study had some limitations. The study only included two participants. These results should be investigated with multiple participants to generalize these findings to the population of children with autism. The treatment focused on teaching conditional discriminations. Future research should extend this findings to other tasks such as teaching prepositions (e.g. in/out). Sailor and Taman (1972) taught a positional discrimination (i.e. "in" and "out") to three children with autism using same or different objects for both tasks. They found that children mastered the position discrimination quicker with the different objects. These results should be replicated with pictures. The participants' ability to discriminate between probe and treatment sessions was a major limitation of this study. In future studies, random generalization probes should be conducted throughout treatment. There was also no baseline generalization probe data due to

extensive amount of probes already conducted in a multiple probe design. However, a baseline probe for generalization can provide a clearer illustration of the results. The results were idiosyncratic. Both children were diagnosed with autism; however, their behaviors and limitations are very different.

**Summary**

The focus of this study was to assess the effect of stimuli on a child's discrimination performance. The results showed that there was no relationship for these participants. Educators can use pictures or objects to teach conditional discriminations using discrete trial training methods; however, exemplars will be needed to teach generalization. Although the type of stimuli had no effect, the study provides an additional replication demonstrating that discrete trail training is an effective method to teach discrimination. Future research should extend these findings to other children, tasks, and generalization.

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