COMPARING A DISCRIMINATIVE STIMULUS PROCEDURE TO A PAIRING PROCEDURE: CONDITIONING NEUTRAL SOCIAL STIMULI TO FUNCTION AS CONDITIONED REINFORCERS

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Social stimuli that function as reinforcers for most children generally do not function as reinforcers for children diagnosed with autism. These important social stimuli include smiles, head nods, thumb-ups, and okay signs. It should be an important goal of therapy for children with autism to condition these neutral social stimuli to function as reinforcers for children diagnosed with autism. There is empirical evidence to support both a pairing procedure (classical conditioning) and a discriminative stimulus procedure to condition neutral stimuli to function as reinforcers. However, there is no clear evidence as to the superiority of effectiveness for either procedure. Despite this, most textbooks and curriculum guides for children with autism state only the pairing procedure to condition neutral stimuli to function as reinforcers. Recent studies suggest that the discriminative stimulus procedure may in fact be more effective in conditioning neutral stimuli to function as reinforcers for children diagnosed with autism. The present research is a further comparison of these two procedures. Results from one participant support recent findings that suggest the discriminative stimulus procedure is more effective in conditioning neutral stimuli to function as reinforcers. But the results from the other participant show no effects from either procedure, suggesting future research into conditions necessary to condition neutral social stimuli to function as reinforcers for children with autism.
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INTRODUCTION

Social stimuli such as smiles, head nods, thumbs-up, and okay signs provided by parents, teachers and other care-givers are important reinforcers to increase the rate of appropriate behaviors in children. Most children diagnosed with autism display significant deficits in the area of social control; i.e., social stimuli do not generally function as reinforcers for these children (Ferster, 1961). Due to this deficit parents, teachers, and other caregivers must rely on reinforcers such as food or toys to increase rates of appropriate behavior in the repertoires of these children. Not only is it impractical to always have to provide a child with edible or tangible reinforcers, but it has relatively low social acceptability. Our society places a great importance on people behaving appropriately because “it is the correct thing to do.” People are referred to doing something because “it is the correct thing to do” when there are no tangible items or edibles are provided for behaving appropriately. However, the cause of the appropriate behavior can likely be attributed to social reinforcers such as smiles, head nods, praise from peers, parents, teachers or other care-givers. For example in a classroom when a child gives his toy to another child that child may smile back at him or his teacher may smile while nodding her head at him. An important therapy goal for children with autism involves conditioning social stimuli to function as reinforcers for these children.

Very little research exists regarding conditioning social stimuli to function as reinforcers for children with autism. The majority of conditioned reinforcement experiments have focused on conditioning stimuli such as lights or sounds for rats and pigeons (Myers, 1958). Lights and sounds do not require the organism to visually orient
towards another organism, these are non-social stimuli. Excluding vocal statements, social stimuli require that the individual visually orients to the individual emitting the social stimulus.

There is a line of research that focuses on using a stimulus-stimulus pairing procedure to condition vocal sounds to function as reinforcers (Yoon & Bennett, 2000; Miguel, Carr & Michael, 2002; Esch, Carr & Michael, 2005). Research on stimulus-stimulus pairing is excluded from this review of the literature because that research focuses on conditioning vocal sounds to function as reinforcers to increase participants’ vocalizations through automatic reinforcement. In contrast the present study focuses on conditioning social stimuli that will be delivered by other individuals to increase behavior.

Two different procedures for establishing conditioned reinforcers are the discriminative stimulus procedure and the pairing procedure (Schoenfeld, Antonitis & Bersh, 1950; Lovaas, Freitag, Kinder, Rubenstein, Schaeffer & Simmons, 1966; Gollub, 1970; Pierce & Cheney, 2004). Research does not provide any conclusive results as to which procedure is more effective in establishing conditioned reinforcement. Instead most studies focus only on one procedure and discuss parameters of conditioning such as temporal proximity, primary reinforcer size, frequency of primary reinforcer, and levels of deprivation and satiation (Shoenfeld, Antonitis & Bersh, 1950; Myers, 1958). As Kelleher and Gollub (1962) summarize at the end of their article reviewing positive conditioned reinforcement, “while discriminative stimuli most often are conditioned reinforcers, stimuli that simply are paired with reinforcers also reinforce” (p.593).

Despite the ambiguity around which procedure is more efficient in conditioning neutral stimuli to function as reinforcement, handbooks for working with children
diagnosed with autism such as Leaf & McEachin (1999) only mention the pairing procedure to condition social stimuli. Leaf and McEachin (1999) instruct parents that “even if your child does not like social reinforcers such as smiles and praise, by associating them with primary reinforcers (e.g., food, drink, favorite toy, etc.), they will eventually become reinforcing as well” (p. 30). This statement indicates that a pairing procedure is effective for children with autism although there is no scientific evidence published to verify that the pairing procedure is effective for children diagnosed with autism. Furthermore, Leaf and McEachin (1999) do not mention any other methods to condition social stimuli to function as reinforcers for children with autism.

Maurice, Green and Luce (1996) state, “Unfortunately, praise is not naturally reinforcing to many children with autism. Nevertheless, by providing it simultaneously with the delivery of small portions of food or other reinforcing consequences, it also may gain reinforcement value to the child” (p. 187). Like Leaf and McEachin (1999), there is no mention of any other procedures to condition reinforcers for children with autism. It is surprising that more attention is not given to conditioning procedures considering the importance of conditioning social stimuli to function as reinforcers for skill acquisition in more natural environments for children with autism.

Lovaas et al. (1966) conducted a study utilizing the discriminative stimulus procedure to condition social stimuli to function as reinforcers for two schizophrenic children “characterized as autistic” (p. 109). Lovaas et al. stated, “although empirical evidence shows (Kelleher & Gollub, 1962) that one can sometimes establish a previously neutral stimulus as an acquired reinforcer, via the classical conditioning paradigm (consistently associating a neutral stimulus with one which already has
reinforcing properties), we failed to observe such effects in the two children with whom we worked” (1966, p. 111). Lovaas et al. (1966) do not provide a detailed description of the pairing sessions nor data supporting that the pairing procedure was ineffective in conditioning social stimuli to function as reinforcers for the participants.

Lovaas et al. (1966) used a discriminative stimulus procedure to condition the word “good” and a shoulder pat to function as reinforcers. The Lovaas et al. (1966) study consisted of two phases: the first phase involved establishing social stimuli as discriminative stimuli for the availability of food, and the second phase involved testing the discriminative stimuli for reinforcing properties. Lovaas et al. (1966) used intermittent schedules to both establish and test the discriminative stimuli. The results demonstrated that a discriminative stimulus procedure was effective in conditioning neutral social stimuli. The discriminative stimulus demonstrated reinforcing properties by establishing a new response, bar-pressing. Lovaas et al. (1966) labeled three operations necessary to establish a social reinforcer for a child with autism: “(a) discriminative stimulus training, (b) intermittent scheduling of reinforcement during that training, and (c) suppression of self-stimulatory behaviors” (p.122). With regard to self-stimulatory behaviors Lovaas et al. (1966) stated that, “their self-stimulatory and tantrum behaviors had been extinguished by shock” (p. 113). Furthermore, Lovaas et al. (1966) manipulated establishing operations by restricting food to experimental sessions only.

Holth, Vandbakk, Finstad, Grønnerud, and Mari (2009) conducted research exploring the effectiveness of using a discriminative stimulus procedure vs. a pairing procedure to condition social stimuli to function as reinforcers for children diagnosed with autism, Down Syndrome, and children with no diagnosis. Results indicated that for
5 out of the 7 children in the study the discriminative stimulus procedure was more effective in conditioning social stimuli to function as reinforcers than was the pairing procedure. During the testing phase participants emitted more responses for the social stimulus conditioned during the discriminative stimulus procedure than for the social stimulus conditioned during the pairing procedure. For 1 of the 7 children the pairing and discriminative stimulus procedures were equally as effective: 24 and 30 responses emitted during the testing phase, respectively. For the last of the 7 children the pairing procedure was more effective in conditioning a social stimulus to function as a reinforcer.

Holth et al. (2009) used various auditory and visual stimuli. Auditory stimuli included: “YAY” sound from a PC, door bell, a toy frog sound, sound from cell phone toy, scratch sound, and sound from a figure. Visual stimuli included: a red smiley face displayed on PC monitor, placing a thumb on the edge of a table, a yellow ball on a stick, a yellow square in a window, and a blue card on a stick. Holth et al. (2009) conducted a multiple-stimulus-without-replacement (MSWO) preference assessment then three free operant reinforcer tests to (1) rule out responses maintained by automatic reinforcement; (2) identify two neutral stimuli; and (3) identify positive reinforcers. Following these assessments the discriminative stimulus procedure was conducted followed by posttests. The pairing procedure was yoked to the discriminative stimulus procedure followed by posttests. Follow-up tests were conducted 2-3 weeks later. However, this time the stimulus from the pairing procedure was tested first followed by testing the stimulus from the discriminative stimulus procedure.

The present study is an extension of Holth et al. (2009) utilizing only gestural social stimuli (e.g., smile, thumb-up and okay sign). The stimuli used by Holth et al.
(2009) during conditioning procedures included objects with only one stimulus that incorporated another individual’s body (e.g., placing a thumb on a table). The stimuli used by Holth et al. (2009) do not necessarily require the participant to visually attend to the behavior of another individual. A smile, thumb-up or okay sign are stimuli that occur in the natural environment and involve another individual.

Practitioners require practical evidence-based procedures to condition neutral stimuli to function as reinforcers for children with autism yet this area has not been widely discussed in the literature. Lovaas et al. (1966) was able to condition social stimuli to function as reinforcers for children with autism. These researchers decreased self-stimulatory behaviors by using of shock before participants started the discriminative stimulus procedure. Lovaas et al. (1966) mentions this decrease in self-stimulatory behavior as necessary to condition stimuli to function as reinforcers. There is no evidence provided to support this statement. It may be possible to condition stimuli to function as reinforcers regardless of self-stimulatory behavior. Furthermore, Lovaas et al. (1966) manipulated establishing operations by restricting the participants to eat only during experimental sessions. Although decreasing self-stimulatory behavior may strengthen the results of conditioning it may not be necessary to decrease self-stimulatory behaviors or manipulate food deprivation before implementing a conditioning procedure.

How effective are the discriminative stimulus and pairing procedures in conditioning neutral social stimuli to function as reinforcers for children diagnosed with autism. The present study is designed to address the lack of research on conditioning new reinforcers for children with autism. Lovaas et al. (1966) demonstrated reinforcing
effects for previously neutral stimuli using the discriminative stimulus procedure, but they did not show outcome data for the pairing procedure. Holth at al. (2009) demonstrated reinforcing effects for previously neutral stimuli with the discriminative stimulus procedure over the pairing procedure for 5 out of 7 participants. However, the stimuli used would not necessarily be classified as social stimuli because they do not require another individual to be in the environment. Furthermore, their graphs for the neutral social stimuli assessment indicate that more responses already occurred during the neutral stimuli assessment for the stimuli used during the discriminative stimulus procedure compared to the stimuli used for the pairing procedure. There is still a significant increase in the rate of responding following the discriminative stimulus procedure from the levels observed during the neutral social stimuli assessment. However, the bias towards the stimuli used during the discriminative stimulus procedure weakens the results of participants who responded at higher rates for the stimuli conditioned during that procedure compared to the rate of responding for the stimuli conditioned during the pairing procedure. The present study addresses these issues by (1) conducting both discriminative stimulus and pairing procedures, (2) using stimuli that require another individual, and (3) equating assignment of neutral social stimuli to conditions in terms of the number of previously observed responses.
METHOD

Participants

Two children diagnosed with autism participated in this experiment. They attended the Child Study Center where they were enrolled in 1:1 therapy based on behavior analytic principles. Jaron was a 3-½-year-old male with limited skills. In therapy he had mastered the following programs: tolerating physical prompting and single-piece insert puzzles. He was working on the following programs: vocal mand training; matching identical objects; imitating simple motor movements; acquiring listener skills identifying desired objects; responding to the instruction, “Get ready”; waiting; holding an adult’s hand while walking; and following simple one-step instructions. He attended 1:1 therapy twice weekly (for a total of 13.5 hrs) and had been enrolled in that program approximately 3 months at the start of the study. Jaron had a limited number of edibles and toys that functioned as reinforcers for his appropriate behavior. He typically worked for M&Ms® chocolate candies (Mars, Incorporated and its Affiliates, www.mars.com) or watching an animated movie.

Bubba was a 4-year-old male who also had a limited skill repertoire. In therapy he had mastered the following programs: “Sit in chair” independently; responding to the instructions “Get ready”; matching identical objects; matching identical pictures; and matching objects to pictures. He used the picture exchange communication system (PECS) and was working on the following programs: vocal mand training; imitating motor movements; following one-step instructions; walking while holding an adult’s hand; matching identical verb pictures; imitating vocal sounds; and making eye contact. He attended 1:1 therapy 4 days/week for a total of 27 hrs and had been enrolled in the
program for approximately 7 months when this study started. Bubba had a small variety of edibles and toys that functioned as reinforcers, but his therapy also relied heavily on edibles and movies as positive consequences for appropriate responding.

Setting and Materials

The study was conducted in various rooms in the Child Study Center. Only two children’s 1:1 therapy sessions were ever conducted in the same room as the experimental session. Primarily, toward the end of the experiment there was no one else in the room. A white screen similar to one seen in a dental or doctor’s office was placed around the session area. This white screen had a metal frame with white vinyl material stretched across 5 panels. The white screen was free standing and could be bent to curve around the session area as needed. Participants sat in child-sized chairs at a child-sized table.

My video camera was utilized to record sessions. The experimenter used her digital watch, or a small white timer, to keep time for Intertrial-Intervals (ITI) and for 5-min sessions during assessment and post-testing. Both the watch and timer beeped at the end of each 5-min session. I recorded data from each session on an index card using a small clipboard with a pen. Interobserver agreement (IOA) data were collected by a blocker during the discriminative stimulus procedure.

Jr. Company, www.starbursts.com) and Chips Ahoy® chewy chocolate chip cookies (Kraft Foods Inc., www.kraftfoodscompany.com). After the preference assessment each participant’s most preferred edible was used: M&Ms® for Jaron and Oreos® for Bubba. Prior to each session edibles were divided into small pieces. Jaron’s M&Ms® were cut into 4 pieces and Bubba’s Oreos® were broken into pieces approximately the same size as half an M&M®. These edibles were placed on top of a plastic container on the floor beside the experimenter’s chair.

Experimental Design and Response Measurement

The experiment consisted of assessments and posttests of social stimuli to determine their reinforcing properties corresponding to two conditioning procedures. First, the discriminative stimulus conditioning procedure was conducted, because the number of pairings during the pairing conditioning procedure was yoked to the number of trials conducted to reach mastery criterion during the discriminative stimulus procedure. For Bubba concurrent schedules were used to assess the effects of stimuli on the rates of responding during assessment and testing phases. An ABA design was implemented to assess the effects of stimuli on the rates of responding for Jaron’s assessment and testing phases.

The dependent variable measured during assessments and posttests was the cumulative response rates recorded during 5-min sessions. The independent variable was the discriminative stimulus and pairing procedures used to condition the neutral social stimuli.

During the discriminative stimulus procedure the participant’s response was scored ‘b’ when the blocker had to block the participant’s hands from reaching for the
edible before the experimenter emitted the social stimulus. This definition of blocking included the blocker’s hands anywhere within a semi-circular area in front and/or to the side of the participant. The participant’s response was scored as ‘p’ when the blocker had to physically prompt the child to reach for the edible after 5s had elapsed following termination of the social stimulus presentation. The participant’s response was scored as ‘i’ when the participant reached for the edible only when the experimenter emitted the social stimulus or within 5s after termination of the social stimulus.

Interobserver agreement (IOA) was calculated for percentage agreement of occurrence during assessments, posttests, and follow-up tests by taking the number of recorded agreements of occurrences of behavior that both observers recorded and dividing it by the total number of agreements and disagreements of occurrences. IOA was calculated for 34.48% of assessments, 32.09% of the conditioning procedures, and 37.50% of posttests and follow-ups. IOA was calculated for 33.18% of the overall sessions conducted. IOA for assessments was 89.40% with a range of 71-100%; for conditioning procedures was 98.39% with a range of 90-100%, and for posttests and follow-up was 91.25% with a range of 71-100%. Overall IOA was 90.74% agreement of occurrence with a range of 71-100% agreement of occurrence.

Procedure

Prior to the two experimental conditions (discriminative stimulus procedure vs. paring procedure) a (1) preference assessment, (2) response assessment, (3) reinforcer assessment, and (4) neutral social stimulus assessment were conducted for each participant (Holth et al., 2009). During each assessment the participant sat in a child-sized chair at the table with the experimenter either perpendicular to or across the table
from the participant. Another individual stood next to the table to film with the video camera. To minimize distractions the white screen was placed around the session area. Except for the preference assessment all assessment sessions lasted 5-min and were terminated early if the participant emitted behavior that indicated distress (e.g., crying). Only one session was terminated early when Jaron cried during an extinction condition.

**Preference Assessment**

The preference assessment, based on DeLeon and Iwata (1996), was a multiple-stimulus-without-replacement (MSWO). The stimuli used during the MSWO were checked on the consent form by each participant’s parent. Each participant tasted a small piece of each edible prior to starting the MSWO. The experimenter randomly sequenced bite-sized pieces of each edible 3-in. apart on the table. The experimenter said, “Pick one” and pointed to the line of edibles.

After the participant selected an edible the experimenter removed all remaining edibles and gave the participant time to consume the selected edible. The experimenter recorded each participant’s selection. The remaining edibles were placed back on the table; however each position was rotated by shifting all edibles one spot to the left. The edible that was consumed was not replaced. This procedure was repeated until all edibles were selected, or the participant made no selection within 30s after the instruction. Several rounds were conducted until a clear first preference was demonstrated (within 3 rounds for both participants).

**Response Assessment**

The response assessment was conducted to identify 6 responses that each participant was physically capable of completing, but had a low operant rate. The
response rate did not increase due to a reinforcing property of the response or a history of high rates of reinforcement for emitting the response. The responses had to be free-operants, so the participant always had the opportunity to emit the response. For Bubba concurrent schedules of reinforcement were being used, requiring two responses with the same topography but with a different identifying feature (e.g., different colors, positions or both). Concurrent schedules were tested for Jaron but even with his most preferred edible reinforcer (tested to demonstrate its reinforcing properties) following one response option, he did not discriminate the contingencies, so an ABA design was implemented with one free-operant response option.

The responses were tested during 5-min intervals for each response. The experimenter physically hand-over-hand prompted the participant to emit 5 responses at the start of the 5-min, then sat back so the participant had free access to the materials. For Bubba 5 responses were prompted for Responses A and B. At the end of 5-min the materials were removed. The experimenter intervened only if there was a safety hazard (e.g., putting small objects into his mouth). The child was allowed to manipulate the materials in any way. The experimenter ensured that the response was always possible to emit. This included returning materials thrown to the ground back on the table, turning buckets back over, taking apart stacked blocks, and returning a magnet to a magnetic strip after it had been left elsewhere on the clipboard or table.

Reinforcer Assessment

A reinforcer assessment was conducted to determine that the edible identified as most preferred for each participant during the preference assessment actually functioned as a reinforcer. One response that met the response assessment criterion
was selected. The experimenter gave Bubba a piece of Oreo® contingent on Bubba emitting Response A; Response B had no programmed consequence during a 5-min session. Then another 5-min session was conducted during which the experimenter gave Bubba a piece of Oreo® contingent on his emitting Response B; there was no programmed consequence for Response A. The experimenter physically prompted Bubba to emit 5 responses for each response in both 5-min sessions to contact the contingencies for both responses. For Jaron the experimenter ran three 5-min sessions in an ABA design. Condition A consisted of baseline and extinction conditions with no programmed consequences. During Condition B contingent on emitting the response the experimenter gave Jaron ¼ of an M&M®. During both conditions the experimenter physically prompted 5 responses so that Jaron could contact the contingencies.

**Neutral Social Stimuli Assessment**

The neutral social stimuli assessment (NSSA) was conducted to identify two social stimuli that had not already functioned as reinforcers for each participant. Two responses from the response assessment were selected for each participant. For Bubba the experimenter emitted the Social Stimulus A contingent on Bubba emitting Response 1A. Response 1B had no programmed consequence during a 5-min session. Then another 5-min session was conducted during which the experimenter emitted Social Stimulus A contingent on Bubba emitting Response 1B. Response 1A had no programmed consequence. The experimenter physically prompted Bubba to emit 5 responses each in both 5-min sessions, allowing for the participant to contact the contingencies for both responses. The same assessment procedure was used to test Stimulus B with Response 4A and Response 4B.
For Jaron the experimenter ran three 5-min sessions in an ABA design. Condition A was the baseline extinction condition with no programmed consequences. During Condition B the experimenter delivered Social Stimulus A contingent on Jaron emitting response 1. During both conditions the experimenter physically prompted 5 responses so that Jaron would contact the contingencies in place. The same assessment procedure was used to test Social Stimulus B with Response 4.

If there was no increase in responding when the social stimulus was delivered contingent on each participant emitting the response, the social stimulus was considered neutral or not to have reinforcing properties. If the response increased following delivery of the social stimulus then the social stimulus was considered already to have reinforcing properties and was not used for that participant. Social stimuli were tested until two neutral social stimuli were identified for each participant.

*General Conditioning Procedures*

During both the discriminative stimulus and pairing procedures the participant sat in a child-sized chair at a child-sized table across from the experimenter. The blocker sat in a chair behind the participant. Another adult stood to the side of the table to film with the video camera. The white screen was placed around the table to minimize visual distractions. The experimenter would say ‘ready,’ to signal to the blocker to physically guide the participant’s hands into his lap. In both procedures the experimenter presented the neutral social stimulus *only* when the child oriented his eyes towards the experimenter. The experimenter emitted the social stimulus for a duration of 2s-6s in an exaggerated manner to ensure the social stimulus was salient in the environment. Each session consisted of 10 trials or pairings and was conducted with at
least 30-min between sessions. Intertrial interval (ITI) was, on average, 30s and ranged from 25s-35s. During the ITI the experimenter and blocker remained quiet, kept neutral facial expressions, and their heads down.

**Discriminative Stimulus Procedure**

After all the aforementioned assessments were conducted the discriminative stimulus procedure was implemented to attempt to condition Neutral Social Stimulus A to function as a reinforcer (Holth et al., 2009). The experimenter said, “Ready”; then the blocker gently guided the participant’s hands into his lap. While the participant’s hands were being guided to his lap, the experimenter placed the piece of preferred edible (i.e., a reinforcer) in the middle of the table between the experimenter and the participant. The edible was the only item on the table.

The experimenter waited for the participant to look at her or to look at the area wherein the neutral social stimulus had been emitted in past trials. In particular, Jaron would stare at the edible then look up at the experimenter’s hands. Jaron’s Neutral Social Stimulus A was a thumb-up. Bubba oriented his eyes to either the experimenter’s eyes or mouth. Bubba’s Neutral Social Stimulus A was a smile. Once the participant oriented his eyes to the appropriate location, the experimenter delivered Neutral Social Stimulus A (smile for Bubba; thumb-up for Jaron). For Bubba the experimenter gave an exaggerated smile; for Jaron the experimenter extended her arm so that the thumb-up was delivered in the air above the edible.

If the participant reached for the edible before the experimenter emitted the neutral social stimulus the blocker blocked the participant’s hands and guided them back to the participant’s lap. After the experimenter delivered the neutral social stimulus
the participant could pick up the edible. Then the participant was allowed to consume the edible while the experimenter and blocker were quiet, kept a neutral expression on their faces and, generally, kept their heads down. If the participant did not reach for the edible within 5s after the termination of the neutral social stimulus, the blocker would physically prompt the participant to reach toward the edible. If the participant dropped the edible in his lap or on the table he was allowed to pick it up and consume it. If the participant dropped the edible on the floor the blocker moved the edible out of the session area with his/her foot. At the end of the session it would be placed in the trash.

A most-to-least prompt hierarchy was implemented to teach the response of reaching for the edible only in the presence of the social stimulus. During the first trial after the blocker placed the child’s hands in the child’s lap, he/she kept his/her hands on the child’s hands and physically prompted the child to reach for the edible when the experimenter presented the discriminative stimulus. Then the blocker kept his/her hands on the child’s until the experimenter presented the discriminative stimulus. When the blocker felt the child keep his hands still then he/she lifted his/her hands just above the child’s hand on the next trial. If the child kept his hands still then on the next trial the blocker lifted his/her hands a little higher and moved them a little bit further apart to the side in a semi-circle. This continued until the blocker completely removed his/her hands behind the child after guiding the child’s hands into his lap.

Mastery criterion for the discriminative stimulus procedure was initially set as follows: first trial scored as an ‘i’ and 90-100% of the 10-trial block scored as ‘i’ across 3 consecutive sessions. The mastery criterion was altered when it was observed that Bubba repeatedly had the first trial scored as ‘i’ and 80-100% of the subsequent 10-trial
block scored as ‘i’. The experimenter considered that the mastery criterion may have been too strict for an applied study. The white screen helped to minimize visual distractions but did not minimize auditory distractions. Bubba mastered the discriminative stimulus procedure with the criterion set as first trial scored as ‘i’ and 80-100% of the 10-trial session scored as ‘i’ across 3 consecutive sessions. Jaron met the same mastery criterion, but after the social stimulus had no effect on behavior during discriminative stimulus post-testing, the mastery criterion was returned to the stricter criterion: first trial scored as ‘i’ and 90-100% of the 10-trial session scored as ‘i’ across 3 consecutive sessions. After meeting mastery criterion three 3-trial sessions were conducted following the same format to strengthen the social stimulus functioning as a discriminative stimulus (SD).

*Discriminative Stimulus Procedure Reinforcer Posttest*

Immediately following the three 3-trial sessions of the discriminative stimulus procedure social stimulus A was tested for reinforcing properties. Discriminative stimulus post-testing was conducted using the same method as in the neutral social stimulus assessments. The participant sat in a chair at the table across from the experimenter with an individual standing to the side with the video camera to record the session and the white screen placed around the session area. The first response tested was the response used for the neutral social stimulus assessment for Social Stimulus A. For Bubba concurrent schedules were implemented, while for Jaron an ABA design was used to test Social Stimulus A for its reinforcing properties. During the concurrent schedules for the first 5-min session the experimenter delivered Social Stimulus A (smile) contingent on the participant emitting Response 1A; during the second 5-min
session the experimenter delivered Social Stimulus A (smile) contingent on the participant emitting Response 1B. Both 5-min sessions started with the experimenter physically prompting the participant to emit each response 5 times to contact the contingencies for each response option. For Jaron Condition A was an extinction condition with no programmed consequence for emitting the response. During Condition B the experimenter delivered Social Stimulus A (thumb-up) contingent on Jaron emitting Response 1. During all three 5-min sessions the experimenter physically prompted the participant to emit the response 5 times to contact the contingency.

Following the SD procedure the social stimulus was tested across three responses to evaluate if it had acquired reinforcing properties. In Bubba’s case it was three sets of responses. Response 1 or Responses 1A and 1B were used to test for reinforcing properties of Social Stimulus A the same day as the three 3-trial sessions for Jaron and Bubba, respectively. If there was no effect for Response 1 or Responses 1A and 1B, then the experimenter tested using Response 2 or Responses 2A and 2B that same day to rule out a unique aspect particular to that response (e.g., level of difficulty). Responses 2 and 3 or Responses 2A, 2B, 3A, and 3B were used to test for reinforcing properties on the next day that Jaron and Bubba (respectively) attended the Child Study Center.

Pairing Procedure

After Social Stimulus A was tested following the discriminative stimulus procedure, the pairing procedure was implemented for Social Stimulus B (Holth et al., 2009). The number of trials conducted during the pairing procedure was yoked to the discriminative stimulus procedure. The experimenter conducted the pairing procedure
with the same number of 10-trial and 3-trial sessions as in the discriminative stimulus procedure.

The experimenter said, “Ready” to signal the blocker to gently guide the participant’s hands into the child’s lap. The experimenter waited for the child to orient his eyes either to the experimenter or to the area where Social Stimulus B was presented. When the participant looked in the correct direction the experimenter emitted Social Stimulus B (thumb-up for Bubba; okay sign for Jaron) in the air approximately midway between the experimenter and participant.

The experimenter presented Social Stimulus B for duration of 2s-6s. Then the experimenter placed a piece of that participant’s most preferred edible in the participant’s mouth or against the participant’s lip 1s after terminating Social Stimulus B. Then the child was allowed to consume the edible. The edible was the same as that used during the discriminative stimulus procedure (i.e., M&M® for Jaron and Oreo® for Bubba). If on delivery the edible fell out of the participant’s mouth onto the table the experimenter picked it up and quickly replaced it in the participant’s mouth.

Pairing Procedure Reinforcer Posttest

Post-testing followed completion of the same number of pairings as trials during the discriminative stimulus procedure to test Social Stimulus B for reinforcing properties. Post-testing was conducted utilizing the same method as during the post-testing that followed the discriminative stimulus procedure.

Response 4, implemented for the neutral social stimulus assessment, tested Social Stimulus B for reinforcing properties. For Bubba concurrent schedules were implemented, while an ABA design was used for Jaron. During Bubba’s first 5-min
session the experimenter delivered social stimulus B (thumb-up) contingent on Bubba emitting response 4A; during the second 5-min session the experimenter delivered Social Stimulus B (thumb-up) contingent on Bubba emitting Response 4B. Both 5-min sessions started with the experimenter physically prompting the participant to emit each response 5 times to contact the contingencies programmed for that response option. For Jaron Condition A was a baseline/extinction condition with no programmed consequence for emitting Response 4. During Condition B the experimenter delivered Social Stimulus B (okay sign) contingent on Jaron emitting Response 4. During all three 5-min sessions the experimenter physically prompted Jaron 5 times to emit Response 4 and, thereby, contact the programmed contingency.

The social stimulus was tested across three responses or three sets of responses. Response 4, or Responses 4A and 4B, were used to test for reinforcing properties of Social Stimulus B the same day as the three 3-trial sessions. Responses 5 and 6 or Responses 5A, 5B, 6A and 6B were used to test the next day that the participant attended. If there was no effect with Response 4, or Responses 4A and 4B, then the experimenter tested using Response 5, or Responses 5A and 5B, that same day to rule out some aspect particular to that response (e.g., level of difficulty).

Follow-up tests

Follow-up testing was conducted after both procedures had been completed and tested. The follow-up test was conducted 2 weeks after the posttest pairing procedure. The testing procedure was the same as the posttests. Social Stimulus B was tested first then Social Stimulus A. Each social stimulus was tested with the same responses used during posttests. Follow-up testing was conducted only with Bubba.
RESULTS

Bubba

Assessments

Bubba’s assessment results are presented in Table 1 and Figures 1-3. Table 1 displays the results from Bubba’s multiple stimulus without replacement (MSWO) preference assessment. Table 1 indicates that Bubba selected Oreos® first during all three rounds of the preference assessment. That confirmed that Oreos® were Bubba’s most preferred edible out of the selection approved by his parents.

Figure 1 shows the results from Bubba’s concurrent responses assessment. All 6 graphs depicted in Figure 1 suggest that the participant could emit the responses but did not emit them at high rates without programmed consequences during the 5-min sessions. The experimenter prompted the participant to emit each response once. No response was emitted more than 7 times in a 5-min session. Prompted responses were not graphed.

Figure 2 depicts the results from Bubba’s neutral social stimuli assessment. Responses included were from the concurrent response assessment and are labeled accordingly. The top two graphs illustrate results from when the programmed consequence of a selected response was the experimenter’s a smile. The bottom two graphs depict results from when the programmed consequence of a selected response was the experimenter giving a thumb-up. The other response had no programmed consequence. All 4 graphs in Figure 2 illustrate that the experimenter’s smile or a thumb-up did not function as a reinforcer for emitting the responses. No response was emitted more than 8 times in a 5-min session. In the second graph from the top, both
responses increased in frequency toward the end, indicating that it was not due to reinforcing effects of the experimenter’s smile but rather to another reinforcing variable that affected both responses. Prompted responses are not graphed.

Figure 3 displays the results from Bubba’s edible reinforcer assessment. Prompted responses are not graphed. The graphs demonstrate that a piece of Oreo® functioned as a reinforcer for the participant making the selected response. Bubba made each response 47 and 50 times during the 5-min sessions in which the experimenter delivered an Oreo® contingent on that response. The responses made were from Bubba’s concurrent response assessment.

*Conditioning Procedures and Posttests*

Bubba’s results from the two procedures implemented to condition neutral social stimuli to function as reinforcers are shown in Figures 4-7. Figure 4 depicts the trial data from the Discriminative Stimulus Procedure and the cumulative number of trials conducted. The top graph confirms that the experimenter’s smile functioned as a discriminative stimulus, because the participant independently reached for the edible only in the presence of the experimenter’s smile. The bottom graph shows that 299 trials were conducted within 32 sessions during the Discriminative Stimulus Procedure.

Figure 5 depicts the results from Bubba’s discriminative stimulus procedure reinforcer posttest. The graphs are formatted such that the first 5-min test session for each response is on top of the second 5-min test session for the corresponding response. Prompted responses were not graphed. The top two graphs indicate that the experimenter’s smile functioned as a reinforcer for Responses 1A and 1B. Bubba emitted Response 1A a total of 76 times when the experimenter smiled contingent on
Bubba emitting Response 1A during the first 5-min session. He emitted Response 1B 1 time during that session. During the second 5-min session, Bubba emitted Response 1A a total of 5 times and Response 1B a total of 82 times when the experimenter smiled contingent on Bubba emitting Response 1B.

The middle two graphs in Figure 5 demonstrate that the experimenter’s smile functioned as a reinforcer for Responses 2A and 2B. Bubba emitted Response 2A 20 times when the experimenter smiled contingent on Bubba emitting Response 2A during the first 5-min session. He emitted Response 2B 1 time during that session. During the second 5-min session Bubba emitted Response 2A 1 time and Response 2B a total of 22 times when the experimenter smiled contingent on Bubba emitting Response 2B.

The bottom two graphs in Figure 5 demonstrate that the experimenter’s smile did not function as a reinforcer for Responses 3A and 3B. Bubba emitted Response 3A a total of 21 times when the experimenter smiled contingent on Bubba emitting Response 3A during the first 5-min session. He emitted Response 3B a total of 14 times during that session. During the second 5-min session Bubba made Response 3A a total of 5 times and Response 3B a total of 6 times when the experimenter smiled contingent on Bubba making Response 3B.

Figure 6 shows the cumulative number of pairings that the experimenter conducted with Bubba during the Pairing Procedure. The total number of pairings was 299 across 32 sessions. This is the same number of pairings broken into the same number of sessions as on the Discriminative Stimulus Procedure trials.

Figure 7 shows the results of Bubba’s pairing procedure reinforcer posttest. The graphs are formatted so that the first 5-min test session for each response is on top of
the second 5-min test session for the corresponding response. The experimenter physically prompted Bubba to emit each response (A and B) 5 times at the start of the 5-min sessions to ensure that Bubba contacted the programmed contingencies for emitting each response. The top two graphs in Figure 7 indicate that for Responses 4A-6B the experimenter’s thumb-up did not function as a reinforcer. Bubba did not emit any unprompted responses of Responses 4A and 4B when the experimenter’s thumb-up was contingent on Bubba making Response 4A during the first 5-min session and when the experimenter’s thumb-up was contingent on Bubba making Response 4B during the second 5-min session.

The middle two graphs in Figure 7 show that Bubba emitted both Responses 5A and 5B a total of 6 times each when the experimenter’s smile was contingent on Bubba making Response 5A during the first 5-min session. During the second 5-min session, Bubba emitted Response 5A a total of 10 times and Response 5B a total of 5 times when the experimenter’s thumb-up was contingent on Bubba emitting Response 5B.

The bottom two graphs in Figure 7 demonstrate that the experimenter’s smile did not function as a reinforcer for Responses 6A and 6B. Bubba did not emit Responses 6A and 6B when the experimenter’s thumb-up was emitted contingent on Bubba making Response 6A during the first 5-min session. During the second 5-min session, Bubba emitted Response 6A a total of 2 times, and Response 6B 1 time when the experimenter’s thumb-up was contingent on Bubba emitting Response 6B.

**Follow-Up Tests**

Figure 8 depicts Bubba’s pairing procedure reinforcer follow-up test. Only unprompted responses are graphed. Both graphs indicate that the experimenter
emitting a thumb-up did not function as a reinforcer. Bubba did not emit Responses 4A and 4B when the experimenter’s thumb-up was contingent on Bubba emitting Response 4A during the first 5-min session. During the second 5-min session, Bubba did not make Response 4A unprompted and Response 4B 1 time when the experimenter’s thumb-up was contingent on Bubba emitting Response 4B.

Figure 9 depicts the results of Bubba’s discriminative stimulus procedure reinforcer follow-up test. The graphs are formatted so that the first 5-min test session for each response is above the second 5-min test session for the corresponding response. The top two graphs indicate that the experimenter’s smile did function as a reinforcer for Responses 1A and 1B. Bubba emitted Response 1A a total of 50 times when the experimenter’s smile was contingent on Bubba making Response 1A during the first 5-min session. He emitted Response 1B 1 time during that session. During the second 5-min session Bubba emitted Response 1A a total of 4 times and Response 1B a total of 19 times when the experimenter’s smile was contingent on Bubba emitting Response 1B.

The middle two graphs in Figure 9 demonstrate that the experimenter’s smile functioned as reinforcement for Responses 2A and 2B during the first 5-min session but not during the second 5-min session. Bubba emitted Response 2A a total of 30 times when the experimenter’s smile was contingent on Bubba making Response 2A during the first 5-min session, and he emitted Response 2B a total of 2 times during that session. During the second 5-min session Bubba emitted Response 2A a total of 4 times and Response 2B a total of 2 times when the experimenter smiled contingent on Bubba emitting Response 2B.
The bottom two graphs in Figure 9 demonstrate that the experimenter’s smile did not function as a reinforcer for Responses 3A and 3B. Bubba emitted Response 3A a total of 6 times when the experimenter’s smile was contingent on Bubba emitting Response 3A during the first 5-min session. He emitted Response 3B a total of 4 times during that session. During the second 5-min session Bubba emitted Response 3A a total of 3 times and Response 3B a total of 2 times when the experimenter’s smile was contingent on Bubba emitting Response 3B.

Jaron

Assessments

Jaron’s assessment results are presented in Table 2 and Figures 10-12. Table 2 displays the results from Jaron’s multiple stimulus without replacement (MSWO) preference assessment. Table 2 indicates that Jaron selected M&Ms® first during all three rounds of the preference assessment. That confirmed that M&Ms® were Jaron’s most preferred edible out of the selection approved by his parents.

Figure 10 shows the results from Jaron’s concurrent responses assessment. All 6 graphs depicted in Figure 10 suggest that while the participant could emit the responses he did not emit them at high rates without programmed consequences during the 5-min sessions. No response was emitted more than 8 times in a 5-min session.

Figure 11 displays the results from Jaron’s neutral social stimuli assessment. Responses used to test the neutral stimuli were from the concurrent response assessment, Figure 10, except that a single response was available in an ABA design. The top 3 graphs depict results when the programmed consequence of Response 1 during Condition B was the experimenter emitting a thumb-up. The bottom 3 graphs
illustrate results from the programmed consequence of Response 4 during Condition B, when the experimenter emitted an okay sign. Condition A (Baseline) had no programmed consequence. Figure 11 illustrates that the experimenter’s thumb-up and okay sign did not function as a reinforcer for emitting the responses. No response was emitted more than 9 times in a 5-min session.

Figure 12 displays the results from Jaron’s edible reinforcer assessment. The graphs demonstrate that ¼ of an M&M® did function as a reinforcer for the participant to make the response. The response was from Jaron’s concurrent response assessment, but used an ABA design. Jaron emitted Response 1 a total of 75 times when an M&M® was delivered contingent on the response during Condition B. During Condition A only 20 and 17 responses were emitted when there were no programmed consequences.

*Conditioning Procedures and Posttests*

Jaron’s results from the two procedures implemented to condition neutral social stimuli to function as reinforcers are shown in Figures 13-17. Figure 13 depicts the trial data from the Discriminative Stimulus Procedure and the cumulative number of trials conducted. The top graph illustrates that the experimenter’s thumb-up functioned as a discriminative stimulus, because the participant independently reached for the edible only in the presence of the experimenter’s smile. The bottom graph shows that 448 trials within 49 sessions were conducted during the Discriminative Stimulus Procedure. The break in the data series indicates where the participant’s responding first met mastery criterion. Posttests conducted after the mastery criterion was met did not evoke responses, indicating there were no reinforcing properties of the experimenter’s
thumb-up. Therefore, the mastery criterion was made stricter for the Discriminative Stimulus Procedure.

Figure 14 depicts the results from Jaron’s first discriminative stimulus procedure reinforcer posttest after the initial mastery criterion had been met. The graphs are formatted so that Condition A (baseline) 5-min session graph is above the Condition B 5-min session graph. The experimenter physically prompted Jaron to emit the response 5 times at the start of the 5-min sessions in order to contact the contingencies for emitting the response. Figure 14 indicates that the experimenter’s thumb-up did not function as a reinforcer. For Response 4 the participant actually emitted fewer responses during Condition B compared to Condition A or baseline. Jaron emitted Response 4 twenty-five times during baseline and 6 times during Condition B, and Response 2 three times during both baseline and Condition B.

Figure 15 depicts the results from Jaron’s second discriminative stimulus procedure reinforcer posttest after the second mastery criterion had been met. The graphs are formatted so that Condition A (baseline) 5-min session graph is above the Condition B 5-min session graph. The experimenter physically prompted Jaron to emit the response 5 times at the start of the 5-min sessions to contact the contingencies for emitting the response. Figure 15 indicates that the experimenter’s thumb-up did not function as a reinforcer. Jaron did not emit Response 1 during baseline and 1 time during Condition B. Jaron emitted Response 2 six times during baseline and 5 times in Condition B. The experimenter terminated the 5-min session for Response 2 Condition B after only 1 min and 30 s because Jaron was repeatedly putting the magnet in his mouth, and this presented a choking hazard.
Figure 16 depicts the cumulative number of pairings that the experimenter conducted with Jaron during the Pairing Procedure. The total number of pairings was 448 across 49 sessions. This is the same number of pairings broken into the same number of sessions as in the Discriminative Stimulus Procedure trials.

Figure 17 shows the results of Jaron's pairing procedure reinforcer posttest. The graphs are formatted so that Condition A is above the Condition B graph. The experimenter physically prompted Jaron to emit the response 5 times at the start of the 5-min sessions to contact the contingencies for emitting the response. Figure 17 indicates that the experimenter’s okay sign did not function as a reinforcer. Jaron emitted Response 4 one time during baseline and did not emit Response 4 unprompted during Condition B. Jaron emitted Response 2 one time during baseline and five times during Condition B.

**Follow-Up Tests**

Follow-up tests were not conducted for Jaron because neither the experimenter's thumb-up nor okay sign demonstrated reinforcing properties during posttests.
DISCUSSION

The results of this study demonstrated that it is possible to condition neutral social stimuli to function as reinforcers for children with autism as shown by Bubba’s results. Bubba’s outcome indicates that the discriminative stimulus procedure was more effective than the pairing procedure. However, Jaron’s results raise interesting questions about prerequisites for conditioning stimuli to function as reinforcers for children with autism.

The results for Bubba are consistent with findings by Holth et al. (2009) where the discriminative stimulus procedure was effective in conditioning stimuli to function as reinforcers for some participants. In Holth et al. (2009) the pairing procedure was effective for some participants. But for Bubba the pairing procedure did not condition the neutral social stimulus to function as a reinforcer when number of pairings was yoked to number of trials. Bubba’s results are also consistent with Lovaas et al. (1966) in that the discriminative stimulus procedure was effective in conditioning stimuli to function as reinforcers.

Testing across three responses for Bubba and two for Jaron provided an opportunity to rule out reinforcer effectiveness for the conditioned social stimuli, due to some unique property of that response. In the case of Bubba the multiple responses allowed observation of the reinforcing effectiveness over time. During posttests reinforcing properties were tested using responses 1A and 1B the same day as the last three strengthening sessions. Responses 2A, 2B, 3A, and 3B were not posttested until 4 days later. Bubba met mastery criterion on a Thursday, responses 1A and 1B were tested that afternoon immediately before the children went home, and Bubba’s next
therapy day was the following Monday. Bubba’s data indicate reinforcing effects of the experimenter’s smile the day the mastery criterion was met and then with responses 2A and 2B 4 days later. However, by the time 3A and 3B were used to test for reinforcing properties there was no difference between the responses.

The reinforcing effects of the experimenter’s smile that was conditioned during the discriminative stimulus procedure did not maintain when further extinction trials occurred. Lovaas et al. (1966) used intermittent reinforcement in both conditioning and testing of the social stimulus for reinforcing properties to increase resistance to extinction. The lack of maintenance is a weakness in this study.

Surprisingly, after the reinforcing effects appeared to be extinguished during the posttests, the follow-up tests demonstrated some reinforcing properties of the experimenter’s smile. However, the participant emitted approximately 30 fewer responses during the follow-up test than he did during the posttests. This indicates that the reinforcing effect of the smile was not as strong as it was during posttests. Follow-up graphs show the same pattern of reinforcing effects extinguishing with each 5-min test session. However, the reinforcing effects of the experimenter’s smile extinguished sooner during the follow-up test than during the posttest.

Jaron’s results are interesting in that there was no effect from either procedure; whereas some effect with at least one procedure had been predicted. A concurrent-operants design was not effective for Jaron. The experimenter determined this when testing for reinforcing properties of the ¼ of an M&M®. Despite several sessions with the edible following only one response there was no differentiation between the responses for the edible. This failure to distinguish between the contingencies in a
concurrent-operants design could be an important distinction between the repertoires of the two participants in terms of their discrimination skills.

Furthermore, Jaron had only a few items that functioned as reinforcers, M&Ms® were his main reinforcer followed by watching movies, though not as strong of a reinforcer. This study would have interfered with his ongoing therapy if M&Ms® were restricted to experimental sessions only. However, access to M&Ms® throughout the day could have interfered with establishing discriminative stimulus control over the availability of M&Ms®. Jaron never seemed to satiate on M&Ms® and continued to mand for them during experimental sessions. Oreos® were not restricted for Bubba during therapy sessions, but there were more edibles and tangibles that functioned as reinforcers for Bubba that were used throughout his therapy sessions. Bubba enjoyed looking at books, watching movies, and would work for access to juice and a variety of edibles. Both Bubba and Jaron engaged in vocal stereotypy throughout the experiment.

Implications for Future Research

This study could be a useful source for future research in the area of conditioning reinforcers for children with autism. One area to investigate would be looking at prerequisites for establishing conditioned reinforcers. Prerequisites may be either related to skill acquisition (e.g., eye contact or visual discrimination) or to the number of existing items that functioned as reinforcers. Compared to Bubba, Jaron had very few items that functioned as reinforcers.

Another important research question regards stereotypy. Lovaas et al. (1966) claimed that decreasing self-stimulatory behavior was an important component in conditioning social stimuli to function as reinforcers. To answer this question it would be
ideal to find participants whose skill levels are very similar but who exhibited different levels of self-stimulatory behavior. In the current study both participants engaged in self-stimulatory behavior but at different rates. Measurements of the rates of self-stimulatory behavior may be important in future research.

Another question regarding the discriminative stimulus procedure is: What constitutes an appropriate mastery criterion? Jaron met mastery criterion but there were no reinforcing conditioning effects. Then the mastery criterion was altered to a stricter criterion, but still there were no reinforcing conditioning effects. It is important to note that when Jaron met the mastery criterion it was typically at the end of a day so the 3 trial sessions that were supposed to strengthen discriminative stimulus control were held the next day. However, Jaron had to be blocked or prompted during the first session in the morning. It may be important to add to the mastery criterion for the discriminative stimulus procedure that the first trial during the first session of the day must be independent/correct.

Conclusion

The results of this study demonstrate that it is possible to condition social stimuli for children diagnosed with autism. The outcomes also indicate that the discriminative stimulus procedure may be more effective than the pairing procedure in conditioning neutral social stimuli to function as reinforcers for children diagnosed with autism. Future research is needed to explore prerequisites related to conditioning stimuli to function as reinforcers as well as parameters that effect conditioning and maintenance of conditioned reinforcers.
This study offers evidence for the effectiveness of the discriminative stimulus procedure in conditioning stimuli to function as reinforcers for children with autism. There is still a need to compare the two procedures experimentally to examine whether the discriminative stimulus procedure reliably conditions neutral social stimuli more effectively than the pairing procedure. Future research is needed to assess parameters and prerequisites involved with the discriminative stimulus procedure to make it effective and practical for implementation.
Table 1

*Bubba’s Preference Assessment Results: Multiple Stimulus without Replacement*

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*Jaron’s Preference Assessment Results: Multiple Stimulus without Replacement*

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Figure 1. Bubba’s concurrent response assessment.
Figure 2. Bubba’s neutral social stimulus assessments.
Figure 3. Bubba's edible reinforcer assessment.
Figure 4. Bubba’s discriminative stimulus procedure trial data and cumulative trials.
Figure 5. Bubba’s discriminative stimulus procedure reinforcer posttest smile.
Figure 6. Bubba’s pairing procedure total number of pairings.
Figure 7. Bubba’s pairing procedure reinforcer posttest thumb-up.
Figure 8. Bubba's pairing procedure reinforcer follow-up test thumb-up.
Figure 9. Bubba's discriminative stimulus procedure reinforcer follow-up test smile.
Figure 10. Jaron's concurrent response assessment.
Figure 11. Jaron's neutral social stimuli assessment.
Figure 12. Jaron’s reinforcer assessment.
Figure 13. Jaron's discriminative stimulus procedure trial data and cumulative number of trials.
Figure 14. Jaron’s discriminative stimulus procedure reinforcing properties posttest: first time mastery criterion met.
Figure 15. Jaron’s discriminative stimulus procedure reinforcing properties posttest: second time mastery criterion met.
Figure 16. Jaron’s pairing procedure cumulative number of pairings.
Figure 17. Jaron's pairing procedure reinforcing properties posttest.
APPENDIX

INFORMED CONSENT FORM
University of North Texas Institutional Review Board

Informed Consent Form

Before agreeing to your child’s participation in this research study, it is important that you read and understand the following explanation of the purpose and benefits of the study and how it will be conducted.

**Title of Study:** Comparing a Discriminative Stimulus Procedure to a Pairing Procedure to Condition Neutral Social Stimuli to Function as Reinforcers

**Principal Investigator:** Rachel Koelker, a graduate student in the University of North Texas (UNT) Department of Behavior Analysis.

**Purpose of the Study:** You are being asked to allow your child to participate in a research study which involves comparing two different procedures to condition social stimuli such as smiles, head nods, thumbs up, etc. as stimuli that would increase your child’s responding like preferred edibles such as candy or preferred tangibles such as a toy. The goal of the study is to have head nods, smiles, thumbs up etc. increase your child’s appropriate behaviors. The child would work for head nods, smiles, thumbs up etc. just as they would work for candy or a favorite toy. Furthermore, the discriminative stimulus procedure may result in increasing a child looking towards adults’ faces for social cues indicating how to behave.

**Study Procedures:** Your child will be asked to sit at his/her regular therapy table during which a preference assessment will be conducted to see which edibles are the most preferred for your child, then that edible will be used to see if it will increase responding. Neutral social stimuli will be tested such as head nods, smiles, thumbs up, etc. to ensure that they do not already increase behavior. Then each child will experience both procedures with different social stimuli being conditioned. An example of the two procedures is as follows using a skittle to condition the social stimuli of a head nod: During the pairing procedure (1) the tutor nods her head immediately before giving the child a skittle versus during the discriminative stimulus procedure (2) the tutor nods her head to signal to the child to reach with their hand to take the skittle sitting on the table. After each procedure the head nods, thumbs up, smiles, etc. will be tested to see if that stimulus alone will increase your child’s appropriate responding. The whole study will take about an hour of each day (broken up) across one to two weeks of your child’s time with a follow up occurring 2-4 weeks after the original study that will take up between 20-40 minutes of one day.

**Foreseeable Risks:** The potential risks involved in this study are that some children may become distressed when access to preferred edibles is restricted to waiting on a social cue. Sessions will terminate immediately if the child protests, cries, whines, or becomes aggressive; on terminating 2 sessions your child will be excused from this study.
**Benefits to the Subjects or Others:** We expect the project to benefit your child by teaching them to attend to social stimuli such as smiles, head nods, thumbs up, etc. Also, these social stimuli should start to increase your child’s appropriate behaviors so that smiling when they do something appropriate may increase that behavior in the future. This study is comparing which procedure is more effective and efficient to improve your child’s therapy as well as the therapy of other children diagnosed with autism in applied behavior analysis programs.

**Compensation for Participants:** There is no compensation for participation. During this study your child will receive preferred edibles on top of their daily diet as they would during a typical therapeutic session.

**Procedures for Maintaining Confidentiality of Research Records:** Your child will be identified on any data sheet associated with this study by a number; the number will correspond to your child’s initials. For example, RK would be identified as 18-11. In any publication or presentation of this data (i.e. the investigator’s thesis defense, at the Association for Behavior Analysis annual conference, etc.) your child will be identified with a random pseudo-name. For example Rachel may be given the pseudo-name Barbara Jean. Sessions will be video recorded. Clips from sessions may be viewed only by individuals associated with the Child Study Center, the University of North Texas Behavior Analysis Department and by professionals at academic conferences. Your child’s name will not be utilized on the video (any mistake usage by the tutor on film will be edited out). The confidentiality of your child’s individual information will be maintained in any publications or presentations regarding this study.

**Questions about the Study:** If you have any questions about the study, you may contact Rachel Koelker at telephone number, or the faculty advisor, Dr. Janet Ellis, UNT Department of Behavior Analysis, at telephone number.

**Review for the Protection of Participants:** This research study has been reviewed and approved by the UNT Institutional Review Board (IRB). The UNT IRB can be contacted at (940) 565-3940 with any questions regarding the rights of research subjects.

**Research Participants’ Rights:** Your signature below indicates that you have read or have had read to you all of the above and that you confirm all of the following:

- Rachel Koelker has explained the study to you and answered all of your questions. You have been told the possible benefits and the potential risks and/or discomforts of the study.
- You understand that you do not have to allow your child to take part in this study, and your refusal to allow your child to participate or your decision to withdraw him/her from the study will involve no penalty or loss of rights or benefits. Your refusal or withdrawal will
not affect your child’s therapy. The study personnel may choose to stop your child’s participation at any time.

- You understand why the study is being conducted and how it will be performed.
- You understand your rights as the parent/guardian of a research participant and you voluntarily consent to your child’s participation in this study.
- You have been told you will receive a copy of this form.

_______________________________
Printed Name of Parent or Guardian

_______________________________  Signature of Parent or Guardian

For the Principal Investigator: I certify that I have reviewed the contents of this form with the parent or guardian signing above. I have explained the possible benefits and the potential risks and/or discomforts of the study. It is my opinion that the parent or guardian understood the explanation.

_______________________________  Signature of Principal Investigator

Date
Child Assent Form

You are being asked to be part of a research project being done by the University of North Texas Department of _____________.

This study involves (describe the project and its purpose in language the subject can easily understand).

You will be asked to (explain specifically what the children will be asked to do) that will take about (specify the time commitment).

If you decide to be part of this study, please remember you can stop participating any time you want to. (or equivalent language adapted for use with older children)

If you would like to be part of this study, please sign your name below.

_________________________  __________________
Printed Name of Child                                Signature of Child

_________________________  __________________
Signature of Child                                Date

_________________________  __________________
Signature of Principal Investigator                                Date

Waiver of Assent

The assent of ____________________________ was waived due to:

________ Age

________ Maturity

________ Psychological State

_________________________  __________________
Printed Name of Parent/Guardian                                Date

_________________________  __________________
Signature of Parent/Guardian                                Date


