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Derived Textual Control in Activity Schedules Using a Stimulus Pairing Observation Procedure

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DERIVED TEXTUAL CONTROL IN ACTIVITY SCHEDULES USING A STIMULUS PAIRING OBSERVATION PROCEDURE

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by

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ABSTRACT

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Activity schedules are commonly used with individuals with developmental disabilities. These schedules have been found to be highly beneficial because they help the learner complete activities independently without additional prompting and support of others. Two young adults diagnosed with Down syndrome, who used pictorial activity schedules, participated in the current study. This study examined an intervention, called stimulus pairing observation (SPO), for helping adults with Down syndrome transfer from use of a pictorial activity schedule to use of a textual activity schedule. Previous research on derived textual control has shown that matching-to-sample (MTS) can be an effective instructional procedure. The current study was done to extend this area of research to see if a SPO procedure is a viable option for deriving stimulus equivalence. The two participants were exposed to a SPO training procedure and were then assessed for their ability to follow a textual activity schedule. The results show that neither of the participants were successful in deriving stimulus equivalence following the SPO training procedure. Results also indicated that a MTS procedure was unsuccessful in deriving textual control. Supplementary research questions evaluated emergent stimulus equivalence relations following a SPO procedure, including the emergence of oral naming of the textual stimuli.

Key words: Stimulus equivalence, stimulus pairing observation, match-to-sample, emergent relations, activity schedules

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CHAPTER I

INTRODUCTION

Down syndrome is a genetic disorder that occurs in approximately 1 out of every 700 infants born in the United States each year (Parker et al., 2010). Sherman, Allen, Bean, and Freeman (2007) identify the most common cause of Down syndrome as meiotic nondisjunction of chromosome 21, which results in an extra chromosome 21 in 95% of individuals diagnosed with Down syndrome. There are a wide variety of possible genetic and environmental risk factors for chromosome 21 nondisjunction. Factors such as smoking at the time of conception (Hook & Cross, 1985; Yang et al., 1999), maternal irradiation exposure (Padmanabhan, Sugunan, Brahmaputhran, Nandini, & Pavithran, 2003), and the use of oral contraceptives (Yang et al., 1999) have all been implicated, but still need empirical evidence to demonstrate a causal relationship. However, the main risk factor for Down syndrome is advanced maternal age because it increases chances of nondisjunction of chromosome 21 (Sherman, Allen, Bean, & Freeman, 2007).

People with Down syndrome share common physical characteristics including short stature, low muscle tone, almond-shaped eyes that slant upwards, a flattened face and nasal bridge, a protruding tongue, and palms that have a single deep crease in the center (Sherman et al., 2007). People with Down syndrome experience cognitive delays and have an increased risk for various medical conditions, such as epilepsy (Goldberg-Stern et al., 2001) and congenital heart defects (Bull, 2011). With medical advances over the past few decades, most of these conditions are treatable, and individuals with Down syndrome will likely lead healthy lives. The life expectancy of individuals with Down

syndrome has dramatically increased over the last 50 years by approximately 0.94 life years per calendar year (Bittles & Glasson, 2004).

Many adults with disabilities such as Down Syndrome have difficulties completing basic skills on their own (Koyama & Wang, 2011; McClannahan & Krantz, 2010). Van Gameren-Oosterom et al. (2013) found that young adults with Down syndrome lack practical and social skills that are necessary for independent daily functioning. Important skills these individuals often lack include maintaining personal hygiene, basic cooking skills, and communicative skills. These individuals often remain dependent on parents, peers, and staff support throughout their lives, and many cannot be left at home alone for any period of time. Also, due in part to their cognitive delays, it is often difficult for their attempts at communication to be understood. Many have language deficits and struggle with articulation of speech sounds. It has been suggested that helping individuals with Down syndrome master specific skills can increase their independence and lessen the support they need later in life (Van Gameren-Oosterom et al., 2013).

One method for increasing independence in individuals with disabilities is through the use of activity schedules. McClannahan and Krantz (2010) describe an activity schedule as a set of pictures or words that serve as cues for an individual to take part in an activity sequence. There are different forms of activity schedules, but the typical schedule consists of a three-ring binder containing pictures on every page that correspond to tasks and activities in which the person must engage. The learner is taught to open the activity schedule binder, turn to the first page, complete the task pictured, and then turn to the following page that signals the next task. Activity schedules are highly beneficial because they help the learner complete activities independently without additional prompting and support of others (McClannahan & Krantz, 2010).

For most learners activity schedules are initially taught in pictorial form. Once the learner can successfully use a pictorial schedule and has some textual recognition, in the form of showing acknowledgement of words, he or she may be able to advance to using a textual schedule (McClannahan & Krantz, 1999; Miguel, Yang, Finn, & Ahearn, 2009). It has been suggested that changing an individual's activity schedule from pictorial to textual is developmentally appropriate for older learners and further increases an individual's independence (Miguel et al., 2009; Sprinkle & Miguel, 2013). Textual schedules are perceived as more age-appropriate for adults in comparison to pictorial schedules because typical adults tend to rely more on reading text than using pictures (McClannahan & Krantz, 1999). Since the use of textual aids is more common among typical adults, use of a textual activity schedule by an adult with a disability may be less stigmatizing than a pictorial activity schedule (Sprinkle & Miguel, 2013).

The purpose of the current study was to examine a novel intervention, called stimulus pairing observation (SPO), for helping adults with Down syndrome transfer from use of a pictorial activity schedule to use of a textual activity schedule. The following chapter provides a review of the literature that will describe the basic behavioral processes underlying the SPO procedure as well as research that suggests it may be effective in the context of activity schedule use. The literature review will begin with a description of the phenomenon of stimulus equivalence and the instructional methods commonly used to teach stimulus equivalence. Use of the SPO procedure to teach stimulus equivalence will be described as well as the research supporting its use.

CHAPTER II

LITERATURE REVIEW

Stimulus Equivalence

According to Cooper, Heron, and Heward (2007) stimulus equivalence involves, "the emergence of accurate responding to untrained and nonreinforced stimulus-stimulus relations following the reinforcement of responses to some stimulus-stimulus relations" (p. 398). Stimulus equivalence has three properties related to the stimulus-stimulus relations that emerge: reflexivity, symmetry, and transitivity. Reflexivity involves matching a stimulus to itself. For example, the spoken word "cookie" is equivalent to the spoken word "cookie" (A=A). Symmetry involves the reversal of a trained stimulus-stimulus relation. If the learner can select the printed word *cookie* when presented with the spoken word "cookie" (A=B), then the learner will also be able to produce the spoken word "cookie" when presented with the printed word *cookie* (B=A) in the absence of instruction. Transitivity involves an emergent relation between stimuli that have never before been presented together. For example, if the learner is taught to select the printed word *cookie* when presented with the spoken word "cookie" (A=B) and to select the actual cookie when presented with the spoken word "cookie" (A=C), then the learner will be able to select the printed word *cookie* when presented with the actual cookie (B=C). (Sidman & Tailby, 1982). The example is diagrammed in Figure 1.

The instructional method traditionally used to train stimulus classes that will result in the emergence of stimulus equivalence is called matching-to-sample (MTS). MTS relies on learning via a conditional discrimination, which is an extension of the typical three-term contingency

(Sidman, 1994). The three-term contingency consists of a discriminative stimulus, a response, and a consequence.

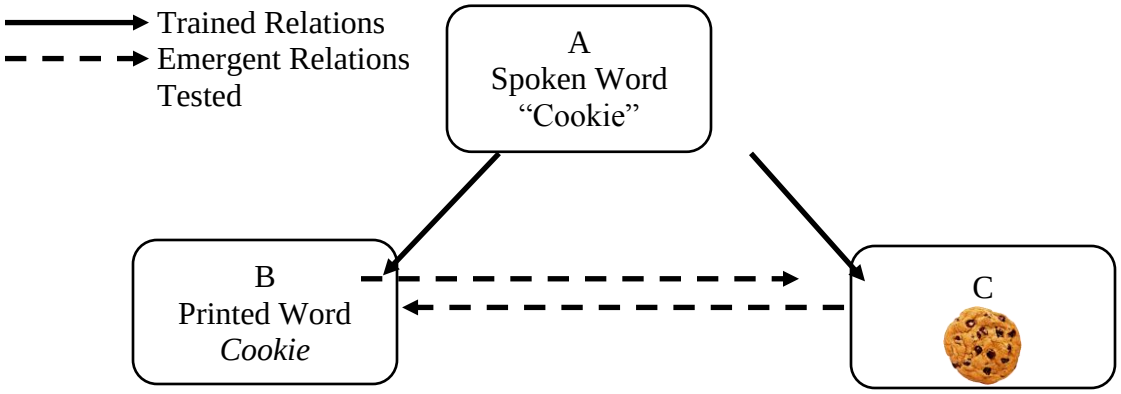

Figure 1. Trained and emergent relations diagram.

For a conditional discrimination, this three-term contingency is brought under environmental control, which results in a four-term contingency: conditional stimulus, discriminative stimulus, response, and consequence (Sidman, 1994). For example, if red and green cards are placed in front of a child, and a teacher requests, "show me green" (conditional stimulus), the teacher's request is a conditional stimulus in the presence of which selection of the green card (discriminative stimulus) will produce reinforcement. If the teacher requests, "show me red" (conditional stimulus), the red card would function as a discriminative stimulus, and would signal the availability of reinforcement for selection of that card. The function of each card as a discriminative stimulus depends, or is conditional on, the stimulus that precedes it (i.e., the teacher's request).

The MTS procedure as used in stimulus equivalence research involves presentation of a sample stimulus along with several comparison stimuli. The sample functions as a conditional stimulus and the comparisons functions as discriminative

stimuli. When presented with a sample stimulus the participant selects one of the comparison stimuli, and selection responses that correctly match the sample are reinforced (Cooper, Heron, & Heward, 2007). For the previous example involving a cookie, the spoken word "cookie" is presented as the sample stimulus. Comparison stimuli are presented in an array in front of the learner and consist of a picture of a cookie and a picture of a lollipop. The learner is told to match, and selection of the picture of the cookie is reinforced, while selection of the lollipop is not reinforced.

The majority of previous interventions using stimulus equivalence have used a MTS format for instruction. In the original study on the phenomenon of stimulus equivalence, Sidman (1971) used this instructional format to examine the emergence of reading comprehension in a 17-year old boy with a severe intellectual disability. Stimuli included spoken words (A), pictures (B), oral naming by the participant (C), and printed words (D). Prior to this experiment, the participant was able to select a picture when an auditory word was spoken to him (A-B), and when given a picture he could orally name the stimulus (B-C). He was trained on the relations of auditory word to visual word (A-D) and oral naming to visual word (C-D). MTS training occurred with an apparatus that had several windows on which stimuli were displayed. A sample stimulus was presented in the center window with several comparison stimuli in the surrounding windows, and he was required to press the window that contained the correct comparison stimulus. Following instruction, several emergent stimulus-stimulus relations were observed including spoken words to printed words (A-D), printed words to oral naming (D-C), pictures to printed words (B-D), and printed words to pictures (D-B). A basic form of oral reading (orally naming printed words) and reading comprehension (matching printed

words to the corresponding picture) was observed with these emergent skills (Sidman, 1971).

The MTS instructional format has been used extensively since Sidman's seminal study. Several studies have used an MTS format to teach various relevant stimuli with various populations. MTS has been used with children with developmental disabilities (Devany, Hayes, & Nelson, 1986; Leblanc, Miguel, Cummings, Goldsmith, & Carr, 2003; Murphy, Barnes-Holmes, & Barnes-Holmes, 2005; Stromer, & Mackay, 1992), children with learning difficulties (De Rose, De Souza, & Hanna, 1996; Lynch & Cuvo, 1995), typically developing children (Johnson & Dixon, 2009), and adolescents with developmental disabilities (Lane & Critchfield, 1998). The procedure has also been utilized with adults with disabilities (Rehfeldt & Root, 2005; Rosales & Rehfeldt, 2007; Saunders, O'Donnell, Vaidya, & Williams, 2003; Saunders & Spadlin, 1989) and with typically functioning university students (Clayton & Hayes, 2004; Lovett, Rehfeldt, Garcia, & Dunning, 2011; Zlomke, & Dixon, 2006). Multiple studies have also used MTS procedures to promote transfer from pictures to text in activity schedules (Miguel et al., 2009; Sprinkle & Miguel, 2013).

Stimulus Equivalence with Activity Schedules

In recent years researchers have begun to examine the use of stimulus equivalence training procedures with activity schedules in order to promote derived textual control, or transfer of stimulus control from pictures to printed words via stimulus equivalence. Miguel, Yang, Finn, and Ahearn (2009) utilized an MTS instructional procedure to promote derived textual control in two 6-year-old children with autism. Stimuli consisted of six cards with photographs of toys and six cards with the corresponding printed names.

Stimuli were toys that were chosen specifically for each individual based on preference assessment results. Nine stimuli were used with each participant, and these were divided into three sets of three stimuli. The researchers used a multiple baseline design across stimulus sets in conjunction with pre- and post-tests for emergent relations. Following a textual activity schedule baseline, in which the pictures in the participants' activity schedule were replaced with printed words, instruction was conducted using a MTS format. The participants initially learned to match dictated words to pictures and then to match dictated words to printed words. During training, all correct matches were reinforced while incorrect responses were followed by re-presentation of the same trial. Results indicated that the children successfully completed the activity schedule with textual stimuli following MTS instruction, which demonstrates derived textual control. Furthermore, post-tests for emergent relations revealed that both participants matched pictures to words and words to pictures with an accuracy rate of 89%. Also, participants orally named all printed words without direct training (Miguel et al., 2009).

Sprinkle and Miguel (2013) compared MTS to a superimposition and fading procedure with an alternating treatments design, to assess which method better promoted derived textual control for two children with autism. Participants were initially trained to follow two picture activity schedules with three items each, and then, a pre-test to evaluate textual control was completed by replacing the pictures in the schedules with printed words. An alternating treatments design was utilized in which a superimposition and fading procedure (SFP) and a MTS procedure were alternated. The SFP consisted of 12 steps and each stimulus was a picture with its textual label superimposed over the picture. The picture was completely visible during the first step, but gradually faded until

there was no portion of the picture visible in the last step. During each trial, the participant was presented with a three-stimulus array, and then a sample picture with superimposed text was presented and the participant was instructed to "find it." The MTS training was conducted in a manner similar to that described by Miguel et al. (2009). Results indicated that the training was completed in a similar amount of time using both methods. Both conditions also resulted in a transfer of stimulus control from the pictures to the printed words and the formation of equivalence classes. Emergent relations were observed only in the MTS procedure in that participants were able to orally name printed words (Sprinkle & Miguel, 2013).

More recently, a study conducted by Ortega (2014) examined derived textual control in a vocational activity schedule with two adults with Down syndrome. Initially, the participants used a picture activity schedule depicting as many as nine kitchen items to set the table. MTS training was conducted with three sets of three stimuli using a multiple baseline design across stimulus sets. Stimuli consisted of dictated names (A), pictures (B), printed words (C), and oral names of the stimuli (D). The method was similar to Miguel et al. (2009) in that pretests and posttests were conducted to test for emergent relations and baseline and post-training assessments using a textual activity schedule were completed. Trained relations consisted of dictated names to pictures (A-B) and dictated names to printed words (A-C). Emergent relations consisted of pictures to printed words (B-C), printed words to pictures (C-B), and printed words to oral naming (C-D). Although, one participant had to be removed from the study because he could not scan the array of comparison stimuli during MTS instruction, derived textual control following MTS was observed for the other participant. This participant also met criterion

on tests for emergent relations and was observed to orally name the text stimuli (Ortega, 2014).

In considering the results of the studies examining derived textual control, it appears that MTS can be an effective instructional procedure, and emergent skills, such as oral naming of printed words, are more likely to occur with MTS training than with superimposition and fading (Sprinkle & Miguel, 2013). A limitation of this procedure was identified by Ortega (2014) because one participant was not able to complete training using an MTS format. The MTS procedure requires the participant to attend to several stimuli during an instructional session, and he or she must be able to scan a small array of stimuli. Because some individuals with disabilities lack these skills, the superimposition and fading procedure has historically been used to teach individuals this skill. It is possible that an alternative instructional procedure that results in emergent relations could be used in this situation instead, and therefore, promote oral naming of the printed words (i.e., oral reading) without direct instruction.

Stimulus Pairing Observation Procedure

Another instructional method that has been shown to result in the emergence of stimulus equivalence is the stimulus pairing observation (SPO) procedure. In the SPO procedure a single stimulus (A) is presented with another stimulus (B) while the learner observes. After a sufficient amount of exposure to this stimulus pairing, a relation will likely form in which A reliably predicts the appearance of B (Leader, Barnes, & Smeets, 1996). In other words, SPO is a procedure in which the learner is presented with two stimuli simultaneously, and this pairing occurs multiple times. For example, a learner is presented with the dictated word “cookie” (A) and a picture of a cookie (B)

simultaneously. This A-B pairing is presented multiple times. After a sufficient amount of pairings, it is likely a relation will form between the dictated word “cookie” (A) and the picture of the cookie (B). The dictated word “cookie” (A) will come to predict the picture of the cookie (B).

Previous research has shown that the SPO procedure can produce stimulus equivalence relations like the emergent relations produced by MTS training. Leader et al. (1996) used a SPO procedure in three experiments involving 35 university students. During these experiments, pairs of arbitrary stimuli and nonsense syllables were presented on a computer screen. Following the SPO procedure, a MTS post-test to evaluate the emergence of stimulus equivalence relations was conducted. Duration was measured between-pairs, the time between the offset of one stimulus pairing and the onset of the next stimulus pairing, and within-pair, the time between the presentations of stimuli in the same pair. Results demonstrated that the SPO procedure effectively produced responses according to equivalence relations. The researchers also concluded that the effectiveness of the SPO depends on the duration of the between-pair-delays as compared to the within-pair-delays. Effectiveness of the SPO procedure increased if the between-pair-delay was longer than the within-pair-delay. The order of the presentation of the stimulus pairs also had an impact on effectiveness. Consistency of random sequencing of the presentation of the stimulus pairs led to appropriate discriminations between pairs, while fixed linear and nonlinear sequences of the presentation of stimulus pairs prevented the appropriate discriminations between stimulus pairs.

Recent studies have extended use of the SPO procedure to socially significant learning outcomes. Omori and Yamamota (2013) used a SPO procedure to assist six

participants with intellectual disabilities in learning reading skills. Stimuli consisted of words written in a different language, Hiragana. Pairs of Hiragana stimuli, such as pictures and dictated words, were computerized and presented simultaneously. During the SPO training, students observed the presentation of four stimulus pairs. All stimulus pairs were presented in random order three times. Results suggest sequential SPO training is effective in promoting the emergence of equivalence relations and fluent eye movement, which is important for reading. Specifically, participants acquired multi-letter word recognition, showing that emergent relations formed between printed text and oral naming. This study demonstrated that it is possible for relations to emerge following a SPO procedure with students with intellectual disabilities.

Rosales, Rehfeldt, and Huffman (2012) also utilized a SPO procedure with three typically developing preschool children who spoke Spanish as their first language. The researchers used the procedure to examine the emergence of symmetry and evaluate the effectiveness of the procedure in aiding the emergence of dictated name relations. Stimuli were divided into three four-item stimulus sets, and were one to three syllable English words (e.g., bee, eraser, and flag). Pictures of similar stimuli were also used. The dependent variable was the percentage of correct dictated name responses during probe trials. Pre- and post-training probes were completed for all dictated name relations using a MTS format. Then, a SPO procedure was conducted. First, the experimenter gained eye contact with the participant to ensure he or she was attending. Then, the experimenter presented one stimulus while stating the English name of the stimulus. For example, a flag was presented while stating, "This is a flag." No response was required from the participants. Trials were presented in random order. Training proceeded in sets of trial

blocks until all relations were presented. Reinforcement was delivered based on compliance. Results indicated that dictated name relations were learned, and the symmetrical relations emerged. Dictated name relations were established due to a SPO procedure, and the researchers suggested that the procedure might help children establish some simple vocabulary skills.

Comparison of MTS to SPO procedure. Previous studies have been conducted to see whether MTS or SPO procedures are more effective. Leader and Barnes-Holmes (2001) studied the effectiveness of the two procedures on producing stimulus equivalence relations. In the first experiment, a within-subjects design was used in order to compare and contrast the two procedures. Participants in condition one were trained using a SPO procedure and a MTS test followed. Afterwards, participants were trained using a MTS training procedure and tested using a MTS test. In condition two, MTS training occurred first followed by a MTS test. Then, participants received SPO training and a MTS test followed. Subsequent experiments incorporated minor procedural adjustments in order to identify if these would result in differences between the two training procedures. The second experiment was similar except the criteria changed to twelve correct responses before advancing to the equivalence test. Experiment 3 was similar except the two negative comparisons were removed from MTS training. Experiment 4 was similar except correct comparisons appeared to the left, center, and right of the screen. In the first three experiments, they found that SPO procedure training was more effective than MTS training. In their final experiment, they found the two procedures were equally effective because of the removal of the negative comparisons and the varying of the spatial position of the correct comparison. This suggests that presentation of negative

comparisons during MTS procedures may be a competing source of stimulus control over the formation of equivalence classes. Overall, these results are promising in demonstrating the efficacy of the SPO procedure in promoting the emergence of stimulus equivalence.

There are numerous advantages of SPO. In SPO procedures, no response is necessary from the learner (Rosales, Rehfeldt, & Huffman, 2012). This is of particular importance because in MTS procedures responding can increase difficulties in acquiring valid equivalence relations because position preference and stimulus preference can potentially be confounding influences (Omori & Yamamoto, 2013). For example, some participants demonstrate a position bias in which they choose whichever stimulus is in a particular location. They are more concerned with the location of the stimulus than the stimulus itself. Other participants will always pick the stimulus they prefer, such as an M&M, rather than choosing the stimulus that is the correct response. Furthermore, the MTS arrangement is limited with some participants because not all individuals can appropriately scan the stimulus array in order to complete this procedure (Ortega, 2014). The benefit of choosing one method over the other greatly depends on the participants and goals of the particular experiment.

An additional advantage of SPO is that reading improvements can be made due to this procedure. In Takahashi and Noro's (2012) study on a SPO procedure on relational learning, reading tests were completed during the probe phase of the experiment. Kanji characters, Chinese characters used in Japanese writing, were used for all testing procedures. During the reading probe test, a nine-year-old boy with autism was instructed to read aloud the Kanji character that appeared on the computer screen. Results of this

study found that following the SPO procedure, the boy equivalence relations emerged involving kanji-picture and kanji-auditory stimuli for some of the stimuli, and the performances transferred to reading (Takahashi & Noro, 2012).

SPO procedures are also advantageous because they resemble many naturalistic interactions that take place during typical development and everyday learning opportunities (Omori & Yamamoto, 2013; Rosales et al., 2012; Takahashi & Noro, 2012). For example, parents often pair an object with its name to expand their child's vocabulary. They will see a bike (a tangible stimulus) and pair it with the word "bike" (vocal stimulus). SPO procedures are also beneficial because they are straightforward, efficient, and easy to implement (Omori & Yamamoto, 2013; Rosales et al., 2012). Two stimuli are paired instead of many. SPO procedures have been shown to be an effective training method for children with disabilities (Omori & Yamamoto, 2013; Takahashi & Noro, 2012), typically developing children (Leader & Barnes-Holmes, 2001a; Leader, Barnes-Holmes & Smeets, 2000; Rosales, Rehfeldt, & Huffman, 2012), and typically functioning university students (Clayton & Hayes, 2004; Leader & Barnes-Holmes, 2001b). This procedure has the potential to be a good option for instruction to promote derived textual control in activity schedules for learners who are unable to do MTS.

Research Question and Hypothesis

The current study examined the use of a SPO procedure to promote derived textual control in an activity schedule with two adults with Down syndrome. Supplementary research questions evaluated emergent stimulus equivalence relations following MTS instruction, including the emergence of oral naming of the textual stimuli. Another supplementary research question evaluated the social validity of the intervention by

surveying staff at the vocational center to determine if they approved of the treatment and outcomes. The survey determined if the staff believed the ability to transfer stimulus control from pictures to text is a valuable skill to possess. It was predicted that a SPO procedure would be effective in promoting the transfer of stimulus control from a pictorial activity schedule to a textual activity schedule in adults with Down syndrome.

CHAPTER III

METHODS

Participants and Setting

Two adult males diagnosed with Down syndrome participated in this study. Participant 1 was 30 years old and was also diagnosed with attention deficit hyperactive disorder and obsessive compulsive disorder. When he was an adolescent, he suffered from depressive and psychotic symptoms that lasted two months, and his verbal abilities were severely impaired following this depressive episode. At the time of the study, his verbal behavior was limited to one-word vocalizations or signs to request or label familiar and preferred items. His vocal utterances were often not articulated clearly and, usually, he did not speak unless prompted to do so. Participant 1 also served as a participant in the study by Ortega (2014), and as a result he was able to respond to nine written words as discriminative stimuli in an activity schedule to complete a cooking task.

Participant 2 is 22 years old and has no comorbid diagnoses. At the time of the study, he would frequently vocalize, but his appropriate vocalizations were limited and not directed toward other people (i.e., talking to himself). Most vocalizations longer than two words were nonsensical and repetitive. When provided with echoic prompts, he spoke in three to five-word sentences. On rare occasions he would vocally request water, bathroom, help, or ball. At the time of the study, he was receiving behavior analytic services that target labeling skills for everyday items.

Both participants work at an agricultural-based vocational center for adults with disabilities in Central Washington. The main vocational tasks are related to raising livestock and gardening. The two participants for this study were selected because goals in their behavior plans included

increasing independence and age-appropriate skills. These participants both used picture activity schedules to gather items needed to make a craft, and were proficient in use of the picture activity schedule. All sessions were conducted at the vocational center's craft area. This area was a room that was approximately 7 m by 5.33 m. The room contained a craft table, six chairs, a desk and two desk chairs. One wall was lined with shelves where craft supplies were kept. Participants were gathering the items from these shelves. Distractions were minimized by requesting that staff and other workers remain out of the craft area during sessions.

Materials

Materials included a three-ring binder with Velcro strips on each of the nine pages, which held the pictures or text cards for the activity schedules. The cards were all 5 cm by 7 cm. Nine of the cards depicted pictures of the items needed to make a craft, and nine of the cards displayed the printed word that corresponded to the craft items depicted in the pictures. The text on the cards was printed in black ink on a white background using Times New Roman 48 point font. Each card had a Velcro strip on the back which was attached to the schedule. There was also a stimulus placement board used for the conditional discrimination tests. This board was 50 cm by 19 cm and had three Velcro strips that were evenly spaced to place the comparison stimuli.

Stimuli used in the stimulus pairing observation procedure consisted of pictures, printed words, and dictated names of the craft supplies included in the activity schedule. There were three stimulus sets, each containing nine stimuli, and each individual stimulus was identified using an alphanumeric label. Pictorial stimuli were labeled as "A," textual stimuli labeled as "B," and dictated name stimuli labeled as "C" for all three stimulus sets. The A, B, and C stimuli were numbered from one to three and those numbers identified a stimulus equivalence class. For

example, A1, B1, and C1 corresponded to the dictated name, picture, and printed word for pencil. The stimuli were presented in Table 1.

Table 1. *Stimuli*

Set 1	A	B	C
1	"Pencil"		Pencil
2	"Paint"		Paint
3	"Brush"		Brush

Set 2	A	B	C
1	"Crayon"		Crayon
2	"Marker"		Marker
3	"Glue"		Glue

Set 3	A	B	C
1	"Tape"		Tape
2	"Scissors"		Scissors
3	"String"		String

Dependent Measures

The effects of the stimulus pairing observation procedure on the percentage of correct responses on the textual activity schedule were the primary dependent variable. A correct response on the textual activity schedule was operationally defined as retrieving the appropriate craft item from the shelf upon seeing the printed word in the activity schedule. The percentage of correct independent responses was calculated by dividing the number of correct responses by the total number of items on the activity schedule and multiplying the result by 100. Secondary dependent measures included the percentage of correct responses on tests for emergent relations involving the pictures, printed words, and oral names of the stimuli.

A secondary independent observer collected data during 53% of Joey's and 54% of Jesse's sessions. Interobserver agreement (IOA) was calculated to ensure reliability of measures. IOA was calculated using point-by-point agreement. This was calculated by dividing the number of agreements between observers by the sum of agreements and disagreements and multiplying the result by 100. The secondary observer was trained by the primary researcher. Training proceeded with the primary researcher clearly describing all operational definitions and reviewing the data sheet with the secondary observer. IOA must be 80% or higher to be considered acceptable. If IOA fell below 80% during the study, booster training was held where the primary researcher reviewed the operational definitions, the data sheet, and details of the study once again. Interobserver agreement for Joey's and Jesse's sessions was calculated at 97%.

Research Design

The effectiveness of the stimulus pairing observation procedure on the transfer of stimulus control from pictorial to textual stimuli was evaluated using a concurrent multiple baseline design across stimulus sets (Miguel et al., 2009). Baer, Wolf, and Risley (1968)

described the experimental logic behind the multiple baseline design. Data was collected concurrently under baseline conditions for performance on all stimulus sets until stable responding was observed. An independent variable was then applied to the first tier of the multiple baseline design, and it was noted if there was a change in responding. After responding on the first tier reached a certain criterion and subsequent baselines remained stable, the independent variable was introduced on the second tier. If the change in responding on the second tier was similar to the change on the first tier, then it suggested that the treatment was effective, and these changes were not occurring simply by chance. The independent variable continue to be applied to subsequent tiers in this fashion. When behavioral changes occur when, and only when, the treatment was applied, effective functional relationship can be inferred (Baer, Wolf, & Risley, 1968). For a visual example, refer to Figure 2, which shows hypothetical data for this study.

The multiple baseline design relies on time series and replication logic to demonstrate a functional relationship using prediction, verification, and replication (Cooper, Heron, Heward, 2007). Prediction was made upon viewing the initial level of baseline responding. It was assumed that responding would remain at that level if no changes were made. Following prediction, the treatment was introduced on the first tier while subsequent tiers of the design remained in baseline. A change in behavior was observed only on the tier of the design exposed to the independent variable. If baseline responding remained stable on the other tiers of the design, the prediction made using the initial baseline was verified. After verification occurred, the independent variable was applied to the second tier of the design, which should have produced a replication of the intervention effect observed on the first tier (Cooper, Heron, Heward, 2007). A functional relationship was inferred if behavior changes occurred only when

the treatment was introduced on each tier of the design. The staggered introduction of the independent variable through time allowed the researcher to rule out the influence of extraneous variables. It was extremely unlikely that an extraneous variable would be introduced at precisely the same time the independent variable was introduced during each experimental phase (Kazdin, 2011).

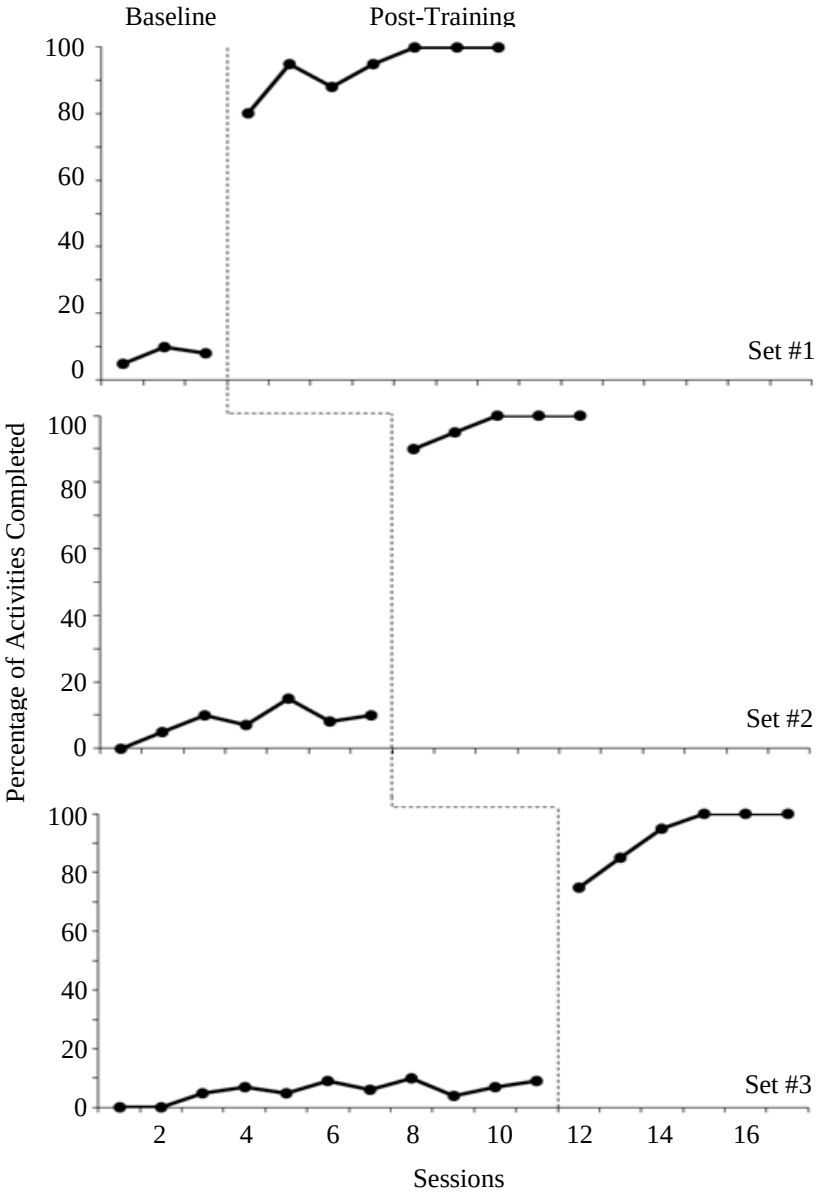

Figure 2. Hypothetical data showing the percentage of correct responses on the textual activity schedule during baseline and post-training assessments.

Procedure

Pre-experimental procedures. The primary researcher discussed study participation with the parents of the participants. Parents were asked to sign an informed consent document before participation began (see Appendix A). The procedure complied with ethical procedures of the Human Subjects' Research Council at Central Washington University. See Appendix B for procedural flow chart.

Preference assessment. A paired stimulus preference assessment was conducted by the primary researcher. The primary researcher developed a list of eight potentially preferred items, by asking a staff member at the vocational center. During this assessment, the primary researcher initially allowed the participant to sample each of the potentially preferred items. Then, the primary researcher presented two stimuli in front of the participant and instructed the participant to, "Pick one." The first item the participant made physical contact with was considered the selected item, and the item that was not selected was removed from the participant's reach. Each item was presented with each other item two times, once on the participant's left side and once on the right. This change in position was done to control for a position bias, which occurs when a person selects an item solely based on location instead of the reinforcing value of the stimulus. The participant was allowed to interact with the item for 20s before the next trial was presented. The primary researcher recorded the selection response on a data sheet (see Appendix C). If during the trial the participant reached for both stimuli, the primary researcher would physically block the response. If neither stimulus was selected, the primary researcher would allow the participant to sample both items for 10s and would then re-present the trial.

Pre-experimental conditional discrimination test (familiar stimuli). The primary researcher presented several stimuli that were familiar to the participant. A single trial consisted

of the presentation of a stimulus placement board with an array of three familiar stimuli attached to the board with Velcro. The pictorial stimuli included were a basketball, work gloves, and a watering can. The stimuli were selected by asking a staff member at the center for three items she had seen the participants identify in the past. A picture sample stimulus was presented on the stimulus placement board along with three comparison stimuli. Then, the primary researcher instructed the participant to "match." Three familiar sample stimuli were presented three times for a total of nine trials. This phase was completed in order to document if the participants had the skill of responding to a conditional discrimination task with several stimuli presented in an array (see Appendix D). Regardless of performance on this test, participants participated in the stimulus pairing observation procedure. However, if the participant lacked the skill of scanning an array of stimuli to select an item, scores on tests for emergent relations at both pre-test and post-test were likely to be low even if derived textual control was observed following the stimulus pairing observation procedure.

Emergent relations pre-test and post-test. In order to evaluate the emergence of stimulus equivalence between the pictures and printed words, a visual-visual conditional discrimination test was conducted (see Appendix E and F). The set-up was identical to the previous test for familiar stimuli. After the presentation of the stimulus placement board with the sample stimulus and comparison stimuli, the primary researcher instructed the participant to "match" and would uncover the comparison stimuli. After the trial was presented, the participant was given 5s to respond. If the participant did not respond within the time limit, the next trial was presented. The primary researcher tested for different relations in separate trial blocks. Relations between pictures and printed words (B-C) and printed words and pictures (C-B) was tested. Emergent textual behavior (oral reading) was also tested by presenting the printed words and asking,

"What's this?" (C-D). Tests were conducted in three blocks of nine trials, so there were 27 tests in all. Each individual relation (e.g., B1-C1) was presented 3 times. Comparison stimuli was presented in a predetermined random order to control for a position bias. The criterion for mastery was 80% correct responses. No reinforcement was provided for correct responses during tests for emergent relations. Reinforcement was provided for being on task. An intervention integrity checklist was filled out by a secondary observer (see Appendix G). The relations are shown in Figure 3.

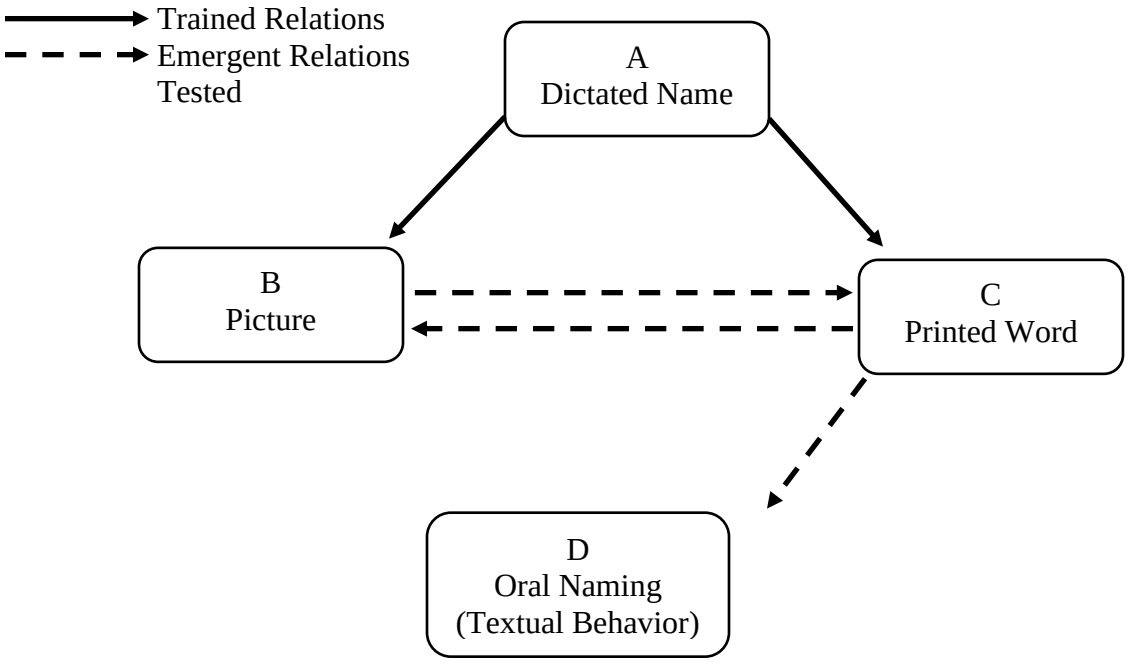

Figure 3. Trained and emergent relations diagram.

Textual activity schedule baseline and post-training assessment. The pictures in each participant's activity schedule were replaced with printed words. The primary researcher presented the textual activity schedule to the participant with the instruction, "It's time to make a craft." The activity schedule was presented once each session, and the order of the printed words in the schedule varied across sessions. No reinforcement was provided during this condition. A

response was counted as correct if, when presented with the textual stimulus, the participant successfully retrieved the item independently. Session length was 5 min., and sessions were terminated if all tasks were not completed within 5 min. Access to a reinforcer was made available after the completion of baseline and post-training assessments so participants would be motivated to do the activity schedule (see Appendix H).

Stimulus pairing observation procedure. First, the primary researcher trained dictated names to pictures (A-B) and then dictated names to printed words (A-C). For each trial, the primary researcher recruited eye contact from the participant in order to ensure he was attending. The primary researcher provided the dictated name (A) of the item and simultaneously presented the pictorial stimulus (B) that corresponded to that name. Following the pairing of the dictated name and picture, the stimulus was removed, and an intertrial interval of 1 s followed before presentation of the next trial. This process continued until all dictated name-picture stimulus pairings in the first set (e.g., A1-B1, A2-B2, A3-B3) were presented three times, which resulted in a block of nine trials. There was six trial blocks of the A-B relations presented to the participant based on the recommendation of Rosales et al. 2012. Between every three trial blocks there was a break for 3 min. During that time participants had access to a preferred activity. Next, there was a block of nine trials with dictated name-printed word (A-C) relations. This trial block proceeded in the same way as the first trial block. Each individual relation was presented three times, and there were six trial blocks of the presentation of A-C relations. The following relations were included in A-C training: A1-C1, A2-C2, A3-C3. The presentation of the pairings was in a predetermined random order. Training for a single set of stimuli took place in one session. Reinforcement, based on the results of the preference assessment, was provided for compliance with the directions and for attention. Reinforcement was provided on a variable-

interval (VI) 60 s schedule (see Appendix I and J). Training for sets two and three progressed in the same way as the first set.

After the SPO procedure, participants were exposed to the textual activity schedule assessment. If they achieved mastery, they would move on to the emergent relations post-test. However, if responding was below mastery, the SPO procedure was repeated.

Procedural reliability. Procedural reliability was obtained by incorporating a secondary observer. The same observer who collected IOA assessed procedural reliability. To train the observer, the researcher clearly explained all steps of the procedure and then showed the secondary observer the data sheet (see Appendix D). Then, the researcher demonstrated the procedure, and finally, the secondary observers practiced making observations and recording on the data sheets.

During the observation period, the secondary observer completed the data sheet, by checking off each step that was done correctly and putting a minus mark if the step was done incorrectly. Included on the checklist were all necessary steps to appropriately complete the experimental procedures. Reliability was collected for the following conditions: emergent relations tests, textual activity schedule baseline, stimulus pairing observation procedure, and textual-activity post-training assessment. Then, the procedural reliability was calculated by dividing the number of correctly performed steps by the total number of steps possible, and converting the ratio into a percentage.

Data Analyses

Visual analysis of the graphed data was used to evaluate the findings of this study. There are four aspects of a graph to examine using visual inspection including trend, level, immediacy of change, and variability. Trends were classified as increasing, decreasing, or steady. Visible

trends in the data were analyzed as stable or unstable. Changes in level were assessed across conditions. A change in level was determined by looking at the difference between the data at the end of one condition and the data at the beginning of the next condition. This was analyzed by computing the change in mean across phases, which referred to shifts in the average level of data sets. The immediacy of change was also assessed. Immediacy of change is how quickly the target behavior changes after treatment is implemented. Variability was also analyzed by looking at the range around the mean line. A large range around the mean indicated that there was great variability. A small range around the mean indicated that the data was relatively stable. All of these measures taken together were the visual analysis that helped to determine if the stimulus pairing observation procedure had an effect on transferring stimulus control from pictures to written words (Kazdin, 2011).

CHAPTER IV

RESULTS

Jesse

Jesse was unable to make any correct selections during the pre-experimental conditional discrimination test with familiar stimuli. Jesse was also unable to respond correctly to the emergent relations pre and post-tests. Usually, he made no response at all.

Figure 4 illustrates the percentage of items Jesse correctly gathered using the textual activity schedule during baseline and after exposure to the stimulus pairing observation procedure. During all baseline probes for sets one and three, Jesse gathered 0% of the correct craft items. His responding during baseline for set two did increase to 33%, for two consecutive trials, but his responding remained below chance. After training with the SPO procedure for set one, his responding did increase after being exposed to the training procedure four times. His responding increased to 33% for two consecutive trials, but then decreased back down to 0%. He was exposed to each A-B (dictated name-picture) pairing for set one three times in each trial block, with 12 trial blocks prior to each textual activity schedule session. Responding never reached criterion within the approved amount of training sessions (7 training sessions were allotted by the human subjects review council). Jesse was unable to meet criterion for the first set of stimuli after an extended period of exposure to the stimulus pairing observation procedure. Therefore, he was unable to advance to subsequent sets. Jesse's participation was discontinued because he was unable to meet criterion after 84 trial blocks of the SPO procedure, where he was exposed to each stimulus pairing 252 times.

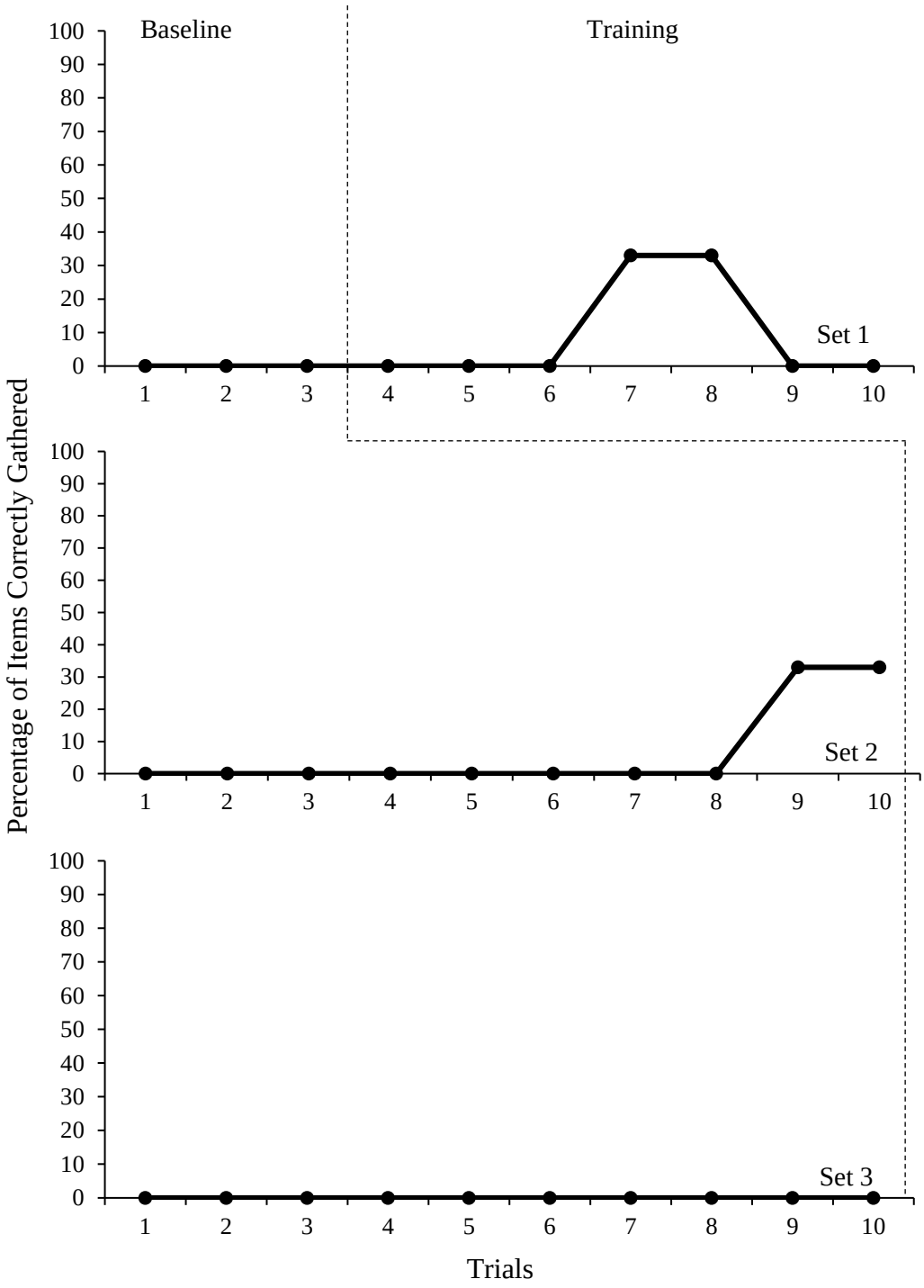

Figure 4. Percentage of items Jesse correctly gathered using the textual activity schedule during baseline and post SPO training.

Joey

Figure 5 illustrates that Joey was successfully able to respond to a pre-experimental conditional discrimination test with familiar stimuli. When presented with an array of three familiar stimuli, he was able to select the correct stimuli that was requested with 100% accuracy.

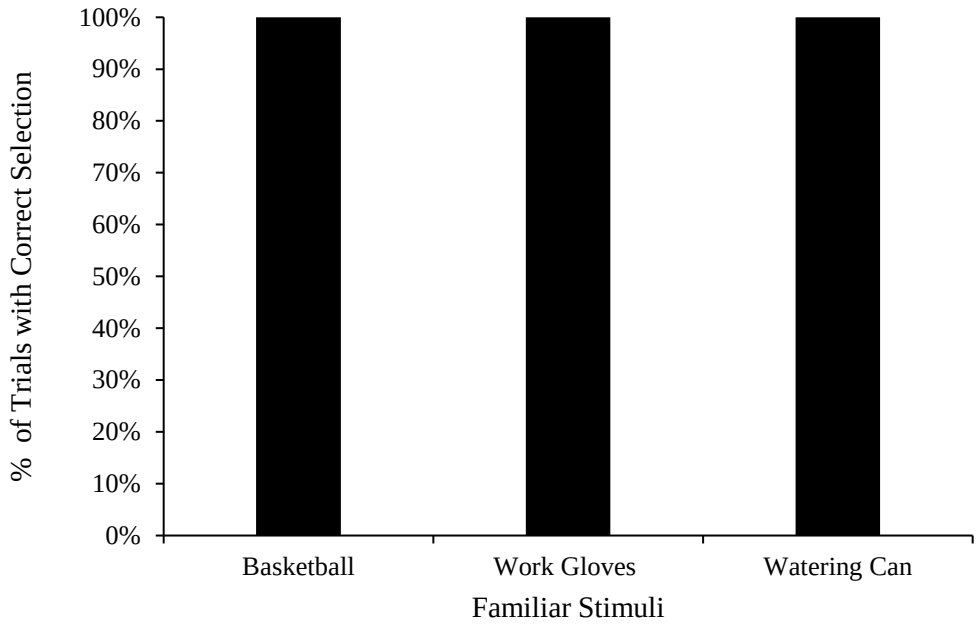

Figure 5. Joey's percentage of trials with correct selection during the pre-experimental conditional discrimination test with familiar stimuli.

Figure 6 displays Joey's results on the emergent relations pre and post-tests. During the pre-test, responding was below chance on sets one and two. Responding was slightly above chance for the C-B (printed words-picture) relation in set three, but below chance on the other two relations in that set. During the post-test for set one, his responding remained below chance. There was an increase of 44% from pre-test to post-test with the C-D (printed words-oral name), but even with the increase, responding was below chance. His participation in the SPO procedure was discontinued after set one.

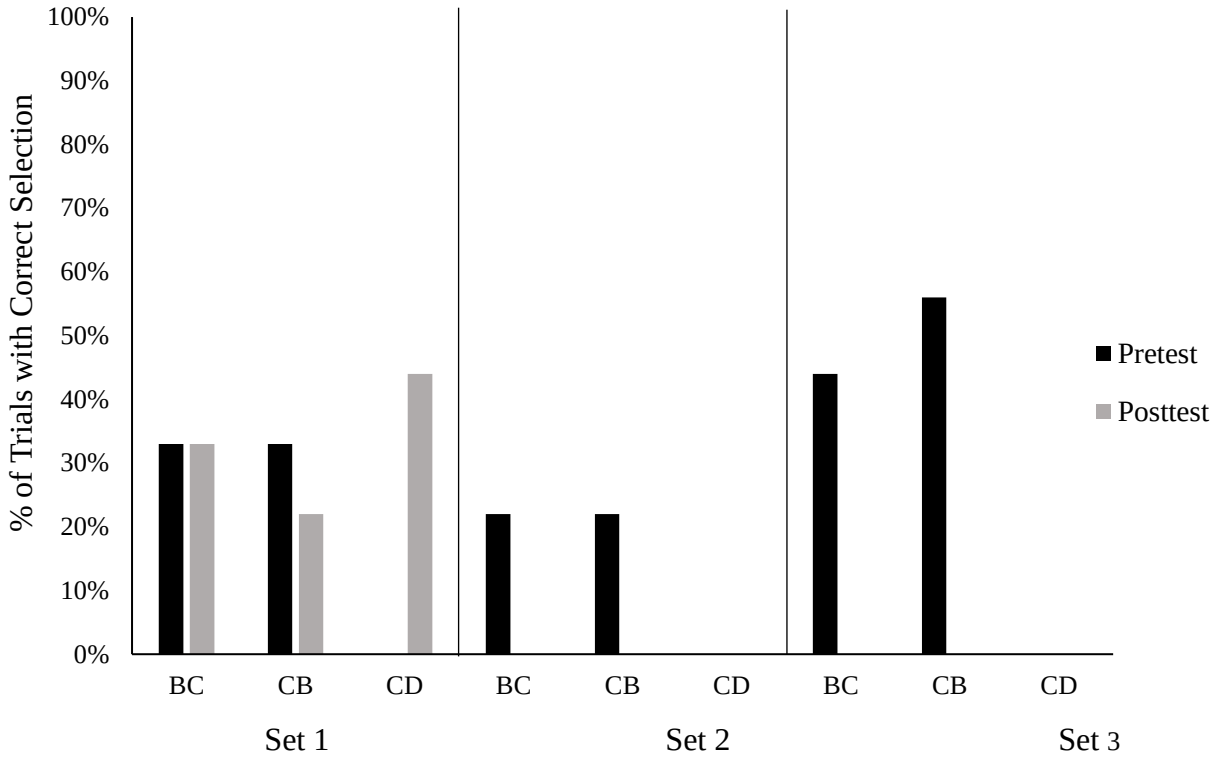

Figure 6. Percentage of correct responses Joey made during the emergent relations pre and post-tests.

Figure 7 illustrates Joey's performance on the textual activity schedule during baseline and after exposure to the SPO procedure. During baseline for sets one and two, his responding was at 0% for all probes. During baseline for set 3, his responding did increase to 66% during 2/10 trials. However, these increases were not consecutive and were still below mastery. After exposure to the SPO procedure for seven sessions, with each session consisting of 12 trial blocks, his responding remained at 0%. His participation for the SPO procedure was discontinued because no progress was being made after an extended period of exposure to the SPO procedure. At the time of the termination of the procedure, his responding had made no improvements after being exposed to each stimulus pairing 252 times, and he could not move on to subsequent sets.

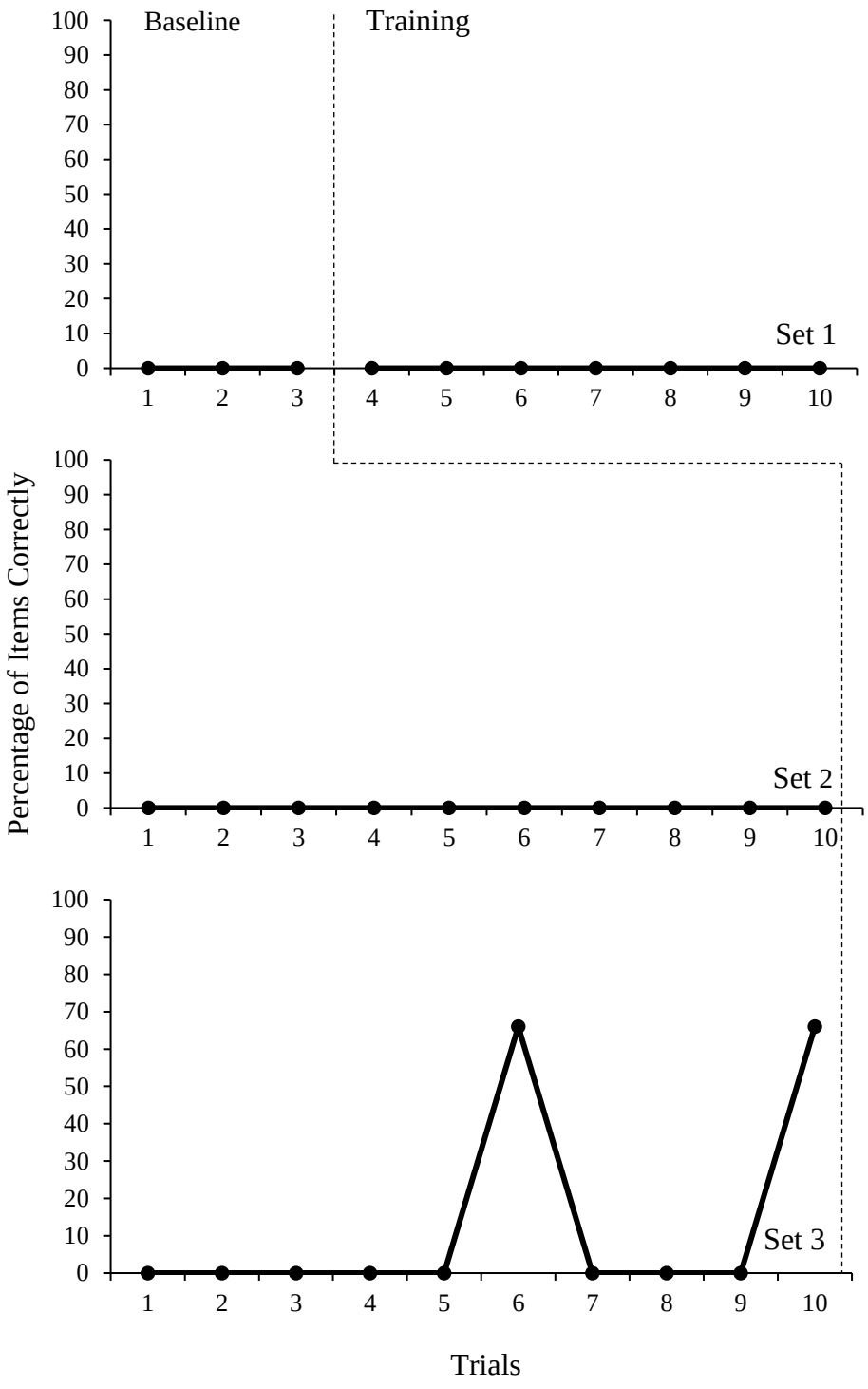

Figure 7. Percentage of items Joey correctly gathered using the textual activity schedule during baseline and post SPO training.

The SPO procedure did not aid the participants in learning stimulus equivalence. Previous research has shown that Joey was capable of learning stimulus equivalence via a matching-to-sample procedure (Ortega, 2014). In an attempt to teach the learner the desired relations, a MTS procedure was conducted in which a vocal sample stimulus (A) was followed immediately by 3 comparison stimuli that were arranged on a stimulus placement board. Initially, a gestural prompting procedure was used, but when progress was not made, the procedure was adapted to a progressive time delay procedure. The participant needed two consecutive nine trial blocks with 8/9 correct to advance to the next level. The time delay procedure began with a zero second time delay (immediate prompt) followed by a two second time delay. Correct responses received reinforcement in the form of verbal praise and juice, while a correctional gestural prompt was used for incorrect responses. The MTS procedure consisted of three levels. The A-B (dictated word-picture) relation was taught during the first level (see Appendix K). Following mastery, the A-C (dictated word-text) relation was taught (see Appendix L). Following mastery of the second level, the final level was taught which consisted of mixed training where trials of A-B and A-C relations were interspersed in sessions of nine trial blocks (see Appendix M). The criterion of making 8/9 correct in two consecutive trial blocks was never reached. Joey's participation was discontinued after he remained on level one for 32 sessions.

Figure 8 illustrates Joey's percentage of correct responding during the MTS procedure for the set one A-B relation. During the first phase, a gestural prompt was given 3 sec. after the trial was presented if there was no response. If there was an incorrect response, a correctional gestural prompt was given. The criterion of getting 8/9

correct for two consecutive trial blocks was not reached after 16 trials, so a time delay procedure was used. The time delay procedure began with a 0 sec. time delay, in which a prompt was given immediately. After criterion was reached, the time delay increased to 2 sec. Criterion was never reached during the 2 sec. phase. After 14 unsuccessful trials, the MTS procedure was terminated.

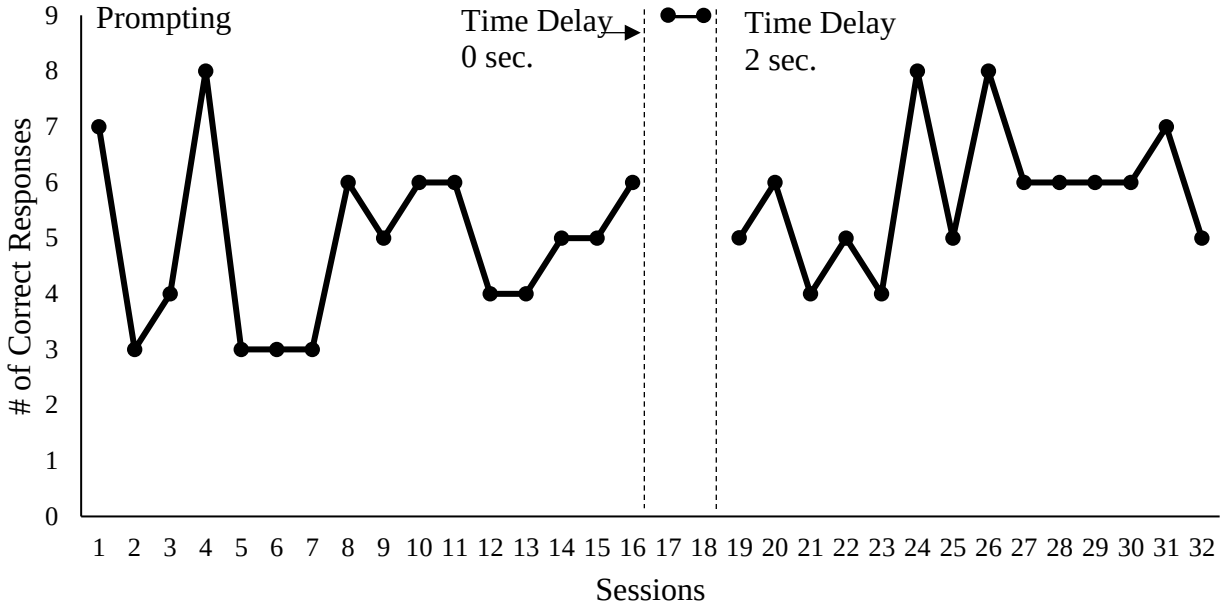

Figure 8. Joey's percentage of correct responses during the matching-to-sample procedure for set one A-B (dictated word-picture) relation.

CHAPTER V

DISCUSSION

This study was done in an attempt to extend Ortega's (2014) study. However, due to the lack of significant data, Ortega's findings were not substantiated by this research. The previous study found a match-to-sample procedure to be effective in promoting derived textual control in one participant. However, the other participant in the study was unable to attend to the MTS procedure. This study used a more simplistic form of stimulus equivalence training (Rosales, Rehfeldt, & Huffman, 2012) to determine if both learners would be able to learn the skill. However, the results of the current study show the SPO procedure to be less effective than the MTS procedure because neither participant was able successfully to complete a textual activity schedule following SPO training. The participant who had success with the MTS training in the previous study was exposed to MTS training again in the current study. However, in this study, the MTS training was not effective for the participant. The participant was unable to follow a textual activity schedule.

The results show that the stimulus pairing observation procedure was not effective at transferring stimulus control for either participant. Both Jesse's and Joey's participation were discontinued due to lack of progress during the SPO procedure. The results also show that the MTS procedure was not effective at transferring stimulus control for Joey. The emergence of derived textual control was not displayed after the SPO training or the MTS training. There are several possible explanations for the lack of emergence relations for the two participants, and these explanations will be explored below.

Jesse

Jesse's inability to respond correctly to the pre-experimental conditional discrimination test suggested that he may be unable to complete conditional discrimination tasks. The stimuli used were items that he used on a daily basis, but he was unable to distinguish between the three items when presented in an array. It was previously shown that he was unable to accurately respond to conditional discrimination tasks; specifically, he had difficulties responding to an array of stimuli (Ortega, 2014). Therefore, the current study used a more simplistic procedure, an SPO procedure, where only two stimuli were paired at once. However, the procedure was still ineffective for Jesse.

At post-test for emergent relations, Jesse responded with 0% accuracy, and usually refused to respond at all. A supplementary relation was including during the post-test where a B-D (picture-oral name) relation was presented. He did correctly name the pictorial stimulus 22% of the time.

After four 12 trial block sessions of SPO training for set one, he did gather 33% of the correct craft items during the textual activity schedule. During the ninth and tenth baseline probe for set 2, he also gathered 33% of the correct craft items. He had a tendency to choose one craft item for the day and select that item for every textual stimuli he was shown in the textual activity schedule. If the item he happened to choose was in the set he was on, he would get a third of the items correct. Therefore, the items he gathered correctly appeared to be due to chance instead of increased skill. After seven exposures to the SPO procedure, no progress had been made so his participation in the SPO procedure was discontinued. He did not move on to an MTS procedure, like Joey,

because previous research suggested he was unable to complete a conditional discrimination task (Ortega, 2014).

There are many possible reasons for Jesse's difficulty in responding to a SPO procedure. One potential reason is that his attention is lacking. He has a hard time attending to work-related tasks, and he has a long history of work avoidance behaviors. When he is presented with a task, he often looks the other direction. During a typical word day, he needs many prompts in order to complete work-related tasks. He is often focused on socializing and rarely focused on work. During the SPO procedure, he often looked at his surroundings and often laughed to amuse himself and others. The environment he was in during the procedure was stimulating with shelves full of crafts, games, and puzzles. Also, there were times people would walk by him as he was doing the procedure, or people could be heard in the next room. He was distracted by this environment. Before completing further stimulus equivalence training procedures, it is suggested that he receives training to promote sustained attention to a task. He did echo many of the words spoken in the SPO procedure, so he was attending to some extent. He even labeled the stimuli on some occasions. However, greater focus is needed in order to successfully derive stimulus equivalence.

Another potential reason the procedure may not have been helpful for Jesse learning stimulus equivalence could be that the learning style in the SPO procedure may not align with his learning style. SPO appeals most to visual and auditory learners, while Jesse may be a kinesthetic learner. Programmed material may be unable to hold a kinesthetic learner's attention (Rita & Dunn, 1993). He was encouraged to stand during

training because he appeared to focus better while standing, but a procedure more interactive may have been more helpful.

It is also possible that Jesse may lack the necessary skills or learning history for stimulus equivalence to emerge. Jesse has language barriers in that his appropriate vocalizations are often limited to one-word utterances. He also has echolalia and often echoes people, phone conversations, and movies. Previous research suggests that severely language disabled individuals may not be able to form stimulus equivalence classes (Devany, Hayes, & Nelson, 1986), and it is possible that Jesse's language is sufficiently impaired so as to include him in this category of individuals.

Joey

During the emergent relations pre-tests with craft items, Joey scored so high that the craft stimuli had to be changed five times. He appeared to have had too long of a learning history with craft items. Relations repeatedly emerged with no stimulus equivalence training. Craft items were deemed too familiar for him to use, so the stimulus used for his procedures was changed to musical instruments. Instead of gathering items to make a craft, he gathered instruments. During the emergent relations pre-tests with instruments, Joey scored below chance on all relations.

The SPO procedure was not successful in helping Joey derive textual control of the stimuli. For the first set of stimuli, his responding remained at 0% accuracy for all baseline and post-training probes. His participation for the SPO procedure was discontinued, and he was unable to move onto subsequent sets, because he showed no progress after his exposure to the SPO procedure after an extended period of time. Given his success with the emergent relation pre-tests for the craft items, it came as a surprise

that the SPO procedure was not effective in deriving relations with the instrument stimuli. It was clear that he was attending to the procedure because he made eye contact with the primary researcher, and he often echoed the dictated stimuli. There are multiple reasons as to why the SPO procedure was unsuccessful for Joey.

Stimulus pairing procedures are not reinforcement based. Reinforcement was given for attending to the procedure, but was not contingent on correct answers. Joey may have had no motivation to select the correct answer since he knew he would get reinforcement as long as he attended to the procedure. Joey enjoyed games and enjoyed getting something correct. This was apparent when he smiled from ear-to-ear when he made a hoop while playing basketball. He loved getting high fives after a made basket; he liked getting rewarded for a job well done. No response is necessary for SPO procedures, so he did not have the opportunity to get something correct. It was a passive approach to learning rather than an interactive one. Joey may do better with more interactive approaches to learning, and approaches that are more response specific reinforcement based. Another reason the SPO procedure may not have worked for Joey is because he had a strong instrument preference.

The SPO was not effective in teaching stimulus equivalence, so a modification to the procedure was made in which an MTS procedure was implemented. The implementation of an MTS procedure was based on previous research where this participant was successfully able to derive textual control of an activity schedule using a MTS procedure (Ortega, 2014).

During the MTS procedure, correct relations were trained by providing a gestural prompt indicating the correct stimuli when an incorrect pairing was chosen by the learner.

There were three levels of the MTS procedure, as described in the previous chapter, but Joey never progressed beyond level one because after repeated exposures to the MTS procedure, stimulus equivalence still did not emerge. He could not gather the correct items from the schedule consistently. His responses were highly variable. He also showed some position bias in that he had a tendency to ignore the right side of the stimulus placement board and pick the stimuli that were either in the left or middle positions. Joey was able to orally name guitar but other relations were limited.

Joey was able to successfully use an MTS procedure to derive textual control of an activity schedule two years prior to the current study (Ortega, 2014). The main reason for the decrease in the MTS procedure's effectiveness is likely due to medical complications that have become more pronounced over the past two years. He experiences multiple ailments that cause him physical pain and emotional stress. These ailments likely leave him with the inability to focus because of the severity of the symptoms. Joey's medical complications were likely present at the time of Ortega's (2014) study. However, the problems are far more severe now. It is believed that because of the severity of his medical issues, he can no longer focus on stimulus equivalence procedures (Smith, 2016).

Limitations and Future Research

There were multiple limitations to this study. One limitation was that participants were frequently gone on vacations. Each time they left for an extended period their performance would regress upon their return, and it would take time to get their responding back to pre-vacation levels. Joey was also frequently absent for doctor's

appointments. Future research should aim at holding training sessions more consistently, with no major gaps in training.

Another limitation is that there was a constraint on the amount of stimulus equivalence training procedures participants could have. If participants did not progress to the next stimulus set within 7 exposures of the procedure, the procedure would be terminated. Future studies should not have such a strict constraint on amount of sessions. It is possible that the SPO procedure and the MTS procedure could be effective in training stimulus equivalence with a higher number of training sessions.

Another limitation was that Jesse could not attend to the procedure long enough for learning to occur. During the sessions, he was very preoccupied by his surroundings. He was very intrigued by the game, puzzles, and crafts on the shelves. Being a social person, he was also very distracted by people as they passed by or as they made noise in other rooms. Future researchers should consider conducting their study in a less stimulating and more private room. Also, Jesse needs to learn how to sustain attention for longer periods of time prior to future studies. Future researchers might consider training for attention prior to conducting a procedure that relies on attention.

It is also likely that Jesse's learning style did not match the learning style utilized in the SPO procedure. The procedure used primarily auditory and visual learning styles, while it is likely that Jesse is a kinesthetic learner. Future researchers should assess their participants' learning style and adapt their procedure based on participants' learning styles.

It is possible that other methods of stimulus equivalence training might be more suitable for Jesse. In a previous study, a superimposition and fading procedure was found

to be effective at transferring stimulus control from pictures to text in an activity schedule (Sprinkle & Miguel, 2013). There are multiple forms of stimulus equivalence training, possibly one that would be effective for Jesse. Future researchers may consider trying a different form of stimulus equivalence training.

The most significant limitation of this study was that Joey had severe medical complications. His gallbladder problems and tendonitis made it excessively difficult for him to concentrate on the procedures. He was motivated by the juice reinforcer, but it is likely that he could not focus long enough to get the correct answer because of the pain was experiencing. He needs to be healthy before he should participate in further research.

Stimulus pairing observation procedures have been shown to be effective in acquiring equivalence relations (Omori & Yamamoto, 2013). Stimulus pairing has also been shown to be effective when compared to match-to-sample training, with the additional benefit of being straightforward (Rosales, Rehfeldt, & Huffman, 2012). Matching-to-sample has also been shown to be effective in acquiring equivalence relations by transferring stimulus control to textual stimuli for activity schedules (Miguel et al., 2009; Ortega, 2014). However, the current study did not extend those findings in that both participants were not able to acquire equivalence relations after exposure to an SPO procedure, and Joey did not acquire equivalence relations after exposure to the MTS procedure. More research is needed in the area of stimulus equivalence, specifically with individuals with Down syndrome. More research is needed to see if SPO procedures and MTS procedures are consistently unsuccessful, or to see if this research study is an anomaly.

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Appendix A

CENTRAL WASHINGTON UNIVERSITY
RESEARCH PARTICIPANT INFORMED CONSENT

Study Title: Derived Textual Control in Activity Schedules Using a Stimulus Pairing Observation Procedure

Principal Investigator: Grace Felling, Graduate Student, Department of Psychology
Contact: FellingG@cwu.edu (218) 760-1510
Faculty Sponsor: Dr. Sadie Lovett, Assistant Professor, Department of Psychology
Contact: LovettS@cwu.edu (509) 973-3453

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1. **What you should know about this study:**
   - Your son or daughter is being asked to join a research study.
   - This consent form explains the research study and your son/daughter's participation in this study.
   - Please read it carefully and take as much time as you need.
   - Ask questions about anything you do not understand now, or when you think of them later.
   - Your son/daughter is a volunteer. If at any point you do not feel comfortable with their continued participation, you may withdraw them at any time without fear of penalty or loss of benefits.
   - Verbal consent will be obtained from your son/daughter throughout the study.
   - While your son/daughter is participating in this study, the study team will keep you informed of any new information that could impact your son/daughter's continued participation in the study.
2. **Why is this research being done?**
   This study is an extension of previous research on derived textual control and activity schedules. Through a process called stimulus equivalence, individuals with disabilities can learn to use textual activity schedules in place of picture activity schedules. This study will extend research by using a new teaching procedure. This new procedure is designed for individuals with disabilities who struggle to learn with traditional instructional formats. Your son or daughter may benefit from being a participant in this study by learning to use a textual activity schedule.
3. **Who can take part in this study?**
   Eligible participants are adults with Down syndrome who are over the age of 18. The participants must be able to complete a picture activity schedule at the start of the study.
4. **What will happen if you join this study?**
   1. Preference Assessment: Several items will be presented to your son/daughter. They will be asked to select the item they wish to interact with. The items they select will be considered their most preferred. Access to these items will be regularly provided to your son/daughter throughout

the study. The preference assessment will occur on a single day during a 30 minute session.

2. Pre-experimental Matching-to-Sample Test: A familiar spoken name of an object will be presented to the participant. Then, three pictures of objects will be presented: a basketball, work gloves, and a watering can. For example, the spoken name "basketball" will be presented. Then, the participant will select the picture that matches that name. Each spoken name will be presented three times. This will be done to see if the participant can complete a task of this format. This session should take no longer than 20 min.
3. Emergent Relations Pre-test: The participant will be presented with either a picture or a written word. Then, they will be asked to match it to a corresponding picture or written word. For example, if a word is presented, then the participant will be asked to match it to the picture that represents that word. The participant will also be shown a written word and asked to name it out loud. Each picture or written word will be presented 3 times. These sessions should take no longer than 20 min.
4. Textual Activity Schedule Baseline: Pictures in the participant's activity schedule will be replaced with printed words. This textual schedule will be given to the participant. Then, they will be asked to gather the items on the schedule to make a craft. The participant will be given the chance to follow the schedule and gather the craft items. The researcher will record the number of steps the participant is able to complete by successfully. Session length will be about 5 min.
5. Stimulus Pairing Observation Procedure: Two items will be presented at the same time to teach the participant that they go together. First the spoken names and pictures will be presented. Then, the spoken names and printed words will be presented. For example, the researcher will say the word "pencil" and hold up a picture of a pencil. Participants will be rewarded with preferred items for following directions. Each session will take no longer than 30 minutes. These sessions will be repeated for about 5 days.
6. Textual-activity Post-Training: This is the same as the textual activity schedule baseline. This session will be completed after the stimulus pairing observation procedure.
7. Emergent Relations Post-test: This is the same as the emergent relations pre-test. This will be completed after the stimulus pairing observation procedure.
    - Items 1 through 7 will take 4 to 6 weeks.

5. What are the risks or discomforts of the study?

There are very minimal risks or discomforts for the participants in this study. This type of procedure is common and usually does not produce negative consequences. The instruction in this study is similar to the instruction used at the Trellis Center on a daily basis. The minimal risks or discomforts may include boredom, fatigue, and frustration. Also, the study does involve procedures in which the participant may answer correctly or incorrectly. The primary researcher

will record if the participant's answer is correct or incorrect. However, no negative feedback will be given to the participant for incorrect responses. Reinforcement and positive feedback will be provided for compliance with directions and for attention, not for correct responses.

6. Are there benefits to being in the study?

Your son or daughter could learn a textual activity schedule. This is beneficial because it increases independence. Also, textual activity schedules may be more age appropriate for adults than picture based activity schedules.

7. What are your options if you do not want to be in the study?

Your son or daughter does not have to join this study. If they do not join, it will not affect any benefits to which they are entitled. Before each session, your son or daughter will be asked if they want to work with the primary researcher. If they act like they want to (i.e. nod, smile, walk toward the researcher, etc.), or if they say "yes," the session will proceed. If they do not act like they want to participate, or if they say "no," the session will not be conducted during that time.

8. Will it cost you anything to be in this study?

The study procedures will be provided at no cost to you.

9. Can you leave the study early?

If at any time the participant or their guardian wishes to end the participant's involvement in the study, they can do so immediately and with no negative consequences. If you wish to have the participant stop at any time, please tell the primary researcher right away. If at any point during the session the participant acts like they want to escape the task, or if they are acting excessively tired or frustrated, the session will be ended. If the participant does leave the study early, the researcher may use information already collected from them.

10. What information about you will be kept private and what information may be given out?

Your son or daughter's name will not be used in any part of the write up of the study. All participants will be given a fake name, known only to the primary researcher and the faculty sponsor. All data will be kept on a password protected computer that only the primary researcher can access. No data will be collected that could reveal the participant's identity.

11. What other things should you know about this research study?

a. What is the Institutional Review Board (IRB) and how does it protect you?

This study has been reviewed by the CWU Human Subject Review Council. HSRC is made up of faculty from many different departments, ethicists, nurses, scientists, non-scientists and people from the local community. The HSRC's purpose is to review human research studies and to protect the rights and welfare of the people participating in those studies. You may contact the HSRC if you have questions about your rights as a participant or if you think you have not been treated fairly. The HSRC office number is (509) 963-3115.

b. What do you do if you have questions about the study?

If you have any additional questions or concerns feel free to contact the principal investigator, Grace Felling, at 218-760-1510.

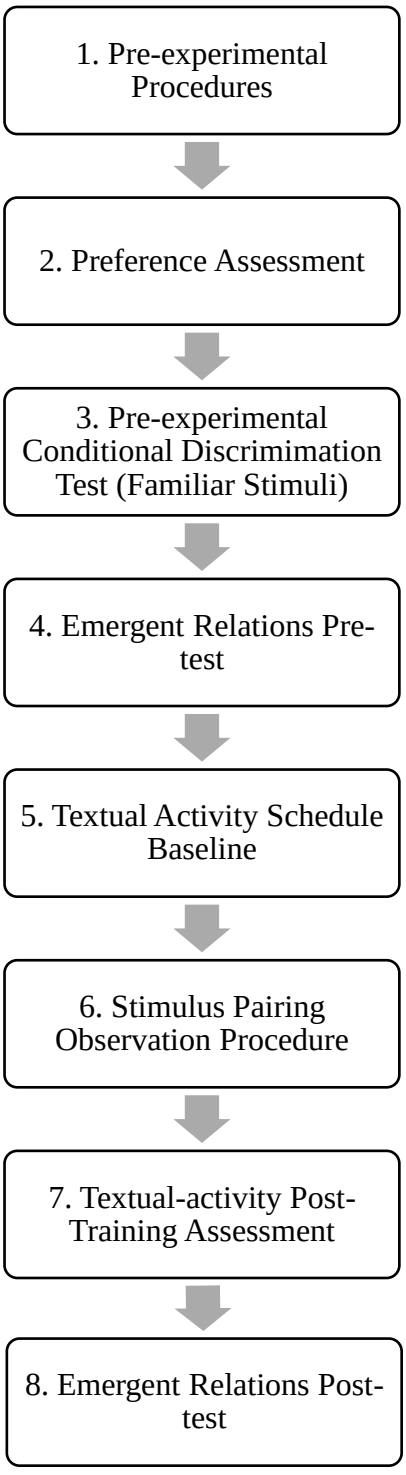
12. What does your signature on this consent form mean?

By signing this consent form, you are not giving up any legal rights. Your signature means that you understand the study plan, have been able to ask questions about the information given to you in this form, and you are willing to participate under the conditions we have described.

A copy of the form will be given to you.

Participant's Name (print): _____
Name of Guardian (print):_____
Guardian Signature: _____ Date: _____
Principle Investigator: _____ Date: _____

Appendix B


1. Pre-experimental Procedures
2. Preference Assessment
3. Pre-experimental Conditional Discrimimation Test (Familiar Stimuli)
4. Emergent Relations Pre-test
5. Textual Activity Schedule Baseline
6. Stimulus Pairing Observation Procedure
7. Textual-activity Post-Training Assessment
8. Emergent Relations Post-test

Appendix C

Preference Assessment: Paired Stimulus Data Sheet

Participant #: _____ Date: _____ Observer: _____

Stimulus Items	Overall Rank
1.	
2.	
3.	
4.	
5.	

Item Presentation	Circle item selected					
1-2	1	2	3	4	5	NS
5-4	1	2	3	4	5	NS
3-1	1	2	3	4	5	NS
2-4	1	2	3	4	5	NS
3-5	1	2	3	4	5	NS
3-2	1	2	3	4	5	NS
2-5	1	2	3	4	5	NS
3-4	1	2	3	4	5	NS
5-1	1	2	3	4	5	NS
1-4	1	2	3	4	5	NS
2-3	1	2	3	4	5	NS
3-5	1	2	3	4	5	NS
4-2	1	2	3	4	5	NS
5-2	1	2	3	4	5	NS
4-3	1	2	3	4	5	NS
1-5	1	2	3	4	5	NS
1-3	1	2	3	4	5	NS
4-1	1	2	3	4	5	NS
4-5	1	2	3	4	5	NS
2-1	1	2	3	4	5	NS
Times Selected						

1. _____ ÷ _____ x 100% = _____
2. _____ ÷ _____ x 100% = _____
3. _____ ÷ _____ x 100% = _____
4. _____ ÷ _____ x 100% = _____
5. _____ ÷ _____ x 100% = _____

Appendix D

Pre-experimental Conditional Discrimination Test
(Familiar Stimuli)

Sample Stimulus:	**Comparison Stimuli:**			**Correct Match**	**Incorrect Match**
Basketball	*Work Gloves*	*Watering Can*	*Basketball*		
Work Gloves	*Watering Can*	*Basketball*	*Work Gloves*		
Watering Can	*Basketball*	*Work Gloves*	*Watering Can*		
Work Gloves	*Basketball*	*Watering Can*	*Work Gloves*		
Watering Can	*Watering Can*	*Work Gloves*	*Basketball*		
Basketball	*Work Gloves*	*Basketball*	*Watering Can*		
Watering Can	*Watering Can*	*Basketball*	*Work Gloves*		
Basketball	*Work Gloves*	*Watering Can*	*Basketball*		
Work Gloves	*Basketball*	*Work Gloves*	*Watering Can*		

Appendix E

Emergent Relations Pre-test and Post-test Datasheet: Crafts

Pictures-Printed Words (B-C): Instruct participant, "Match"

Sample Stimulus: Picture	**Comparison Stimuli: Printed Word**			**Correct Match**	**Incorrect Match**
Pencil	*Pencil*	*Paint*	*Brush*		
Paint	*Brush*	*Pencil*	*Paint*		
Brush	*Paint*	*Brush*	*Pencil*		
Paint	*Pencil*	*Paint*	*Brush*		
Pencil	*Brush*	*Pencil*	*Paint*		
Brush	*Paint*	*Brush*	*Pencil*		
Pencil	*Pencil*	*Paint*	*Brush*		
Brush	*Brush*	*Pencil*	*Paint*		
Paint	*Paint*	*Brush*	*Pencil*		

Printed words-pictures (C-B): Instruct participant, "Match"

Sample Stimulus: Printed Word	**Comparison Stimuli: Picture**			**Correct Match**	**Incorrect Match**
Paint	*Pencil*	*Paint*	*Brush*		
Pencil	*Brush*	*Pencil*	*Paint*		
Brush	*Paint*	*Brush*	*Pencil*		
Pencil	*Pencil*	*Paint*	*Brush*		
Brush	*Brush*	*Pencil*	*Paint*		
Paint	*Paint*	*Brush*	*Pencil*		
Brush	*Pencil*	*Paint*	*Brush*		
Pencil	*Brush*	*Pencil*	*Paint*		
Paint	*Paint*	*Brush*	*Pencil*		

Printed words-oral name (C-D): Ask participant, "What's this?"

Sample Stimulus: Printed Word	**Comparison Stimuli: Oral Name (Participant said, "_____")**	**Correct Match**	**Incorrect Match**
Brush			
Pencil			
Paint			
Pencil			
Paint			
Brush			
Paint			

Brush			
Pencil			

Pictures-Printed Words (B-C): Instruct participant, "Match"

Sample Stimulus: Picture	**Comparison Stimuli: Printed Word**			**Correct Match**	**Incorrect Match**
Crayon	*Crayon*	*Marker*	*Glue*		
Marker	*Marker*	*Glue*	*Crayon*		
Glue	*Glue*	*Crayon*	*Marker*		
Marker	*Crayon*	*Marker*	*Glue*		
Glue	*Marker*	*Glue*	*Crayon*		
Crayon	*Glue*	*Crayon*	*Marker*		
Glue	*Crayon*	*Marker*	*Glue*		
Crayon	*Marker*	*Glue*	*Crayon*		
Marker	*Glue*	*Crayon*	*Marker*		

Printed words-pictures (C-B): Instruct participant, "Match"

Sample Stimulus: Printed Word	**Comparison Stimuli: Picture**			**Correct Match**	**Incorrect Match**
Marker	*Crayon*	*Marker*	*Glue*		
Crayon	*Marker*	*Glue*	*Crayon*		
Glue	*Glue*	*Crayon*	*Marker*		
Crayon	*Crayon*	*Marker*	*Glue*		
Glue	*Marker*	*Glue*	*Crayon*		
Marker	*Glue*	*Crayon*	*Marker*		
Glue	*Crayon*	*Marker*	*Glue*		
Marker	*Marker*	*Glue*	*Crayon*		
Crayon	*Glue*	*Crayon*	*Marker*		

Printed words-oral name (C-D): Ask participant, "What's this?"

Sample Stimulus: Printed Word	**Comparison Stimuli: Oral Name (Participant said, "_____")**	**Correct Match**	**Incorrect Match**
Glue			
Marker			
Crayon			
Marker			
Crayon			
Glue			
Crayon			

Glue			
Marker			

Pictures-Printed Words (B-C): Instruct participant, "Match"

Sample Stimulus: Picture	**Comparison Stimuli: Printed Word**			**Correct Match**	**Incorrect Match**
Tape	*Tape*	*Scissors*	*String*		
Scissors	*Scissors*	*String*	*Tape*		
String	*String*	*Tape*	*Scissors*		
Scissors	*Tape*	*Scissors*	*String*		
String	*Scissors*	*String*	*Tape*		
Tape	*String*	*Tape*	*Scissors*		
String	*Tape*	*Scissors*	*String*		
Tape	*Scissors*	*String*	*Tape*		
Scissors	*String*	*Tape*	*Scissors*		

Printed words-pictures (C-B): Instruct participant, "Match"

Sample Stimulus: Printed Word	**Comparison Stimuli: Picture**			**Correct Match**	**Incorrect Match**
Scissors	*Tape*	*Scissors*	*String*		
Tape	*Scissors*	*String*	*Tape*		
String	*String*	*Tape*	*Scissors*		
Tape	*Tape*	*Scissors*	*String*		
String	*Scissors*	*String*	*Tape*		
Scissors	*String*	*Tape*	*Scissors*		
String	*Tape*	*Scissors*	*String*		
Scissors	*Scissors*	*String*	*Tape*		
Tape	*String*	*Tape*	*Scissors*		

Printed words-oral name (C-D): Ask participant, "What's this?"

Sample Stimulus: Printed Word	**Comparison Stimuli: Oral Name (Participant said, "_____")**	**Correct Match**	**Incorrect Match**
String			
Scissors			
Tape			
Scissors			
Tape			
String			
Tape			

String			
Scissors			

Appendix F

Emergent Relations Pre-test and Post-test Datasheet: Music

Pictures-Printed Words (B-C): Instruct participant, "Match"

Sample Stimulus: Picture	**Comparison Stimuli: Printed Word**			**Correct Match**	**Incorrect Match**
Guitar	*Conga*	*Shaker*	*Guitar*		
Shaker	*Shaker*	*Guitar*	*Conga*		
Conga	*Guitar*	*Conga*	*Shaker*		
Shaker	*Conga*	*Shaker*	*Guitar*		
Conga	*Shaker*	*Guitar*	*Conga*		
Guitar	*Guitar*	*Conga*	*Shaker*		
Conga	*Conga*	*Shaker*	*Guitar*		
Guitar	*Shaker*	*Guitar*	*Conga*		
Shaker	*Guitar*	*Conga*	*Shaker*		

Printed words-pictures (C-B): Instruct participant, "Match"

Sample Stimulus: Printed Word	**Comparison Stimuli: Picture**			**Correct Match**	**Incorrect Match**
Guitar	*Conga*	*Shaker*	*Guitar*		
Shaker	*Shaker*	*Guitar*	*Conga*		
Conga	*Guitar*	*Conga*	*Shaker*		
Shaker	*Conga*	*Shaker*	*Guitar*		
Conga	*Shaker*	*Guitar*	*Conga*		
Guitar	*Guitar*	*Conga*	*Shaker*		
Shaker	*Conga*	*Shaker*	*Guitar*		
Conga	*Shaker*	*Guitar*	*Conga*		
Guitar	*Guitar*	*Conga*	*Shaker*		

Printed words-oral name (C-D): Ask participant, "What's this?"

Sample Stimulus: Printed Word	**Comparison Stimuli: Oral Name (Participant said, "_____")**	**Correct Match**	**Incorrect Match**
Guitar			
Conga			
Shaker			
Conga			
Shaker			
Guitar			
Shaker			

Conga			
Guitar			

Pictures-Printed Words (B-C): Instruct participant, "Match"

Sample Stimulus: Picture	**Comparison Stimuli: Printed Word**			**Correct Match**	**Incorrect Match**
Drum Sticks	*Drum Sticks*	*Rain Stick*	*Vibraslap*		
Rain Stick	*Vibraslap*	*Drum Sticks*	*Rain Stick*		
Vibraslap	*Rain Stick*	*Vibraslap*	*Drum Sticks*		
Rain Stick	*Drum Sticks*	*Rain Stick*	*Vibraslap*		
Vibraslap	*Vibraslap*	*Drum Sticks*	*Rain Stick*		
Drum Sticks	*Rain Stick*	*Vibraslap*	*Drum Sticks*		
Vibraslap	*Drum Sticks*	*Rain Stick*	*Vibraslap*		
Drum Sticks	*Vibraslap*	*Drum Sticks*	*Rain Stick*		
Rain Stick	*Rain Stick*	*Vibraslap*	*Drum Sticks*		

Printed words-pictures (C-B): Instruct participant, "Match"

Sample Stimulus: Printed Word	**Comparison Stimuli: Picture**			**Correct Match**	**Incorrect Match**
Rain Stick	*Drum Sticks*	*Rain Stick*	*Vibraslap*		
Vibraslap	*Vibraslap*	*Drum Sticks*	*Rain Stick*		
Drum Sticks	*Rain Stick*	*Vibraslap*	*Drum Sticks*		
Vibraslap	*Drum Sticks*	*Rain Stick*	*Vibraslap*		
Drum Sticks	*Vibraslap*	*Drum Sticks*	*Rain Stick*		
Rain Stick	*Rain Stick*	*Vibraslap*	*Drum Sticks*		
Vibraslap	*Drum Sticks*	*Rain Stick*	*Vibraslap*		
Drum Sticks	*Vibraslap*	*Drum Sticks*	*Rain Stick*		
Rain Stick	*Rain Stick*	*Vibraslap*	*Drum Sticks*		

Printed words-oral name (C-D): Ask participant, "What's this?"

Sample Stimulus: Printed Word	**Comparison Stimuli: Oral Name (Participant said, "_____")**	**Correct Match**	**Incorrect Match**
Drum Sticks			
Rain Stick			
Vibraslap			
Rain Stick			
Vibraslap			
Drum Sticks			
Rain Stick			

Drum Sticks			
Vibraslap			

Pictures-Printed Words (B-C): Instruct participant, "Match"

Sample Stimulus: Picture	**Comparison Stimuli: Printed Word**			**Correct Match**	**Incorrect Match**
Sleigh Bells	*Hot Rod*	*Music Stand*	*Sleigh Bells*		
Hot Rod	*Sleigh Bells*	*Hot Rod*	*Music Stand*		
Music Stand	*Music Stand*	*Sleigh Bells*	*Hot Rod*		
Hot Rod	*Hot Rod*	*Music Stand*	*Sleigh Bells*		
Music Stand	*Sleigh Bells*	*Hot Rod*	*Music Stand*		
Sleigh Bells	*Music Stand*	*Sleigh Bells*	*Hot Rod*		
Music Stand	*Hot Rod*	*Music Stand*	*Sleigh Bells*		
Sleigh Bells	*Sleigh Bells*	*Hot Rod*	*Music Stand*		
Hot Rod	*Music Stand*	*Sleigh Bells*	*Hot Rod*		

Printed words-pictures (C-B): Instruct participant, "Match"

Sample Stimulus: Printed Word	**Comparison Stimuli: Picture**			**Correct Match**	**Incorrect Match**
Sleigh Bells	*Hot Rod*	*Music Stand*	*Sleigh Bells*		
Hot Rod	*Sleigh Bells*	*Hot Rod*	*Music Stand*		
Music Stand	*Music Stand*	*Sleigh Bells*	*Hot Rod*		
Sleigh Bells	*Hot Rod*	*Music Stand*	*Sleigh Bells*		
Hot Rod	*Sleigh Bells*	*Hot Rod*	*Music Stand*		
Music Stand	*Music Stand*	*Sleigh Bells*	*Hot Rod*		
Hot Rod	*Hot Rod*	*Music Stand*	*Sleigh Bells*		
Music Stand	*Sleigh Bells*	*Hot Rod*	*Music Stand*		
Sleigh Bells	*Music Stand*	*Sleigh Bells*	*Hot Rod*		

Printed words-oral name (C-D): Ask participant, "What's this?"

Sample Stimulus: Printed Word	**Comparison Stimuli: Oral Name (Participant said, "_____")**	**Correct Match**	**Incorrect Match**
Sleigh Bells			
Music Stand			
Hot Rod			
Music Stand			
Hot Rod			
Sleigh Bells			
Hot Rod			

Sleigh Bells			
Music Stand			

Appendix G

Intervention Integrity Checklist

Emergent Relations Tests	**Performed correctly?**
Stimulus placement board was presented with appropriate stimuli (e.g., sample stimulus and 3 comparison stimuli)	Y N
Comparison stimuli presented in order specified on data sheet	Y N
PR gave the instruction, "Match" or "What's this?"	Y N
PR gave the participant 5 s to respond	Y N
All relations identified on data sheet were presented.	Y N
No reinforcement was given by PR for emergent relations	Y N
Reinforcement was given by PR for on task behavior	Y N
Textual Activity Schedule Conditions	**Performed correctly?**
No labels are visible on the craft items used	Y N
Textual activity schedule presented with appropriate stimuli (e.g., set 1, set 2, set 3 stimuli)	Y N
Textual stimuli were placed in activity schedule in random order	Y N
PR gave the instruction, "It's time to make a craft."	Y N
No reinforcement or prompts were given by the PR	Y N
Session was terminated if all tasks were not completed within 5 min	Y N
SPO Condition	**Performed correctly?**
PR ensured participant was making eye contact	Y N
PR presented picture/text stimulus and corresponding dictated name stimulus simultaneously	Y N
PR removed the stimulus and waited 1 s before presenting the next trial	Y N
There was a 3 min break after three trial blocks	Y N
Procedure Fidelity:	**/17**

Appendix H

Instruction: “It’s time to gather crafts/instruments”
Participant:

Date: Condition and Trial:

Set 1:		
Stimuli	**Correct**	**Incorrect**
Total Correct:		

Set 2:		
Stimuli	**Correct**	**Incorrect**
Total Correct:		

Set 3:		
Stimuli	**Correct**	**Incorrect**
Total Correct:		

Date: Condition and Trial:

Set 1:		
Stimuli	**Correct**	**Incorrect**
Total Correct:		

Set 2:		
Stimuli	**Correct**	**Incorrect**
Total Correct:		

Set 3:		
Stimuli	**Correct**	**Incorrect**
Total Correct:		

Appendix I

Stimulus Pairing Observation Procedure: Crafts

SET 1:

A: Dictated Name	B: Picture
Pencil	Pencil
Paint	Paint
Brush	Brush
Paint	Paint
Pencil	Pencil
Brush	Brush
Pencil	Pencil
Brush	Brush
Paint	Paint

A: Dictated Name	C: Printed Word
Paint	Paint
Brush	Brush
Pencil	Pencil
Brush	Brush
Paint	Paint
Pencil	Pencil
Paint	Paint
Pencil	Pencil
Brush	Brush

A: Dictated Name	B: Picture
Paint	Paint
Brush	Brush
Pencil	Pencil
Brush	Brush
Paint	Paint
Pencil	Pencil
Paint	Paint
Pencil	Pencil
Brush	Brush

A: Dictated Name	C: Printed Word
Brush	Brush
Pencil	Pencil
Paint	Paint
Pencil	Pencil
Brush	Brush
Paint	Paint
Pencil	Pencil
Paint	Paint
Brush	Brush

A: Dictated Name	B: Picture
Brush	Brush
Pencil	Pencil
Paint	Paint
Pencil	Pencil
Brush	Brush
Paint	Paint
Pencil	Pencil
Paint	Paint
Brush	Brush

A: Dictated Name	C: Printed Word
Pencil	Pencil
Paint	Paint
Brush	Brush
Paint	Paint
Pencil	Pencil
Brush	Brush
Pencil	Pencil
Brush	Brush
Paint	Paint

Appendix J

Stimulus Pairing Observation Procedure: Music

SET 1:

A: Dictated Name	B: Picture
Guitar	Guitar
Shaker	Shaker
Conga	Conga
Shaker	Shaker
Guitar	Guitar
Conga	Conga
Guitar	Guitar
Conga	Conga
Shaker	Shaker

A: Dictated Name	C: Printed Word
Shaker	Shaker
Conga	Conga
Guitar	Guitar
Conga	Conga
Shaker	Shaker
Guitar	Guitar
Shaker	Shaker
Guitar	Guitar
Conga	Conga

A: Dictated Name	B: Picture
Shaker	Shaker
Conga	Conga
Guitar	Guitar
Conga	Conga
Shaker	Shaker
Guitar	Guitar
Shaker	Shaker
Guitar	Guitar
Conga	Conga

A: Dictated Name	C: Printed Word
Conga	Conga
Guitar	Guitar
Shaker	Shaker
Guitar	Guitar
Conga	Conga
Shaker	Shaker
Guitar	Guitar
Shaker	Shaker
Conga	Conga

A: Dictated Name	B: Picture
Conga	Conga
Guitar	Guitar
Shaker	Shaker
Guitar	Guitar
Conga	Conga
Shaker	Shaker
Guitar	Guitar
Shaker	Shaker
Conga	Conga

A: Dictated Name	C: Printed Word
Guitar	Guitar
Shaker	Shaker
Conga	Conga
Shaker	Shaker
Guitar	Guitar
Conga	Conga
Guitar	Guitar
Conga	Conga
Shaker	Shaker

Appendix K

Matching-to-Sample: A-B

SET 1:

A: Dictated Name	**B: Picture**			**Response:** +/- +p
Guitar	Guitar	Shaker	Conga	
Conga	Shaker	Conga	Guitar	
Shaker	Conga	Guitar	Shaker	
Conga	Shaker	Conga	Guitar	
Guitar	Guitar	Shaker	Conga	
Shaker	Conga	Guitar	Shaker	
Conga	Guitar	Shaker	Conga	
Guitar	Conga	Guitar	Shaker	
Shaker	Shaker	Conga	Guitar	
				Total: /9

SET 1:

A: Dictated Name	**B: Picture**			**Response:** +/- +p
Conga	Guitar	Shaker	Conga	
Shaker	Shaker	Conga	Guitar	
Guitar	Conga	Guitar	Shaker	
Shaker	Shaker	Conga	Guitar	
Conga	Guitar	Shaker	Conga	
Guitar	Conga	Guitar	Shaker	
Conga	Guitar	Shaker	Conga	
Guitar	Conga	Guitar	Shaker	
Shaker	Shaker	Conga	Guitar	
				Total: /9

Appendix L

Matching-to-Sample: A-C

SET 1:

A: Dictated Name	**C: Text**			**Response:** +/- +p
Guitar	Guitar	Shaker	Conga	
Conga	Shaker	Conga	Guitar	
Shaker	Conga	Guitar	Shaker	
Conga	Shaker	Conga	Guitar	
Guitar	Guitar	Shaker	Conga	
Shaker	Conga	Guitar	Shaker	
Conga	Guitar	Shaker	Conga	
Guitar	Conga	Guitar	Shaker	
Shaker	Shaker	Conga	Guitar	
				Total: /9

SET 1:

A: Dictated Name	**C: Text**			**Response:** +/- +p
Conga	Guitar	Shaker	Conga	
Shaker	Shaker	Conga	Guitar	
Guitar	Conga	Guitar	Shaker	
Shaker	Shaker	Conga	Guitar	
Conga	Guitar	Shaker	Conga	
Guitar	Conga	Guitar	Shaker	
Conga	Guitar	Shaker	Conga	
Guitar	Conga	Guitar	Shaker	
Shaker	Shaker	Conga	Guitar	
				Total: /9

Appendix M

Matching-to-Sample: A-B-C

SET 1:

A: Dictated Name	**Relation**	**Stimuli**			**Response:** +/- +p
Guitar	A-C	Guitar	Shaker	Conga	
Conga	A-B	Shaker	Conga	Guitar	
Shaker	A-B	Conga	Guitar	Shaker	
Conga	A-C	Shaker	Conga	Guitar	
Guitar	A-C	Guitar	Shaker	Conga	
Shaker	A-B	Conga	Guitar	Shaker	
Conga	A-C	Guitar	Shaker	Conga	
Guitar	A-C	Conga	Guitar	Shaker	
Shaker	A-B	Shaker	Conga	Guitar	
					Total: /9

SET 1:

A: Dictated Name	**Relation**	**Stimuli**			**Response:** +/- +p
Conga	A-C	Guitar	Shaker	Conga	
Shaker	A-B	Shaker	Conga	Guitar	
Guitar	A-B	Conga	Guitar	Shaker	
Shaker	A-C	Shaker	Conga	Guitar	
Conga	A-C	Guitar	Shaker	Conga	
Guitar	A-B	Conga	Guitar	Shaker	
Conga	A-C	Guitar	Shaker	Conga	
Guitar	A-C	Conga	Guitar	Shaker	
Shaker	A-B	Shaker	Conga	Guitar	
					Total: /9